REPUBLIC OF INDONESIA

REPORT

ON

DEVELOPMENT OF PULP AND PAPER INDUSTRY

November 1970

prepared for

OVERSEAS TECHNICAL COOPERATION AGENCY

GOVERNMENT OF JAPAN

by

JAPANESE SURVEY TEAM FOR THE DEVELOPMENT PLAN OF PULP AND PAPER INDUSTRY IN THE REPUBLIC OF INDONESIA

FOREWORD

In compliance with the request of the Government of the Republic of the Government of the Republic of Indonesia, the Government of Japan agreed to extend its assistance in the field survey of the entire area of Indonesia for clarifying the existing state of its paper and pulp industry, availability and distribution of pulpwood resources and other development problems, and entrusted the Overseas Technical Cooperation Agency with its execution. The survey was conducted to collect data and information needed in the formulation of a master plan for developing Indonesia's paper and pulp industry as part of its Five Year Economic Development Plan.

The Agnecy, having full congnizance of the necessity for Indonesia to develop pape and pulp industry, organized an eight-man team headed by Mr. Tomoya Muramatsu, Manager of Business Department of Honshu Paper Co., Ltd., and despatched it Indonesia for a field survey which lasted for a period of 35 days from June 4, 1970.

The report hereby presented has been compiled on the basis of the findings of the field survey.

It would give me a great pleasure if this report should serve to accelerate the development of Indonesia's paper and pulp industry and at once enhance the amity between Indonesia and Japan.

I avail myself of this opportunity to express my heartiest gratitude to the competent Indonesian authorities, the Ministry of Industry in particular, for their unlimited assistance and cooperation which were most valuable in the execution of survey activities.

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October 1970

Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency

国際協力事業団

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I. INTRODUCTION

1. Purpose of Survey

In an effort to reconstruct her national economy, Indonesia has been implementing, since 1969, a Five Year Economic Development Plan involving Pulp and Paper industry for which Japan was requested to extend her assistance in the formulation of a master plan.

The survey team despatched to Indonesia in compliance with the said request of the Indonesian Government was commissioned to the task of studying and clarifying problems presently involved in the Indonesian Pulp and Paper industry and charting the course of its furture development for the formulation of the master plan. It was desired that the master so prepared would be compatible, on the one hand, with the overall economic and ind. ..l development of Indonesian and would contribute, on the other, to the efficient use of economic assistance now being extended to the country by the Japanese Government.

Field surveys conducted by the survey team therefore covered all the paper mills now in existence and those whose contruction in under examination.

2. Acknowledgement

The survey team was organized rather hastily around the middle of May 1970 and engaged in survey activities for purposes described in the preceding paragraph. Despite the limited time allowed for the survey and the inability to make satisfactory arrangements and preparations in advance, the team was enabled, with the cooperation of official and private organizations concerned, to fulfil its functions as scheduled.

The team wishes to express its deep gratitude to the competent Indonesian authorities, the Japanese Embassy in Djakarta, and Japanese organizations and residents in Indonesia whose unlimited cooperation has been most valuable in the smooth implementation of survey activities.

3. Formation of Survey Team

Name	Assignment	Position
Tomoya Muramatsu	Leader	Manager, Sales Administration Department, Honshu Paper Co., Ltd.
Noriteru Ono	Mechanical Engineer	Chief Engineer, Oji Paper Co., Ltd.
Hisao Ohsako	Forester	Manager, Pulpwood Division, Mitsubishi Paper Mills Co., Ltd.
Yasuji Mori	Mechanical Engineer	Engineer, Jujo Paper Co., Ltd.
Seiichi Murakami	Market Researcher	President's staff, Shikoku Paper Manufacturing Co., Ltd.

Name	Assignment	Position
Chowa Matsunoo	Forester	Chief, Import Wood Section, Honshu Paper Co., Ltd.
Riichiro Shibata	Paper Manufacturing Engineer	Chemist, Hokuetsu Paper Co., Ltd.
Yasutomo Suzuki	Market Researcher	Coordinator, Ministry of International Trade and Industry

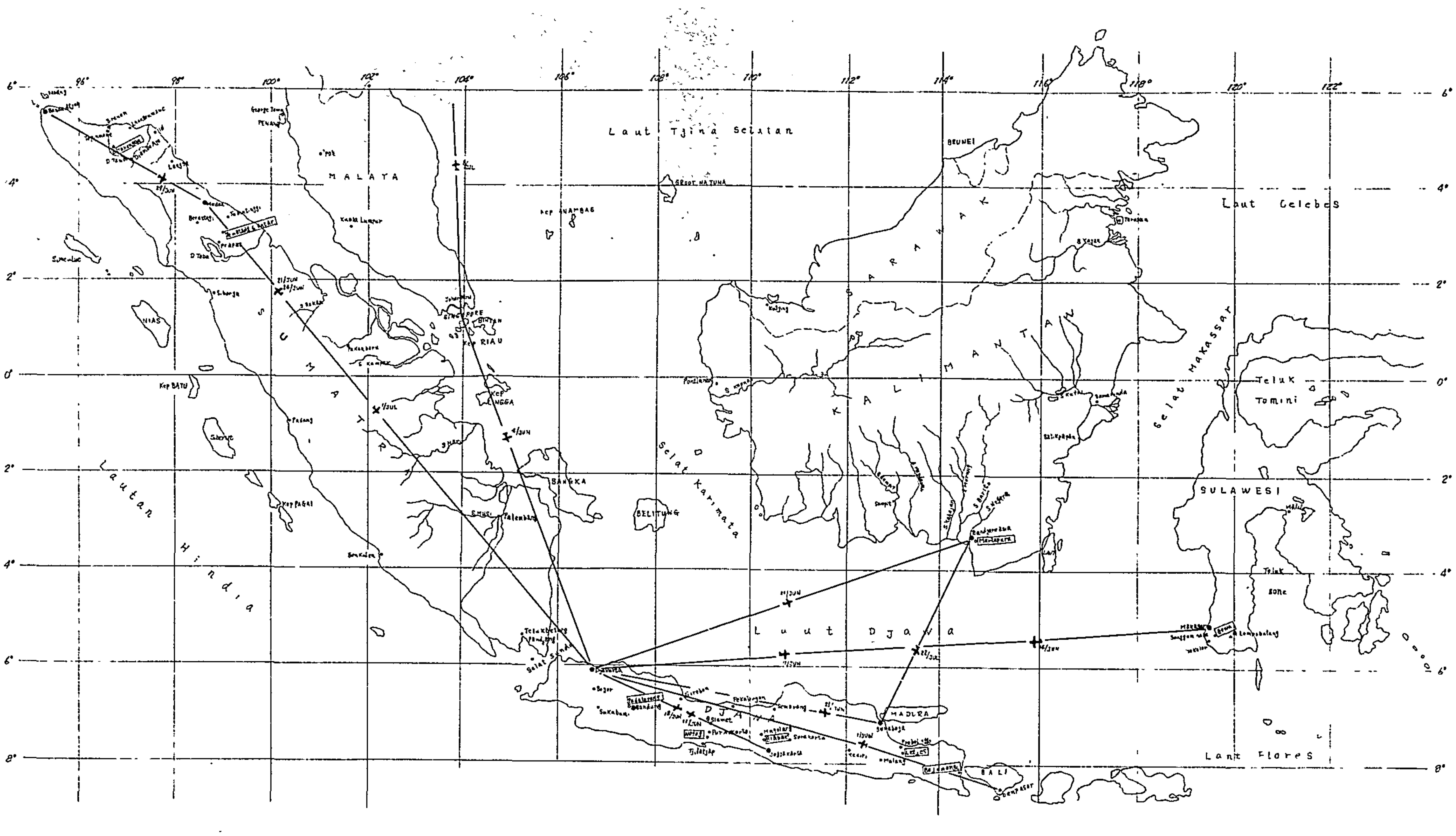
4. Itinerary of Survey Team

Date	Day	Members	Description
June 4	Thu.	All members	Departure from Haneda and arrival at Djakarta.
5	Fri.	"	Courtesy calls on and arrangements with the Japanese Embassy, OTCA, OECF and JCI.
6	Sat.	"	Courtesy call on and arrangements with the Ministry of Industry.
7	Sun.	"	Inspection of Bogor Botanical Garden.
8	Mon.	"	Visits to Japanese firms concerned and arrangements with the Japanese Embassy.
9	Tue.	"	Departure from Djakarta for a visit to Padalarang Paper Mill. Overnight stay at Bandung.
10.	Wed.	"	Visits to the Cellulose Research Institute and Padalarang Paper Mill. Return to Djakarta.
11	Thu.	Muramatsu, Ohsako, Murakami, Matusnoo and Mori (A Group)	Departure from Djakarta and arrival at Makasar.
		Ono, Suzuki and Shibata (B Group)	Departure from Djakarta and arrival at Jogjakarta.
12	Fri.	A Group	Visit to Gowa Paper Mill and inspection of a bamboo forest in Gowa.
13	Sat.	B Group	Visit to Blabak Paper Mill.
14	Sun.	A Group	Departure from Makasar and arrival at Djakarta.
		B Group	Classification of data.
15	Mon.	Muramatsu, Murakami and Mori	Visits to paper converting plants in Djakarta, and arrangements with OECF and JCI.

Date	Day	Members	Description
Jun 15	Mon.	Ohsako and Matusnoo	Departure from Djakarta and arrival at Semarang.
		Ono, Shibata and Suzuki	Departure from Blabak and arrival at Notog.
16	Tue.	Muramatsu, Murakami and Mori	Market Research in Djakarta.
17	Wed.	Ohsako and Matsunoo	Visit to Perhutani Branch Office and inspection of forests in Notog area.
		Oho, Shibata and Suzuki.	Inspection of Notog Project area.
18	Thu.	Muramatsu, Murakami and Mori	Arrangements with the Japanese Embassy and the Ministry of Industry.
		Ohsako and Matsunoo	Inspection of Tjilatjap area.
		Ono, Shibata and Suzuki	Departure from Jogjakarta and arrival at Djakarta.
19	Fri.	Ohsako and Matusnoo	Arrival at Djakarta.
		All other members	Classification of data.
20	Sat.	Ono and Murakami	Departure from Djakarta and arrival at Bandjarmasin.
		All other members	Classification of data.
21	Sun.	Ono and Murakami	Visit to Martapura Paper Mill.
		Mori, Shibata, Ohsako and Matsunoo	Departure from Djakarta and arrival at Medan.
		Suzuki	Departure from Djakarta and arrival at Surabaja.
		Muramatsu	Stay in Djakarta for a visit to a corrugated board factory.
22	Mon.	Ono and Murakami	Departure from Bandjarmasin and arrival at Surabaja where Suzuki joined the group.
		Mori, Shibata, Ohsako and Matsunoo	Visit to Siantar Paper Mill.
		Muramatsu	Arrangements with the Japanese Embassy, Ministry of Industry and other organizations.

Date	Day	Members	Description
Jun 23	Tue.	Ono, Murakami and Suzuki	Courtesy call on and arrangements with the Surabaja District Office of the Ministry of Industry, and visit to cigarette plants.
		Mori, Shibata, Ohsako and Matsunoo	Departure from Siantar and arrival at Medan.
		Muramatsu	Presentation of a progress report to the Japanese Embassy.
24	Wed.	Ono, Murakami and Suziki	Market research in Surabaja.
		Mori, Shibata, Ohsako and Matsunoo	Aerial survey of Takengun district.
		Muramatsu	Departure from Djakarta and arrival at Medan.
25	Thu.	Ono, Murakami and Suzuki	Departure from Surabaja and arrival at Letjes.
		Muramatsu, Mori, Shibata, Ohsako and Matsunoo	Departure from Medan and arrival at Takengun.
26	Fri.	Ono, Murakami and Suzuki	Visits to Letjes Paper Mill and sugar plants.
27	Sat.	Muramatsu, Mori, Shibata, Ohsako and Matsunoo	Survey of Takengun and its vicinities.
28	Sun.	Ono, Murakami and Suzuki	Departure from Letjes and arrival at Banjuwangi.
		Muramatsu and Matsunoo	Departure from Takengun and arrival at Banda Atjeh.
		Mori, Shibata and Ohsako	Departure from Takengun and arrival at Medan.
29	Mon.	Ono, Murakami and Suzuki	Visit to Banjuwangi Paper Mill, and arrival at Denpasar.
		Muramatsu and Matsunoo	Departure from Banda Atjeh and arrival at Medan.
		Mori, Shibata and Ohsako	Classification of data.
30	Tue.	Ono, Murakami and Suzuki	Classification of data.
		Muramatsu, Mori, Shibata, Ohsako and Matsunoo	Aerial survey of areas around Lake Toba and Takengun.

Date	Day	Members	Description
Jul 1	Wed.	Ono, Murakami and Suzuki	Departure from Denpasr and arrival at Djakarta.
		Muramatsu, Mori, Shibata, Ohsako and Matsunoo	Departure from Medan and arrival at Djakarta.
2	Thu.	All members	Classification and arrangement of data
3	Fri.		
4	Sat.	"	Report to the Japanese Embassy.
5	Sun.	"	Preparations for return trip
6	Mon.	"	Report to the Ministry of Industry, and shipment of official documents and articles.
7	Tue.	"	Courtesy call on the Japanese Embassy, OECF, OTCA and JCI, and report to BAPPENAS.
8	Wed.	"	Departure from Djakarta for Tokyo.


Laut Tjina Selatan
MALAYA
SUMATRA
Lautan Hindia
Selat Karimata
KALIMANTAN
SARAWAK
BRUNEI
Laut Celebes
Selat Makassar
Teluk Tomini
SULAWESI
Teluk Bone
Laut Djawa
Laut Flores
NIAS
BANGKA
BELITUNG
MADURA
BALI
DJAWA

6. Summary

To give appropriate recommendations on the development of the Indonesian Pulp and Paper industry, it is of controlling importance to have a thorough acquaintance with its constitution and nature coupled with an accurate knowledge of its existing conditions. These factors are immensely affected by the hereditary and environmental characteristics to which the country is subjected.

From this standpoint, the team endeavoured to confirm the "herediatry" characteristics of Indonesia formed by its long history, studied the basic principles and policies of the present Administration from its Five Year Economic Plan, administrative organization and taxation system to have an understanding of its "domestic environments", and also exerted itself to get acquainted with its "social environments" through examination of its labour force and infrastructure as well as the level of industries affiliated with the pulp and paper industry. (Refer to Part II).

A characteristic never to be overlooked with respect to the Indonesian pulp and paper industry is that the raw materials required for the industry comprise chiefly of addy straw and bamboo at present, with little or no pulp wood being in use. The team is of the opinion that the desired development of pulp and paper industry and production of quality products will necessitate, in addition to the continued use of the conventional cheap raw materials, an increased use of pulp wood through exploitation of forests and woods. (Refer to Part III).

Another characteristic of the Indonesian pulp and paper industry that deserves attention is that despite the low level of demand for papers, the domestic production is still lower and satisfies less than 20% of domestic requirements. However, in view of the potential abundance of raw materials and of the apparent trend for increased domestic demand for papers for packing and other industrial uses, it is probable that production increase by a large margin would be achieved if attention is paid to the proper selection of products to be turned out. It is also probable that the domestic demand can be met without resorting to import if the country's own paper industry grows to have international competitive power in quality and price. (Refer to Part IV).

With this in mind, the team made surveys on seven existing paper mills (one of which is under construction) by visiting each of them.

As shown in Table 1, most of the paper mills visited are either expected to enter shortly into the black. There are still some mills, however, whose operation is considered to remain for some time to come. Visits to these paper mills enabled the team to be informed of their respective problems. (Refer to Part V).

Survey activities also covered Takengon and Notog Districts, the proposed sites for

Table 1 Conditions of Existing Paper Mills in Indonesia

	Paper Mill	Location	Year of Construction	Pulp: Material	Pulp: Production Method	Water Supply	Power Supply	Paper Making Machine: Wire Width No. of Driers	Paper Making Machine: Design Daily Capacity	Kinds of Products	Present Daily Production	Monthly Sales under Full Operating Condtions: Delivery by Trucks	Monthly Sales under Full Operating Condtions: Delivery by Sea Transport	No. of Employees	Appraisal of Payability	Problems Involved and Measures to be Taken
Mills Already in Operation	Padalarang	Western Djawa	1922 & 1932 (Netherlands)	Paddy straw	Soda method	Spring water	Commercial power and private power generation	2.40 m 10	12 tons	Printing paper Writing paper Thin paper Note-books	12 tons	300 tons	0	723	Operation shows a profit	1. Superannuation of facilities. 2. Qualitative and quantitive limit incidental to the use of straw as material. 3 Installation of a new thin paper making machine
	Blabak	Central Djawa	1957 (Italian credit)	"	Pomilio method	"	Private power generation	2.60 m 26	20 tons	Writing and printing papers	10 tons	250 tons	0	519	Operation suspected to be in a slight deficit.	1. Production recovery by means of Pomilio Method. 2. Improvement of generator capacity. 3. Limitation to the use of straw. 4. Achievement of planned daily production of bagasse.
	Letjes	Eastern Djawa	1939 (Netherlands) 1970 (German credit)	"	Soda method	Lake water	Commercial power (Private power generation)	2.70 m 16 2.70 m 23	30 tons	"	24 tons	600 tons	0	898	Deficit operation due to additional equipment installation considered to be improved shortly.	1. Augmentation of daily production capacity through installation of a new machine and increased pulp production. 2. Use of bagasse pulp for paper production.
	Banjuwangi	"	1969 (Japanese reparation)	Bamboo	KP method (Used chemicals are recovered)	River water	Private power generation	2.80 m 25	30 tons	"	22 tons	750 tons	0	767	Profit gainable by a monthly production of 600 tons.	1. Achievement of planned daily production through rehabilitation of facilities and installation of stand-by machines. 2. Elevation of technical level. 3. Estimation of upper limit of production increase.
	Gowa	Southern Sulawesi	1967 (Japanese reparation)	"	"	"	"	2.75 m 23	30 tons	"	0	300 tons	450 tons	880	Profit gainable by a monthly production of 650 tons.	1. Resumption of production activities through early completion of rehabilitation work. 2. Construction of forest roads and intake facilities. 3. Improvement of management and technical level. 4. Securing of working funds and machine parts. 5. Ocean freight for transport of products.
	Pematang Siantar	Northern Sumatra	1967 (Japanese reparation)	Pinus Merkusii Imported BKP	GP method	"	"	1.93 m 20	15 tons	Newsprint Low grade printing paper	1 – 2 tons	200 tons	175 tons	228	Deficit suspected unavoidable even by full-scale operation.	1. Recovery from deficit operation 2. Price modification of newsprint 3. Change of production coverage. 4. Low daily production capacity. 5. Subsidies to make up for high ocean freight and deficit.
Mill Not Put in Operation Yet	Martapura	Southern Kalimantan	Construction under the Japanese reparation in progress	Rubber tree Agathis Berneesis Werb	KP method (Chemicals recovered) GP method	"	"	1.50 m 20	10 tons	Low grade printing paper	–	100 tons	150 tons	400 (planned)		1. Pulp production from rubber trees. 2. Small scale integrated production. 3. Completion and trial operation of production facilities. 4. Ocean freight for transport of products. 5. Improvement of technical level 6. Securing of labour force. 7. Production of proper kinds of commodities.
Total									147 tons		69 – 70 tons			4.415		

establishment of pulp and paper industry, where the team studied the possible development of the two districts with consideration given to the weight each district would carry in the entire pulp and paper industry of the country. (Refer to Part VI)

As a result of the surveys briefed above, the team reached the conclusion and recommendations given below.

1) Though subjected to a number of problems to be solved, the Indonesian pulp and paper industry has excellent prospects. Raw materials available at low costs, if exploited in future, will amply satisfy the need for large production increase. With the rate of self-supplying capacity still remaining on a low level, development of pulp and paper industry should be given a high priority since it can readily be promoted for full domestic production.

2) Conventional production pattern which has been concentrated on printing and writing papers should be shifted to the production of papers for industrial uses, particularly the packaging and wrapping papers.

3) Development of the Indonesian pulp and paper industry should be promoted gradually by following slow but steady development stages. For this purpose, adoption of the following three plans is recommended.

a) Plans for Immediate Implementation

Maximum efforts should be made for early attainment of the design capacity set for paper mills at Padalarang, Blabak, Letjes, Banjuwangi and Gowa. Though this will call for some repair works of superannuated and defective facilities as well as for the securing of spare parts and stand-by equipment, operation of all the five paper mills will enter into the black if capital investment is made for such repair works and procurement of parts and equipment for stand-by use (and if the import tariff on HVS and others is maintaned).

For operation of Pematang Siantar Mill which fails to prodocue returns for the moment, continued supply of deticit covering subsidies is recommended in anticipation of the favourable turn of environmental conditions in future.

As for Martapura Mill whose construction is nearing completion, its operation is not to be expected to yield profit though its smooth and payable operation is hoped for.

b) Short-term Plan

Padalarang Mill is recommended to be equipped with a cigarette paper machine during the few years before completion of the Five Year Plan so that it will make a new start as a thin paper mill.

For the four paper mills located at Blabak, Letjes. Banjuwangi and Gowa, maximum production increase is urged to be materialized within the limits of available water supply, materials and plant facilities, with efforts made for comprehensive coordination between them for production items.

It is further recommended that one of these mills be provided with a clay coating equipment for production of paper with higher quality and more added-value.

The annual production capacity of 160 thousand tons envisaged to be attained under the Five Year Plan around the end of its term is a rather hopeful and optimistic estimate. Production increase is recommended to be prompted at a steady and justifiable pace.

c) Long-term Plan

Management of those paper mills which are presently enjoying profitable operation may reach an impasse in future in regard to their production capacity and the quality of their products because of their dependence on paddy straw and bamboo. To avert such an impasse, use of bagasse and pulp wood is recommended, thereby to improve the quality and production capacity and to shift to the production of more profitable commodities.

It is expected that by the time when the aforementioned measures have been taken, both Takengun and Notog Projects which resort mainly to acerose trees will be brought close to their materialization, with the pulp production from latifoliate trees also developed into full scale operation. The pulp and paper industry of the country will then undergo a transformation from the groups of small-scaled integrated paper mills into an all-inclusive, comprehensive and medium-scaled pulp and paper industry, and enter into the second stage of its development.

To ensure the domestic production of wood pulp and mass production of paper products under Tagengun and other projects, necessary preparations should be initiated immediately.

4) Following protective measures should be taken since the Indonesian pulp and paper industry is as yet unable to sustain itself on its own.

a) Institutional improvement involving the new establishment of main offices which would provide a uniform guidance and supervision.

b) Tax prerogatives including protective tariff, corporation tax, sales tax, etc.

c) Smooth provision of funds for construction, repair works and operation, and

special financial measures to cover the deficit accumulated since the commencement of operation.

d) Provision of training courses for elevation of management and production techniques.

e) Inducement of foreign credits and technical cooperation.

f) Elevation of the level of infrastructure and industries affiliated with the pulp and paper industry.

g) Establishment of an improved distribution system.

5) Need for Self-fulfilment

Needless to say, the management of respective paper mills, whether state-owned or privately operated, should exert its own efforts to achieve a favourable payability. For this purpose, it is recommended that –

a) the Asosiasi Pulp & Kertas Indonesia take the lead for the rationalization of the industry through its diversified activities;

b) engagement in the processing industries be accelerated to assure and improve the added-value productivity;

c) efforts be made for development of new products and materials;

d) introduction of profit-based budget compilation and management control based on profit end production goals be effected for cost reduction.

II. ENVIRONMENTAL CONDITIONS SURROUNDING THE INDONESIAN PULP AND PAPER INDUSTRY

1. Structural Characteristics of Indonesia

Indonesia is physically composed of many islands scattered in a wide area extending over a distance of 5,100 km from east to west and 1,800 km from north to south. North-south extension of the area is plotted by Sabang Island situated in Lat. 6°N to the north of Sumatra Island and by Timor Island situated in Lat. 1°S. At the western end of the area is Sumatra Island (Long. 95°E), and at the eastern end is West Irian (Long. 148°E). Numerous islands found in this vast area, counting as many as 13,677, have a total area of 1,904,345 km^2 which is 5.2 times as wide as Japan, with a population of about 120 million.

The oceanic tropical climate of the country dividies the whole year into two distinct seasons, the wet season lasting from October to March and the dry season from April to September. Although the entire country is situated close to equator, its climate affords relatively comfortable living environments with the atmospheric temperature and precipitation averaging 25 to 27°C and 1,500 to 2,000 mm respectively throughout the year.

The country produces a variety of agricultural products such as rubber, tobacco, coffee, copra, palm oil, tea and sugar, and is also favoured with rich mineral resources including petroleum, zinc, bauxite and coal as well as abundannt forest resources.

Inhabitants are composed of about 600 tribes belonging mostly to the Malay-Mongoloid stock, with a minor portion that belongs to the Melanesian stock. In addition to the Indonesian which is adopted as the national language, it is said that more than 400 different languages (Bahasa Daerah) are spoken by respective tribes in different areas. Indonesia is the world's largest Islamic country with about 85% of its inhabitants following Islamism. Followers of Christianity and Hinduism are also found though in a limited number. Ardent Islamic inhabitants who strictly follow the doctrines of their faith are found in larger numbers in outer areas including Sumatra and Sulawesi Islands than in Djawa Island. Customs of the inhabitants vary by tribes and areas.

65% of the total population, or 78 million persons, live in Djawa and Madura Islands, whereas the outer areas involving Sumatra, Sulawesi and Kalimantan Islands are inhabited by 42 million persons. With its high population density which is rarely seen in other parts of the world, Djawa Island was the political, economic as well as social centre throughout the 350 years of Dutch colonial control. In contrast with Djawa Island, the outer areas including Sumatra and other islands were subjected to the colonial exploitation due to their rich natural resources but were left intact with reinvestment made for their development. The cultural disparity between Djawa and other islands created over the colonial period

is still very large and does not appear to be narrowed even today. In Djawa Island, natural resources are being drained in inverse proportion to the population expansion. Its economy therefore depends increasingly on the rich natural resources available in the outer territories.

Indonesia joined the sovereign countries of the world after it earned independence through the struggle for freedom which lasted from 1945 to 1949. However, the efforts made after independence for casting away the colonial economy and establishing a new and sound economy of its own based on the national consciousness did not produce the expected results on account of the failure of economic policies and the priority given to the military and political aspects. The general decline of the Indonesian economy could therefore be considered to have resulted from the devastation of the colonial economy.

The political, social and economic instability suffered by Indonesia today arises the following structural characteristics of the country.

(1) Existence of numerous islands within a vast territory.
(2) Inhabitants consisting of different tribes.
(3) Difference in languages and customs between tribes.
(4) Disparity in political, economic and cultural level between Dajawa Island and the outer terriority.
(5) Dual economic structure.

It is quite understandable that the Indonesian Government has, ever since the days of Sukarno Administration, advocated the slogan "Satu Nusa, Satu Bangsa, Satu Bahasa (Single State, Single Race and Single Language)" on every occasion it fetches, with "Bhinneka Tunggal Ika (a motto meaning the unity in diversity in Sanskrit)" engraved in the crest of Garuda.

This policy for accelerating the unit of the country is succeeded to by the present Administration.

2. Fundamental Policies of the Present Administration and the Five Year Economic Development Plan

2-1 Political and economic transition

On August 17, 1945 immediately after termination of the World War II, Indonesia declared independence and embarked on military actions against the Netherlands. The ensuring years witnessed a number of developments including a long period political blank created before the establishment of the Dutch-Indonesian Union based on the Hague Treaty concluded in November 1949, the denunciation of the said Treaty soon after its conclusion, and attainment of complete independence in February 1956. The political confusion which prevailed Indonesia before independence invited its economic devastation.

The prime cause for delayed reconstruction of Indonesian economy is the gross mistake committed by Hatta and Shafril, the pro-westen group in the triarch system including Sukarno which ruled the country during the aforementioned pre-independence period, who gave preference to the restoration of Dutch economic interests in Indonesia over the economic rehabiliation and modernization of their own nation.

The advent of Sukarno Administration, realized after expulsion of Hatta and Shafril in 1957, was unfortunately accompanied by the armed rebellion which took place successively in the outer territory of Sumatra, Sulawesi and Kalimantan. The Government was therefore forced to take policies giving priority to military actions in order to maintain public peace, and the activities for economic reconstruction inevitably gave place to politics and military actions With the recovery of public peace in 1960, a chance for economic rehabilitation was offered, but was soon withdrawn due to the ensuring recurrence of conflict with the Netherlands on West Irian and the hostile policy taken against Malaysia in 1963.

In the meantime, removal of the Dutch economic influence resulted in the impeded development of the two major sectors of the country's economy, i.e., the modern industrial sector involving concentrated capital investment and the traditional rural economy supported by intensive supply of labour force. During the period subsequent to 1961 when the Sukarno Administration reinforced its dictatorship, red-ink budget was continually carried out to cover the expenses for the expanding national armaments, which sharply aggravated the trend for inflation that started during the World War II.

The price index during the period mentioned above with 1954 taken as the base year is as given below.

1954	100
1958	206
1959	275
1960	330
1961	644
1962	1,648
1963	3,770
1964	8,870
1965	61,400

The failure of the Eight-Year Comprehensive Development Plan implemented from 1961 caused the inflation to become more rampant than ever. This failure invited, coupled by the confiscation and nationalization of assets belonging to Europeans and anticommunist Chinese residents, a decline of production, distribution and foreign trade, and further deterred the smooth operation of the communication system connecting numerous islands of the

country. Expansion of military movements spurred the already dwindling trend of economy, causing the isolation of regional economy. As a remedy to such situation, the Government then made an attempt to attain the self-sufficiency of local economy, and dared to make double investments for construction of small factories in each locality. Construction of paper mills carried out under the Japanese reparation is an example of such attempt of the Government.

2.2 Fundamental Policies of the Present Administration

Prime objectives entertained by the present Administration are the removal of all evils produced under the Sukarno Administration, checking of the downward trend of economy, curbing of inflation, and establishment of a sound basis for future economic development.

The fundamental strategy to attain these objectives, whose particulars are briefed below, is incorporated in the "Policies for Activities of the Ampera Cabinet" which was adopted at the meeting of M.P.R.S. in July 1966.

(1) Preference of domestic interests over international interests, with stress placed on agricultural development for economic rehabilitation.

(2) Implementation of short-term development measures including—
Checking of inflation;
Restoration of economic infrastructure;
Export promotion;
Self-sufficiency of foodstaffs; and
Self-sufficiency of clothing.

(3) Implementation of long-term development measures in the following priority order—
a) Agriculture
b) Infrastructure
c) Mining and manufacturing industries, and petroleum industry.

(4) Abandonment of projects which are neither economical nor productive.

(5) Implementation of measures for local development involving—
a) Authorization of wide autonomous right of local governments;
b) Commissioning local governments to the coordination of developments in their respective areas; and
c) Attainment of balanced relations between the central and local governments in the financial aspects.

(6) Rearing and fostering of cooperative associations.

(7) Approval of private capital investments. (Under the Sukarno Administration,

priority was given to the state capital)

(8) Implementation of foreign policies centering on the preferential assurance of national interests and observation of the principles of economics.

(9) Inducement of foreign credits and assistances compatible with the future repayment capability and not liable to incur an increased burden on the nation.

(10) Achievement of economic rehabiliation and stabilization in phases.

a)	Latter half of 1966 :	Liberation period.
b)	First half of 1967:	Rehabiliation period during which the supply of nine basic commodities is to be increased.
c)	Latter half of 1967:	Development period during which productivity improvement is to be accelerated and the self-sufficiency of the nine basic commodities is to be achieved.
d)	1968:	Stabilization period.

Efforts of the present Administration to cast away the economic isolation which was advocated as economic independence under the Sukarno Administration and to shift to open economy for inducement of foreign economic aids on the basis of the abovementioned basic strategy are yielding, though at a slow tempo, satisfactory results in the political as well as economic stabilization.

2-3 Five Year Economic Development Plan

The Indonesian economy, which has gone through the rehabilitation and stabilization phases mentioned in item (10) of the preceding paragraph, is now in the development stage under the Five Year Development Plan which covers the period from April 1, 1969 to March 31, 1974.

In the Five Year Development Plan, which was formulated in conformity to the "Policies for Activities of the Ampera Cabinet," it is envisaged that the development efforts will be directed chiefly to agriculture, and the development of all other sectors is intended to promote the agricultural development. This basic attitude in implementing the Five Year Plan is quite justifiable for reasons given below.

1) Agriculture accounts for more than 50% of gross national income.
2) 75% of the inhabitants engage in agriculture.
3) Increased production and self-sufficiency of rice is a matter of top urgency.
4) Restoration of estate agriculture, which is a major source of foreign currency earnings, is urgently called for.

While the price stabilization of foodstuffs is an indispensable factor in the desired

stabilization of people's livelihood, it is hoped that the increased production of agricultural commodities will serve for the promotion of fertilizer and other affiliated industries as well as of the farm produce processing industries.

The Plan also envisages the solution of the current shortage of foreign currency reserve through promotion of exports and substitution of domestic products for import supplies. Acquisition of foreign currency earnings is expected to be attained by the export of agricultural and mining products, whereas the saving of foreign currency reserve is anticipated to be achieved chiefly by the development of domestic textile industry.

Needless to say, restoration and expansion of infrastructure is a prerequisite to the smoother distribution of commodities and quicker transmission of information. This points to the necessity for a huge capital investment to make up for the delayed economic development through the execution of the Five Year Plan. In this connection, it is noteworthy that besides calling on private concerns for active investment, the Government declared in the Five Year Plan that it would invest in infrastructure and other sectors which are not so attractive to private enterprises for their low profitability as well as in pilot activities. It also deserves attention that the Government, having allowed free capital transactions by foreign concerns under the Plan, appears particularly willing to induce capital investment, project aids and technical aids of foreign countries to cover the greater portion of the cost required in the implementation of the Plan.

The priority order of development measures incorporated in the Plan, as announced by Vice minister Salim of BAPPENAS, is as follows.

(1) Agriculture, with particular emphasis on foodstuffs.
(2) Infrastructure which is more needful of improvement than any other sectors.
(3) Industries as a whole.
(4) Increase of employment opportunities.
(5) Social development.

The future course of development of the Indonesian economy is to be understood from the above priority order and the basic strategey specified in the aforementioned "Policies for Activities of the Ampera Cabinet."

2-4 Weight of Pulp and Paper Industry in Five Year Development Plan

The Indonesian Government holds that pulp and paper industry would not only be most readily developed but would also serve for cutting down foreign currency payments through substitution for imported supplies and would eventually grow into an export industry. The Government also considers that pulp and paper industry carries a significant weight national development because it will absorb a large labour force and can be operated with locally available materials for production of papers whose demand will rise with the population increase and social development.

At present, however, the Indonesian pulp and paper industry has an annual production capacity of a mere 10 thousand tons, so that the demand is mostly met by imports and the rate of self-sufficiency is extremely low. Printing and writing papers occupy the highest percentage of all the products of pulp and paper industry of the country. Production of existing paper mills is on a level far below the design capacity due to the shortage of raw materials and working funds, superannuation of equipment and facilities, or inconvenient location.

Table 2 Five Year Development Plan of Indonesian Pulp and Paper Industry

Unit: Thousand tons

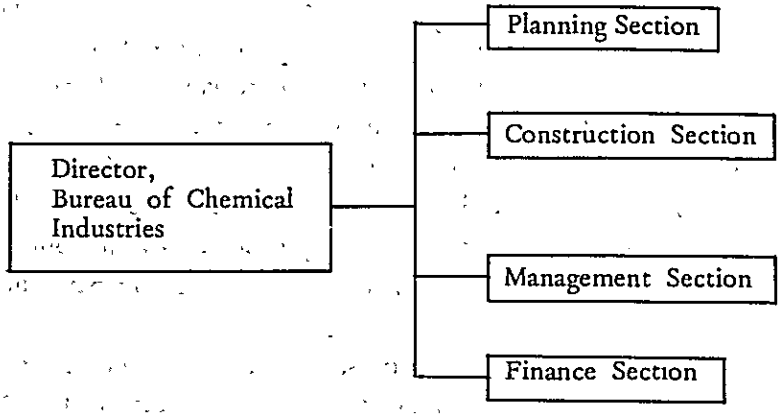
Year / Paper Mill	69/70	70/71	71/72	72/73	73/74
Letjes	4	9	12	12	12
Padalarang	3	4	4	4	4
Blabak	2.5	4	7.5	7.5	7.5
Pematang Siantar	1.5	3	4.5	4.5	4.5
Gowa	1.5	6	9	9	9
Banjuwangi	3	9	9	9	9
Private paper mills	0.5	0.5	0.5	0.5	0.5
Newsprint mills					60
Kraft paper mills					60
Total	16	35.5	46.5	46.5	166.5
Total value in million RP	109	224	314	314	1,049

The above table shows that the new construction of Banjuwangi Mill and expansion of Letjes Mill were accomplished during the intial two years of the plan as originally scheduled. The plan envisages the completion of Martapura Mill and other projects within the remaining three years for an annual production of 166,500 tons to be materialized at the outset of 1974. The team considers that the realization of the five year plan would not be possible without exertion of maximum efforts because of the miscarriage of plans currently noticed with the paper mills at Siantar, Gowa and Blabak and of the problems involved in the execution of Martapura and other projects. The plan may be justified, however, in that the production now centering on writing paper is intended to be diversified for supply of papers for industrial uses such as newsprint and kraft paper.

3. Administrative Organization

Though placed under the supervision of the Ministry of Industries, pulp and paper industry in Indonesia is under the direct control of the Bureau of Chemical Industries of the said

Ministry. The Bureau of Chemical Industries is divided into four sections as illustrated below.



These four sections, each controlled separately by the Director of the Bureau of Chemical Industries, take charge of chemical industries including pulp and paper, caustic soda, fertilizer, cement, automobile tyres, etc. in their respective capacities. To be more precise, when a project is taken up, the planning Section undertakes the preliminary survey for drafting its basic programme, formulation of working programme, liaison works and conslusion of contract. When the contract for construction is concluded, the project is transferred to the Construction Section which is responsible for the completion of construction work, trial operation, and supervison of the operating conditions for a specified time after delivery. The Construction Section transfers the project to the Management Section only after it is confirmed that the constructed facilities are ready to be put into normal service. The project thus transferred to the Management Section becomes a P.N. (state-operated enterprise), and leaves the hand of the Management Section as an independent P.T. (joint-stock company) when considered to have made a smooth growth. The team understands that the coordination and liaison between these sections and the adoption, implementation and transfer of new projects and other important questions are decided according to the resolution reached at the regular meeting held once a month with the attendance of the Director of the Bureau of Chemical Industries and chiefs of the four sections. Other government offices affiliated with pulp and paper industry are the Directorate General of Forestry, Ministry of Foreign Trade and Ministry of Public Works. It is hoped that a close cooperation and coordination be maintained between these offices and the Bureau of Chemical Industries.

During the survey period, the team maintained close contact with, and was offered valuable cooperation by, the Bureau of Chemical Industries. It must be added, though with much reluctance, that the team felt an acute shortage of statistics, reports, maps and other data, and noted the lack of an integrated guidance policy for pulp and paper industry and the sectionalism existing between government offices which may be ascribable, in part, to the organizational inadequacy of the Bureau of Chemical Industries. Under the

existing organization of the Bureau, a project for a paper mill, if adopted, is transferred from one section to another upon completion of respective stages such as planning, construction and management, but there seems to exist no appropriate system under which full responsibility is assumed for providing an integrated administrative guidance for the satisfactory implementation of the project throughout the project period with an eye on the overall trend of pulp and paper industry. In view of the short shistory of the Indonesian pulp and paper industry and the need for systematic and coordinated development of a number of small-scaled paper mills which are scattered throughout the country and operating on an integrated production system, it is advisable that an authoritative and responsible system be established under which development policies be implemented by the joint efforts of all competent government offices for the rapid growth of pulp and paper industry.

Apart from the abovementioned administrative offices, there exists an association of pulp and paper industry (Asosiasi Pulp & Kertas Indonesia) which was established in April 1969.

The organization and activities of the association are as described below.

Name:	Asosiasi Pulp & Kertas Indonesia
Establishment:	April 5, 1969
Location:	Bandung
Purpose:	Promotion of the Indonesian pulp & paper industry through the joint efforts of experts and experienced persons well versed with pulp and paper industry.
Activities:	(1) Establishment of a sound industrial basis for development of pulp and paper industry. (2) Development of the Indonesian pulp and paper industry into a full-fledged industry. (3) Cooperation and coordination between all pulp and paper enterprises with respect to— a) market, production and labour; b) research and investigation, and propagation of techniques. (4) Cooperation between domestic organizations affiliated with pulp and paper industry with the similar overseas organizations.
Main Office:	President—Ir. Satijatmo (Padalarang Mill) Vice President—Ir. Oetjok (Letjes Mill)
Secretariat:	Secretary General—Ir. Abubakar (Banjuwangi Mill) Deputy Secretary General—Ir. Adi Sumarja (Takengun Project) Director in Charge of General Affairs—Ir. Sri Margono (Blabak Mill) Director in Charge of Finance—Ir. Hendajani (Bandung Textile Research Institute)
Chiefs of Sections:	Finance—Drs. Sukarwandi (Bureau of Chemical Industries) Market—Ir. Moch. Sjoeb (Padalarang Mill) Research and Survey—Ir. R. Gardjito (Bandung Textile Research Institute)

Industrialization–P.A. Patinama Ing. (Banjumas Project)
Production and Techniques–Ir. Soeharto (Bureau of Chemical Industries)
Labour–Ir. Aflat (Bureau of Chemical Industries)

Branch Offices:
Sumatra–Pematang Siantar Mill
Central Djawa–Blabak Mill
Eastern Dajwa–Letjes Mill
Kalimantan–Martapura Project
Sulawesi–Gowa Mill

The Asosiasi, established with the abovementioned structure and objectives, already held two meetings, one in August and the other in November 1969, for coordination of production and sales activities between respective paper mills. It is hoped that the Asosiasi, whose activities are still limited due to its short history, will play a positive role in the development of the Indonesian pulp and paper industry. It is further hoped that the Natic Federation of the pulp and paper Industry of Japan will maintain a close contact with the Asosiasi and render technical and other assistances through the mutual exchange of information. The team noticed a strong concern expressed by the Asosiasi for the organization, management and activities of the Japanese Federation of the pulp and paper Industry.

4. Taxation System

The Indonesian Government kept on carrying out an unbalanced budget for many years. The deficit in budget reached its extreme in 1965 when an deficit rate of 173% against total revenue was recorded as a result of the outbreak of the September 30 Incident. With the untiring efforts made by the present Administration for resuming a balanced finance, the deficit rate declined to 5.8% and 5.7% against revenues and expenditures respectively in 1967.

Table 3 Breakdown of Revenues

Unit: Million RP

Item	Revenues Collected in 1967	Revenues Estimated for 1968
Direct Taxes	13,820	32,155
Indirect Taxes	6,447[3]	10,845
Customs Duties & Consumption Duties	23,557[5]	36,855[25]
Foreign Credits	25,580	32,700
Others Revenues	14,745[2]	26,130[7]
Total	84,150	138,685[95]

Note: Others include revenues from export bills, oil concession, foreign currency allocation to local governments, and receipts of respective government offices.

As is clear in the above table, nearly 30% of the total revenues is occupied by foreign credits, and customs and indirect taxes also account for a large portion of the revenues, whereas direct taxes amount to a small sum since they are imposed on a limited portion of the national income due to the generally low level of the nation's livelihood. It merits attention that revenues arising from foreign trade involving import duties, receipts from export bills and foreign currency allocation to local governments, amount to about 32% of total revenues. These revenues from foreign trade, when added to foreign credits, occupy more than half of total revenues. Composition of revenues shown in the above table is indicative of the instability and inflexibility of the taxation system currently in force.

Under the existing taxation system, the Indonesian pulp & paper industry is subject to imposition of the following taxes.

1) High customs tariff applied to imported materials and chemicals.
2) High corporation taxes.
3) Sales taxes levied irrespective of gains or loss of business activities.

(1) Corporation tax

In case a paper mill operating at a daily production capacity of 30 tons with an annual sales proceeds of RP 600 million gains a profit of RP 1 for each kg of products sold at RP 100, a corporation tax of 60% is levied on the said profit.

The assessable incomes of a corporation and the rates of corporation tax leviable thereon are as tabulated below.

Assessable Income of Corporation Tax (Thousand RP)	Rates of Corporation Tax (%)
Less than 1,250	20
1,250 – 2,500	30
2,500 – 3,750	40
3,750 – 5,000	45
5,000 – 6,250	50
6,250 – 7,500	55
More than 7,500	60

(2). Sales Tax

Sales tax is imposed on the tax factory price of products shipped by producers. While daily necessaries are exempted from the sales taxes, papers are treated as taxation articles. Although the basic rate applicable is 20%, a rate of 11% (selling price x 110% x 10%) is applied to the products of existing paper mills.

(3) Others

Import duties are levied on imported materials and chemicals with the exception of pulp. In addition, the so-called M.P.O. (Menghitung Padjak Orang) and a source tax of 2 to 3% are imposed on paper making enterprises and the tax factory price, respectively.

5. Infrastructure

Importance of infrastructure in economic development carries a particular weight in Indonesia which is composed of complex elements. Redevelopment and expansion of road network, ports and harbours, railways, power supply, communication system, etc., which are a pressing need for the unified development of the country, can never be dispensed with for the smooth production and distribution of paper pulp products.

5-1 Roads

Roads in Indonesia can be broadly classified into national highways, provincial roads and local roads.

Total distance of roads in Indonesia:	80,848 km	
National Highways	9,893 km (Paved distance	– 4,037 km)
Provincial Roads	20,958 km ("	– 7,610 km)
Local Roads	49,997 km ("	– 3,728 km)

5-2 Railways

Railways are all state-owned, but their management is rather poor. Train operation for both passenger and goods services is not satisfactory with the exception of the Djakarta–Surabaja Line. The special night express service of the air-conditioned "Bima" available on this line is quite popular. On the Surabaja–Banjuwangi Line, however, the team failed to notice any satisfactory train service. Maintenance of tracks which have a narrow gauge is in poor condition, and transport of sugar canes harvested from sugar-cane fields extending along the line is conducted on a limited scale. Poor train service and deficient maintenance of tracks are in a worse condition in the outer terriotory of Sumatra, causing an extreme inconvenience for foreigners wishing to travel by train.

In addition to the shortage of rolling stock, the railway service in Indonesia suffers the shortage of fuel coal, materials and equipment for truck maintenance, and parts of rolling stock. Of a total of 904 locomotives reported to be servicing in Djawa Island, 630 are of the old type equipped with steam engines that have been used for more than 35 years.

Mileage of Railway Routes:

Djawa–Madura Line	–	4,684 km
Southern Sumatra Line	–	643 km
Western Sumatra Line	–	258 km
Northern Sumatra Line	–	511 km

More than 60% of these routes are needful of repair and replacement works since they have been put in service for a period exceeding 40 years. However, due to the aforementioned shortage of necessary materials and equipment and the deficient availability of railway engineers, it appears inevitable to resort to foreign aids in order to materialize the desired recovery of railway services.

Railway Passengers and Goods:

Number of Railway Passengers	–	200 million in 1960 135 million in 1967
Tonnage of Railway Goods	–	5.45 million tons in 1955 3.71 million tons in 1965

5-3 Motor Transportation

Because of the poor railway service described in the preceding paragraph, overland transport must necessarily depend on the use of automobiles such as buses, trucks and passenger cars. People make use of horse-carriages which are observed every where in the country as well as buses which are mostly over-filled. In Djakarta, the team often noticed small privately operated buses in service.

80% of transport service is undertaken by private enterprises. The term learned, however, that the state-owned DAMRI, which is reported to be expanding at an annual growth rate of 5%, carried 8.96 million passengers during 1964. Volume of overland cargo transport is not known. For short-distance cargo transport in local areas, carts and cattle- or horse-drawn carriages seem to be in substantially wide use.

5-4 Ports and Harbours

Major ports and harbours of Indonesia are as follows. (Ports marked with a circle are important ones)

Djawa:	o Tandjung Priuk
	o Semarang
	o Surabaja
	Tjurebon
	Merak
	Tjilatjap
	Banjuwangi
Sumatra:	o Belawan
	Sabang
	Padang
	Pekan Baru
	o Palembang
	Pandjang
	Pangkal Pinang
Sulawesi:	o Makasar
	Menado
Kalimantan:	o Bandjarmasin
	Balikpapan
Other Areas:	Ambon
	Kupang
	Gilimanuk

These ports are subjected without exception to the superannuation of wharfs, piers, mooring buys, warehouses and other port facilities. In addition, the silting up of their entrances by sands prevents the entry of large vessels. Only few of them allow the entry of vessels exceeding 10,000 tons. The team frequently observed dredging boats in many ports, but failed to notice any in active dredging operation. Most of these dredging boats were left in port areas with no crew found on them.

5-5 Marine Transportation

Since Indonesia is composed of numerous islands, the marine transportation that links Djawa with the islands in outer territory is of vital importance. During the Dutch colonial period, K.P.M. (Royal Dutch Shipping Co.) ruled the marine transportation by linking all the major ports of Indonesia with its accurate services. The monopolistic domination of K.P.M. over the Indonesian marine transportation continued even after the country's independence. However, with the adoption of hostile policies against the Netherlands in

1957, the network of sea transportation was brought to a collapse and is not yet fully recovered. The retarded recovery of the sea transport network is due mainly to the withdrawal of all K.P.M. vessels from Indonesia and their concentration at Singapore, a measure taken by the Dutch in fear of the possible confiscation immediately after Indonesia embarked upon counter actions against the Netherlands. The Indonesian Government imported vessels to re-establish the sea transport network, but failed to secure a sufficient number of vessels comparable to K.P.M. The deficient operation and management techniques, coupled by the ensuring military actions, brought about a drastic decline of inter-island transportation and trade, giving a serious damage on the distribution of commodities.

During the present survey, the team noticed that the payability of operation of Gowa and Siantar Mills is largely reduced by the high transport cost of paper from the outer territories. Transport cost per ton of paper between respective ports is as given below.

Makasar	—	Djakarta	$40.00 (=approx. RP 16,000)
Makasar	—	Surabaja	RP 13,000
Tokyo	—	Djakarta (Freight alone)	$20.00 (=approx. RP 8,000)
Bandjarmasin	—	Djakarta	RP 11,300
Bandjarmasin	—	Surabaja	RP 9,000
Medang	—	Djakarta	RP 29,000

Table 4 — Number of Vesseles of the Indonesian Nationality

Name of Shipping Co.	1960		1965	
	No.	Tonnage	No.	Tonnage
State-owned PELNI	60	93,000	86	144,000
Private companies serving on coastal lines	169	76,000	143	151,000
Sate-owned DJAKARTA LLOYD	2	13,000	36	374,000
Private companies serving on overseas lines	3	14,000	12	29,000
Total	234	191,000	277	698,000

Table 5 Number of Chartered Vessels

Name of Shipping Co.	1960		1965	
	No.	Tonnage	No.	Tonnage
State-owned PELNI	25	74,295	20	73,271
Private companies serving on coastal lines	21	39,339	2	10,984
State-owned DJAKARTA LLOYD	16	99,882	19	192,310
Private companies serving on overseas lines	3	14,563	2	20,084
Total	65	228,079	43	296,649

As shown in the above table, the number of vessels increased substantially during the five year period. It is unknown, however, how many of these vessels actually engaged in the shipping service.

6. Labour Force

Indonesia consists of many islands including Djawa, Sumatra, Sulawesi, Kalimantan and West Irian, and has a population of 120 million. Of these many islands, Djawa Island, which occupies less than 7% of the entire area of the country, is inhabited by 65% of total population.

Population distribution among major islands is as follows.

Djawa:	78,200	thousand
Sumatra:	19,800	"
Kalimantan:	5,200	"
Sulawesi:	8,900	"
West Irian:	900	"
Other Islands:	7,000	"

With this heavy population concentration, Djawa has a population density of about 500 persons per km^2, a density rarely observed in other parts of the worlds. While more than 80% of inhabitants of Djawa Island are farmers, they hold an average of about 0.5 ha of land. With practically all arable lands under cultivation, farmers in Djawa cannot hope for an increase in their holding through opening new fields. About 30% of farmers are farm labourers who, unable to tenant a farm land, make living by offering their labour during the transplanting or harvesting season or working as venders. In some districts of the island, these farm labourers are said to account for 50% of all farming population. While the cultivated acreage remains almost the same, the population of Djawa is expanding at a rapid rate of 2.5 to 2.8% per annum.

Considering the heavy population concentration in Djawa and the high percentage of farmers in the total population, the preferential policy currently pushed forward for self-sufficiency of foodstuffs and promotion of export crops does not seem to promise a satisfactory solution of the unemployment problem involving the need for reducing a large number of the latent jobless. It follows therefore that the expansion of labour market must be promoted through accelerated efforts for industrialization.

This leads to the macroscopic conclusion that the construction of paper mills can be justified insofar as labour force is concerned. However, there arise three problems that demand due consideration with respect to the employment of labourers.

Firstly, paper mills must be constructed in or near Djawa Island if its concentrated labour force is to be made use of.

Secondly, paper mills constructed in the sparsely populated outer territories cannot be operated to their full capacity with the poor labour force available, and should resort to the settlement of labourers in outer territories. In this case, selection of factory locations and preparations for housing and welfare facilities of labourers should be made with careful attention given to maintaining harmonious relations between Javanese labourers and resident labourers of outer territories. Failure to give due consideration to the maintenance of such harmonious relations which entails many difficulties due to the difference in habits and customs between Javanese and residents of outer territories as well as to the inherent tribal complex leads to the disharmony between new comers and indigenous residents, and makes the settlement of Javanese labourers impossible. It is to be noted that the emigration of Javanese into outer territories, which has been encouraged since the days of the Dutch colonial control, hardly turned out a success except in a district in Lampong of Southern Sumatra, nor is it enough to catch up with the sharp population increase of Djawa.

Thirdly, procurement of skilled and technical labourers essential for modern industries is made extremely difficult since virtually all labourers available are farm workers. Training these farm workers into capable factory workers is even more difficult because of the poor industrial infrastructure of the country. In addition, recruitment of technicians and engineers required at respective mills also involves difficulties due to the fact that technical schools are limited in number and the colleges and universities, mostly built around 1960 and provided with a deficient teaching staff and poor facilities, have so far sent out a scanty number of graduates.

The above consideration points to the necessity for training middle-level technical staff who would serve as the back-bone of the development of the Indonesian pulp and paper industry. For this reason, accelerated efforts should be made for the despatch of Indonesian students and trainees to Japan, technical and personnel interchange between Japanese and Indonesian colleges and universities, establishment of training organizations and

research institutes in Indonesia, and on-the-job training and guidance by Japanese engineers staying in Indonesia over a long period. The same efforts are required for improved production and sales activities and better management of factories.

7. Industries Affiliated with pulp and paper Industry

7-1 Industries Supporting pulp and paper Industry

(1) Chemicals Required

Chemicals required for production of pulp and paper are the following.

i)	Chemicals for digestion:	Sulphur, salt cake, sodium sulphite, calcium carbonate or calcium oxide, and soda ash or caustic soda.
ii)	Chemicals for bleaching:	Liquid chlorine, bleaching powder or hypochlorite, chlorine dioxide or chlorate, sulphuric acid, salt, hydrochloric acid, hydroperoxide, sulphur dioxide, caustic soda.
iii)	Chemicals for purifying water:	Aluminum sulphate, soda ash, sodium silicate.
iv)	Chemicals for sizing:	Rosin, aluminum sulphide.
v)	Filling material:	Clay

(2) Relationship with Various Industries

Paper pulp industry requires great quantities of chemicals listed above, and therefore has a close relationship with industries producing such chemicals.

i) Salt cake is the by-product of chemical fibre industry, Potassium bichromate industry and cullet industry.

ii) Sodium is a by-product turned out in the production process of synchetic phenol, one of the materials of nylon.

iii) Chlorine and chemicals of chlorine group has been provided by the salt water electrolysis industry, and pulp & paper industry in turn promoted the development of salt water electrolysis industry through its heavy consumption of chlorine.

Recent development of salt water electrolysis industry has been achieved by the chlorine consumption by pulp and paper industry, city water sterilization, polyvinyl chloride industry, vinylidene chloride industry, trichloroethylene industry, BHC industry, and titanium industry. Salt water electrolysis industry is now making a further and rapid progress with the recent development of petrochemical industry and high polymer industry.

iv) Cuastic soda became available in large quantities at low cost along with the increasing demand for chlorine. Increased demand for caustic soda is sustained by such industries as chemical fibre, paper pulp, soap, dyestuff, sodium glutamate, cellophane and alumina.

v) Soda ash is affiliated with such industries as sheet glass, glass products, inorganic chemicals, aminoacid, soap, and paper pulp.

(3) Chemicals for Pulp and Paper Industry and Their Demand in Japan

The post-war production of pulp and paper in Japan was reopend by SP method and continued to resort to it until the beginning of 1950 when the basis was established for shifting to KP method.

The following table shows the demand for chemicals in Japan for production of pulp and paper during 1960 when the production system of practically all mills shifted to KP method.

Table 6 Demand by Japanese Paper Mills for Chemicals
(Actual Requirements in 1959)

Unit: 1,000 tons

Chemical	Total Demand (A)	Demand by Paper Pulp Industry (B)	Demand Ratio (B/A)
Sulphur	228,669	84,883	37.1%
Caustic Soda	779,170	100,138	12.9
Bleaching Powder	10,404	7,390	71.0
Bleaching Liquid	357,038	320,588	89.8
Liquid Chlorine	138,476	87,463	63.2
Salt Cake	140,499	82,077	58.4
Aluminum Sulphate	156,000	95,300	61.1
Clay	35,522	29,202	82.2
Rosin	21,000	10,000	47.6

(4) Development of Indonesian Pulp, Paper and Affiliated Industries

It will be understood from the description of the preceding item that the development of the Japanese pulp and paper industry has been backed up by the combined effects of technological and productive capacity of various affiliated industries.

A study of data of similar affiliated industries in Indonesia such as fertilizer, caustic soda, cement, salt, sulphur and calcium carbonate reveals that they are operating

in a small scale on a low technical level with no balanced relationship between each other, and in consequence are not yet capable of providing comprehensive and combined technological effects. This is quite natural in a developing country like Indonesia which is on the way of active introduction and development of various industries carried out in parallel for industrialization. If such introduction and development of industries are controlled by the Government under an overall and comprehensive industrialization plan, the Indonesian pulp and paper industry will be given better chances for development.

7-2 Caustic Soda Industry (Waru State-owned Caustic Soda Plant)

Waru State-owned Caustic Soda Plant, located in Waru in the outskirts of Surabaja, is the only caustic soda plant in Indonesia built in 1956 by Asahi Glass Co., Ltd. of Japan at a construction cost of $4 million and RP 80 million (conversion rate: $1 = RP 12).

Design capacity of this plant is as given below.

Caustic soda:	3,000 t/year
Hydrochloric acid (35%):	3,000 t/year
Bleaching powder (C1 32%):	3,000 t/year
BHC (100%) :	8,400 kg/year

It is to be regretted that its operation was gradually curtailed and the quality of products declined for reasons given below.

(1) Suspension of caustic soda production due to the limited demand for by-products of chlorine group.

(2) Corrosion developed on production machinery and equipment.

(3) Shortage of funds.

Due to the operation curtailment of Waru Plant, paper mills at near-by places such as Letjes and Banjuwangi now depend on import for the supply of necessary chemicals.

Indonesia's annual requirement of caustic soda is said to amount to about 70 thousand tons if all paper mills are put in normal operation. A large amount of caustic soda is therefore imported each year. The team learned that the supply of caustic soda is irregular and the price hiked by nearly three times in recent years due to the shortage of supply. Recovery of full-scale operation of Waru Plant is therefore hoped to be realized as soon as possible. This, however, would demand the implementation of a comprehensive policy under which all paper mills in Indonesia will be induced to make use of chemicals produced at Waru Plant and the city water processing in Djakarta, Surabaja and other cities will be conducted with the bleaching powder turned out at Waru Plant.

Upon completion of the rehabilitation now in progress, Waru Plant will be provided with the annual production capacity tabulated below.

Table 7 Annual Production of Waru Plant

Unit: tons

	1970	1971	1972
Caustic Soda (100%)	856	3,000	3,000
Hydrochloric Acid (35%)	1,101	4,700	4,700
Bleaching Solution (8%)	1,372	1,680	1,680
Liquid Chlorine (99.8%)	225	900	900

7-3 Fertilizer Industry

Pusri Urea Fertilizer Plant, constructed in the suburbs of Palembang in Southern Sumatra at the end of 1960, maintains a high operation ratio, serving as a model to be followed by other industries of the country whose production is generally stagnated due to many unsolved problems. Production system developed by Toyo Koatsu of Japan and adopted at this plant is yielding an excellent results by virtue of the Government's preferential policy for agriculture. Construction of a second plant is now under examination.

In addition to Pusri Plant, there is one petrochemical plant now under construction at Gresik and one superphosphate plant whose construction is suspended at present. Construction of the former is financed by the Italian credit amounting to $56,100 thousand. Construction of the latter plant, initiated with the Soviet credit at Tjilatjap, is now suspended and its resumption is unknown though 80% of machines and equipment have already arrived.

Production schedule of all the three plants including the superphosphate plant is as tabulated below.

Table 8 Production Schedule of Fertilizer Plants

Unit: Thousand tons

Plant / Year	Pusri No. 1 Plant	Petrokimia	Pusri No. 2 Plant	Tjilatjap	Total
69/70	46.5 N	–	–	–	46.5 N
70/71	46.5 N	*17 N	–	–	63.5 N
61/72	46.5 N	**56 N	–	–	102.5 N
72/73	46.5 N	56 N	52.5 N	–	155.0 N
73/74	46.5 N	56 N	177.0 N	18 P	279.5 N 18.0 P

* ZA= 10,000 tons N
Urea = 7,000 "
** ZA = 35,200 "
Urea = 20,800 "

7-4 Cement Industry

There exist three cement plants in Indonesia, namely, Padang Plant, Gresik Plant and Tonasa Plant (Southern Sulawesi). Production of all the three plants is going on relatively smoothly for a number of reasons including:

1) Local availability of raw materials;
2) Simple production process;
3) Active domestic demand; and
4) Advantage over imported supply in transport cost.

Brief description of the three plants is given below.

Padang Plant:	Annual production – 150 thousand tons. Production facilities are superannuated since they were constructed during the Dutch colonial period.
Gresik Plant:	Annual production – 375 thousand tons. This plant was completed in 1956 with the U.S. credit, and had an annual production of 250 thousand tons with two kinds. An additional production capacity of 125 thousand tons was achieved later by the installation of another kiln in 1961. Upon completion of Kiln No. 4 which is under construction, the plant will have annual production capacity of 500 thousand tons.
Tonasa Plant:	Annual production – 120 thousand tons. This plant was completed in 1968 with the Czechoslovak credit.

In addition to the above three plants, Tjibinong Plant Project is now in progress for completion by the end of 1971 with an initial annual production capacity of 400 thousand tons.

Table. 9 Scheduled Annual Production of Cement Plants

Unit: Thousand tons

Year \ Plant	Gresik	Padang	Tonasa	Tjibinong	Total
69/70	322[x]	143[x]	69[x]		534
70/71	375	120	80[xx]		575
71/72	375	139[xxx]	120		634
72/73	445[xxxx]	201	120	400[xxxxx]	766
73/74	500	200	120	400	934

x: Actual production recorded in 69/70.

xx: Production of Tonasa Plant has not yet reached the full capacity since rehabilitation is still in progress.

xxx: Expected completion of rehabilitation and modernization works of Padang Plant at the end of 1972 will assure a production increase of 19% (= 19 thousand tons) in the first quarter of 1972 over 1971.

xxxx: Expansion of Gresik Plant, which is delayed by several months, is assumed to be completed around the middle of 1972. Production increase that could be achieved by the first quarter of 1973 is therefore considered to amount to about 70 thousand tons.

xxxxx: Tjibinong Plant is expected to be completed in 1971 for trial operation in the first quarter of 1972.

7-5 Salt Industry

Salt is produced at the state-owned salt manufactory in Madura Island as well as at privately operated manufactories located in Madura, northern coast of Eastern Djawa, Central Djawa, Makasar and Bali. Annual production capacity of the state-owned manufactory which covers an area of 6,000 ha is 300 thousand tons, and that of all privately owned manufactories combined, covering an area of 10,000 ha, is also 300 thousand tons.

Table 10 Production and Demand of Salt in Indonesia

Unit: Thousand tons

Year	State-owned Manufactory	Private Manufactories	Total	Demand
1964	53,000	250,000	303,000	433,000
1965	230,000	250,000	480,000	441,000
1966		200,000	200,000	449,000
1967	107,000	200,000	307,000	457,000
1968	28,000	100,000	128,000	465,000
1969	240,000	200,000	440,000	474,000
1970	280,000	250,000	530,000	483,000
1971	300,000	300,000	600,000	493,000
1972	300,000	300,000	600,000	501,000
1973	300,000	300,000	600,000	510,000

Note: Demands up to 1968 are based on values actually recorded.

7-6 Sulphur Resources

Sulphur deposits are found throughout the country. The largest sulphur producing area is Telaga Bodas of Western Djawa where approximately 1,200 thousand tons of muddy deposit with sulphur content ranging from 28 to 55% is estimated to be available.

A project is now in progress for construction of a sulphur plant with a daily capacity of 50 tons at Wanaradja near Garut in Western Djawa.

Table 11 Estimated Deposit of Sulphur in Indonesia

Unit: Tons

Area	Soil Condition	Purity	Deposit	Sulphur Content
Tarutung (Sumatra)	Fine sand	90% S	120,000	102,000
Namora Langit (Sumatra)	Muddy	40	140,500	56,000
Sorik Merapi (Sumatra)		56 on average	240,000	134,000
"	Fine sand & clay	27 on average	320,000	86,000
G. Mahawa (Sulawesi)	Muddy	53	230,000	96,000
Kawah Masem (Sulawesi)	Muddy	53	55,000	29,000

Area	Soil Condition	Pruity	Deposit	Sulphur Content
Tangkuban Prahu (Djawa)	Pure		14,000	14,000
"	Unknown		405,000	Unknown
"		57	470,000	270,000
Kawah Putih (Djawa)		65	240,000	165,000
"		20	1,000,000	200,000
Telaga Bodas (Djawa)		50	1,110,000	500,000
Dieng (Djawa)	Unknown		150,000	Unknown
Total Estimated Deposit				1,643,000

Note: CIF value of imported sulphur is $43.5 per ton.

7-7 Lime Stone (Bata Kapur)

Lime stone needed for the operation of Notog Mill is produced in the following two areas.

Adjibarang Area

Lime stone deposit in this area was revealed by the test-pit digging conducted by the Geological Department to a depth of 10 m. within an area of 125 m. x 2,000 m. The test-pit digging produced 2.5 kg. of lime stone per m^2. Hence the deposit in this area is assumed to be –

6,250,000 t = 125 x 2,000 x 10 x 2.5

Lime stone in this area is in the form of hard crystallized lumps presenting yellowish grey colour. Since it has a high hardness, its calcination must be conducted at a high temperature.

Karangbolong Area

According to the explorations undertaken by the Soviet prospectors in 1962, lime stone deposit in Karangbolong extends over an area of 45 km^2 and has an average depth of about 100 m.

Lime stone required for Takungeun Project is planned to be supplied by sailing boats or overland transport from a number of districts encircling Lake Tawar, such as Mopar, Atutamin, Pendemun, Burni Gegerung, and Angkup.

The rayon plant at Palembang resorts more to Baturadja than to Bangka Island for the supply of lime stone, though its demand can be met by the deposit in either district.

The Government has therefore built a calcining furnace at Baturadja which has an annual production of 10 thousand m^3. Baturadja reportedly has a deposit which can amply meet consumption for 150 years at an annual rate of 10 thousand m^3. Lime stone availalable in Baturadja is also reported to be best suited in quality for pulp processing purposes.

7-8 Bagasse

Table 12-A Sugar and Bagasse Production in Western Djawa

Unit: Tons

Plant	Sugar Production	Bagasse Production
Kadipaten	10,400	28,470
Djatiwangi	9,000	24,660
Gempol	6,900	18,906
Karangsuwung	7,100	19,454
Tersa Baru	26,100	71,514
Sindang Laut	11,400	31,236

Note: Average annual production of sugar by all six plants is 70,900 tons.

Table 12-B Sugar and Bagasse Production in Central Djawa
(16 plants involving plants in Jogjakarta City)

Unit : kWT=100 kg, t=tons.

Year		Sugar Production		Bagasse Production
1966		2,188,916 KWT		5,992,024 KWT
1967		2,169,821		5,942,892
1968		1,700,239 (Jan. – July Period)		4,654,444
	State-owned Estates	Private Estates	Total	
1969	163,365 t	28,800 t	192,165 t	526,056 t
1970	166,422	30,340	196,762	538,640
1971	169,186	31,920	201,106	553,564
1972	181,167	33,150	214,317	586,882
1973	184,340	34,400	218,740	598,806

Note: Figures for years subsequent to 1968 are scheduled production.

Table 12-C Scheduled Sugar and Bagasse Production in Eastern Djawa

Year	Sugar Production	Bagasse Production
1969	350,000 t	959,000 t
1970	390,000	1,029,400
1971	420,000	1,149,600
1972	440,000	1,204,400
1973	470,000	1,286,600

7-9 Electric Charge

Table 13 Electric Charge

(Based on the Standing Rate Act enforced as from May 1, 1968)

Consumer / Rate	Industrial Consumers Min: 10 KVA	Household Consumers		Government Offices, National Bank, & Foreign Missions Min: 250 KVA
		250 KVA – 2,500 KVA	More than 2,500 KVA	
Standing Rate	RP 135 per 0.5 KVA	RP 10.50 per 25 KVA	RP 11 per 25 KVA	RP 13 per 25 KVA
Meter Rate	a. RP 5.50 per KWH during off-peak hours	RP 5 per kWH up to 250 hrs/ month	RP 5.50 per KWH up to 200 hrs/ month	RP 4.50 per KWH up to 150 hrs/ month
	b. RP 20 per KWH during peak hours	RP 15 per KVA for more than 250 hrs/ month	RP 16.50 per KVA for more than 200 hrs/ month	RP 13 per KWH for more than 150 hrs/month
Addition-anl charge to cover hike of fuel and transport costs	RP 1 per KWH	RP 1 per KWH	RP 1 per KWH	RP 1 per KWH

Note: A special rate determined by the Power Board is applied to industrial consumers whose consumption exceeds 500 KVA.

7-10 Rosin

Indonesia's largest rosin distilling plant is located at Lampahan in Takengun district of Atjeh Province in the northern part of Sumatra.

Lampahan Rosin Plant, now under the control of the Bureau of Estate Agriculture, was established by the Dutch in 1938. After its confiscation by the Japanese army in 1942, it was operated jointly by Tozan Noji, a Mitsubishi-affiliated company, and Arakawa Rinsan Chemical Industries until the termination of the World War II.

In the years subsequent to the termination of war, the plant was reduced to a devastated state due to the internal disturbances of the country and fire hazards. However, surveys conducted twice by Arakawa Rinsan in 1968 and 1969 respectively disclosed that the plant was in operation in a small scale though its facilities were superannuated and defective equipment were left unrepaired.

At present, the plant produces 250 tons of finished rosin and 50 tons of turpentine oil per month from 450 tons of raw rosin collected from Pinus Merkusii available in its vicinities. Rosin turned out at this plant is dark in colour and poor in quality with a high percentage of impurities: and a large dispersion due to deficient quality control including decolouring and rinsing. A test conducted by Arakawa Rinsan in Japan on the raw rosin used at the plant is reported to have produced normal gum rosin.

Past records show that the plant processed 1,000 tons of raw rosin a month during the 1941 – 1942 period. The team is of the opinion that if proper production guidances are provided with the necessary rehabiliation and repair works effected, the plant will have a capacity that can fully satisfy the domestic demand with some surplus for export. A Japanese credit of $500 thousand was decided to be offered this year for the reconstruction of the plant for which investigations are being carried out by JCI.

Restoration of its full-scale operation is much hoped for.

Table 14 Estimated Population of the Republic of Indonesia

Unit Thousand persons.

	Area	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1	Western Djawa Province (including Djakarta)	20 643	21,111	21,597	22,100	22,622	29,162	23,723	24,304	24,907	25,532	26,180
2	Central Djawa Province	18,456	18,875	19,308	19,759	20,225	20,708	21,207	21,729	22,268	22,827	23,406
3	Jogjakarta City	2,247	2,298	2,351	2,406	2,462	2,522	2,582	2,646	2,711	2,779	2,850
4	Eastern Djawa Province	21,880	22,377	22,892	23,425	23,978	24,551	25,146	25,761	26,400	27,063	27,751
	Total of Djawa and Madura	63,226	64,661	66,148	67,690	69,287	70,943	72,660	74,440	76,286	78,201	80,187
5	Southern Sumatra Province	4,865	4,983	5,106	5,234	5,366	5,504	5,647	5,794	5,948	6,107	6,273
6	Riau Province	1,240	1,270	1,302	1,334	1,368	1,403	1,439	1,477	1,516	1,557	1,599
7	Djambi Province	748	767	785	805	826	846	869	891	915	939	965
8	Western Sumatra Province	2,330	2,387	2,445	2,507	2,570	2,636	2,704	2,775	2,848	2,925	3,004
9	Northern Sumatra Province	4,984	5,106	5,232	5,363	5,498	5,639	5,785	5,937	6,094	6,257	6,427
10	Atjeh Province	1,636	1,676	1,718	1,760	1,805	1,851	1,899	1,949	2,001	2,055	2,110
	Total of Sumatra	15,803	16,189	16,588	17,003	17,433	17,879	18,343	18,823	19,322	19,840	20,378
11	Western Kalimantan Province	1,589	1,627	1,667	1,709	1,752	1,797	1,844	1,892	1,942	1,994	2,048
12	Central Kalimantan Province	495	511	524	537	550	564	579	594	610	626	643
13	Southern Kalimantan Province	1,479	1,515	1,553	1,592	1,632	1,674	1,717	1,762	1,808	1,857	1,907
14	Eastern Kalimantan Province	553	567	581	595	611	626	642	659	677	695	714
	Total of Kalimantan	4,120	4,220	4,325	4,433	4,545	4,661	4,782	4,907	5,037	5,172	5,312
15	Northern and Central Sulawesi Province	2,012	2,061	2,112	2,165	2,220	2,276	2,335	2,397	2,460	2,526	2,595
16	Southern and Southeastern Sulawesi Province	5,097	5,222	5,350	5,484	5,622	5,767	5,916	6,071	6,232	6,399	6,572
	Total of Sulawesi	7,109	7,283	7,462	7,649	7,842	8,043	8,251	8,468	8,692	8,925	9,167
17	Bali Is.	1,790	1,834	1,879	1,926	1,975	2,025	2,078	2,132	2,189	2,247	2,308
18	Lombok and Sumbawa Is.	1,814	1,858	1,904	1,951	2,001	2,052	2,105	2,161	2,213	2,277	2,339
19	Flores and Timor Is.	1,971	2,049	2,069	2,121	2,174	2,230	2,288	2,348	2,410	2,475	2,542
	Total of Bali and Little Sunda Is.	5,575	5,711	5,852	5,998	6,150	6,307	6,471	6,641	6,817	6,999	7,189
20	Moruka Is.	793	812	832	853	874	897	920	944	969	995	1,002
21	West Irian	767	780	800	819	841	862	884	907	931	957	982
	Total of Outer Territory	34,161	34,995	35,859	36,755	37,685	38,650	39,151	40,690	41,760	42,882	44,030
	Total of Indonesia	97,387	99,656	102,007	104,445	106,972	109,593	112,311	115,130	118,084	121,089	124,217

Source Central Bureau of Statistics.

Notes Population in 10 major cities in 1970 is estimated to be as follows. (Unit. Thousand persons)

1	Djakarta	5,692	6	Medan	590
2	Jogjakarta	2,779	7	Palembang	505
3	Surabaja	1,241	8	Makasar	473
4	Bandung	1,086	9.	Surakarta	453
5	Semarang	619	10	Malang	419

III. FOREST RESOURCES

1. Forest Area and Resources

Forests in Indonesia occupy an area of 121 million ha, or 64% of the country's total area which is 190 million ha. FAO's data for 1968 indicate that this value accounts for 22% of the entire forest area of Asia which is 550 million ha. Thus, Indonesia is favoured with the richest forest resources in Asia.

Forest area broken down by territories is as shown in the following table.

Table 15 Forest Area in Indonesia

Unit: Thousand ha

Territory	Total Area	Forest Area	Ratio of Forest Area
Djawa and Madura	13,217.4	2,989	23%
Sumatra	47,360.6	28,420	60
Kalimantan	53,946.0	41,470	77
Sulawesi	18,903.5	9,938	46
Bali	556.1	121	22
Nusatenggara	7,805.3	1,363	17
Maluku	7,450.5	6,000	80
W. Irian	42,195.1	31,000	73
Total	190,434.5	121,301	64

Source: Some Aspects of Forest Development in Indonesia, Directorate General of Forestry, October 1967

Note: Statistics of forest area are subject to minor discrepancies depending on the data employed.

With a few exceptional cases, all the forests in Indonesia are national forests.

These forests can be tentatively classified as tabulated below by their functions.

Table 16 Classification of Forests by Functions

Unit: Million ha

Classification	Area
Protection Forest	48
Production Forest	39
(Ordinary Forest)	(25)
(Denuded Forest)	(14)
Forest Converted to Farm Land	30
(Ordinary Forest)	(18)
(Denuded Forest)	(12)
Others	5
Total	122

Source: Laporan Tahun 1968, Direktorat Djenderal Kehutanan

Forest area that provides resources for various industries totals 43 million ha which comprises the ordinary forests of both production forest and forest converted into agricultural land. In actuality, however, forest area exploited by industries is limited to about 3 million ha which is only a small portion of the total available area.

Abundance of forest resources in Indonesia is ascribable to the fact that all factors such as atmospheric temperature, precipitation and photoperiodic effect provide ideal environments for the growth of plants. The forest aspect is divided into three, the Asian continental and Australian aspects and the one which reflects the influence of the two aspects.

Table 17 Meteorological Data at Various Points in Indonesia (1961)

Place of Observation		Height above Sea Level	Atmospheric Pressure	Photoperiodic Ratio	Atmospheric Temperature	Humidity	Precipitation	No. of Rainy Days
Area	Location of Observatory	(m)	(mb)	(%)	(°C)	(%)	(mm)	(days)
Western Djawa	Djakarta	7	1,010	67	26	82	1,788	135
"	Bandung	768	926	60	23	78	1,846	194
Central Djawa	Semarang	2	1,011	74	27	77	2,189	136
Eastern Djawa	Surabaja	7	1,010	74	27	79	1,477	112
Northern Sumatra	Medan	25	1,010	54	26	83	2,212	162
Western Sumatra	Padang	7	1,010	63	27	80	3,881	160
Southern Sumatra	Palembang	8	1,010	55	26	84	3,488	143
Western Kalimantan	Pontianak	3	1,009	56	27	83	3,190	185
Eastern Kalimantan	Balikpapan	5	1,009	47	26	85	3,240	206
Northern Sulawesi	Menado	8	1,009	63	26	82	3,477	208
Southern Sulawesi	Makasar	2	1,010	72	26	80	2,880	135
Maluku	Ambon	4	1,010	51	26	82	3,089	179
Nusa Tenggara	Kupang	45	1,010	78	29	73	1,455	89

Source: Some Aspect of Forest Development in Indonesia.

Forests in Kalimantan and Sumatra are tropical rain forests whose major part belongs to Diptrocarpaceue, wheras those in Djawa and southeastern islands are mostly occupied by tropical monsoon forests. Humidity in Djawa and southeastern islands is substantially lower than in Kalimantan and Sumatra, and some of the trees in these areas cast their leaves in the dry season.

Accumulated forest resources, though not fully clarified due to the limited surveys hitherto conducted, are composed chiefly of broad leaf trees and partly of needle leaf trees such as Agathis Berneensis Werb and Pinus Merkusii which are found in upland areas.

Some of major species of trees found in Indonesia are given below.

Needle Leaf Trees:	Pinus Merkusii Agathis berneensis Werb
Broad Leaf Trees:	Shorea spp Gonystylas bancanus Kurz Diptrocarpus spp Dryobalanaps arematica Cotyleisbium spp Eusideroxylon zwageri Diospgres spp Tectona grandis Swietenia mahagoni Jack Rhizophora sp mangrope

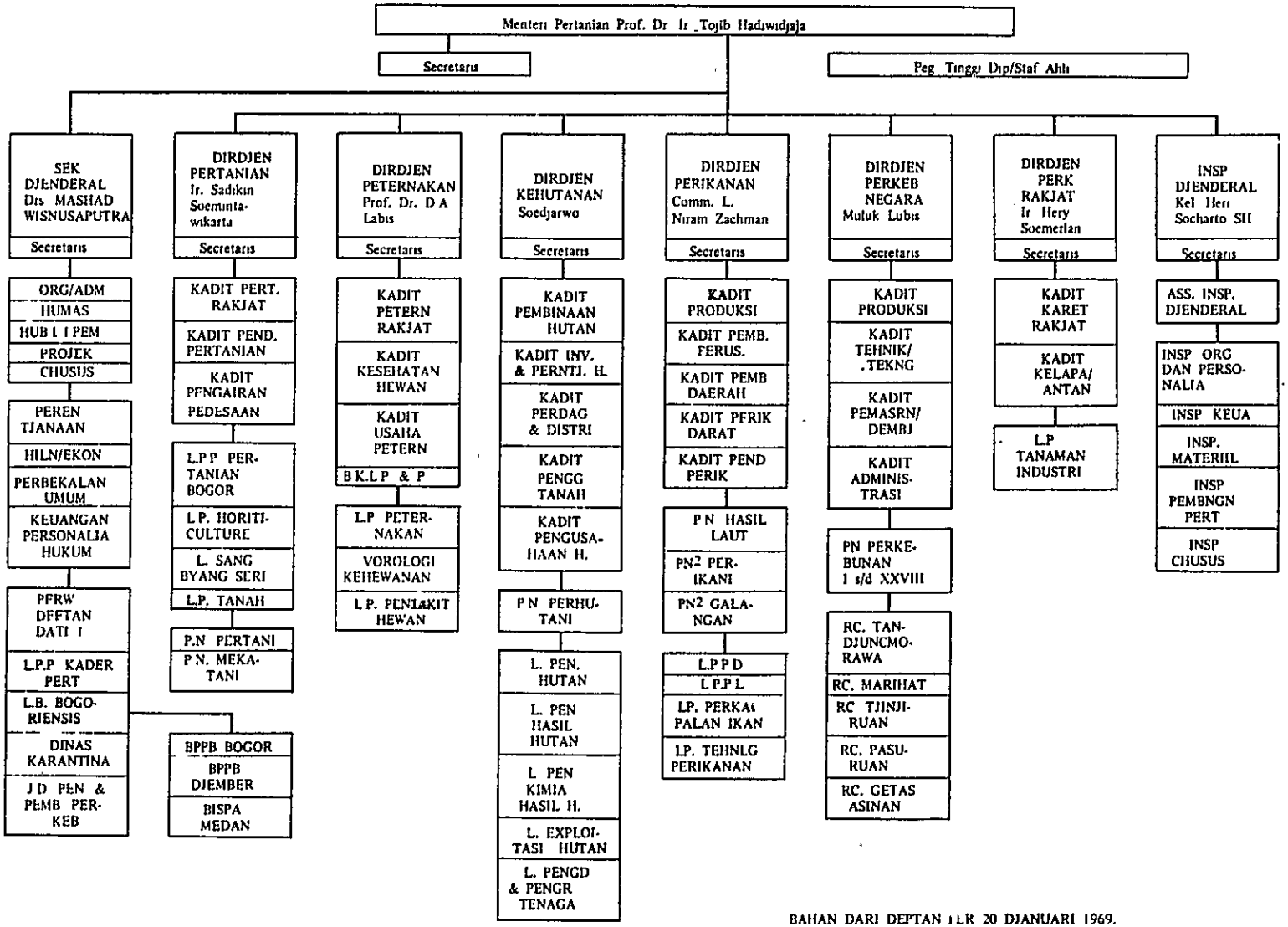
Trees belonging to Diptrocarpaceue are rather few in Djawa. The most abundant in Djawa are the teak forests whose major part was created by afforestation. In contrast, forests in Sumatra abound in trees of Diptrocarpaceue such as Shorea spp, Eusideroxylon zwageri, Dryobalanaps arematica, with mangrove trees forming an extensive swampy forest in the central and southern parts. Kalimantan likewise abounds in trees belonging to Diptrocarpaceue, but in the southern part of the island, there is a natural forest of Agathis berneensis Werb which is said to extend over an area of 25 thousand ha. In Sulawesi, trees of Diptrocarpaceue are rather few, and major species are Agathis berneensis Werb, Diospgres spp, and Merbau.

Feeling of trees in natural forests is allowed for living trees of as many as 450 species exceeding 40 cm in diameter. This indicates the diversity of available species in the forests in Indonesia. Utilization of trees not in use at present or of lower diameter class will therefore augment the availability of accumulated forest resources by a large margin.

2. Administrative Organization

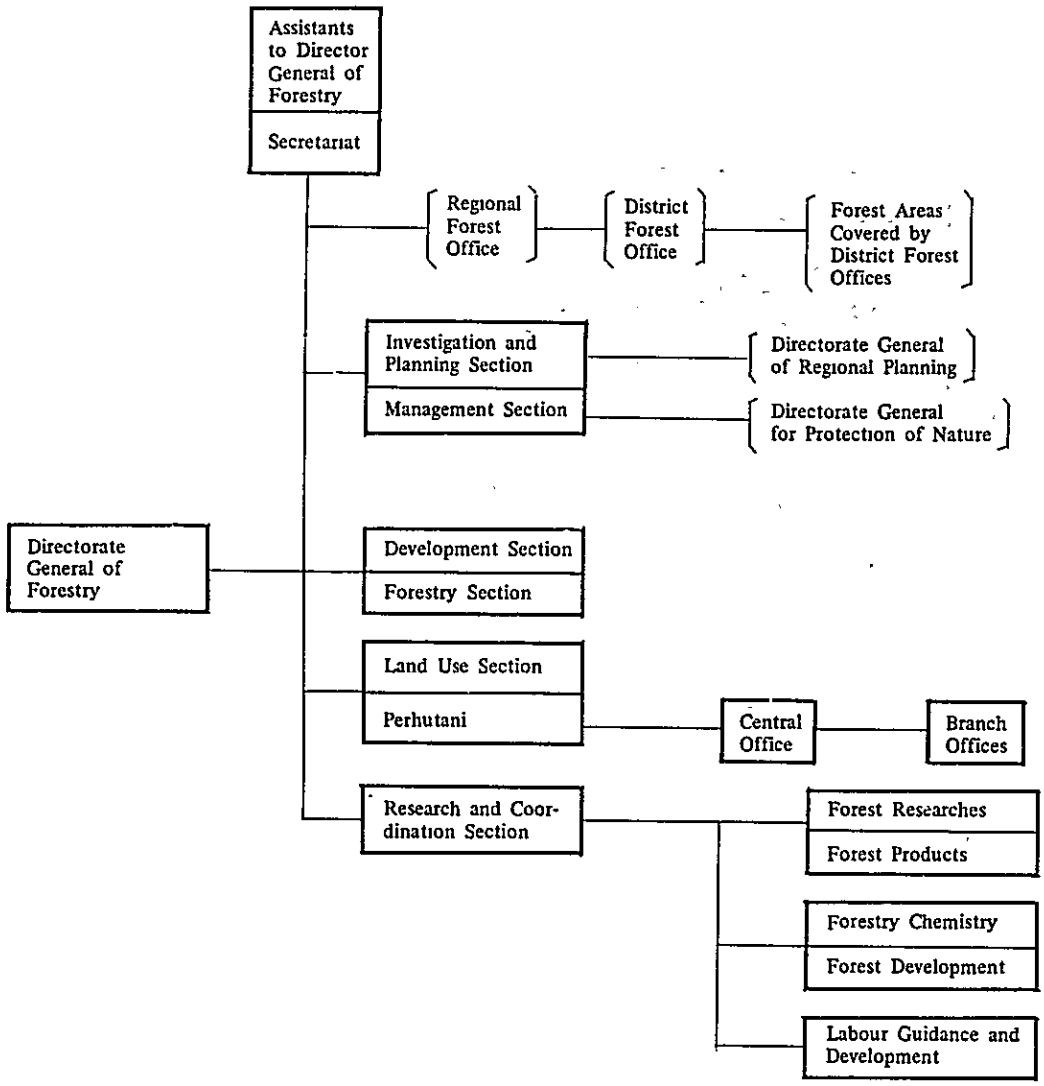
The administrative organization for forest management, which was raised to a status of Ministry during the Sukarno Administration, is now under the control of the Directorate General of Forestry of the Ministry of Agriculture since 1967.

Table 18 Schema Organisasi Departemen Pertanian



BAHAN DARI DEPTAN I LR 20 DJANUARI 1969.

Table 19 Organization of the Directorate General of Forestry



Forest management is undertaken by local administrative organizations to which the authority was consigned in conformity to the principles of local autonomy. However, the comprehensive and overall administrative responsibility for forest plans, forestry legislations, forest utilization and protection, land use, etc. is assumed by the central government.

Perhutani is a state-owned forestry enterprise under the direct control of the Directorate General of Forestry, and has a main office in Djakarta and five branch offices at Surabaja, Semarang, Bandjarban, Sampit and Balikpapan, with another special project office located at Pontianak in Western Kalimantan. Its activities cover the management of planted teak forests and other forests in Eastern and Western Djawa as well as forests in specified areas of Kalimantan.

Operating on a self-paying basis, Perhutani runs lumber mills and rosin plants, as well.

Regional Forest Office belongs to respective provincial governments, and its activities are carried out under the control of the supervising governor. However, the right to appoint the directors of regional forest offices and chiefs of district forest offices is vested with the Director General of Forestry.

3. Afforestation

Afforestation has long been practised in Indonesia centering on the teak tree planting in Djawa Island. Planted species, occupied predominantly by teak, came to include Pinus Merkusii, Agathis berneensis Werb and some broad leaf trees in later years. Djawa has been the centre of afforestation activities, and islands in the outer territory are inactive in afforestation except in limited areas.

The poor afforestation activities in the outer territory is due to the dependence on natural regeneration after the feeling of broad leaf trees and to the consequent immaturity of economic conditions for investment in afforestation.

Afforestation activities over the past several years as revealed by the available data are tabulated below.

Table 20 Transition of Afforested Area

Unit: Thousand ha

Year	Djawa and Madura				Sumatra	Sula-wesi	South-eastern Islands	Kali-mantan	Total of outer Terri-torry	Total
	Teak	Needle Leaf Tree	Broad Leaf Tree	Total						
1962	23.8	8,7	22.1	54.6	2.8	0.1	3.3	0.1	6.4	60.9
1963	22.8	9.9	32.1	64.7	2.8	3.5	2.7	–	9.0	73.7
1964	22.6	8.9	37.3	68.3	2.9	1.2	1.2	–	5.3	74.1
1965	22.2	7.6	31.4	61.2	3.4	1.8	1.6	–	6.8	68.0
1966	24.0	6.3	34.3	64.6	3.9	2.9	2.0	–	8.8	73.4
1967	24.4	6.7	33.0	64.1	3.9	1.8	1.7	–	7.4	71.4
1968	23.7	9.0	31.4	64.1	3.2	2.0	2.2	–	7.4	71.5

Source: Report on the Indonesian Forestry, 1970: Mr. Fukushima, Technical Officer of the Forestry Agency, Japan.

4. Lumber Production

Lumber production in Indonesia is not clear due to the difficulty in estimating the cut-volume of non-registered fellers.

Tabulation of yearly cut-volume based on the statistical data of the Directorate General of Forestry is as given below. Cut-volume of teak trees maintained a 500 thousand m^3 level for sometime in the past until it dropped to 450 thousand m^3 in 1968. Considering the resources available, the teak wood production would be maintained on a 400 thousand m^3 level.

Table 21 Transition of Lumber Production

Unit: Thousand m^3

Use	1964	1965	1966	1967	1968
Timber	1,952	1,770	1,983	2,853	3,828
Firewood	1,020	930	1,161	1,133	1,105
Charcoal	341	185	363	364	366
Total	3,313	2,885	3,507	4,350	5,299

Source: Statistik Kehutanan Indonesia 1968

Breakdown of lumber production by areas is as given below.

Table 22 Lumber Production by Areas

Unit: 10 thousand m^3

Area / Year	Djawa	Sumatra	Kalimantan	Sulawesi	Maluku & West Irian	Nusa Tenggara	Total
1963	163	148	32	5	–	5	355
1964	156	130	27	5	3	10	331
1965	136	132	10	2	–	9	289
1966	145	147	44	3	2	11	351
1967	168	183	62	6	2	15	435
1968	229	186	87	7	3	19	530

Source: Statistik Kehutanan Indonesia 1968

As is clear in the above table, lumber production for supply of timbers, firewood and charcoal is most active in Djawa which is already developed and in Sumatra where the forest development is in progress. In contrast with these two islands, development in Kalimantan is impeded due to the unfavourable climatic conditions, handicapped social environments, shortage of labour force and low technical level, despite the fact that the forest resources in this island, which is the third largest island of the world, account for nearly one-third of the total forest resources of the country.

5. Export and Import of Forest Products

Teak, Shorea spp and Diospgres spp constitute the major species exported to Japan, European countries, Hongkong, Formosa, Korea and Singapore.

Table 23 Exports of Lumber

Unit: Thousand m^3

	1966	1967	1968
Teak	17	14	29
Non-teak lumber (round timber)	278	517	1,189
Non-teak lumber (sawn timber)	5	5	?

Source: Laporan Tahun 1968, Direktorate Djenderal Kehutanan

Export of almost all round timbers and about half of sawn timbers of teak is handled by Perhutani. Perhutani is also a large exporter occupying about 20% of Indonesia's total export volume of tropical broad leaf trees.

Export volume of sawn timbers of tropical broad leaf trees, which is on a low level as shown in the above table, is expected to pursue a steady upward trend through implementation of the timber export plan by Indonesian and foreign enterprises now engaged in forest development.

Forestry by-products such as rotan (Calamus sp. Dalmonorops) and other items hold the place over timbers in the total export value of forest products, though their relative importance is on the decline. These by-products accounted for 60 to 85% in the total export value during the 1960 – 1965 period.

In the imports of forest products, paper accounts for 90%, with special plywoods and woodworks constituting the major portion of imported wooden articles.

Table 24 Trade Returns of Major Forest Products

Unit: RP million

Year	Imports			Exports
	Lumber	Paper, Pulp	Total	
1961	153	1,183	1,334	293
1962	62	657	719	226
1963	70	680	750	228
1964	63	1,083	1,146	244
1965	91	813	904	216
1966	15	123	138	57

Source: Biro Pusat Statistik

6. Forest Development

Forest development in Indonesi is still in the initial stage. Cause for the delayed development lies not in the shortage of resources or maket, but in the lack of development funds, labour force and production techniques.

Forest development in Indonesia is undertaken by both public and private enterprises, of which the largest is Perhutani.

The Government's endeavours for forest development are manifested in its policy for giving concession to both domestic and foreign enterprises to make full use of their capital investment. Concession is afforded on condition that enterprises undertaking a small scale forest development should establish sawmills in several years after commencement of their activities and plywood factories in another several years, and that enterprises operating on a large scale should construct pulp mills in future.

Thus the Government expects that investment in forest development would lead to the growth of forestry and forest product processing industry, promotion of emigration, and improvement of roads including forest roads.

The aforementioned Government policy is already put in practice and is gradually yielding development effects. However, due to a number of restrictive factors such as unfavourable climatic conditions, deficient techniques and the need for infrastructural improvement, it does not seem fully warrantable that the forest development will be carried out as originally planned.

As described above, forest resources in Indonesia await the future development. The Government's efforts for forest development are augmented by its policy to induce foreign capitals for a phased plant construction scheme concordant with the tempo of forest development. The policy envisages the construction of small-scaled sawmills in the first stage, to be followed by the establishment of plywood plants and then pulp plants. Such sequential development is certainly suited to a country like Indonesia which has abundant resources to be developed. Considering various conditions under which the country is placed, an attemp to establish pulp & paper mills without going through preparatory development stages cannot be justified.

It is to be added that the operation of pulp plants should be carried out in close cooperation with the affiliated small-scaled plants such as sawmills and plywood plants. Management of pulp plants will be largely improved in the procurement of materials if waste and rejected lumber is supplied by sawmills and plywood plants, and this in turn would serve for smoother operation of such sawmills and plywood plants.

The Government admits that the retarded development is attributable to the lack of funds, experience and techniques, and that the shortage of funds has invited the shortage and poor condition of transport facilities including vessels, with the resultant hike in the freight.

Therefore, successful forest development hinges on the parallel improvement of infrastructure. Infrastructural improvement should be attained by degrees by the Government, and should not be expected to be conducted by enterprises to which the concession is given, because their operation is based on the profit-seeking purpose and does not provide assistances for forest development.

7. Five Year Development Plan

The following is the briefing of description given under the item for forestry in the Five Year Development Plan, precluding data and information already described in the foregoing pages.

Forest area now being used is about 3 million ha which is only 7% of total area of ordinary forests. During the period from 1960 to 1965, Indonesia produced 410 thousand m^3 of teak, 1,000 thousand m^3 of non-teak lumber, and 380 thousand tons of other forest products. In addition, a production of 2,000 to 3,000 thousand m^3 was attained during the same period, though it is not on the record.

Exports of lumber during the said period is as tabulated below.

Table 25 Exports of Lumber (1960 – 1965)

Volume in thousand m^3
Value in $ million

Year	Teak	Non-teak Lumber	Export Value
1960	13.0	113.4	1.8
1961	8.1	93.2	1.3
1962	4.4	113.5	1.0
1963	7.6	99.3	1.5
1964	10.3	63.2	1.8
1965	11.5	127.0	2.0

Assuming that the cutting plan for 1960 is effected to the 2.4 million ha of production forests for annual coverage of 400 thousand ha, and that 40 m^3 of material wood per ha can be obtained from the cutting area, annual total production of material wood would amount to 1.6 million m^3 which, if exported, would earn a foreign currency income of $240 million. Though this is just a rough estimate, it would make anyone convinced of the huge economic potential of Indonesian forests.

Deterred forest development in Indonesia is due to the lack of funds, techniques and experience.

Foreign concerns show much interest in the forest development in Indonesia and there are 25 foreign and domestic enterprises to which the concession has been granted. Breakdown of these 25 enterprises is as follows.

Enterprises making direct capital investment:	6
Joint ventures:	5
Enterprises operating on a product apportionment basis:	8
Domestic enterprises not supported by foreign capitals:	6

Total cutting area allocated to these enterprises is 2,445 thousand ha, and the funds invested by them total $107.7 million and RP 385 million.

Table 26 Estimated Lumber Production

Unit: Thousand m^3

Year	Teak	Non-teak Lumber
69/70	400	2,500
70/71	400	3,200
71/72	400	4,200
72/73	400	5,300
73/74	400	7,500

It is hoped that the lumber export, now marking a 500 thousand m^3 level each year will increase to 1,500 thousand m^3 in 1969 through implementation of a modern development method. It is expected that effective execution of a modern development method will produce an export increment amounting to 800 to 1,000 thousand m^3 each year.

Thus, upon completion of the Five Year Plan, lumber export is expected to reach a 5,000 thousand m^3 level.

The scheduled increase of lumber export is as tabulated below.

Table 27 Export Plan for Forest Products

Unit: Lumber in thousand m^3
By-products in tons
Value in $ million

Year	Teak		Non-teak Lumber		By-products	Export Value
	Sawn Timber	Round Timber	Sawn Timber	Round Timber		
69/70	12	12	4	1,200	73	28.5
70/71	15	13	8	1,680	83	43.0
71/72	20	14	12	2,460	69	58.0
72/73	25	15	16	3,570	76	85.0
73/74	35	16	20	5,000	76	120.0

Since the supply of forest resources provides the possibility of establishing such industries as plywood, paper and rayon, lumber export of Indonesia is expected to follow an upward tendency.

Measures for development of forestry can be considered under the following five items.

1) Classification of forest resources
2) Promotion of production and export
3) Protection and continued expansion of forests
4) Education, training and public enlightenment
5) Research and investigation activities

For the five-year forest development plan, an amount of RP 10,000 million is expected to be appropriated, from which RP 601.5 million has been earmarked in the development budget for 1969/1970.

Projects proposed under the said five-year forest development plan include the following.

1) Classification of the national forest resources and implementation of forest plans.
2) Improvement of land use efficiency.
3) Preparation of maps of national forests.
4) Implementation of multi-purpose forest development projects.
5) Augmentation of lumber production and processing.
6) Implementation of a teak production and processing project.
7) Implementation of a production and processing project of non-lumber resources (by-products).
8) Development of forest product processing industries.
9) Public enlightenment on forestry.
10) Development of protection forests and forest parks.
11) Promotion of forestry education and training.
12) Coordination of forest development plans.
13) Market exploitation for forest products.

It merits attention that lumber production surpassed the target volume in the initial year of the Five-Year Plan. However, the Plan does not touch on detailed measures for the materialization of many projects which are listed at the end of the description. The team is of the opinion that the classification of forest resources and consolidation of statistics should be given top priority among the many proposed projects.

The present meagreness of data on actual state of forest resources is noted to be hindering the proper orientation of future forest development and the formulation of policies for forestry. Deficiency of data is exemplified by the development efforts made by respective enterprises which are forced to spend a substantial time and expenses in obtaining the necessary data. It is therefore hoped that urgent steps be taken for grasping the existing state of forest resources through aerial mapping and other means.

As for the lack of consolidated statistics of Indonesian forestry which may be ascribable partly to many inherent conditions of the country and partly to the extreme difficulty in preparing accurate forestry statistics, the team noticed the figure of a single item, the forest area, which was given in a number of data lacked conformity to each other. Hence the consolidation of forestry statistics is urged for proper execution of forestry policies.

8. Outline of Forest Product Processing Industries

8-1 Sawmills

Indonesia has more than 400 sawmills operating on a relatively large scale. With smaller-scaled cottage type sawmillers with more than 10 employees inclusive, the country's total number of sawmills is estimated to exceed 4,000.

Estimated volume of material trees lumbered at these sawmills totals approximately 3 million m^3. Total volume of material trees consumed by all sawmills including subsistence-level small sawmillers, which should certainly surpass 3 million m^3, is not known.

Sawmills in Indonesia are located either near the forest area or in consuming areas. Those near the forest area supply their products to the consuming areas, and those in the consuming areas to constructors, craters, furniture makers and other consumers. Most of the sawmills are privately operated save a few exceptions including Perhutani which runs 15 sawmills equipped with better facilities than private mills and located in Djawa and Kalimantan.

Generally speaking, they are noted to be in want of funds and obliged to operate at a rate of about 50% due to the shortage of spare parts and costly freight. The greater part of their products is occupied by timbers of teak and other broad leaf trees, with a minor portion covered by needle leaf trees. FAO's data indicate that timbers of needle leaf trees amounted to only 16 thousand m^3 in 1963 when the total timber production of the country registered 1,781 thousand m^3. Modernization of sawmills is to be accelerated in view of the annual timber requirement of 3,600 thousand m^3 which must be satisfied for the smooth implementation of the Government's housing programme.

8-2 Match Plants

With pulp and paper industry set aside, Pinus Merkusii and Agathis berneensis Werb find their largest outlet in the match industry.

Match plants in Indonesia numbered 11 in 1967 and their total capacity is said to reach 100 thousand cases. Rate of their operation is quite low, and the production

achieved in 1967 is estimated to be about 50 thousand cases which represents half the total production capacity.

The fact that foreign made matches are imported against payment of a 40% duties in spite of the possibility of meeting the domestic demand with the current production capacity may be explained by the said low operation rate and the poor quality of domestic products.

There are, however, a number of highly mechanized plants, but due to the higher selling price of their products as compared with imported matches, or to the superannuation of facilities and shortage of funds, some of these mechanized plants are not in operation.

Timber requirement is said to range from 0.5 to 0.6 m^3 per case at highly mechanized plants and from 0.7 to 1.0 m^3 per case at other less mechanized plants. Total annual requirement of timber for match production is estimated to be within the range of 40 to 50 thousand m^3.

8-3 Plywood Industry

Indonesia has two relatively large-scaled plywood plants, one located at Langket in Northern Sumatra and the other at Natul in Southern Sumatra. Annual production capacity of the two plants combined is reported to be 25 to 30 thousand m^3, but the actual production represents about half of this capacity. Material trees for their plywood production are those belonging to Diptracarpaceue.

Besides these two plants, there exist two smaller plants in Djawa, and two others now under construction in Southern Kalimantan.

Plywoods turned out at these plants are used, for the most part, in making export cases of tea whose export amounts to as much as 60 thousand tons a year.

Foreign enterprises to which the concession has been given for prompting forest development are planning the construction of plywood plants. It can therefore be expected that plywood production will increase with the progress of forest development.

8-4 Rosin Industry

Perhutani runs one rosin plant in Djawa and four located in Ngebel, Pulung, Keluleng and Karee, respectively Production capacity of all the four plants combined recorded 200 tons/month.

Besides these Perhutani plants, there exists a small plant in Djawa which engages in the distillation of rosin purchased from Perhutani.

In addition, the Directorate General of Estate Agriculture is carrying out rosin production at Lampahan in Northerm Sumatra with a monthly output of 250 tons.

Although the annual production capacity of all rosin plants in Indonesia is reported to amount to 10 thousand tons, actual output is estimated to be in the neighbourhood of 7 thousand tons (or monthly output of 600 tons).

Rosin is consumed chiefly for production of printed cotton (Batik) in Djawa.

8-5 Pencil Plants

There is one pencil plant in Djakarta which has a production capacity of 42 thousand grosses and uses Pinus Merkusii as material tree. Consumption of Pinus Merkusii at this plant is very small.

9. Needle Leaf Trees in Indonesia

Needle leaf trees growing in Indonesia are limited to two speices, Agathis berneensis Werb and Pinus Merkusii. Agathis berneensis Werb forms natural forests in Kalimantan and Sulawesi, and has hitherto been cut only for the purpose of oil extraction. In recent years, however, it has come to be appraised as lumber for construction works, and is being exported to Japan from Sampit, Pulangpisan and Palopo. Resources of this tree that have been accumulated over the past years are on the decrease with the progress of their exploitation, which has resulted in the prohibitive measure against cutting trees of small diameter class.

Agathis forest in Central Djawa is an artificial forest created under the control of Perhutani by planting on the southern slope of the watershed, and enjoys an excellent growth by virtue of abundant rainfall. Although the present age of trees ranges from 25 to 30 years, supreme tree species are cut by the selective felling method and timbers measuring more than 20 cm in diameter are exported to Japan as crating materials. Since this tree finds its domestic outlet only in the match industry and trees of small diameter class are used as firewood, its use for pulp production would be justified for the intensive utilization of its resources.

Pinus Merkusii is a species that grows naturally in Atjeh Province. During the Dutch colonial period, this tree was commended as suitable for afforestation with the result that artificial forests were created at a height about 1,000 m above sea level. Therefore, all the existing Merkusii forests grown satisfactorily in various areas excluding Atjeh such as Central Djawa, Eastern Djawa, Malino in Southern Sulawesi, and vicinities of Lake

Toba in Northern Sumatra are artificial forests.

Export of this tree to Japan is on the decline because of the quality degradation caused by blue stains or insect damage soon after the delivery which is made in the wet or summer season in Japan on account of its dry season cutting period.

After resin is extracted, therefore, it could be used only for match and pulp production irrespective of the diameter class.

10. Pulp and paper Industry Viewed with Regard to Forest Resources

Despite its abundance in forest resources, Indonesia's trade balance of major forest products shows an excess of payments over receipts. This is because the country exports cheap tropical broad leaf trees and imports highly processed paper or pulp.

Considering the steady and sustained demand for paper in Indonesia on the one hand, and the need for saving the country's foreign currency reserve on the other, it may be said that domestic production of paper is one of the pressing needs of Indonesia.

A general review of the existing pulp and paper industry discloses, however, that straw and bamboo are used as raw materials in almost all cases, with paper production from pulpwood noted to be nearly ignorable. While the country is favoured with vast forest resources, the present technical level only allows the use of needle leaf trees such as Pinus Merkusii and Agathis berneensis Werb and limitedkinds of broad leaf trees including rubber tree. A test conducted for rationalized pulp production covered a number of tropical broad leaf trees only to indicate their characteristics. Hence they are still left intact without being used for pulp production.

With the decrease in the would's pulp resources excepting those in Canada and Siberia, attention is now focussed on tropical broad leaf trees in South American and other areas. Further, the relative hike of the price of material wood caused the paper industry to augment its production.

For the desired production expansion from the existing level of 10 to 30 tons/day to a daily production of more than 100 tons, the Indonesian paper industry would be forced to make use of pulpwood in place of straw and bamboo.

Above consideration leads to the conclusion that the resources of needle leaf trees and broad leaf trees suited for pulp production would have to be, and can be, expanded through intensive afforestation.

It is to be added that broad leaf trees, if mixed with needle leaf trees, would suffice for production of papers not required to have superior quality.

Paper mills to be established in future will have to be located at places where trees suited for paper production can be obtained readily and at low cost and where the finished products can find their outlet with ease. These conditions can be best satisfied at places near a river port having a huge forest area extending in its back. Paper mills established at such places would find it easy to obtain timbers not satisfying the required standards and waste lumbers from sawmills in addition to the material wood produced on their own.

In view of the existing state and prospect of lumber and plywood production briefed below, it is urged that the pulp and paper industry of Indonesia maintain close cooperation with the material wood producers and sawmillers rather than resort solely to production on their own for the supply of pulpwood.

(1) 50% of forest resources cut by material wood producers are suited for export, but the remaining 50% are left near the cut-over area since their quality are not fit for export.

(2) 4 to 5% of material wood cut and transported for export cannot be sold for such defects as heart rot, crack or insect damage. Such defective lumbers are abandoned either near the cut-over area or in rivers, or exported with no profit.

(3) Efforts for elevating added-value would induce sawmills and plywood plants to be established at collecting and shipping centres of material wood, with the result that they would assure constant supply of waste lumber.

Comprehensive and effective use of lumber as suggested above with special reference to the pulp and paper industry would be fully justified for the efficient utilization of resources.

A plan that may deserve attention with respect to the aforementioned establishment of paper mills is the construction of small chip carriers to be used for collecting waste lumbers from islands in the outer territory for paper production at places close to the consuming areas. This plan envisages the establishment of paper mills similar to Djakarta Mill which has chipping and other wood processing facilities in outer islands. Since the waste lumbers thus collected can be used with selected pulpwood materials at a substantially high mixing ratio if the quality of papers is not required to be very high, the paper making techniques required and developed under this plan would provide the basis for formulating a future production scheme in which due consideration must be given to the intensive use of broad leaf trees.

Application of new materials for paper production is in rapid progress. History of the Japanese pulp and paper industry presents a fine example of this progress. It is

evident that the bay will come when short-fibre trees are used as important woodpulp materials.

The team wishes to add finally that the procurement of material wood demands a large amount of investment and mechanization. The Government is therefore urged to direct its efforts not only to plant construction but also to raising necessary funds including afforestation funds for normal forest preservation and to the efficient management of Perhutani.

IV. DEMAND AND DISTRIBUTION

1. Demand for Paper in Indonesia

Because of the short history of the Indonesian pulp and paper industry, data and statistics on the demand and supply of pulp and paper in the country are not sufficiently consolidated. The Asosiasi Pulp & Kertas established in April 1969 is not fully functioning either.

The team found it difficult to obtain accurate statistics, reports or investigation data dealing with production, sales and distribution. Demand for paper in Indonesia given in the following pages is therefore based on the estimate made within the limits of available data.

1-1 Domestic Production

As shown in the following table, production of six paper mills combined accounts for about 40% of the total capacity. Target production volume planned for 1970 is 35,500 tons, but actual production is expected to be about 19,000 tons.

Table 28 Production of Six Paper Mills

Unit: Tons

Plant	Location	Capacity	Production Record					1970	
			1965	1966	1967	1968	1969	Estimate	Production Ratio
Padalarang	Western Djawa	12 t/day (3,600/ year)	3,163	3,373	3,438	3,583	3,118	3,240	90%
Letjes	Eastern Djawa	30 t/day (9,000 t/ year)	3,574	3,455	3,339	3,218	3,486	6,000	67
Blabak	Central Djawa	20 t/day (6,000 t/ year)	2,887	2,364	639	2,040	3,020	3,000	50
Banjuwangi	Eastern Djawa	30 t/day (9,000 t/ year)	–	–	–	–	3,500	6,000	67
Siantar	Northern Sumatra	15 t/day (4,500 t/ year)	1,498	674	345	600	300	300	6.7
Gowa	Southern Sulawesi	30 t/day (9,000 t/ year)	–	–	967	1,867	1,424	439	4.8
Total		137 t/day (41,000 t/ year)	11,122	9,866	8,678	11,308	14,848	18,979	46.1

Notes:

1. Daily production capacity of Letjes Mill increased from 10 tons to 30 tons upon completion of a new plant in May 1970 by the German aid.
2. Production of Banjuwangi Mill started in April 1969.
3. Gowa Mill completed trial operation in June 1967, and entered into commercial operation as from 1968. Due to the ensuing management difficulties, however, its operation has been suspended since March 1970.
4. Siantar Mill has curtailed operation since its completion in August 1962.
5. Production of private paper mills has been omitted.

Table 29 Estimated Production by Plant and Commodity (1969)

Unit: Tons

Commodity	Padalarng	Blabak	Letjes	Banjuwangi	Siantar	Gowa	Total
Cigarette paper	250						250
Typing paper	160						160
High grade paper	308	1,300	1,886	3,000		1,000	7,494
Cyclostyle	1,040	250	200				1,490
Note-books	360	220	600				1,180
Kraft paper				500		424	924
Cover paper	260	500	500				1,260
Newsprint					300		300
Paperboard	430	750	300				1,480
Others	310						310
Total	3,118	3,020	3,486	3,500	300	1,424	14,848

Table 30 (1970)

Cigarette paper	250						250
Typing paper	190						190
High grade paper	350	675	3,839	5,100		439	10,394
Cyclostyle	1,040	74	220				1,335
Note-Books	370	250	400				1,020
Kraft paper				900			900
Cover Paper	300	1,295	1,025				2,620
Newsprint					300		300
Paperboard	430	705	525				1,660
Others	310						310
Total	3,240	3,000	6,000	6,000	300	439	18,979

1-2 Imports by Commodities

Table 31 Imports by Commodities

Unit: Tons

Commodity	1963	1964	1965	1966	1967	1968	1969
Paperboard	546	835	832	993	2,018	2,718	2,491
Newsprint	24,929	29,572	28,589	16,164	16,111	29,138	12,737
Printing & Writing Paper	23,303	25,589	20,613	9,731	29,552	27,560	17,291
Lithographic printing paper	103	93	119	10	119	128	68
Wrapping paper	12,779	8,527	9,277	7,027	15,291	13,914	8,098
Wallpaper		32	65	1	20	8	—
Cigarette paper	2,121	3,596	4,552	3,822	3,802	5,643	2,001
Others	3,918	3,138	2,842	6,968	5,809	8,766	1,662
Total	67,699	71,382	66,879	44,716	67,623	87,871	44,348*
Imported from		Japan		25,858	26,510	26,546	
		Afro-Asian Countries		10,708	18,872	31,635	
		Eruope & USA		8,150	21,341	29,690	

* Imports for 1969 indicate the values recorded during January – June period.

Though the import for the latter half of 1969 is unknown, the annual import volume of paper of Indonesia is estimated to range from 87,000 to 88,000 tons at present.

Commodity-wise, newsprint and printing and writing paper occupy a predominantly large portion, or 32 to 33%, followed by wrapping paper (including kraft paper) and cigarette paper.

Newsprint is imported from Canada and Scandinavian countries for the most part, while high grade paper is imported mostly from Japan. Cigarette paper is supplied chiefly by Japan and France. Import of paper from mainland China is conspicuous in recent years.

Table 32 Import Volume of Pulp

Unit: Tons

Year	Volume
1963	1,539
1964	969
1965	1,442
1966	1,826
1967	104
1968	135

1-3 Estimate of Demand

Based on the domestic production and imports of paper given in the preceding paragraph, demand for paper in Indonesia is estimated as follows.

(1) Demand for Paper in Recent Years

Table 33 Demand for Paper in Recent Years

Unit. Tons

Year	Total Demand (A)	Domestic Production (B)	Imports	Rate of Self-sustenance (B/A)
1965	78,001	11,122	66,879	14.2%
1966	54,582	9,866	44,716	10.8
1967	76,351	8,628	67,723	11.3
1968	99,179	11,308	87,871	11.4
1969	102,848	14,848	88,000	14.4
1970	107,000	19,000	88,000	17.7

i) Stagnancy noted in 1966 for both domestic production and imports is considered ascribable to the confusion caused by the political change in 1965.

ii) Values for years in and after 1969 are based on the judgement of and inference drawn from the situations observed during the survey period due to the lack of statistical data.

iii) Production of private paper mills has been omitted due to the lack of data.

iv) Rate of self-sustenance, though on the gradual increase, is estimated to range from 14 to 18%.

v) Demand for paper in 1970 estimated by the Government is as tabulated below.

Table 34 Estimated Demand for Paper in 1970

Commodity	Quantity (t)	Percentage (%)
Newsprint	38,600	36.5
Printing and Writing Paper	30,000	28.3
Kraft Paper	10,400	9.7
Paperboard	2,500	2.4
Cigarette Paper	6,200	5.9
Others	18,300	17.2
Total	106,000	100%

(2) Five Year Development Plan and Forecast of Future Demand

The current Five Year plan aims at attaining an annual production capacity of 166,500 tons at the outset of 1974 for complete satisfaction of domestic demand and export of surplus products through rehabilitation of the existing six mills, expansion of Padalarang and Letjes Mills and construction of Newspaper and Kraft paper mills with 200 tons per day capacity each.

The above development plan has perhaps been mapped out at the recommendation of the World Bank.

Table 35 Demand for Paper Estimated by World Bank

Unit: Tons

Commodity	1969	1973
Writing and Printing Papers	53,500	58,500
Wrapping Paper	47,500	52,000
Newsprint	39,750	43,500
Paperboard	12,250	13,500
Total	153,000	167,500

Comparative study of the above estimate and the Five Year Plan discloses that upon completion of the Plan at the beginning of 1974, Indonesia will have to import about 25,000 tons of printing and writing papers and paperboards, but will be able to export an approximately same quantity of newsprint and wrapping paper. As for kraft paper, the demand estimate made by the Directorate General of Chemical Industries indicates that 16,000 tons will have to be imported even after construction of a plant having an annual production capacity of 60,000 tons.

Estimates given above are all made on the assumption that the industrial development and the implementation of various projects that support it make a smooth progress. These estimates, however, need to be modified because of the retarded progress of the projects and the curtailed operation of already constructed plants which is due to the difficulty in obtaining necessary machine parts and raw materials, shortage of working funds, and lack of technical and managerial skill.

Hence the demand growth during the five-year period from 1969 to 1973 is estimated as follows on the basis of an average annual growth rate of 10%.

Demand in 1969:	102,000 tons
" 1970:	112,000 "
" 1971:	123,000 "
" 1972:	135,000 "
" 1973:	150,000 "

1-4 Demand by Commodities and Its Transition

(1) Estimate of Demand by Commidities

An attempt to estimate the demand by commodities entails difficulties and cannot hold an acceptable accuracy since it must be made on the basis of total demand and its growth inferred from the limited data. The table given below is an outcome of such an attempt.

Table 36 Growth of Demand by Commodities

Unit: Tons

Commodity	1970		1971	1972	1973
	(A)	(B)			
Newsprint	38,600	27,000	28,500	30,000	32,000
Printing & Writing Papers	30,000	38,000	40,000	42,000	46,000
Kraft Paper	10,400	14,000	20,000	24,500	29,000
Paperboard	2,500	5,000	10,000	15,000	18,000
Cigarette Paper	6,200	6,200	6,500	6,800	7,000
Others	18,300	16,800	18,000	16,800	18,000
Total	106,000	107,000	123,000	135,000	150,000

Notes: (A) Demand estimate made by the Indonesian Government.

(b) Modified demand estimate.

Newsprint	Of the total demand estimated by the Government, about 70% (27,000 t) alone has been assumed to be used for printing newspapers. Of the remaining 30% (11,600 t), 70% (8,000 t) has been added to printing and writing papers, and 30% (3,600 t) to kraft paper for wrapping.
Kraft paper	For the rapid growth of demand for kraft paper and ordinary wrapping paper, refer to Table 39.
Paperboard	Refer to Reference Data No. 1 and Table 40.

(2) Demand and Rate of Self-sustenance

Table 37 Demand and Rate of Self-sustenance

Unit: Tons

Commodity	Demand (1970)	Domestic Production (1970)	Rate of Self-sustenance
Newsprint	27,000	–	0%
Printing & Writing Papers	38,000	13,090	34.4
Kraft Paper	14,000	3,500	25.0
Paperboard	5,000	1,660	33.2
Cigarette Paper	6,200	250	4.0
Others	6,800	500	2.9
Total	107,000	19,000	17.7

(3) Changes in Demand for Paper

In any country of the world, paper making industry never fails to begin its production activities with the supply of printing paper. Printing paper production is then ensued by the production of industrial papers. This is the pattern followed by the paper making industry in all European countries and the U.S.A., and the Japanese paper making industry has also pursued exactly the same pattern of development.

In Indonesia, there are signs for marked increase in the demand for papers for wrapping and industrial purposes.

Table 38 Transition of Monthly Annual Production by Commodities in Japan

Unit: Tons

Commodity	1935	1945	1955	1965	1969	1969/1935
Newsprint	20,986	6,188	38,331	98,683	134,506	6.4
Printing Paper	25,642	5,161	59,196	97,450	156,257	6.6
Writing & Drawing Papers	2,247	131	4,736	6,843	8,172	3.6
Kraft & Wrapping Papers	10,295	3,478	20,407	70,756	94,812	9.2
Thin Paper & Miscellaneous Paper	3,040	2,644	8,894	77,873	118,527	39
Total of Paper	62,210	17,662	116,084	351,605	512,279	8.2
Total of Paperboard	17,485	3,227	49,195	256,614	430,203	24.6
Total	99,695	20,829	165,279	608,219	942,482	11.8
Paper: Paperboard	78 : 22	85 : 15	70 : 30	58 : 42	54 : 46	

As shown in the above table, paper production increased by 12 times during the 35-year period from 1935 to 1969 which includes the post-war rehabilitation period. The highest growth rate was achieved in the production of thin papers (including those for home use), followed by paperboard and kraft paper.

Estimated Demand for Kraft Paper

Source: Directorate General of Chemical Industries

Unit: Tons

Table 39-1 Estimated Annual Demand for 1969 – 1973 Period

Year	Cement	Fertilizer	Radio & TV	Tobacco	Others	Total
68/69	13,699	2,200	659	1,943	1,850	20,350
69/70	15,960	2,200	733	2,209	2,110	23,212
70/71	17,955	6,050	790	2,831	2,763	30,389
71/72	22,610	14,850	879	4,217	4,256	46,812
72/73	33,250	14,850	950	5,321	5,437	59,808
73/74	43,890	17,842	1,021	6,691	6,944	76,388

Table 39-2 Estimated Annual Requirements of Cement Plants

Year	Gresik	Padang	Tonosa	Thibinong	New Projects	Total
68/69	9,975	3,192	532	–	–	13,699
69/70	10,640	3,192	2,128	–	–	15,960
70/71	10,640	4,655	2,128	–	–	17,955
71/72	13,500	5,852	3,192	–	–	22,610
72/73	13,500	5,852	3,192	10,640	–	33,250
73/74	13,500	5,852	3,192	10,640	10,640	43,890

Table 39-3 Estimated Annual Requirements of Fertilizer Plants

Year	Sri Widjaja (Palembang)	Gresik	Thilatjap	Djati Barang	Total
68/69	2,200	–	–	–	2,200
69/70	2,200	–	–	–	2,200
70/71	2,200	3,850	–	–	6,050
71/72	8,800	3,850	2,200	–	14,850
72/73	8,800	3,850	2,200	–	14,850
73/74	8,800	3,850	2,200	2,922	17,842

(Reference Data No. 1)

Demand for Base Paper for Corrugated Board in Indonesia

Indonesia had no corrugated board industry until it first came into being this year. Until last year, there existed only one manual corrugater installed at a corner of an enameled ironware maker in Djakarta, and all the corrugated board boxes required were imported from Japan, Singapore and Hongkong.

Political stabilization attained in recent years has stimulated the inducement of foreign capitals which led to active production activities and resultant demand for corrugated board boxes for packing such products as oil and grease, tobacco, seasonings, textiles, cosmetics, frozen marine products, dairy products, etc.

This gave rise to the construction of corrugated board plants by the resident Chinese concerns and foreign firms. Number of plants already in operation, scheduled to be completed within this year or planned to be constructed totals eight at present. Rapid expansion of corrugated board industry is expected since the establishment of plants, now limited to the vicinities of Djakarta, is likely to take place in other districts including Surabaja.

Since domestic production of base paper is not available, the country resorts to import from Japan and North America for the supply of liner boards and from Japan for corrugated medium. The team learned that negotiations are under way for construction of a corrugated board plant at Djati Luhur under joint management of Padalarang Mill and a Norwegian concern.

Table 40 List of Corrugated board Plants

(As of End of June 1970)

Name of Enterprise	Owner	Corrugater			Planned Start of Operation	Material Requirement	
		Maker	Available Width	Speed		Liner Board	Medium Board
METINBOX	LIMEX, Bangkok	Niwa Iron-works, SS-1 SS-2	61" 61"	50 m 35 m	May	150 t	140 t
PUPAR	Putera Adil	Uchida Iron-works, D-3	165 cm	120 m	June	220	200
U.C.B.	Hsinkee Hong, Ltd., Hongkong	Uchida Iron-works	63"	70 m	July	130	120
GURU	Norwegin concern	Simon Hooper	220 cm	200 m	Unknown	500	470
PERSEROAN DAGANG & PERINDUSTRIAN, DKT		Niwa Iron works	61"	30 – 50 m	August or September	90	80
INDUK DJAJA	Bonauli		120 cm		"	Unknown	Unknown
FIRMA BANANG			37"		Within 1970	Unknown	Unknown
TUGU SERIBU	Mei Hwa Print Tong Hin Gelas	Uchida Iron-works	145 cm, single		August or September	40	40
						1,130 t	1,050 t

Notes: Calculation basis of material requirements:

Surface liner – 180 g/m^2, medium board – 130 g, back liner – 50%: 180 g, 50%: 130 g

A flute – 70%, B flute – 30%

Number of working days per month – 25 days

Daily working hours – 7 hours

Width x Speed x 60 min. x 7 hrs. x 0.4 (Width efficiency 0.8) (Speed efficiency 0.7) (Operating efficiency 0.7)

x 25 days = Monthly output

(Reference Data No. 2)

Demand for Cigarette Paper

Indonesians have a strong taste for cigarettes, and it is not difficult to see young boys about 10 years old smoking.

In the densely populated cities of Eastern Djawa where abundant labour force is available, there are hundreds of hand-rolled cigarette factories where male and female labourers are employed. Aromatized cigarettes produced by these factories far surpass the Western style mechanically rolled ones in quantity. Production scale of these two types of cigarettes is estimated to be as tabulated below.

Table 41 Production Scale of Cigarettes

Kind of Cigarette	Production Method	Maker	Annual Production	Cigarette Paper	
				Specification	Annual Consumption
White Cigarette	Mechanical rolling	BAT. ATOMACY FAROKA INDUSTRIAL etc.	15 billion cigarettes	21 – 22 g bobbin	800 tons
Kretek & Klambak	Hand rolling, aromatizing with Tjingkeh	Some hundred makers joining Kretek Maker's Association	25 billion cigarettes	24 – 28 g sheet	2,000 tons

Production of Kretek cigarettes is subject to extreme fluctuation due to the sharp price fluctuation of aromatics (tjingkeh= clove). Consequently, similar fluctuation takes place in the consumption of cigarette paper (sheet paper, 4.645 kg/Ream, measuring 20" x 30" and weighing 24 g/m^2).

Import of cigarette paper for hand-rolled cigarettes during the past five years is as tabulated below.

Table 42 Import of Cigarette Paper from Japan

Unit: tons

Year	Quantity
1965	2,008
1966	1,675
1967	2,153
1968	2,909
1969	2,145

Table 43 Number of Members of Kretek Makers' Association
(As of December 1968)

Area	City	Number
Northern Sumatra	Medang	16
Western Djawa	Bandung	1
Central Djawa	Thirebon	4
	Tegal	11
	Purwokerto	13
	Jogjakarta	9
	Surakarta	24
	Magelang	21
	Kudus	199
	Semarang	21
Eastern Djawa	Bodjonegoro	41
	Madiun	66
	Kediri	89
	Surabaja	109
	Malang	44
	Denpasar	11
Total		679

2. Distribution

To obtain an accurate knowledge of the commodity distribution in Indonesia entails more difficulty than to make an estimate of demand. The difficulty is attributable to the complete absence of an established distribution system of commodities including paper, and the extreme instability of price and volume of distributed commodities which become available only by the speculative transactions conducted by resident Chinese merchants.

2-1 Distribution by Areas

Table 44 Distribution of Paper by Areas

Area	Population (Thousand persons)	Percentage (%)	Paper Consumption (Tons)	Percentage (%)
Djakarta	5,700	21.7	64,200	60.0
Western Djawa	19,800			
Central Djawa	22,800	21.1	13,900	13.0
Jogjakarta	2,800			
Eastern Djawa	27,000	22.3	18,200	17.0
Sub-total	78,200	64.6	96,300	90.0
Sumatra	19,800	16.3	5,400	5.0
Kalimantan	5,200	4.3	1,300	1.2
Sulawesi	8,900	7.3	3,000	2.8
Little Sunda Is.	7,000	5.7		
West Irian	900	0.7	1,000	1.0
Other Areas	1,000	0.8		
Sub-total	42,800	35.4	10,700	10.0
Grand total	121,000	100.0	107,000	100.0

Notes: 1) Study of population percentages and paper consumption in Djawa and outer territories discloses that more than 90% of paper is distributed in Djawa as outlined in the above table.

2) Population of respective areas is based on the estimate for 1970 appearing in the data of the Central Bureau of Statistics.

2-2 Demand-Supply Condition and Locations of Paper Mills

Table 45 Demand-Supply Condition and Locations Paper Mills

Mill	Production Capacity	Location	Demand	Surplus Output
Padalarang	3,600 t	Western Djawa	64,200 t	
Blabak	7,500	Central "	13,900	
Letjes	9,000	Eastern "	18,200	(-) 67,200 t
Banjuwangi	9,000	"		
Gowa	9,000	Southern Sulawesi	8,800	7,200
Siantar	4,500	Northern Sumatra	2,400	2,100
Martapura	3,000	Southern Kalimantan	1,300	1,700

The plants in Djawa, located close to major consuming cities such as Djakarta, Surabaja and Jogjakarta, transport their products by trucks. There is no doubt that they are in a far more advantageous position than the mills in the outer territory irrespective of the transport means they resort to.

Overland freight per kg from these plants to respective consuming cities is as given below.

Mill	Djakarta	Semarang	Surabaja
Padalarang	RP 2.0	RP 3.0	RP 5.5
Blabak	4.0	1.0	2.5
Letjes	5.5	1.0	2.5
Banjuwangi	8.0	5.0	2.0

In contrast with these four mills, mills in the outer terriory can find little outlet of their products in their vicinities, and must therefore seek the market either in other parts of the outer territory or in Djawa. The high amount of sea freight and cargo handling charges at ports incurred on them for the transport of their products does not allow them to compete with the mills in Djawa or imported products.

Sea freight per kg from these mills to Surabaja and Djakarta is as tabulated below.

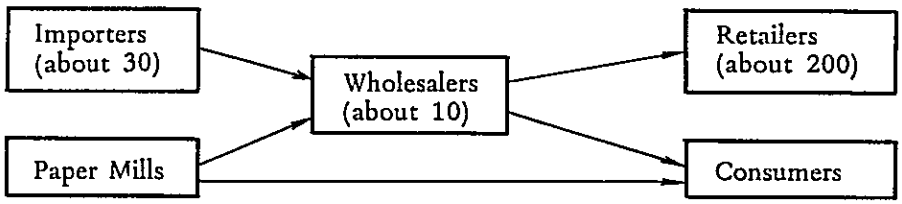
Table 46 Freight from Mills in Outer Territory to Djakarta and Surabaja

Unit: RP

Destination / Mill (Port of Shipment)	Djakarta	Surabaja
Gowa (Makasar)	16.00	13.00
Siantar (Medan)	29.00	—
Martapura	11.30	9.00
JAPAN	8.00	

2-3 Distribution System

The distribution system in Indonesia can be roughly illustrated as follows, though it does not seem to be firmly established.



In the above-illustrated system, five importers, Warga Djaja, Gardu Gjati, Nakau, Sinar Selatan and Kemu Keten are called the Big Five and controlling the market. Commodities imported by them flow to the wholesalers. Underselling of Japanese commodities seems to have discouraged the importers recently. Business appears rather dull and sluggish these days. There are moves among leading wholesalers to negotiate directly with Japanese firms and not through the importers. Importers are, on the other hand, trying to take advantage of this trend for establishing and maintaining their respective sales routes, and tend to strengthen their trading function of paper alone.

Leading importers are under the Chinese management, though they are nominally represented by Indonesian presidents. Flow of commodities through the distribution channels involving wholesalers and retailers is therefore controlled by the resident Chinese.

Djawa is the centre of market activities and 70% of such activities is concentrated in Djakarta. It is said that nearly 75% of business negotiations are concluded in Kota, the Chinese district.

When considered from the viewpoint of paper making industry, the following may be cited as being characteristic of the distribution system of Indonesia.

(1) Direct supply from paper mills to users are state-operated enterprises or large-scale enterprises under joint management of the Indonesian Government and foreign concerns. Supply to other private enterprises which are mostly under the Chinese management is made available through Chinese merchants. While the demand for paper is satisfied for the most part by the supply from overseas countries, import transaction is in the hand of the resident Chinese. As a result, the paper market is manipulated by the Chinese and state-owned paper mills hardly have the function and capability to sell their products as they wish.

(2) Coordination between paper mills, particularly in the aspect of sales activities, is deficient, which results in their production of same and competitive commodities. This trend is taken advantage of by distributors.

(3) Systematization of paper production, secondary processing and tertiary processing is not achieved yet. Ruling of note-books alone being carried out at paper mills on a small scale, it is evident that paper mills have not yet attained an influential position.

3. Price and Market Conditions

3-1 Selling Price

At the meeting of the Asosiasi Pulp & Kertas Indonesia held in 1969 at Padalarang, selling prices of products turned out by respective paper mills were standardized as shown in the table below.

Table 47 Standardized Prices of Papers
(Adopted on October 30 and November 1, 1969)

(500 sheet for 1 ream)

Commodity	Basis weight	Dimensions	Djakarta	Semarang	Surabaja
HVS	60 g/m^2	65 x 100	RP 2,060	RP 2,060	RP 2,060
Snow White	"	"	2,140	2,140	2,140
Cyclostyle	69	55 x 75	105/kg	105/kg	105/kg
Drawing Paper	120	"	3,000	2,900	2,900
Envelope Paper	100	65 x 100	2,780	2,780	2,780
Paperboard, White	100	61 x 86	6,100	6,060	6,100
Paperboard, Coloured	100	"	6,400	6,400	6,400
Wrapping Paper	50		2,300	2,300	2,300
Note-book of 18 sheets			5/book	5/book	5/book

Maximum discount rate for each transaction:

2%	for an amount exceeding	RP 500,000
4%	"	1,000,000
6%	"	1,750,000
8%	"	2,500,000

3-2 Market Conditions

The Cabient order issued on April 17, 1970 abolished the double exchange rate hitherto applied to DP and BE for application of a single rate. This is one of the Government's efforts towards normalizing Indonesia's economy. However, the former rate (RP 326) is still effective for procurement of commodities included in the Government's budget with credit foreign currency or funds contributed in aid of projects.

The Government allowed the procurement of commodities under the Yen credit for the current fiscal year for the first ten days of July. Of a total of $55 million assistance allocated to general commodities, $25 million was spent in no time. Due to this overheated and speculative procurement trend, the Government had to suspend the use of Yen credit.

Under the circumstances, it is not unlikely that commodities not much serving public interests will be delisted from Yen credit application, and there are some who suspect that the exchange rate will be raised from RP 326 to about RP 360.

Negotiations for import of paper has been rather inactive in anticipation of the approval for Yen credit procurement. There are signs that newsprint, high grade paper, cellophane paper and other special papers will also be delisted. Therefore, the market might present a continued strong tone.

Price of paper has risen this year partly because of the recent revision of import tariff on high grade paper on which 40% is now levied instead of the former tariff of 30%.

Current price of high grade paper and other comodities stands as follow.

i) Selling price of high grade paper

Imported paper	:	RP 2,900/ream (=RP 148.72/kg)
Home-made paper	:	RP 2,700/ream (=RP 138.46/kg)

ii) Selling price of newprint

Japanese roll newsprint	:	RP 60.95 – 63.50/kg
Canadian "	:	RP 68.08
American "	:	RP 71.50

iii) C & F Price of imported B.K.P.

Japanese product	:	$240/MT

As for cigarette paper, many rolled cigarette makers in Central and Eastern Dajwa which use it were seriously affected by the price hike of clove (tjingkeh) (See the table below), and it is reported that 90% of these rolled cigarette makers have suspended production and are waiting for reduction of clove price.

For this reason, stock of Japanese sheet cigarette paper has increased, with the result that its price went down to RP 1,550 in Djakarta and RP1,600 in Surabaja. Market conditions recovered in autumn last year is now heading for a decline. The extreme instability of rolled cigarette production is causing repetitive and sharp fluctuation of demand for cigarette paper.

Table 48

Year	Price
1968	RP 300/kg
1969	2,100/kg
1970 (begining)	1,600/kg
1970 (July)	2,600/kg

Table 49 — Perhitungan/Kaikulasi Baru Haroa Kertas

— Per 17/Apr. 1970 —

Devisa Umum Rp 376/US$
NVP Bea Masuk 378/US$
Ongkos² 50/US$

Nama Kertas	Tarip Pos	Statist. No.	Bea Masuk (Import tariff)	Op Centen Addition-al tax)	Padjak Pendjualan	RP/US$1
Aluminum Foil	631	8060	10%		5%	487
Aluminum Foil, Gold	312/11	4160	70	50%	20	986
Aluminum Foil, Silver	312/11	4160	70	50	20	986
Bankpost Bond	315/1	4140	20	50	5	567
Bible Paper	315/1	4140	20	50	5	567
Blotting Paper	315/11	4240	30	50	10	655
Blue Cover	307/11	4180	20	300	5	766
Bitumenkraft	307/11	4180	30	100	10	719
Blue Match Paper	315/11	4180	30	–	10	592
Boekbinderslinnen	368	5730	20	–	5	526
Briefkaartcarton	315/11	4140	30	50	10	655
Casing	307/111	4180	30	100	10	719
Carbon Basispapier	315/1	4330	20	50	5	567
Cellophane	908/11a	2770	15	–	10	531
Cigarette Paper	309/11	4210	30	–	10	592
Cyclosytle Paper	315/1	4150	30	50	10	607
Couverture	315/11		30	50	10	655
Drawing Paper	315/1	4230	20	50	5	567
Duplex Carton	315/11	4070	30	50	10	655
Ersats Parkament	307/111	4180	30	100	10	719
Filtroerpapier	315/1	4240	20	50	5	567
Glanspapier(Flintpapier)	311	4310	40	50	10	719
Glassine Paper	307/111	4180	30	100	10	719
Grey Board	302/1	4070	20	–	5	526
HVS	315/1	4130	20	100	5	607
HVI – HHI	315/1	4140 (4150)	20	50	5	567
Ivoorcarton	315/11	4140	30	50	10	655
Kartotheekcarton	315/11	4140	30	50	10	655
Kraft Paper	307/111	4180	30	100	10	719
Kunstdrukpapier	315/1	4160	20	50	5	567
Litho Papier	315/1	4140	20	50	5	567
Manifoldpaper (doorslag)	315/1	4140	20	50	5	567
Newsprint	308/1	4090	–	–	–	428
Newsprint Coloured	308/1	4110	20	–	5	526
Offset Papier	315/1	4140	20	50	5	567
Register Papier	315/1	4140	20	50	5	567
Stencil Basispaier	315/1		20	50	5	567
Stroobord No. 100/UP	302/1	4060	20	–	5	526
Tissue Paper	315/11	4180	30	50	10	655
Cotton Paper	315/11	4310	30	50	10	655

V. STATE OF EXISTING PAPER MILLS

1. Padalarang Paper mill

1-1 History

This mill is located on the western outskirts of Bandung and is the oldest paper mill in the Republic of Indonesia, being established in the colonial dyas under the Dutch control.

In 1922 the mill was inaugurated as a corporation with its headquarters in Netherland and the German made No.1 paper machine was installed.

In 1932 No.2 paper machine was added to its facility.

In 1958 the mill was nationalized into the Kertas Negara Padalarang Letjes together with Letjes mill and placed under the control of the BAPPENAS.

In 1961 Letjes paper mill was separated and this mill came under the administrative control of the Ministry of Industry as a P.N.

1.2 Description of Facilities and Capacities

Digester	:	Vertical stationary (fixed) type, 25-25 m^3 x 5 units
Paper machine	:	No.1 paper machine-wire width 2,400 mm
	:	No.2 paper machine-wire width 2,250 mm
2 super-calenders, 2 machine calenders		
3 cutters and 3 bobbin machines		
Converting machine	:	Complete note-book making machine Complete blue-print paper coating machine
Production	:	Finished goods – 10 t/day
Type of products	:	Various types ranging from cigarette paper (24 g/m^2) to cyclostyle paper and Manila carton (250 g/m^2) are being produced.
Water supply	:	Water is available from four gushing springs located near the mill at the rate of 100 ℓ/sec. Besides, the mill possesses the water rights for the supply of water from the irrigation canal at the rate of 100 ℓ/sec.
Power supply	:	1,000 KW of power is purchased from P.L.N. (Unit cost of Rp 6.5/KWH). One out of three 275 KVA diesel generators is in operation (Unit cost of Rp 5.5/KWH).
Steam	:	Heavy oil burning boilers : Two – 2.5 t/h capacity One – 2.8 t/h capacity 6-8 kg/cm^2 (unit cost of steam Rp 900/t).

1-3 Production Achievements

Daily production of 12 tons has been attained recently reflecting the effect of the First Rehabilitation Program which began in 1969. See Table 50.

1-4 Raw Material

Straw pulp is produced from rice straw by Soda Method and all the straw pulp is made to paper by paper machine. Current production is 12 t/day. Besides, imported pulp is being used at the ratio of 10%.

Rice straw is collected from the area within a radius of 200 km from the mill such as Tjirebon (150 km from the mill) and Karawang (120 km from the mill). The price of rice straw is Rp. 4.5 ex factory and the water content is 17 % on the average. A study is being made on the advisability of using bagasse produced by Tjirebon sugar plant.

1-5 Manpower

The total number of employees is 723, of which 38 are female workers.

1-6 Profit and Loss Accounts of the Mill

In spite of its small scale, this paper mill is an excellent mill such as constantly gaining profit. This is mainly due to the fact that the mill manufactures only high priced thin papers and maintains a stable production level of 10 t/day or more.

1-7 Problems

The present finishing yield is in the range from 75% to 80% and in some extreme cases the finishing yield is 62% only depending on the type of products. Efforts should be made to raise these low yield up to 95%. To attain this objective, basic technology on the manufacture of thin paper must be acquired and at the same time, improvement must be made on the facilities.

Facilities of the mill were installed 50 years ago and since then these facilities have been maintained almost in their original form. Therefore, with the 5 t/day paper machines of the model of a half century ago and whose productivity is extremely low, the mill has no competitive power compared with other new paper mills equipped with new model machine having a apacity of 30 t/day.

If these are left as they are, the mill will only see its fall from the line of competition before long. It is of urgent necessity, therefore, to replace these machines with new models as early as possible. It is fortunate for the mill, however, that it is favored by excellent

infrastructure and that it is in a favorable position for the mill. What is important for the mill, therefore, is to take a "Scrap and Build" policy with the emphasis placed on the production of light weight thin papers having a high added value.

The recent price escalation of caustic soda is one of the major factors for the increase of production costs. As the mill has an electrolyte facility, a study should be made on the pay-ability when caustic soda (and chlorine) are produced with its own facility.

Table 50 Production Achievements of Padalarang Paper mill by Product type

Type of products	1964	1965	1966	1967	1968	1969
H V S	987.4	638.5	607.2	424.4	492.7	289.4
Cyclostyle paper	266.6	320.1	151.0	758.8	829.3	1,171.4
Drawing paper	257.4	143.4	669.4	215.0	236.9	90.6
Manila carton	244.9	534.3	328.6	374.3	413.4	289.0
Manifold paper	464.4	386.6	339.3	220.5	307.1	94.2
Cigarette paper	185.5	110.3	122.4	163.6	176.1	208.8
Note-book paper	166.7	235.0	239.9	285.6	80.0	46.2
Wrapping paper	184.6	281.6	332.6	356.4	466.7	927.9
Total	2,757.5	2,649.8	2,790.4	2,798.7	3,002.1	3,117.6

1-8 Note

Information concerning the Padalarang Paper mill is given in detail in the following report, from which the data was obtained for this section.

Report on the improvement and Expansion Program for the Padalarang Paper mill in Jan., 1970 Japan Consulting Institue.

2. Blabak Paper mill

2-1 History

This paper mill was established in 1957 by the Sindacato Cellulosa Pomilio Company of Italy with the financial aid from the Vanga industrials. The mill construction was completed in 1961 and the operation started in 1962. Originally, the mill was intended for the production of 20 tons of cyclostyle paper, writing paper and paper board by Pomilio Method using rice straw as raw material, but because of delays in the construction work and insufficient technical assistance, the operation method was switched from Pomilio Method to the conventional Soda Method. For this reason, the current production is kept low at the level of 10 t/day. The mill is presently under the administrative control of the Ministry of industry.

2-2 Description of Facilities

Table 51

Dept	Description of Facilities	Quantity	Specification
Pulp	Straw cutter	1	
	Digester	1	Pomilio Method, ϕ – 1.5m, height – 21m
	No. 1 Tower	1	Cℓ Tower
	No. 2 Tower	1	NaOH
	Washer	3	
Screen	Coarse screen	1	
	Fine screen	1	
	Centri-cleaner	1	
	Bleaching Tower	2	
Bleaching	Filter	2	
Wet m/c	Wet Machine	1	Width – 1.6m
Paper m/c	A.B. Conical Refiner	1	
	Rotary Screen	2	
	Wire Part		Width – 2.6m, Wire length – 28m
	Press Part		Plain press rollx3
	Dryer Part		ϕ 5 feet x 26
	Calender		6 stages
Finishing	Rewinder	1	Width – 2.4m 400m/min
	Paper cutter	1	Single, width 1.4m
	Ruling Machine		
	Folding Machine		Monthly production 1,200,000 pieces

Water Supply: A clean gushing spring is located in the rear of the mill and water is supplied to the mill with two 70 t/min. pumps. As another unexploited spring is also available in the neighboring area, sufficient water supply will be secured even when the production reaches the 24 t/day level.

Power Supply: Power is provided by one 1,200 KVA, two 820 KVA and one 120 KVA (DC) diesel generators. However, one of the 820 KVA generators is not in satisfactory condition (Generator efficiency being 60 to 65%)

and a power shortage occurs when one of the generators is taken out of service for maintenance. This is one of the factors which obstruct normal production.

Steam: Two 12 Kg/cm^2, 8 t/h water tubular type boilers in operation.

2-3 Production Achievements

Immediately after the start of operation the digestion process by Pomilio Method was not functioning properly against the expectation with the resultant shortage of pulp supply and the production since then has been limited to the level of about 10 t/day. Major troubles area:

1) Filters get clogged frequently by silica trouble after soda digestion and the removal of silica from the filter inevitably increases the time of suspension.

2) When the entire length of rice straw is used, the design yield is 40% but the actual yield is in the range from 18 to 20%.

3) Because of the present digestion system by Soda Method and not by pressure method, the yield is kept below 30% and the quantity of charge is correspondingly small.

4) There is a power shortage due to limited out-put of 820 KVA diesel generator which has only 60 to 65% generating efficiency.

5) While the trim width of paper machine is 2.4m, the width of rewinder is 2.2m and that of cutter is 1.4m, showing unbalance between them.

6) Because of lack of roll grinders, rolls must be sent outside for grinding and a considerably lengthy time is consumed before they are returned to the mill. For this reason, badly damaged rolls are being used out of necessity.

Production achievements under these conditions are shown below.

Table 52

Year	Pulp Production	Paper Production
1961	747,155 kg	1,572,930 kg
1962	1,638,419	3,157,069
1963	1,556,401	2,831,729
1964	1,578,937	2,841,765
1965	1,624,874	2,887,102
1966	1,425,435	2,364,054
1967	375,224	639,004
1968	1,558,908	2,040,544
1969	2,423,475	3,355,435

2-4 Raw Material

Because of its location being in the center of rice producing area, the mill is able to obtain rice straw from the area within a radius of 100 Km. Because of poor pulp yield of rice straw, only the head portion of the straw is utilized at present but the pulp yield is still limited to 30%. Price of rice straw is 4 Rp ex factory, of which 3 Rp is the cost of transportation. Utilization of only the head of straw will inevitably expand the area of collection. Though a study is being made on the advisability of using bagasse for the increase in the future pulp production, the period in which bagasse is produced by sugar plant is mainly from May through July. Therefore, the use of bagasse still involves many problems such as the means of storage and purchasing prices. In general, imported pulp is used for the production of cyclostyle at the blending ratio of 20 to 30% and for the production of other papers at the blending ratio of 10 to 12%.

2-5 Manpower and Production Cost

This mill employs a total of 519 workers. Monthly payment per employee is 1,700 Rp (Total monthly payment of 880,000 Rp for 519 employees). In addition, each employee receives payment of 3,200 Rp in kind and a bonus once a year.

Products are marketed mainly in Djakarta (a distance of about 600 Km) and Surabaya (a distance of about 400 Km) and the cost of transportation by truck is 4.5 Rp and 2.5 Rp respectively. Freightage by railway is 2 to 3 Rp higher than that by truck.

The production cost was said to be 125 Rp but detailed information was not available. Judging from the prevailing conditions, however, it seems that some deficits are unavoidable at the current production level of 10 t/day.

2-6 Problems

Though the mill has many problems in respect of facilities and operating techniques, as mentioned previously, great efforts are being made for the improvement of the business.

With the present production level, however, the mill will soon face financial difficulties.

To avoid this situation, the following measures must be given immediate attention.

1) Steps must be taken immediately to maintain constant production level of 24 t/day. More specifically, necessary improvements must be made on the facility and efforts should be made to raise the level of operating technique with the assistance of foreign specialists so that the required quantity and quality of pulp may be secured with the Pomilio Method which should be the best method for digestion of straw pulp.

2) Like other paper mills which use straw pulp as raw material, a study should be made on the improved use of this raw material and at the same time, research must be made to develop new types of product so that competition with other fellow paper mills may be avoided. In the field of processed goods, it is hoped that a further study be made on the advancement to other types.

3) In view of the anticipated increase in the production and the current orders for the roll paper, it will be necessary to replade the cutter with the one having the width corresponding to the width of paper machine or to expand the width of the rewinder.

3. Letjes Paper mill

3-1 History

This mill is located in Letjes Province of East Java and was established by a Dutch paper manufacturing company as a subisidary of the Padalarang Paper mill.

1939: Established as Papiel Padalarang Letjes.
1940: Operation started.
1958: Placed under the control of the Indonesian Government and designated as a State-Owned Mill.
1964: Expansion of the mill started with the aid of West Germany but the work was discontinued.
1968: Expansion work resumed.
1970: Work completed and operation started in May. The Second Improvement Project is under consideration.

3-2 Description of Facilities

Table 53

Dept	Description of Facilities	Q'ty	Specifications
Pulp	Straw Washer	1	
	Straw Cutter	2	
	Digester	4	Vertical type-35m^3
	Tumbling Digester	3	43m^3, installed in 1970
	Washer	3	"
Screen	Filter		
	Riffler		
	Centrifugal Screen	1	
	Centeri-Cleaner	1	Installed in 1970
Bleaching	Porcher	3	
	1 Stage Bleaching Tower & Filter		

Dept	Description of Facilities	Q'ty	Specifications
Bearing	Beater	5	
	Pulper	1	
	Edge Runner	2	
	Pulp Machine	1	With dryer
	Refiner	4	Installed in 1970
Paper m/c #1	Wire Part		Width – 2.7m Wire Length – 15.95m
	Press Part		Plain x 3
	Dry Part		One intermediate dryer ϕ 1mx 16 + 2
Paper m/c #2	Wire Part		Width – 2.7m Wire length – 28m
	Press Part		Plain x 3
	Dry Part		ϕ 1.5m x 23
	Calender		6 stages
Finishing	Rewinder	1	
	Super Calender	2	10 stages
	Paper Cutter	2	
Note book making	Ruling M/C		
	Folding M/C		

Water supply: Water is supplied by pump from a gushing spring (lake Ronggodjalu) 3 Km east of the mill at the rate of 10,000^3/day. This spring is also used as a source of city water and surplus water is discharged to a river.

Power supply: Diesel generators are provided but the supply of purchased power is sufficient for the current production.

3-3 Production Achievements

(1) Facilities upon completion of the expansion project in 1970 will be as follows:

Paper:	Capacity of existing facilities	10 t/day
	Capacity of additional facilities	20 t/day
	Total	30 t/day
Straw pulp:	Capacity of existing facilities	9 t/day
	Capacity of additional facilities	16 t/day
	Total	25 t/day

Blending ratio of imported pulp – 10 to 20%
Capacity of note-book making facilities

Consumption of base paper	60 t/month
Production of note-books	3,000,000 volumes/month

(2) Type of Products

Cyclostyle paper, Writing paper, Wrapping paper, Cover paper.
Basis weight – 60, 70, 100, 120, 180g/m^2.

Table 54 Production Achievements

Year	Pulp Production	Paper Production	Production of Finished Papers	Average daily Production
1968	2,690 ton	3,218 ton	2,776 ton	9.25 ton
1969	2,875	3,486	3,023	10.08

Average monthly production of note-book is 1,500,000 volumes.
Current daily production after the addition of new machines is maintained at the level of 24 tons.

3-4 Raw Material

Raw material of rice straw is obtained from the area within a radius of 100 Km at the maximum and 50 Km on the average. Price of rice straw is Rp 4/kg ex factory for the purchase of only the head portion of stalk and Rp 2.65 ex factory for the purchase of full length of stalk. Standard water content is set at the maximum 30%. In addition to rice straw, use of bagasse is also being considered. The quantity of bagasse produced annually by sugar plants located within a radius of 10 to 90 Km from the mill is said to be 600,000 tons (with actual water content of 70%) after deduction of the quantity used as fuel. If 1/3 of this quantity is available, daily paper production of 18tons may be achieved. The production cost of per paper Kg with the estimated purchase price of Rp 2.5 for bagasse will be as follows:

Rp 2.5 ÷ 0.3 (water content) ÷ (0.70 ~ 0.65) (Depithing) ÷ (0.5 ~ 0.46) (pulp yield) ÷ 0.9 (paper yield) = Rp 26.5

This figure is higher than that with rice straw.

(Note) Calculation of cost with rice straw:

Rp 4 ÷ 0.7 (water content) ÷ (0.34 ~ 0.4) (pulp yield) ÷ 0.9 (paper yield
= Rp 15.8

It is needless to say that the cost of bagasse pulp may be lowered substantially by providing a clause in the contract requesting stricter allowable water content and dry depithing of bagasse at the sugar plant when the full scale use of bagasse is contemplated in the future. In this country where oil fuel is available at reasonable prices it is desirable to give full consideration to the question of utilizing bagasse as raw material of paper.

3-5 Manpower and Production Cost

The total number of employees is 898. The fact that the present working force is an increase of only 161 workers from the level held prior to the installation of new machines indicates the effect of expansion on the reduction of production cost. When the number of employees (said to be 550) in the Dutch colonial days is taken into consideration, it seems that there still is room for rationalization. The annual payment of wages including allowances in kind amounts to Rp 114 million or Rp 12,700 per employee. In the case of annual production of 9,000 tons, personnel expense per paper Kg will be Rp 12.6.

Being located on Java Island, the mill is convenient for transportation by truck and railway. Additionally, the Port of Propolinggo is situated at a distance of 14 Km from the mill and the availability of schooners will contribute to the reduction of transportation cost of products. With the additional efforts for increased production, the business of the mill will be further improved.

3-6 Problems

Like the Padalarang Paper mill, this mill is favoured by excellent location conditions, water supply and transportation. This is one of the reasons for early establishment of this mill in the country and the expansion of facilities was realized this year. Though the effect of the expansion may not be evaluated for some dulation, the mill with its experiences and techniques gained in the past 30 years is expected to overcome difficulties of various degrees and to bring the second phase expansion project to a success. To attain this goal, however, it is important to take the following points into consideration.

1) Competition with the Banjuwangi, Blabak and Gowa Paper mills in Suravaja market. Comparison of the quality and production cost between the products made from rice straw and the products made from bamboo.

2) The increase of production will inevitably result in the increase of costs for the collection of rice straw. Therefore, it is necessary to make a study on the advisability of producing bagasse pulp.

3) Though the use of imported pulp must be continued, the world wide supply of wood pulp is not smooth and the prices of wood pulp show a rising tendency. It is very likely, therefore, that there will be an increasing need for the supply of bamboo pulp from Banjuwangi.

4. Banjuwangi Paper mill

4-1 History

December	1962:	A contract concluded for the construction of a mill with a loan covered by the reparation of Japan.
August	1963:	Construction started but suspended later.
	1968:	Construction resumed.
March	1969:	Construction completed.
June	1969:	Guarantee operation performed and the mill was left to the owner.
January	1970:	Departure of Japanese engineers and contract fulfilled.

4-2 Description of Facilities

Table 55

Dept	Description of Facilities	Q'ty	Specifications
Pulping	Bamboo Crusher	1	
	Chipper	1	
	Chip Bin	1	300 m^3
	Digester	2	50 m^3
	Wolf Thickener	3	ϕ 2.25m, Length – 1m
Bleaching	Bleaching Tower	5	240 m^3
	Filter	5	ϕ 2.5m x length – 1m
Refining	Hydrapulper	1	5 m^3
	Steel Refiner	4	110 kW
	StoneRefiner	3	95 kW
Paper m/c	Wire Part		Width 2.85m x length 26m
	Press Part		#1 press-suction
			#2, #3 press-plain
	Dry Part		ϕ 1.525m x 25
	Calender		9 stages

Dept	Description of Facilities	Q'ty	Specifications
Power	Vacuum Evaporater Recovery Boiler Oil Boiler		400 m^2 15 kg/cm^2, 6.5 t/h 15 kg/cm^2, 12 t/h

Water supply: 24,000 tons of water is drawn daily from a stream in the mountain in the back of the mill and filtered for plant use. As there is no extra capacity in this supply during the dry season, there will be a shortage of water when increased production is attempted in the future. Present water consumption is approximately 15,000 tons and it will be necessary to take such measures as reuse by circulating water or a stricter water management policy for the conservation of water.

Power supply: Present power consumption is 2,500 kW and two generators are provided, of which one is a standby generator.

4-3 Production Achievements

Table 56 Production Achievements

Year and month	Production	Number of operating days
Apr. 1969	84,715 kg	1 shift operation
May "	230,940	1 and 2 shifts operation
June "	450,385	22 days
July. "	359,180	16 days (Inspection)
Aug. "	456,965	21 days
Sept. "	495,940	20 days
Oct. "	639,655	27 days
Nov. "	568,355	23 days (Bulan puasa)
Dec. "	603,830	26 days
Jan. 1970	401,040	19 days (New Year Holidays)
Feb. "	502,445	26 days
Mar. "	466,776	27 days

Daily production of 30 tons or over had been maintained since October 1969 but it decreased gradually since February 1970 after the departure of Japanese engineers and finally, the mill had to decrease its operation at the end of March due to the damage of economizer tube in recovery boiler. At time of the visit to the mill by the survey team the repair work was nearing completion and the operation was said to have been resumed

in early July of this year. The visit by the team coincided with the personnel reassignment at the mill and therefore detailed information was not available. However, one official remarked, "While the Japanese instructors were assigned to the mill production was smooth but after their departure there have been frequent troubles. We realize the need of further studies on the management of material, technique and process on our part but we are very concerned over our ability to bring up the production to the design capacity. Concerning the failure of the part, there might have been some operational errors but there could have been a defect in material of the part itself. If instructions of the Japanese engineers were provided as before, these problems could be solved". With the above remark he pointed out the following as the essential factoros for the improvement of the situation.

(1) Soda recovery techniques depending on the operation of recovery boiler.
(2) Operating techniques for paper making.
(3) Techniques on production control and personnel administration.

4-4 Raw Material

Bamboo as raw material is supplied from a Perhutani owned bamboo forest covering an area of 7,000 ha at the foot of Mt. Raung approximately 40 Km southeast of Banjuwangi Town. For the mill having a daily production capacity of 30 tons, monthly supply of 2,700 tons of bamboo is required. Since the supply from the above mentioned 7,000 ha bamboo forest is a little short of required quantity, this is compensated by the bamboo purchased from privately owned bamboo forests having a total area of 2,300 ha around the mill.

The price of bamboo is Rp 4.8 ex factory for those with 25% water content, which is considered rather high. It will be necessary to confirm with Perhutani on its future policy for the preservation and planting of bamboo forest and for the improvement of forest road and to obtain its assurance for stable supply of bamboo in the future.

Since the mill is not equipped with electrolytic facilities, an utmost effort should be made to secure stable supply of liquified chlorine and caustic soda. Because of the suspension of operation at the Waru Soda Plant, supply of soda must depend on the import for the time being. For this reason, early resumption of operation at the Waru Plant is eagerly awaited.

4-5 Manpower

The number of employees is 767. As in the case of other paper mill, this mill also has an excessively large number of employees assigned to indirect field. There is still room for personnel reduction.

4-6 Production Costs

Since the operation of the mill has not yet attained the level of stabilized production because of its short history being established only a year ago, the present production cost runs quite high. More specifically:

(1) Due to troubles of various types resulting from unfamiliarity with the operation and maintenance techniques on the part of workers, operating hour of the mill gets shorter and the production is kept at a low level correspondingly.

(2) Liquified chlorine and caustic soda have to be imported against expectation, resulting in high prices of these items. Use of bleaching powder in place of liquified chlorine is unavoidable but it results in the deterioration of quality and increased production cost.

(3) Prices of bamboo supplied by Perhutani are rather high.

(4) In spite of its advantageous location being on Java Island, its exact location is in the eastern tip of the Island. Consequently, the freight of raw material and finished goods is relatively high.

Table 57 Calculation of Production Cost for Banjuwangi Paper mill

Cost Element		Basic Unit	Unit cost	Amount	Cost per paper kg
		kg/paper ton	Rp/kg	Rp/month	Rp/kg
Raw material, chemicals	Bamboo	2060	6.50	10,042,500	13.39
	Bleaching Powder	100	106	7,950,000	10.60
	Caustic Soda	41	80	2,460,000	3.28
	Clay	180	24	3,240,000	4.32
	Others			5,600,610	7.47
Fuel	Heavy oil	760ℓ	12.50	7,125,000	9.50
	Diesel oil	590ℓ	12.50	5,531,250	7.37
Packing Materials				1,500,000	2.00
Sales Tax				8,850,000	11.80
Total of Variable Costs				52,299,360	69.73
Consumption material for paper m/c, auxiliary materials				2,548,500	3.40
Repairing cost				3,600,000	4.80
Labour cost				6,420,000	8.56
Administrative expense				3,832,500	5.11
Insurance				450,000	0.60
Paid interest				7,500,000	10.00

Cost Element	Basic Unit	Unit cost	Amount	Cost per paper kg
	kg/paper ton	Rp/kg	Rp/month	Rp/kg
Total of Fixed cost			24,351,000	32.47
Production cost before depreciation			76,650,360	102.20
Depreciation			12,862,500	17.15
Total Production Cost			89,512,860	119.35

Monthly production	750 ton	650 ton	550 ton	450 ton
Production cost before depreciation	102.20	107.19	113.99	123.83
Total Production cost	119.35	126.98	137.39	152.41
Selling Price	133.40	134.07	135.00	135.00
Profit before depreciation	31.20	26.88	21.01	11.17
Profit after depreciation	14.05	7.09	▲ 2.39	▲ 17.41

In this table calculation was made on the assumption that 550 tons were sold to Surabaja (Freight being Rp 2) and the quantity exceeding this amount were sold to Djakarta (Freight being Rp 8).

4-7 Problems

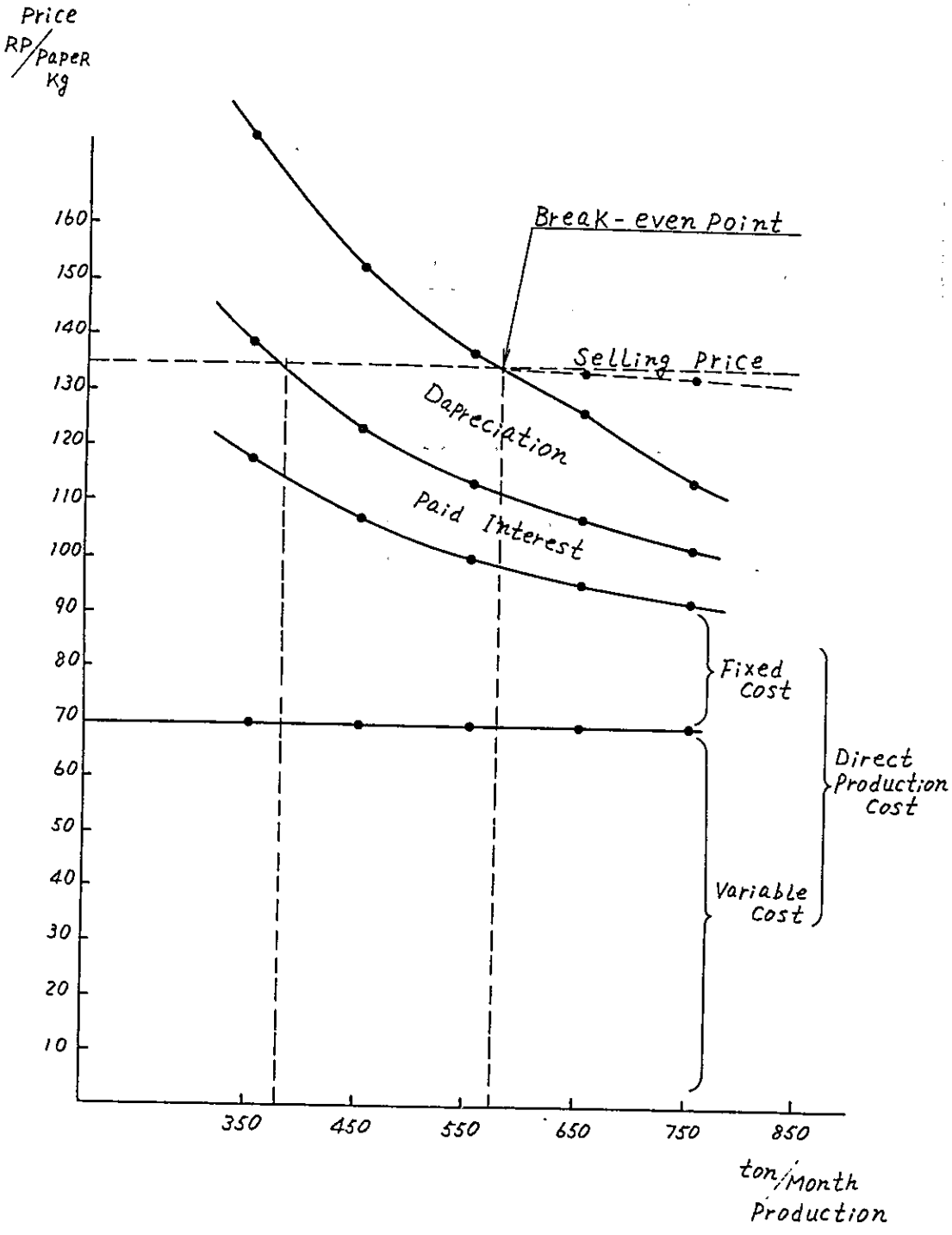
1) As stated previously, the mill has a short history of operation and therefore has not yet attained the level of stabilized production. It is important, therefore, to improve this situation with the help of technical and management assistance in the next few years.

2) Because of limited capacity of water and bamboo supply, expansion of facilities on a large scale cannot be expected.

3) To realize the maximum production within its power, continuous full operation is desirable. For this purpose, efforts must be made for the elimination of obstacles to the improvement of the condition. This objective may be attained by implementing carefully planned rehabilitation programs such as improvements in the supply of spare parts and additional installation of stand-by equipment.

Table 58

Cost Accounting on Banjuwangi Paper Mill



4) On the problem of insufficient opacity for the paper, one of the defects with the cyclostyle paper made from bamboo pulp, it is recommended that some attempts, use of a mixture with straw pulp, for example, should be made to solve the problem.

5. Gowa Paper mill

5-1 History

This paper mill is located 16 Km east of Makasar, Gowa Country, South Sulawesi Province.

1963: Contract was concluded with the Repatriation Ministry as a Japanese reparation project.

1965: Construction work completed but the operation was not inaugurated due to a shortage of operating funds under inflation.

1966: Electrolytic facilities were additionally installed as a reparation item.

1967: Operation started.

1968: Process was changed from the Kraft Method to Soda Method in June. A survey team dispatched by the Japanese Government arrived and a rehabilitation project was worked out in October.

1970: Operation was suspended in the middle of March due to a shortage of operating funds and poor business results.

5-2 Description of Facilities

Table 59

	Facilities	Quantity	Remarks
Bamboo Preparation Dept.	Chipper	2	Disc diameter – 1,270 mm, motor – 130 kW
Cooking Dept.	Vertical Digester Blow Tank	2	45 m^3, 10 kg/cm^2 150 m^3
Washing Dept	Washer Cowan Screen	1 1	3 stages, 7 m^2/1 set 40 t/d
Bleaching			C-E-H-E-H
After Screening Dept.	Centri-Cleaner	95	

	Facilities	Quantity	Remarks
Stock Prep. Dept.	Refiner #1 " #2	2 4	Conical type Deluxefiner
Paper m/c	Fourdrinier type Wire part Press part Dry part Calender	1	 Width 2.75m 1st/Suction press 2nd, 3rd Plain press ϕ 1,525m x 24 canvas ϕ 1.22 x 6 10 stages
Finishing Dept.	Paper cutter Guillotine cutter Packing Press	1 1 1	Double 150 m/min Press. 100 t
Chemical Recoverying Plant	BL Tank Evaporator BL Boiler BL Boiler	 4	90 m^3 4 stages, 498 m^2 15 kg/cm^2
Power Plant	Oil Boiler Diesel Generator	1 4	Water type, 15 kg/cm^2 2,200 B.H.P x 3 375 B.H.P x 1
Bleaching Agent making Dept.	Electrolysis		Cl_2 gas, 2.37 t/d NaOH 2.69 t/d

Water supply: The quantity of water required for the production of 30 t/day, including the supply to employee's housing, ranges from 15,000 to 16,000 m^3/day. The capacity of water intake facility is 21,000 m^3/day, which is sufficient for the requirement. The source of water supply is the Djeneberang River 1.5 Km far from the mill and the water is drawn to the mill by a canal.

The following points concerning the water source and the intake facility require special attention.

1) The water rights to be secured in relation to the operation of the Kampili Dam upstream.

2) Bank protection works for the upstream of intake facility.

3) Construction of a dam to keep the water vein in the dry season.

Power supply: Required power is being supplied by its own power plant. With the operation of a thermal power plant (12,500 KVA x 2), which is now under construction at the site between Makasar and Gowa and is expected to be completed by the end of the year, the power situation will be further improved.

At present, production of paper is suspended but part of diesel generators are in operation to supply power to Makasar City.

5-3 Production Achievements

Table 60

Year and Month		Paper Production
	1967	967,234 kg
Jan. ~ Mar.	1968	350,161
Apr. ~ Jun.	"	321,970
Jul. ~ Sept.	"	645,880
Oct. ~ Dec.	"	569,886
Jan. ~ Mar.	1969	462,505
Apr. ~ Jun.	"	300,775
Jul. ~ Sept.	"	415,617
Oct. ~ Dec.	"	309,954
Jan.	1970	161,304
Feb.	"	191,669
Mar.	"	86,385

The production capacity of this mill is 30 t/day (9,000 t/year) but the actual production achievements are as shown in the above table, which are far below the design immediately after the initial operation troubles occured to chemical recovery facility as a result of unfamiliarity the operation on the part of workers and due to the deficiency of the facility. In June 1968 the process by Kraft Method was discontinued and changed to Soda Method. However, the shortage of operating funds became more aggravated as a result of a decrease in the sales and the procurement of spare parts became harder than ever. With the turn of the year the prices of caustic soda escalated extremely and it was practically impossible to continue the operation of the mill. Finally, the operation was suspended on March 13, 1970.

5-4 Raw Material

5-4-1 Gowa Paper mill uses bamboo as raw material and manufactures cyclostyle papers and writing papers by processing bamboo by Kraft Method. Bamboo is supplied from a natural bamboo forest in Udjungbulo district approximately 25 to 35 Km southeast of the mill, which was purchased from the country government of Gowa. The total area of the bamboo forest is 24,100 ha, of which the area available for planting is shown in the table below.

Table 61

Restricted Forest	6,000 ha
Privately owned Land, rice paddy, farm	4,800 "
Vacant lot	5,945 "
Bamboo Forest	7,355 "
Total	24,100 ha

Note: Area available for planting = (vacant lot + Bamboo Forest) x 80% ≒ 10,000 ha

This bamboo forest is a natural pure forest comprising mainly Bambu Duri and is seen on the hill. Though the forest is fairly thick, the yield is not great because of unavailability of thorny portion for use. It is necessary, therefore, to make a gradual change to Bambu Paring which can be used in its entire length from the root to the top.

5-4-2 Growth and Cutting Rotation

In this region bamboo shoots come out in the rainy season (November – December). The bamboo has the height of its growth in January and February and stops growing in April or May. Thereafter no increase is seen in the volume but the density increases further in the following two to three years. In other words, the cutting rotation of three years is considered most appropriate.

Table 62

Forest age	Density of bamboo
1	0.73
2	0.78
3	0.83
4	0.84
5	0.84
6	0.85

Bamboo forests in Southeast Asia are said to have an increment of 4 – 6 t/ha in air-dry weight in a year (source: p 96 reference data) and therefore, the standard volume at the cutting rotation amounts to 12 to 18 tons/ha and the average of 15 tons/ha.

5-4-3 Standard Annual Cutting Volume and The Quantity of Bamboo Consumed at Gowa Paper Mill.

To secure stabilized supply of bamboo to Gowa Paper Mill, it will be necessary to improve the existing forest road network to make the transportation of bamboo possible from any part of the forest and to implement systematic planting so that the existing forest may be turned to a normal forest which will be able to supply bamboo continously.

Annual production at Gowa Mill:	30 t/day x 300 days = 9,000 tons
Annual consumption of bamboo (yield – 40%):	9,000 ton ÷ 40% = 22,500 tons
Annual consumption of bamboo (Bone dry yield rate):	22,500 ÷ 60% = 37,500 tons
Annual cutting area:	37,500 ÷ 15 ton = 2,500 ha
Area required for bamboo planting:	2,500 ha x 4 year = 10,000 ha

The above figures are the result of a calculation but in actuality, if the annual cutting of 2,500 ha is to be maintained, a well planned program on stabilized supply of labour force, mechanization of cutting and loading operations must be implemented in addition to planting of forest and the improvements of forest road.

The annual growth rate of Madake (long-Jointed bamboo) and Mosochiku (Phyllostachys mitis) in Japan is said to be 7 t/ha and 11 t/ha, respectively. Since this region is favored by excellent weather condition, it is considered possible to increase the yield from 5 tons to 10 tons as stated above. If this goal is attained, the area of cutting may be reduced to half of the present level.

5-4-4 Problems Related with Bamboo Supply

1) Purchase of Bamboo from Privately Owned Forests.

It is very risky to depend solely on its own forest for the supply of bamboo in consideration of unexpected emergency. Fortunately, there are many bamboo forests around farm houses in the area extending to Malino district. If steps are taken to purchase bamboo from these forest and provide the farmer with the means of gaining additional incomes during off season period, the difficulty of obtaining bamboo will be greatly alleviated.

The volume of bamboo in mills own forest is estimated at 7,355 ha x 15 ton = 110,000 ton. Until such time as these forests are made into normal forests, it will be unavoidable to depend on the privately owned forests for the supply of 20% of its requirement as shown in the table below.

Table 63

Year	Present volume	Anticipated yield from planting	Supply			Balance of volume in mill's own forest
			Mills Own forest	Privately owned forest	Total	
1	110,000		30,000	7,500	37,500	80,000
2			30,000	7,500	"	50,000
3			30,000	7,500	"	20,000
4		37,500	30,000	7,500	"	27,500
5		37,500	100% 37,500	0	"	27,500

2) Cutting operation

Because of its topographical features having a long stretch of hills, there are many forest stands in which transportation of bamboo by truck is possible only by expanding the existing forest road. It will be more convenient, however, if rope-way is provided for the sloped land.

Cutting should be done by the so-called clear cutting method.

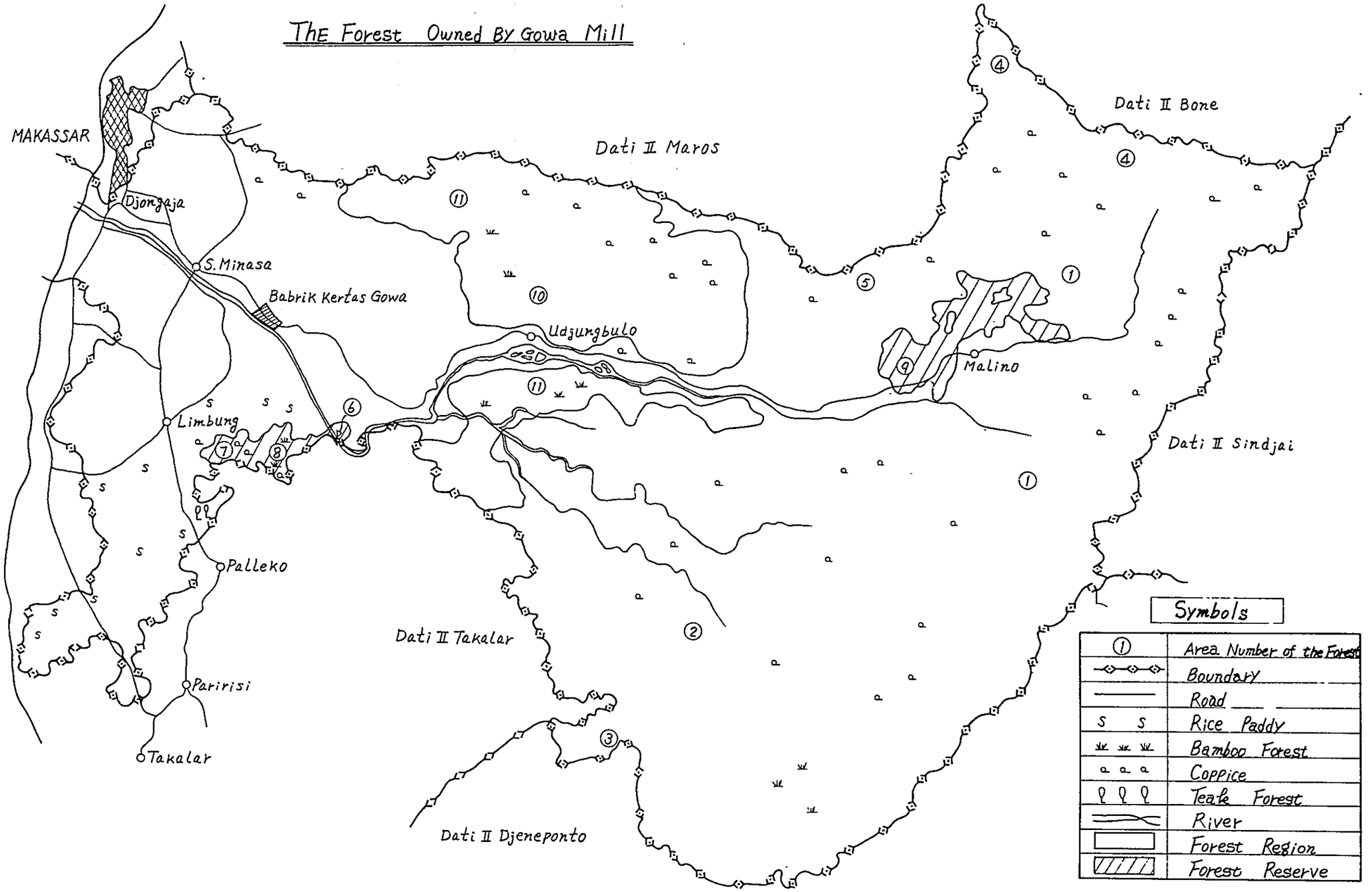
Since the cutting rate in the rainy reason is expected to drop to 50% of that in the dry season, it will be necessary to plan for the storage of bamboo in the mill during the dry season. Consideration must also given to the securing of trucks and forest laborers in preparation for the busy cutting season.

Efforts should also be made for the maintenance of the existing forest roads along with the efforts for early completion of the proposed forest road having a total length of 50 Km.

3) Planting Work

Planting of Bambu Paring may be accomplished either by the cutting method or by the root separation method. Selection of the method should be made by taking into considerating seedling survival rate, operating efficiency and the required costs. A study should also be made to see whether or not the fertilization is more advantageous for the acceleration of growth. The standard fertilization is said to 20 – 30 kg of nitrogenous fertilizer, 10 – 15 kg of phosphatic fertilizer, 10 – 15 kg of potassic manure and 20 – 30 kg of silicic acid for an increase of one ton in the production in the air-dry weight per ha.

THE Forest Owned BY Gowa Mill



4) Programming of Operation Plans and Evaluation of Existing Volume of Bamboo

A survey of vacant lots (5,945 ha) and bamboo forests (7,355 ha) should be conducted again to confirm cut-over area and the area available for planting and then the prospective planting area should be designated by district according to the quantity required for transportation. A survey should also be made on the production volume by species in order to determine cutting rotation and standard annual cutting volume appropriate for the specific district and management plans to insure continued bamboo production should be worked out.

5) Question of whether the Supply of Bamboo can Meet Increased Production at Gowa Paper Mill

It is probable that the increased production will be attempted by the Gowa Paper Mill in the long run. In such a case, the availability of raw material bamboo will be the most important factor along with the availability of water.

The future question will be "To what extent the strengthened management of bamboo forest, as mentioned above, could satisfy the requirement arising from increased production at Gowa Paper Mill."

References:

"Utilization of Bamboo Forest Resources in Southeast Asia", Structure of Bamboo industries, Natural Resources Statistics Section, Natural Resources Bureau, Ministry of International Trade and Industry.

5-5 Manpower

The number of employees, once exceeded the 1,000 level at time of the inauguration of the operation, has dropped to the present level of 880. Of this number, however, 600 employees have been laid-off since the suspension of operation and the employees regularly reporting for work now number less than 300.

As there is a small population in this area compared with Java, securing labor force, particularly the skilled worker, is always accompanied by difficulty.

5-6 Production Cost

A trial calculation was made to obtain the break-even point for the event of resumption of operation at the Gowa Paper Mill. The break-even point without considering depreciation will be 450 t/month and that with depreciation will be 550 t/month (see the chart) in Table 65.

Table 64

Cost Element		Remarks	750 T/Month	
			Amount Rp	Rp/kg
Variable Cost	Bamboo (40% moisture)	3,900 kg/paper, 3 Rp/kg ton	8,775,000	11.70
	Chemical, Fuel Oil		30,936,293	41.25
	Packing Material		1,500,000	42.00
	Sales Tax	Sales x $\frac{1}{1.1}$ x 10%	7,977,272	10.64
	Total		49,188,565	65.59
Fixed Cost	Consumption material for paper m/c	Wire cloth 1 piece/M No. 1 Felt " 2 " " 3 " " Canvas each 1 piece/6M.	1,073,500	1.43
	Auxiliary Material		726,500	0.97
	Repairing Cost		3,600,000	4.80
	Labour Cost	Cash & payment in kind. 750 Men	6,500,000	8.66
	Other Cost	Administrative expense	3,140,000	4.19
	Insurance		435,000	0.58
	Loan Interest		10,357,500	13,89
	Total		25,830,500	34.43
Production cost before depreciation			75,019,065	100.03
Depreciation			8,792,000	11.72
Total Production cost			83,811,065	111.75
Sales & selling price			94,950,000	126.60
Balance			11,138,935	14.85

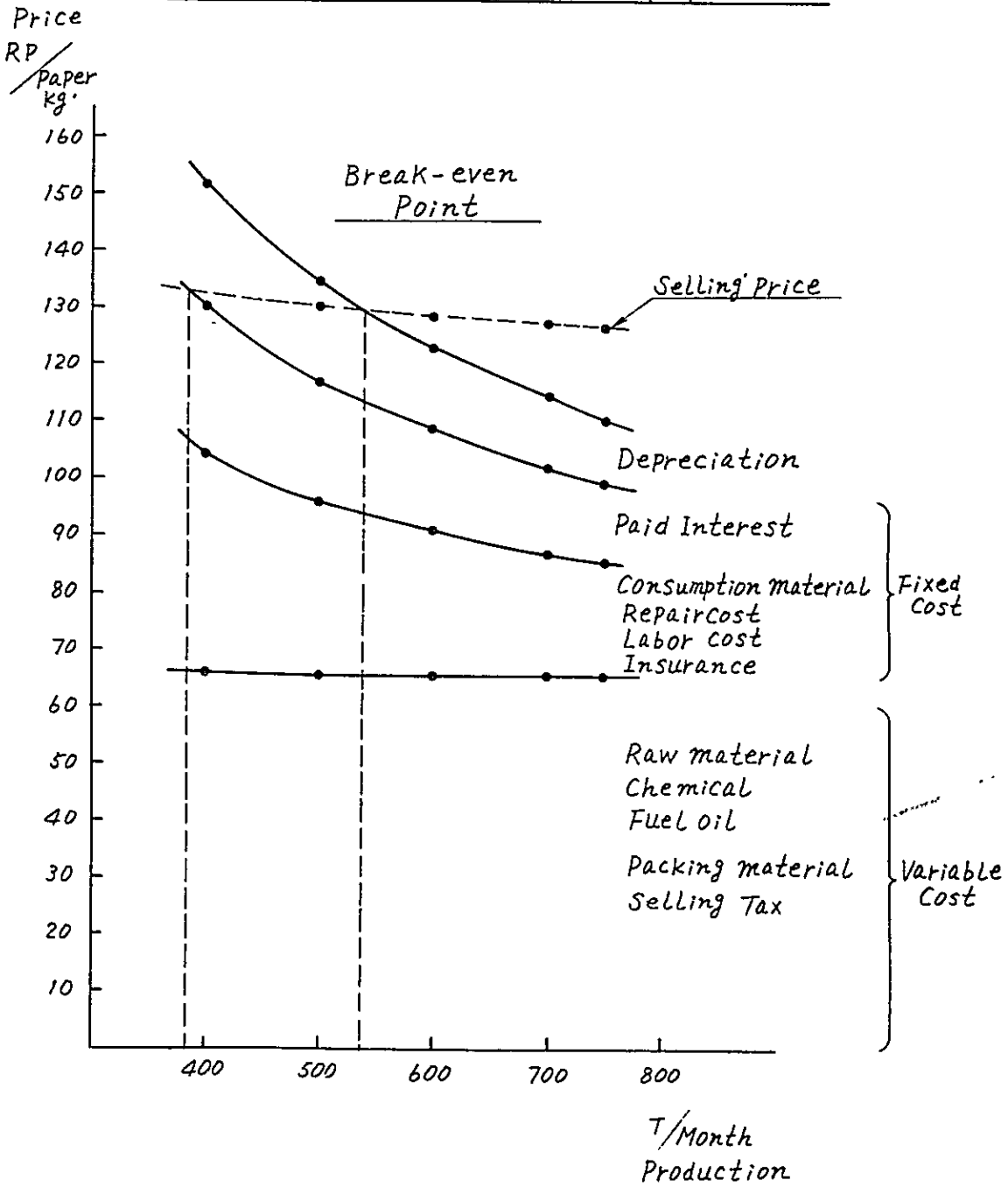
	750 T	700	600	500	400
Prod. cost before Depreciation	100.02 Rp	102.53	108.80	117.57	130.71
Total production cost	111.74	115.09	123.45	135.15	152.70
Selling price	126.60	127.14	128.50	130.40	132.50
Profit before depreciation	26.57	24.61	19.70	12.83	1.78
Total Balance	14.85	12.05	5.05	▲ 4.75	▲ 20.20

Sale 300 t ..... 135 Rp (in Makassar)
150 t ..... 125 Rp (in Surabaja)
Others ..... 119 Rp (in Djakarta)

A Note-book making plant has recently been completed in Makassaru
Under the current plan, this plant is to consume 150 – 200 tons of writing paper produced by the Gowa Paper mill.

Table 65

Cost accounting and Break-even point on Gowa paper Mill



5-7 Problems

Because of many problems including a shortage of operating fund under inflation since its inauguration, coupled with inadequate training in technical field on the part of operators, the mill has not yet established a firm operating structure. With the implementation of full scale rehabilitation project which has been formally decided, it is hoped that various pending problems will be solved gradually.

1) Improvement Work

With the investment of large amount of foreign loans and domestic fund, such problems as the defects soda recovery plant and a shortage of spare parts will be solved. It is very doubtful, however, whether the facilities once completed will be maintained for a long period of time after they are put in operation. In other words, it may be necessary for the mill to receive technical assistance from resident foreign engineers for a considerably long period of time.

2) Operating Fund

As a result of suspension of operation over a long period of time, machines and equipment have begun to deteriorate. To provide necessary works on these facilities to realize early operation, however, unexpectedly large amount of working fund will be required. A thorough and well planned financial and management program must be implemented to insure effective utilization of scarce Rp fund. In the past the operating fund had to be eaten up to cover the deficits ever since the start of operation. When this fact is taken into consideration, the financial cost in the form of interest on the bank loans will amount to an enormous figure and this will be come a heavy burden for normal operation.

3) As evident with other paper mills which have a short history, this mill also lacks adequate supplies and spare parts. It is considered great importance to secure additional equipment as a stand-by and spare parts to maintain continuous operation of the mill located in the remote area where transportation is not convenient.

4) Social Conditions and Labor Force

Being situated in the underdeveloped area that experienced a long period of confusion following the Independence of Indonesia, the mill is encountering difficulties in securing labor forces of good quality.

It is imperative for the mill, however, to tackle this problem as a pioneer industry in the regional development.

5) Market

Demands for papers in the local area are negligeble and the majority of the product must be marketed in Java Island. In this country where distribution system for commodities has not yet been developed the cost of transportation is extremely high and the mill is in a disadvantageous position in this respect compared with other paper mills in Java.

6) Raw Material

First of all, there is some uncertainty for the supply of bamboo. When the future expansion of facilities is taken into consideration, it will be necessary to make a study on the advisability of pulp production with the use of raw material other than bamboo, the wood produced in South Sulawesi, for example.

7) Water Supply

For the mill solely depending on the Djeneberang River which has a great fluctuation in its discharge between the dry season and rainy season, for water supply, it will be necessary to plan a concrete measure to secure stable water supply with a considerably large capital investment.

6. Pematangsiantar Paper mill

6-1 History

February 1959:	Contract was concluded with the Ministry of Repatriation for the construction of a paper mill as a Japanese reparation project.
August 1962:	The mill was completed and delivered to Indonesia.
September 1965:	Additional delivery of water supply facilities, boilers, etc, was made but the work was suspended.
March 1968:	Construction work resumed.
Beginning of 1969:	Work completed and operation resumed.

6-2 Description of Facilities

Table 66

	Facilities	Quantity	
Wood Room	Swing Saw Machine	1	1070 mm 15 HP
	Band Saw	1	
	Double Splitter	1	
	Drum Barker	1	Dia. 2000 mm x 3500 mm L
Grinder Room	Pocket Grinder	2	450KW, 375 Rpm, 3 pocket
	Rotary Screen (KCS)	1	30 HP
Wet m/c	Wet Machine	1	
Preparation Room	Jordan	2	55 kW
	Tube Separator	1	
Paper Machine	Rotary Screen	1	
	Wire		2000 mm (width) x 19950 mm (length)
	Press	3	
	Dryer	32	Six of 32 are canvas dryers
	Winder	1	
	Cutter	2	
S.P. Part	Pulper	1	Dia 2150 mm, 400 Rpm
	Jordan	1	37 kW
Dry Broke	Pulper	1	Dia 1800 mm, 400 Rpm
Diesel Generators	1250 KVA	2	
	50 KVA	1	
Boiler	Tubular Boiler	2	2.58 T/Hour, 8.5 kg/cm^2
	Lancashire Boiler	1	2.6 T/hour, 8.5 kg/cm^2

Water supply: Intake and filtration facilities capable of treating water for a daily production of 30 tons, drawn from the Banbolong River were completed in 1969.

Power supply: Two 1,250 KVA diesel generators are provided. Power consumption per paper kg is 1.8 KWH. As no stand-by generator is provided, a power shortage occurs and the production activities are greatly hampered when one generator is taken out of service for maintenance.

6-3 Production Achievements

Table 67

	Number of working days	Paper production	Sales of paper	GP production
1968	227 days		year end stock 108 t	
1969	85	337.3 t	456.5	310.4 t
Up to June 1970	20	65.7	62.5	33.2

As shown in the above table, the mill barely maintained operation until 1968 in spite of constant water shortages but after 1969 the operation has been in virtual suspension due to a shortage of working fund and unavailability of spare parts. The number of scheduled working days for the year is 287, which is fewer than that of other papermills.

In the past the mill maintained the daily production level of 18 tons for a quite long period of time and there were no specific problems as far as the facilities were concerned except the power shortage and unavailability of spare parts. As one of the reasons for the recent suspension of operation, lack of fund to meet the rise in the price of imported KP and poor business results may be pointed out.

6-4 Raw Material

This mill is to manufacture newsprint by purchasing imported pulp (USP or BKP) and blending it with mill's own ground pulp. However, the mill lacks funds to purchase imported pulp and as a result there is no stock of imported pulp at present. So the mill, out of necessity, purchases about 40 tons of waste paper in Medan over a period of 3 to 4 months. Colored waste paper is used for cover paper and non-colored waste paper is used for cyclostyle paper, when the waste paper is used up the mill cease operation.

While the price of imported BKP is on the order of Rp 90 ex factory (the price seems to have risen to Rp 100 at last), that of the waste paper is such low as Rp 11, but the trouble is that the quantity of waste paper available is very small.

6-5 State of Pulp Wood for GP

6-5-1 State of Forest

Pulp wood used by P. Siantar paper mill for the production of GP is pinus merkushi and the wood collection areas are as shown in the following table.

Table 68

District	Area of Forests
Simalungun/T. Karo	7,417 ha
Samosir	5,328
Toba	5,692
Total	18,431 ha

However, the area which is actually supplying pulp wood to the mill at present is the forest covering an area of 6,083 ha in Aec Na Uri and this area is the main part of Simalungun district.

The distribution of forest stand, revealed by a survey made by the District Forest Office, is unbalanced as shown in the table below.

Table 69

Age of trees	Simalungun	Samosir/Toba	Total
2 - 6 years	2,024 ha	1,797 ha	3,821 ha
7 – 11 "	1,305	1,097	2,402
12 – 16 "	274	4,852	5,126
17 – 21 "	120	2,417	2,537
22 – 26 "	–	–	–
27 – 31 "	1,007	550	1,557
32 – 36 "	1,435	242	1,677
37 – 41 "	471	35	506
Over 42 years	19		19
Total	6,616	10,990	17,606

From the above table it is known that in Simalungun (hereinafter referred to as "A" district)the trees of 30 years old or over is the main object of cutting and the area of forest having 12 to 26 years old trees is extremely small but shows an increasing tendency in the past 10 years. In contrast to this, the trees generated in the 1950's is abundant in Samosir, Toba (hereinafter referred to as "B" district).

It may be said, therefore, that the shortage of supply in "A" district can be compensated by "B" district. In other words, with the annual increment rate of 7.5 m^3 in normal forest. production of 17,606 x 7.5 ≒ 130,000 m3 may be expected.

6-5-2 Use of Pinus Merkusii

Table 70

unit: m^3

	Export	For Match	For Paper	Total
1961		22,346	3,310	25,656
1962		18,333	1,801	20,134
1963		19,386	7,408	26,794
1964	1,301	17,984	4,659	24,144
1965	17,011	19,433	5,295	41,739
1966	29,869	11,663	2,264	43,496
1967	38,085	13,800	1,050	52,915
1968	34,573	7,160	1,020	42,753
1969	47,908	10,386	1,047	59,341

Source: Data provided by P. Siantar Aek Na Uri District Forest Office.

The above table shows a gradual increase of demand for Pinus Merkusii in this district. This increase, however, is due to the increase in the export and the consumption of pines for the production of match is rather on a decrease. Demand for pines for paper production in 1969 is less than 2% of the total production of pines.

6-5-3

As stated previously, there should be no problem on the preservation of the forest, judging from the distribution of forest stand in both "A" district and "B" district, and it may also be said that the supply of pulp wood poses no problems as far as the quantity is concerned. However, the forests in "B" district are on the cliff over-hanging Lake Toba and on the Island of Samosir, which is also situated on the lake and has cliffs all around it. Under these conditions, the cost of logging and log transportation, will be extremely high. For this reason, only "A" district will be taken up for discussion for the time being.

Fortunately or unfortunately, export of Pinus Merkusii has been decreasing sharply recently. If it is possible to prolong systematically the consumption of old trees until such time as the shortage of standing trees of 12 to 26 years of age is eliminated, the problem of pulp wood supply will be solved without difficulty.

In short, annual consumption of 40,000 m^3 may be easily secured. If 16,000 m^3 is consumed for the production of match, 24,000 m^3 is available for GP, which is sufficient for daily production of 30 tons.

6-6 Manpower

The total number of employees in this paper mill is 228. This number is excessively large compared with the production achievement when the fact that the mill lacks chemical pulp facilities is taken into consideration. There is a large organization and the number of employees assigned to indirect field accounts for 47.5% of the total strength. Personnel reduction will be possible by the simplification of organization leaned to the indirect field.

6-7 Production Cost

For the mill which has its own GP facility but is destined to maintain the production of middle and lower grade paper with a combined use of its own pulp and imported KP on an extremely small scale, it is almost impossible to realize a profit when the prices of imported pulp are skyrocketing. Moreover, the power shortage and other factors make it more difficult for the mill to secure scheduled production level and the prospect is utterly hopeless.

Production costs calculated on the basis of available data are shown in the following table.

Table 71

Cost Element		Basic unit	Unit cost	Amount/month	Unit cost/paper kg
Raw material	Pines	3.11 m^3	2,500 Rp	2,099,250 Rp	7.775 Rp
	NBKP	0.27 t	88,500	6,451,650	23.895
Chemical	Alum. Sulphate	35 kg	21	198,450	0.735
	Pine resin	5 kg	90		0.45
Fuel	Diesel oil	810 ℓ	15	3,289,500	12.15
	Heavy oil	270 ℓ	8	583,200	2.16
	Lubricant	16.3 ℓ	90	396,090	1.467
Consumption material for paper m/c	Wire cloth	6 pieces,year	216,800	108,400	0.402
	Felt	30/year	200,000	500,000	1.852
	Canvas	8/year	274,000	182,667	0.677
Total Variable Cost				13,921,707	51.562

	Amount/month	Unit cost/paper kg
Labor cost	19,954,167	7.238
Repairing cost	1,000,000	3.704
Admin. expense	275,000	1.019
Interest paid	1,320,000	4.889
Insurance	145,833	0,540
Total Fixed Cost	4,695,000	17.389
Production cost before depreciation	18,616,707	68.951
Depreciation	1,500,000	5.556
Total prod. cost	20,116,707	74.507

Note: GP production is to be 3.684 m^3 wood/GP ton.
Material: Yield rate is to be 90% and blending ratio is to be 76% GP to 24% of KP.

Production/month	200 t	270	337.5	375
Prod. cost before deprec.	75.037	68.951	69.475	64.082
Total production cost	82.537	74.507	69.917	68.082
Factory price	62.000	54.481	30.185	48.467
Profit before depreciation	▲ 13.037	▲ 14.470	▲ 19.288	▲ 15.615
Net proft	▲ 20.527	▲ 20.026	▲ 19.732	▲ 19.615

Note: Factory price: 200 tons of products are marketable within Medan but the balance must be transported to Djakarta at a cost of Rp 29/kg. As a result, the net profit for the mill decreases as shown in the table above.

Products from the Siantar Mill (cyclostyle paper) is evaluated to be of the same quality as imported newsprint (sheet) and marketed for the same price as the imported newsprint.

6-8 Problems

1) The fact that selling prices of products are set at an extremely low level, almost the same as that of imported newsprint (sheet) must not be overlooked. Newsprint is free from import duties and its price is pegged at an unreasonably low level compared with that of fine paper.

Table 72

Cost Accounting

Pematang Siantar Paper Mill

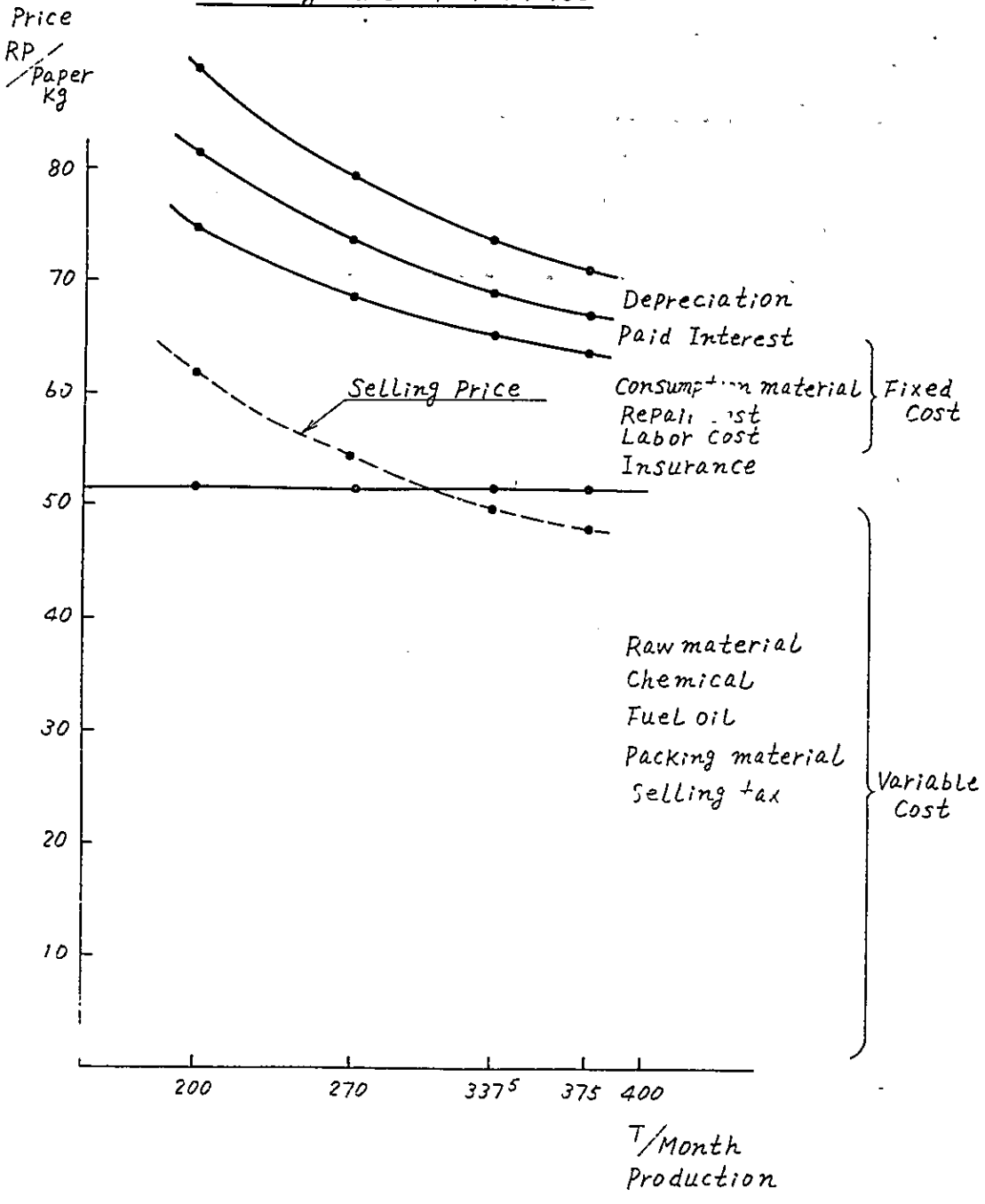


Table 73 Market Prices

	Price in Japan		Price of imported item in Indonesia			
		Percentage		Percentage	Import duties	Sales tax
Newsprint	¥ 63	100	63	100	0	0
Fine paper	¥ 90	143	148	235	40%	5%

2) High costs of transportation to consuming area. The freightage of products from this mill to Djakarta amounts to about Rp 30, which is as large as ½ of the selling price at the market.

3) High price of imported pulp. The price of imported BKP is said to have jumped from C & F $205 to $240 recently. This is equivalent to Rp 107 in delivery price and far from commercial base.

4) Waste paper is available only in very small quantity.

5) Though the present daily production level of 15 tons is considered to be rather low for the mill specializing in newsprint, the amount of interest paid, depreciation and personnel expense, which the mill must bear is rather small. In other words, the disadvantage of being small in scale is not reflected in the production cost.

6) To realize full-fledged operation, rehabilitation of power generator and other facilities must be given a serious consideration.

7. Martapura Paper Mill

7-1 History

1958: A final decision was made by the Ministry of Repatriation for the construction of a mill as a Japanese reparation project.

1960: Complete facilities arrived in Surabaja from Japan.

1961: Completion of the work expected but the work delayed considerably.

1965: Administrative control of the mill was transferred from the Repatriation Ministry to the Ministry of Industry. Contract for additional facilities and parts concluded.

1970: Contract for additional facilities and parts concluded.

7-2 Description of Facilities

Table 74

Department	Description of Facilities	Quantity	Specifications
Wood Operating Dept	Band Saw	1	
	Circular Saw	1	
	Drum Barker	1	ϕ 2.4m, length 9m.
	Chipper	1	ϕ 1.2m
	Crusher Screen	1	Rotary type
Cooking Dept	Digester		
	Diffuser		ϕ2.1 m height 7.7 m
	Jonsson Screen	2	$20m^3$
	Flat Screen	2	
Mechanical Pulp Dept	Pocket Grinder	1	300 HP, 250 R/M
	Knot Screen	1	
	Sliver Screen	1	
	Wet Machine	1	Width 1.5m
Bleaching Dept	Wolf Thickener	3	ϕ 1.2m x width 1.5m
	Poacher	2	
	Flat Screen	1	
	Wet Machine	2	Width 1.6m
Recovery Equipment Dept	Vacuum Evaporator	3	
	Recovery Boiler	1	15 kg/cm^2, 1.5t/h
	Reduction Equipment		40 t/h (add-
Stock Preparation Dept	Hydrapulper	1	
	Jordan Engine	1	
	Rotary Screen	2	
Paper m/c	Wire Part		Width 1.5m, length 18m
	Press Part		3 sets
	Dry Part		ϕ 1.2m x 20
	Calender		10 stages
Finishing Dept	Rewinder	1	Width 1.4m
	Paper cutter	1	Single, width 1.45m

Construction of this mill began in 1959 but due to such factors as delays in the preparation work for receiving the facilities on the part of Indonesian side, a shortage of Rp fund and an accident as equipment fell into the sea during unloading operation from the ship, work was delayed considerably. With the repeated additional delivery of equipment, however, the work is expected to be completed around the end of the year at last. Only remaining work at present are brick-laying for boiler and part of piping work.

Water supply: The original plan called for the supply of water from the East Martapura River. However, for fear of a decrease in the flow rate of the river as a result of raised river-bed by the deposit of carried over soils in the river-bed, it was later decided to draw water from the present confluence of the Martapura River (2.8 Km from the mill) Presently, the water is being supplied from this point by water mains 300 m/m in diameter. The discharge in the dry season is 40 m^3/sec but the discharge at the abovementioned confluence is 400 m^3/sec and there is no problem as far as the water supply is concerned.

Power supply: No public power plant is operating in the vicinity of the mill and power supply must depend on its own power plant. The mill is equipped with two 950 KVA diesel generators and one 100 KVA stand-by generator provided under by 1350 PS. In East Kalimantan the price of diesel oil is 10 – 15% higher than in other regions.

7-3 Raw Material

Originally, it was planned to produce wood free paper and writing paper by Kraft Method with the use of Agathis as raw material. Under this plan, however, the Agathis was to be obtained from the forest covering an area of about 100,000 ha in Buntok district 300 Km up-stream of the Barito River, carried on floats to Banjarumasin where pulp wood were to be landed and transported to the mill. Later, the stock of Agathis in this forest was found to be only 400,000 m^3 and this fact, coupled with an increasing demand for Agathis in the construction field, made it more difficult for Marutapura Paper Mill to secure the supply of Agathis in terms of both quantity and price.

It so happened at that time that the Cellulose Research Institute in Bandung had successfully developed a means to use the rubber tree for the production of pulp. Under these conditions, coupled with the fact that waste rubber trees were available in abundance in the area around the Martapura paper mill, it was decided to use Krafi pulp made from rubber tree and GP made from Agathis for the daily production of 10 tons of middle class cyclostyle paper (Blending of imported BKP at the rate of 10% is also contemplated).

7-4 Manpower

The mill is now under construction and the number of employees including the Project Manager is 140. This number is expected to increase at least to 400 when the mill is put into operation. As Kalimantan has a sparse population and is remotely located, difficulties will be encountered in securing laborer, particularly skilled workers.

7-5 Problems

1) Though rubber trees and Agathis wood are abundant in Kalimantan, the area is vast and extensive and a considerably large amount of expense will be required for the collection of raw wood.

2) Because of inconvenience of traffic with other provinces and islands, transportation of raw material and products will require high costs and longer time.

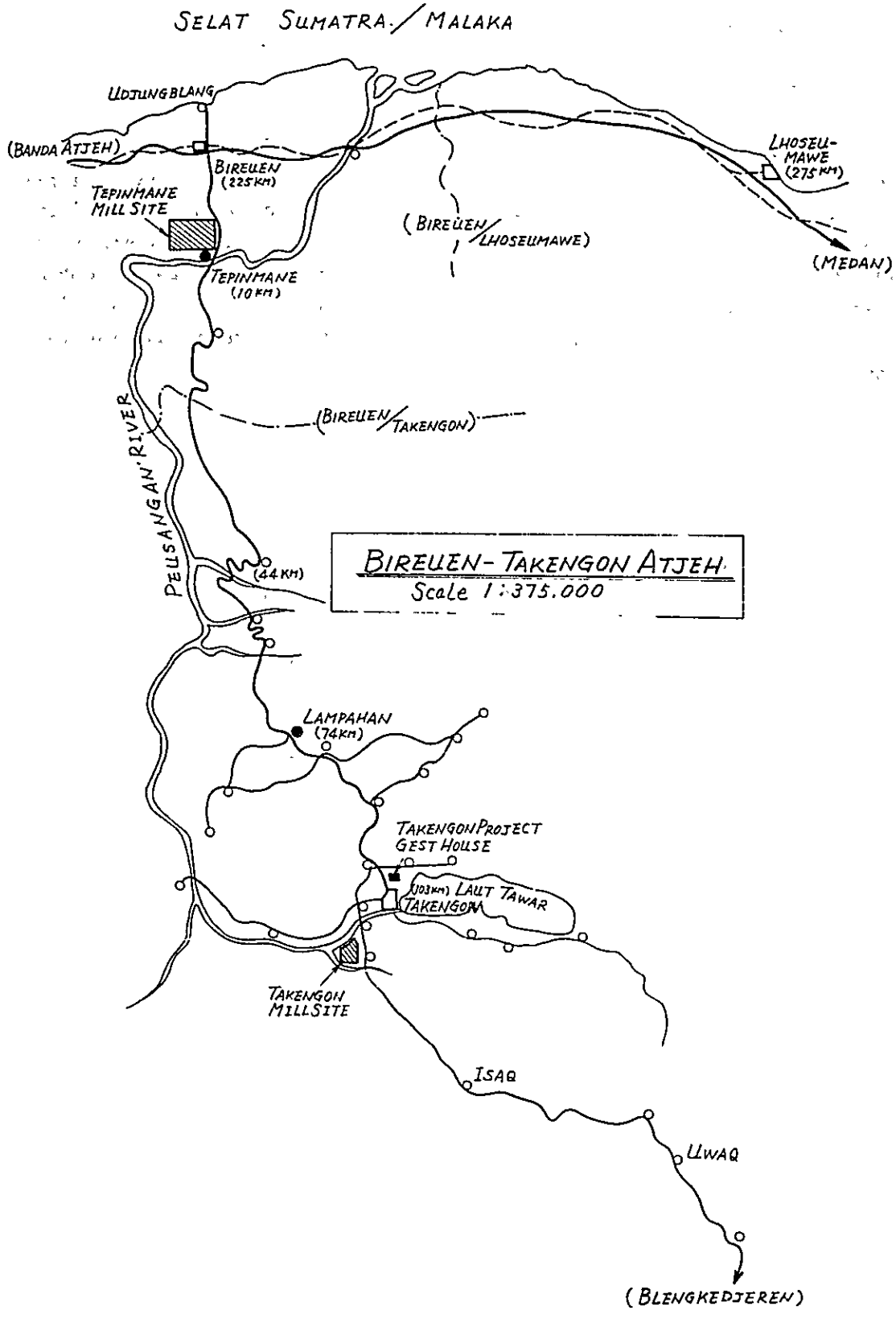
3) Because of sparse population in the area, difficulty will be encountered in securing high level workers.

4) There are some apprehensions concerning the technique for the production of Kraft pulp from rubber trees.

5) For the paper mill having such a small capacity as the daily production of 10 tonsons, which operates on the combination of Kraft Method by means of chemical recovery and GP Method by means of 300 HP grinder, an increase of costs may not be unavoidable.

6) In view of the high price of imported BKP, a conceivable means to reduce the cost is to stop the use of imported BKP and the production of GP and shift to the production of middle class paper with the use of KP made from a digested mixture of rubber and Agthis.

7) Difficulties resulting from lack of experience in management and operation.


SELAT SUMATRA / MALAKA
UDJUNG BLANG
(BANDA ATJEH)
BIREUEN (225 KM)
TEPINMANE MILL SITE
TEPINMANE (10 KM)
(BIREUEN / LHOSEUMAWE)
LHOSEU-MAWE (275 KM)
(MEDAN)
(BIREUEN / TAKENGON)
PEUSANGAN RIVER
(44 KM)
BIREUEN - TAKENGON ATJEH
Scale 1 : 375.000
LAMPAHAN (74 KM)
TAKENGON PROJECT GEST HOUSE
(103 KM) LAUT TAWAR TAKENGON
TAKENGON MILLSITE
ISAQ
UWAQ
(BLENGKEDJEREN)

VI Pending Projects

1. Takengon Project

1) History

Under the contract signed in 1964 for private loans on deferred payment basis for the Takengon Project in Atjeh Province, Sumatra, a paper mill having a daily production capacity of 100 tons of cyclostyle paper and writing paper and 15 tons of pulp sheet was to be constructed in the suburbs of Takengon on the shores of Lake Tawar and part of construction equipment was shipped in 1965. However, as a result of the so-called "September 30 Incident", the project had. to be suspended. For six years since then, no decision has been made on the fate of this project with the attention being paid to the changes in the situation in and out of the country.

2) Raw Material

The use of Merkusii Pine other than for pulp production is not conceivable. In the area around Takengon the Merkusii Pine grows wild in the vast forest covering an area of 147,000 ha. Particularly, the pine forests around Lampahan are excellent in terms of both tree height and diameter. At present the pine tree in these forest are utilized for the collection of resin and only a small portion is used for lumbering (for the manufacture of containers of resin) and the fully grown adult forest stand is left untouched.

In this country supply of lumber for building and housing construction depends mainly on hardwood and Pinus Merkusii is being utilized only for the manufacture of pencile and matches. Hardwood species of Dipterocarpiaceae such as Meranti are more suitable for veneer production and Merkusii Pine may be said to be best for pulp wood.

As the species which is suitable for pulp production and forms a pure forest stand in large forest lots, there cannot be any species other than Agathis and Merkusii Pine, the species in question here.

§ Area of Merkusii Forest

Table 75 Acreage of Merkusii Forests Around Takengon District

	District	Area of district	Area of forest
A	Baleq	6,100 ha	3,900 ha
	Burnitelong	2,500	2,200
	Bidin	6,300	3,100
	Sub-total	14,900	9,200
B	Isaq	6,800	5,700
	Mungkur	3,600	2,600
	Umang/Remokor	11,200	8,650
	Selula	8,000	5,500
	Sub-total	29,600	22,500
C	Lake Tawar	2,800	2,500
	Total	47,300	34,200

In addition to the area around Takengon district, the following areas are also available.

Blangkedjeren	86,300 ha
Oneng and others	13,500 ha
Total	99,800 ha

The on-the-spot survey and aerial observations made in the recent survey showed that the area of adult Merkusii forest in Blangkedjeren district covers merely half of the total area and the tree age was estimated at about 20. Grasslands were seen everywhere and the forests were sparsely vegetated. The forest type in Oneng district is considered to be slightly better than that in Blangkedjeren but the forest is located considerably far from Takengen and therefore is considered out of the scope of this project.

§ Volume of Forests in the Project Area

In the 1968 report (Pinus Merkusii Forest Development Integrated with a pulp and paper Industry in Atjeh), the average volume of the forest was estimated at 117 m^3/ha but after a survey by the team it was felt that this estimate was a little too conservative. In Area "A" there are places where the volume has reached about the 300 m^3/ha level. In Area "B", where there seem to have been a forest fire, the forests are still young and the volume of timber is estimated to be far smaller than that in Area "A". In Area "C" the volume of timber is estimated to be much smaller than that in Area B. Estimated timber volume may be summarized as follows:

Table 76

Area	Acrease	Volume	Total volume
Area A	9,200	220 m^3/ha	2,024 thousand m^3
Area B	22,500	110	2,475
Area C	2,500	90	225
Total	34,200	138	4,724

§ Required Quantity of Pulp Wood

A report by the Forest Engineering Institute in Bogor estimates that the Takengon Project (115 tons of paper pulp) will require 220,000[3] of raw wood (This seems to be an overestimate). Calculation on the basis of the above table shows the present annual increment of 5.3 to 5.5 m^3 per ha and consequently, the consumption period of the existing volume will be about 45 years. From the standpoint of normal forest, an annual increment must be about 6.4 m^3 even with the cutting rotation of 20 to 25 years. This increment rate of 6.4 m^3 may be attained by the implementation of rather intensive management of forest (discussed later).

§ Problems

- Forest Conservation and River Improvement.

The forest in Area "C" (on the shores of Lake Tawar) stands on the steeply sloped rocky terrain. Clear cutting of this forest must be avoided from the standpoint of forest conservation and river improvement, and the emphasis must be placed on the preservation of the forest in this area by employing selective cutting system or other cutting systems.

Even with the exclusion of this area from the scope of the project, an annual increment of 7 m^3/ha may be expected from Area "A" and Area "B" and the demand for raw wood under the current project will be satisfied without difficulty.

- Relation to the Collection of Pine Resin.

Lampahan Rosin Plant is now engaged in the collection of pine resin in Area "A" and Area "B" and 250 tons of rosin is produced monthly. In the future the production of rosin will be further increased and the area of forest for the collection of pine resin will be expanded from the present acresge (5,000 ha). We do not consider the forest in which resin is collected to be out of the scope of the Takengon Project but instead we believe that the rosin industry and pulp industry can co-exist in view of the fact that the object of pulp industry is the standing trees after the collection of resin.

- Planting

The cut-over area for the production of pulp wood should be provided immediate planting. Increase of forest volume must be attempted through continuous and intensive planting. We observed natural generation of young trees on many occasions but artificial planting should not be neglected.

In Takengon district many idle spaces such as waste land, grassland, privately-owned land and province-owned land, where planting seems possible, were observed. Planting in these spaces should be promoted vigorously.

It is said that in this district there is a habit of burning grasses so that the wild animals seeking the young grass grown in the burned area may be lured for hunting. This habit may cause a forest fire and therefore should be prohibited.

- Improvement of Forest Road and Mechanization of Work.

Improvement of forest road is indispensable for the logging of pulp wood. Particularly for Area "B", forest road improvement plans must be worked out consistent with the cutting program by district by taking into consideration the production quantity, optimum quantity to be transported by one forest road and the estimated damage to the forest in the rainy season. Construction of ropeways for sloped lands and valleys and the mechanization of logging operation must also be contemplated.

- Selection of Mill site

From the standpoint of the availability of raw wood alone, it is desirable to construct a paper mill close to the forest area. In such a case, however, other conditions generally tend to become more disadvantageous. In the event the mill is located far from the forest area, a study should be made on the practicability of chipping log of small diameter class at several points in the forest before transporting to the mill.

3) Process Water and Effluent

The Takengon Project, whether its site is located in the subrubs of Takengon Town or in Tepinmane near Bireven, must depend on the Peusangan River originating in Lake Tawar for water supply.

Distribution of Pinus Merkusii around Takengon

1/500.000

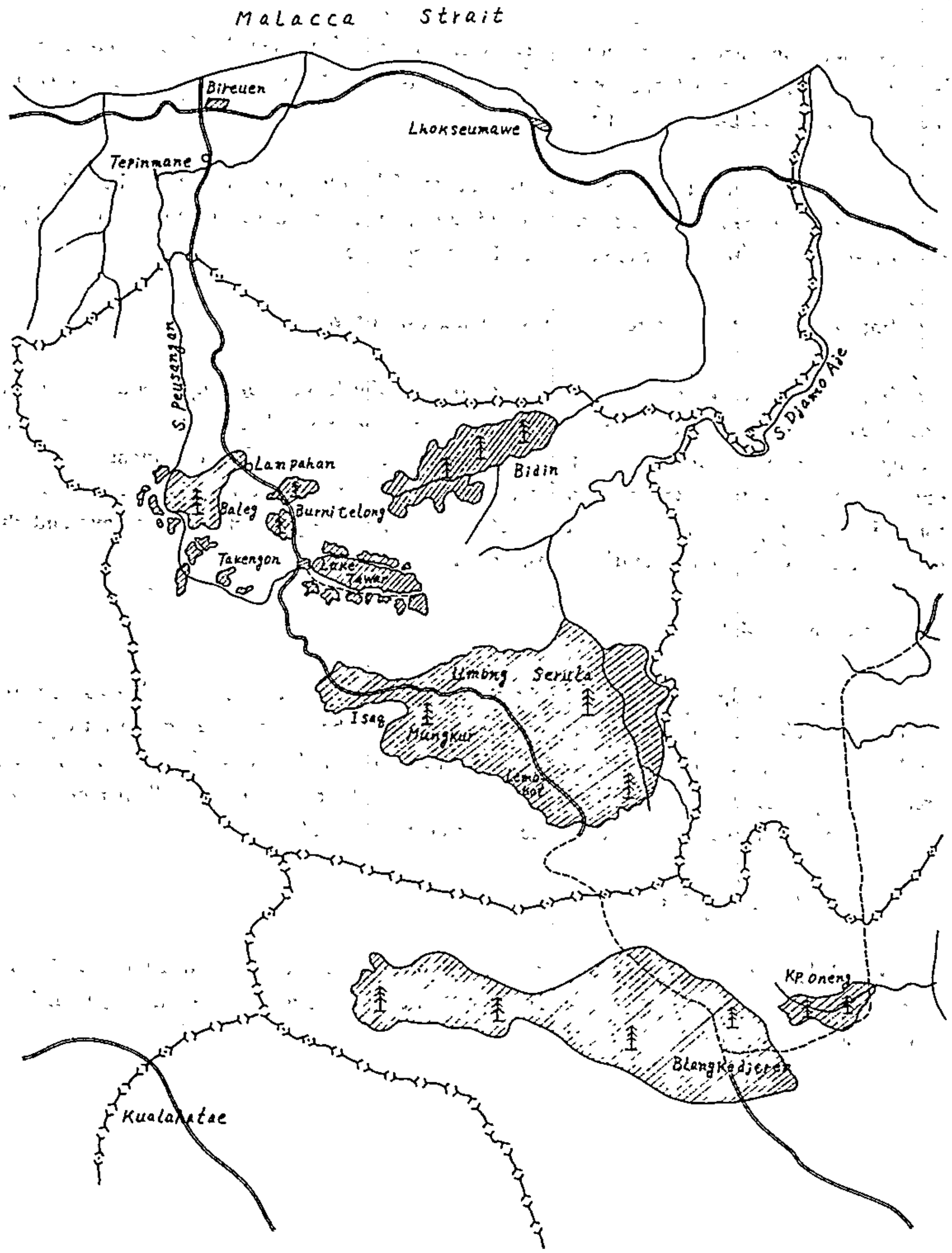


Table 77 Discharge of the Peusangan River 1965

Month	Ordinary water Discharge	
January	4.8 m^3/sec.	414,000 m^3/day
April	4.7 " "	406,000 " "
July	2.27 " "	196,000 " "
September	3.47 " "	299,000 " "

(Report of Projek Pabrik Kertas Takengon)

According to the above table, the discharge in July, the dry season, decreases to half of the discharge in the rainy season. However, these figures represent the discharge in the project site in the suburbs of Takengon and the figures for Tepinmane will be much higher. A pulp and paper mill having a daily production capacity of 100 tons requires 40,000[3] of water daily and therefore this demand will be easily met if only careful consideration is given to the location of intake and protection of river banks so that the supply of water in the dry season may be secured.

As to the quality of water, downstream near Tepinmane become turbid in the rainy season.

For the treatment of waste water from the mill, consideration must be given to the benefit of the residents and the irrigation water. In the case of daily production of 100 tons, the dilution of waste water without treatment will be a cause of serious pollution problems. Therefore, some means of treating waste water must be contemplated, for example, by constructing sedimentation basins, or canals extending directly to the straight of Malacca in the case of Tepinmane.

4) Location Condition

As stated previously, this project is quite advantageous in respect of water supply and the availability of raw material. However, the following two points may be considered as the greatest disadvantages for the project area.

(a) Satisfactory port facility is not available in the vicinity of the project area.
(b) The project area is at a considerable distance from the product market.

5) Type of Products

(a) Production of cyclostyle paper and writing paper should not be attempted. This is because all of the existing paper mills in the country are engaged in the production of cyclostyle paper and writing paper. Though part of the existing mills may convert to the production of thin paper, most of them will have to follow the course toward increased production of cyclostyle paper and writing paper by using rice straw and bamboo as in the past. For this reason, the Takengon Project should avoid competition with these existing mills.

(b) Production of items which are in rapidly growing demand should be contemplated. As stated previously, a rapid increase of demands for Kraft paper, newsprint and corrugated board is expected in the future. The supply of these products, moreover, depends entirely on the import resulting in the expenditure of a large amount of foreign currency.

(c) Mass production should be contemplated. Takengon is situated in a remote region and possess qualification for a relatively large production scale. Kraft paper, newsprint and corrugated board are the products suited for mass production.

d) Products should be of the type that can be delivered to consumers directly. The products mentioned above are in rapidly growing demand and suited for mass production. These products, moreover, are in large individual demand and for this reason, may be delivered to consumers directly under better sales condition.

e) Products should be of the type which is highly profitable.

Table 78

Type of products (Japanese make)	C & F Price	Import Duties		Delivery Price in case of special application
		General	Special cases	
Kraft paper	$195	60%	Exempted for state-owned enterprise or similar enterprise	On the order of Rp 88
Newsprint	$160	0		"Rp 65
K-liner	$165	45%	Exempted for joint ventures	"Rp 70
Semi-chemical medium board	$133	45%	Same as above	"Rp 57
Fine paper		40%	None	"Rp 148

Judging from various conditions stated above, the Takengon Project should concentrate its efforts on the production of sheet kraft paper and K-liner, which can be made from unbleached kraft pulp, and at the same time, it should be a supply source of bleached KP to other paper mill.

6) Comment on the Takengon Project

The latent resources of Pinus Merkusii in Atjeh is abundant but this rich resources can not be used for any purpose other than for pulp wood with the exception of resin collection. If this resources is available, daily production of 100 tons of kraftpulp may be possible. Under present conditions, however, lack of adequate road and the port facilities for the transportation of construction materials and machinery, raw materials and products after the completion of the mill is detrimental to the survival of the mill. The shortage of labor force, particularly the skilled workers, may also be considered as one of the bottlenecks. Any way, the solution of the problems centering on the logging infrastructure will determine the fate of this project.

A plan should be worked out immediately for the construction of a port also in relation to such industries as rosin sugar, rubber, coco palm oil, and coffee.

When these problems are solved this project will also be able to play an important role as a supply source of pulp to other paper mills and will make its debut as the first bulk products manufactory. It is hoped that a detailed plan incorporating a series of projects ranging from logging to the delivery of products be worked out and is to be followed by more detailed feasibility study.

2. Notog Project

1) History

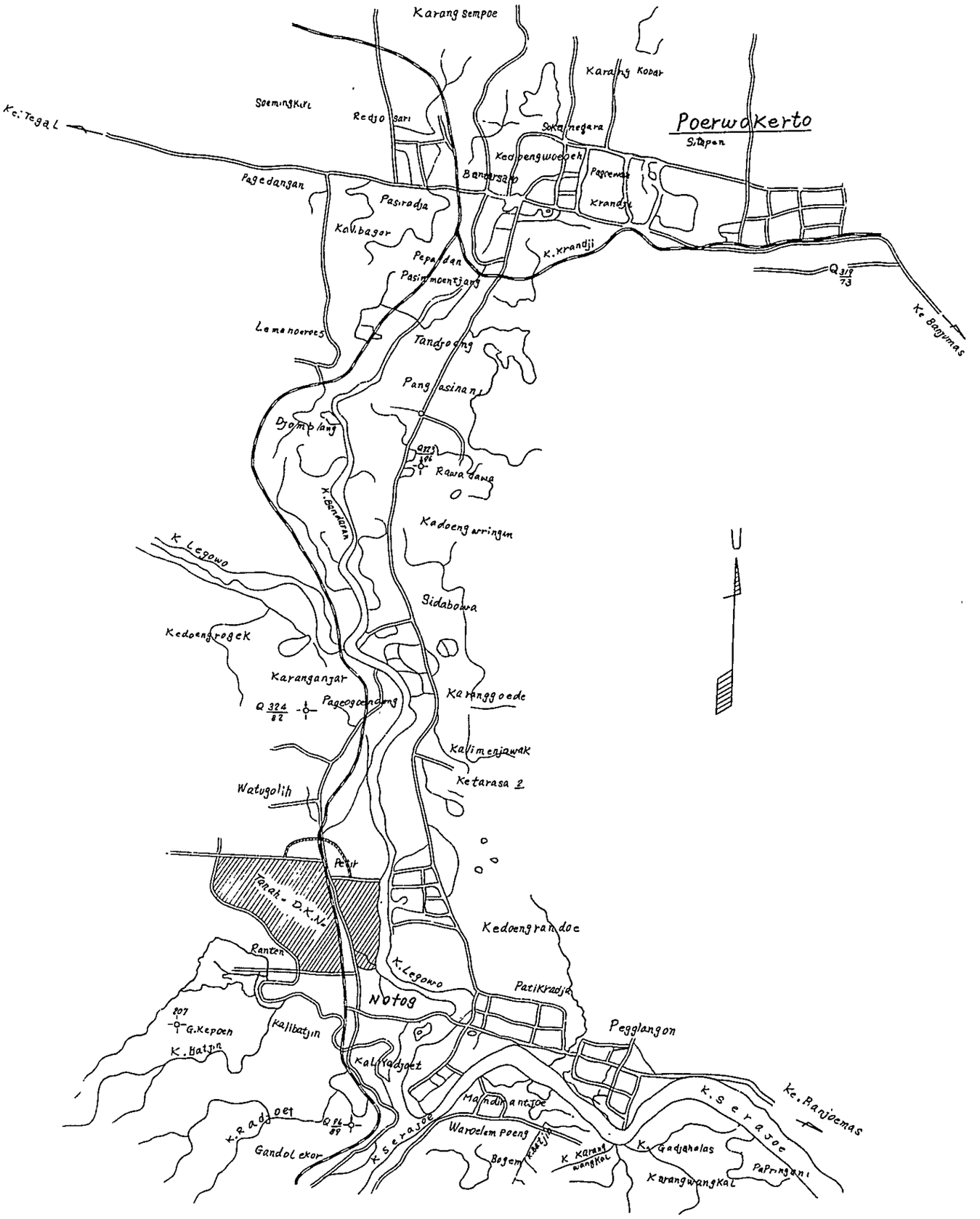
1957: Construction of a paper mill was planned by France but cancelled following a confrontation between this country and Malaysia.

1963: The project was again planned by West Germany and seemed to make a fair progress but was suspended just before the start of construction as West Germany withdraw from the project upon Indonesia's decision to construct Takegon Paper mill.

1965: This project was also taken up by East Germany but was again suspended as a result of the "September 30 Incident".

2) Proposed Mill Site.

The proposed mill site is located east of Purwokerto and convenient for railway transport and water transport along the Legowo River. A lot covering 51 ha has already



Digambar dari lembar 44/XI-1-A-[63-A]

Scale : 1:25.000

PROJEK :
KERTAS NOTOG BANJOEMAS
Gbr No. I/1 Hal. i Djuni 1967

been purchased by the Ministry of Industry. The excellent Port of Tjilatiap is 250 Km south and accessible by a paved road having a total length of 250 Km.

3) Water Supply

The minimum discharge of the Legowo River is 0.7 m^3/sec. (1964 – 1966 data). This is considered adequate since the requirement for the water for the production of 100 tons of pulp and paper is 500 m^3/paper ton. Waste water from the mill is to be discharged to the Serajoe River.

4) Labor Force

As the site is situated in densely populated Java, required general laborers will be secured without difficulty. It is needless to say, however, that a careful plan should be worked out in advance for the training of skilled workers and engineers.

5) Road and Port Facilities

Though the trunk roads in Java are all paved, they need to be reinforced and improved for the transportation of heavy materials and equipment. Particularly, the need for the construction and improvement of forest roads for log transportation was keenly felt.

The Port of Tjielatjap 50 Km south of the mill site has a depth of 7 m and has a 155 m long pier. However, the pier facility is so deteriorated that it is not capable to handle heavy cargoes. Besides, the pier is not provided with a crane. A plan must be worked out for the improvement of port facilities.

6) Forest Resources in Notog

1. Distance for Log Transportation

The object of log transportation will be Pinus Merkusii and Agathis Damara in the area centering around G. Slamet in Central Djawa.

Forest of these species are under the jurisdiction of Semarang Regional Forest Office of Perhutani and the main stand of trees are seen in the forest under the control of Pekalongan, Bumiaju, Purworedjo, Banjumastimur district forest offices. These forests are located at a distance of 25 – 100 Km from Notog.

2. Increment and Cutting Rotation

All of these forests are planted forests but their increment is satisfactory and the increment of Agathis, in particular, is excellent under favorable natural condition.

Although some variations are seen depending on the land features, the logging season is to be set at 25 years with the consideration given to the production of saw timber.

The production quantity of pulp wood at the logging season is estimated at 110^3/ha for Agathis.

Merkusii (25 years old) 150 m^3/ha, pulp wood % 80%
Agathis (" ") 300 m^3/ha, pulp wood % 50%

3. Relationship Between Standard Annual Cut and Consumption of Pulp Wood

As the distribution of forest age for both Merkusii and Agathis is unbalanced and there are very few adult forests of 15 years old or over, much can not be expected for the first 10 years. Thereafter, however, the production quantity will be increased gradually as the planted forests will produce satisfactory results.

Table 79 Area of Planted Forests By Forest Age

Species \ Forest Age	1-5	6-10	11-15	16-20	21-25	Over 26	Total
Merkusii	9,664	7,043	4,372	2,107	355	1,795	25,336 ha
Agathis	1,362	2,318	1,708	188	966	829	7,371
Total	11,026	9,361	6,080	2,295	1,321	2,624	32,707

Table 80 Estimated Production of Pulp Wood

Species		Object Area	Annual cutting Area	Pulp wood stock	Estimated annual cut
Merkusii	First 6 years	2,150 ha	360 ha	110m^3/ha	39,600 m^3
	Following 5 years	2,107	420		48,200
	" 5 years	4,372	870		95,700
	" 5 years	7,043	1,400		154,000
	" 5 years	9,664	1,930		212,300
Agathis	First 11 years	1,983	180	150m^3/ha	27,000
	Following 5 years	1,708	340		51,000
	" 10 years	3,680	370		55,500

Table 81 Estimated Cutting Volume and Pulp Production

Year	Estimated Annual Cut	Unit Ratio	Pulp Production/Year	Pulp Production/day
1970 – 1976	66,600 m^3	6 m^3/ton	11,100 t	37 t
1977 – 1981	75,200		12,500	42
1982 – 1986	146,700		24,400	81
1987 – 1991	209,500		34,900	116
1992 – 1996	267,800		44,600	148

Accordingly, if the unit ratio is set at 6 m^3 wood/pulp ton, the 30 t/day production level can be maintained for the time being. It will also be possible to expand the production to the 100 t/day level after 1987. In that case, however, it will be necessary to possess a normal forest covering an area of approximately 45,000 ha.

4. Problems

From the standpoint of forest stock alone, construction of the Notog paper mill seems to be justified. For the realization of large scale sustained yield, however, the following requirements must be fulfilled.

4-1 Improvement of Public Road

Most of the public roads in the city, town and village are the second or third class roads and the restriction on the weight of cargoe to be transported over these roads is a major obstacle to the transportation by truck. This hampers the effort to reduce the transportation cost.

More specifically, as the maximum weight allowed on these roads is 3.5 tons, the volume of logs that can be transported by a truck is a mere 2.5 m^3, one half of the loading capacity of the truck. It is important, therefore, to take steps for the replacement of existing bridges, expansion of road width and the improvement of curved roads with the cooperation of the Ministry of Construction.

4-2 Construction of New Forest Roads and Improvement of Existing Forest Roads

Only forest roads are the one having a total length of 8 Km in Purworedjo and the one in Banjumastimur having a total length of 15 Km. These are not adequate for long transportation in the quantity corresponding to the production scale of the mill.

Perhutani seems to be planning the construction of new forest road having a total length of 127 Km by 1975. Appropriate route should be selected by taking into account the cutting stand of trees and the work should be started immediately. Roads in the Merkusii forest north of G. Slament are counter sloped in most cases and therefore smooth log transportation may not be expected unless improvements are made on these roads. It is needless to say that abundant forest stock is of no value as raw material unless it is transported out of the forest.

4-3 Expansion of Logging Operation Area and Promotion of Operating Efficiency

Assuming that the production quantity of one logging operation area is 1,500 m^3/month in the dry season and 750 m^3/month in the rainy season, the annual log production will be 10,000 m^3. When the production of saw timber is taken into consideration, only 6,000 m^3 can be expected as pulp wood.

$(1{,}500m^3 \times 5) + (750m^3 \times 7) = 12{,}750\ m^3$
$12{,}750m^3 \times 0.8 = 10{,}000\ m^3$
$10{,}000m^3 \times 0.6 = 6{,}000\ m^3$

where: 0.8 = Safety percentage
0.6 = Ratio of pulp wood

Consequently, in order to supply logs to the paper mill having daily production capacity of 30 ton, it will be necessary to own 9 or more logging operation areas.

$(30\ t \times 300\ days) \times 6m^3 = 54{,}000\ m^3/year$

Though there is an abundant labor resources available in Central Djawa, the present operating system of the human wave tactics will require 1,500 or more forest labourers. Employment and supervision of such a large number of labourers will be a big task on the part of the management. It is needless to say that the operation can not relay on human power forever. Therefore, plans must be worked out for the mechanization of work by introducing chain saw, yarder, ropeway and tractors to promote the efficiency of logging operation and increase the production.

4-4 Planting

Planting is being carried out vigorously by various district forest offices. In consideration of the need for the rationalization of future management and log transportion, planted lands should be concentrated in one specific region and their dispersion should be avoided as much as possible.

As to the nursery, there is no need for providing a large area, as the growth of nursery stock is quite rapid. It will be necessary, however, to provide an additional nursery at the foot of mountain as the area of planting increases.

The present forest is a pure forest of only one species but when the danger of insect damage or forest fire is taken into consideration, it will be advisable to plan mixed planting of hardwood.

4-5 Structure of Log Production

It is advisable to give all the responsibility for the supply of log to the Perhutani, the owner of the forest.

Even when there is a shortage of pulp wood, continuous supply may be maintained by the adjustment of the quantity of export wood, match wood and fire wood.

4-5 Factory Site and the Utilization of Hardwood

The distance of 50 Km between Notog and Tjilatjap has no major effect on the cost of log transportation.

When the future use of the rich resources of hardwood left untouched in the outer islands and the anticipated pollution problems are taken into consideration, it seems more advantageous to construct a paper mill in Tjilatjap where the port is said to have a depth of 10 m and a capacity to accommodate ships up to 14,000 tons. As to the supply of pulp wood, a positive study should be made on the utilization of waste rubber wood which have already reached the logging season in the field forest.

7) Comments on the Notog Project

With a combined use of Pinus Merkusii and Agathis which is considered to be more effectively utilized as construction material or raw material for veneer production, construction of a pulp & paper mill having a daily production capacity of 30 tons is conceivable under present condition. In other words, construction of a pulp & paper mill of the size equivalent to that of the Banjuwangi or Letjes paper mills is feasible. This project, however, can not be a key project in the country's comprehensive pulp & paper industry expansion program.

However, in view of the fact that the Merkusii forest at the northern base of Mt. Slamet is being preserved and tended by the Regional Forest Office, this project may be most suitable for the production of Duplex Board or medium board with effective utilization of this Merkusii resources, waste rubber wood, and bagasse produced by sugar plants in the neighboring area. Production of Duplex Board has not yet been given serious consideration

SKETSA TRANSPORTASI
BAHAN BAKU
PROJEK KERTAS NOTOG
BANJUMAS

KETERANGAN

- DJALAN KERATA API.
- DJALAN UMUM (PUDT)
- DJALAN UMUM (PUK/
- RENTJANA DJALAN
- (---) (---) ROUTE TRANSPORTASI KAJU

LAUT DJAWA

KE TJIREBON

BREBES

TEGAL

PEMALANG

KE SEMARANG

ADIWERNA

RALAPULANG

JAMANI

RANDUDONGKAL

MOGA

BANJUHUDAL

KALIBAKUNG

(4A)

PRUPUK

BODJONG

BULAKAN

WATUKUMPUL

PULOSARI

TUWEL (4A)

BUMIDJAWA

SIMPOR

BELIK

BONGAS

MARIBAJA

(8A)

KARANGANJAR

GUTJI

KEPETEK

GN.DIPODJOJO

PS.BERENG

SALEM

SIRAMPOG

KALIPEDES

3428

GN.SLAMET

KARANGREDJA

PENGASINAN

(11)

BUMIAJU

IGIRKLANTJENG

(4)

TAMANSAT

BOBOTSARI

SIDJAMPANG

KRETEG

BATURADAN

KE BANDJAR

MADJENANG

(3)

PURBOLINGGO

(8)+(8A)

PURWOKERTO

(1)+(6)

BANDJARNEGARA

WONOSOBO

KE SEMARANG

(6)

KRETEK

(10)

KE BANDJAR

ADJIBARANG

(2) KEPETEK

KALIWIRO

(1)

SAPURAN

SUKARADJA

(3)

NOTOG

PATIKRADJA

BANJUMAS

KAPIL

WANGAN

(12)

GOMBONG

MAOS

KROJA

KEBUMEN

PINUS MUDA
PINUS TUA

AGATHIS MUDA
AGATHIS TUA

BATU KAPUR

TJILATJAP

PREMBUN

KE PURWOREDJO

NUSAKAMBANGAN

KULAWINANGUN

KUTOARDJO

KE JOGJAKARTA

SAMODRA INDONESIA

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by other paper mills and is the item which is expected to be in growing demand in the future.

As for the mill site, it will be necessary to make surveys of the area near Tjilatjap Port or the area around the Port of Tjirebon by taking into account the convenience of transportation of pulp wood and chemicals and the delivery of products.

VII. MASTER PLAN

1. Summary

From our survey of the pulp and paper industry in the Republic of Indonesia, we have learned that the industry involves many porblems. We have also found that the environment for the industry is not necessarily favorable and that the efficiency of each individual paper mill, in terms of both human and material abilities, need to be further improved. However, the future of the pulp and paper industry in this country is in no way pessimistic. We have been able to find some promising factors. We believe that the industry will certainly be able to make further progress if and when appropriate measures are taken both domestically and diplomatically in the future. As a conclusion, we recommend the following.

1) Efforts should be made for increased production of the type which is in growing demand within the scope of available raw material.

2) Efforts should be concentrated first on the solution of urgent problems and then on the planning and implementation of an interim program for the remaining period of the Five Year Project. Then, a long-range program should be worked out and efforts should be made for the implementation of the program. (Table 30).

3) Various protective measures should be implemented to foster and promote pulp and paper industry which is still in its infancy.

4) Positive efforts on the part of the pulp and paper industry itself are the essential factors foı its progress.

2. Position of Pulp and paper Industry in Indonesia's Economy

The Republic of Indonesia is a newly rising nation gaining her independence not too long ago and is in a fair way to the progress with an enormous population of 120 million and abundant natural resources. It is said that the consumption of paper is a barometer of a country's culture. In this sense, we strongly believe that the pulp and paper industry in this country deserves further development in the course of industrialization and modernization of the country.

Reasons for this belief are the following:

1) Bamboo, rice straw, bagasse and forest resources are very rich in this country and the future growth of demand for paper will be satisfied without difficulty by the development of forest resources.

2) Domestic supply of paper accounts for only 17% of the total demand at present and particularly, no domestic production of kraft paper and corrugated board, both of which are considered to be in growing demand in the future, has ever been attempted in this country.

Table 82

	Plan	Urgent Plan	Short-Range Plan (Within the Five Year Project Period)	Long-Range Plan (After 1974)
Existing paper mills	Padalarang	Implementation of rehabilitation plans Improvement and level-up of product quality Research on the use of rubber wood and others	Installation of thin paper machines Research on the development of new products	Conversion to thin paper specialty mill. Level-up of technical standard and product quality
	Blabak	Aequisition of pulp production technique by Pomilio Method. Improvement of auxiliary facilities.	Achievement of design capacity of 20 t/day. Planning of paper processing.	Conversion to cyclostyle paper and writing paper specialty mill.
	Letjes	Full operation of new machines Research on the use of bagasse.	Implementation of the Second Production Expansion Project. Achievement of daily production of 45 tons. Expansion of paper processing capacity.	Cyclostyle paper and writing paper specialty mill. Planning of the Third Project.
	Banjuwangi	Implementation of facility enforcement work. Technical guidance and training. Improvement of operating rate.	Achievement of design capacity. Level-up of technical standards. Planning of paper processing industry.	Production of coated paper
	Gowa	Acceleration of rehabilitation with the aim of resuming operation within the year. Technical guidance and training.	Improvement of operating rate. Full operation. Level-up of technical standards. Planning of paper processing industry and research on the use of wood pulp., Plantation.	
	Siantar	Production in the quantity to satisfy demands in its own area. Acceptance of subsidies from the government.	When sorrounding conditions turn for the better, increased production will be attempted after rehabilitation of facilities.	Study on the conversion measures in relation with the Takengon Project.
Under Const.	Martapura	Completion within the year. Difficulties lie ahead. Protective measures required.	Acquisition and training on operating techniques. Promotion of measures for the use of rubber pulp (test plant). Conversion to more profitable products.	Diversification of product to meet the local demands.
New Project	Notog Takengon	Feasibility Study (Close watch on the change of situation in and out of the country. Type of product, production scale, mill site, profitability)		Decision on the production of heavy packing paper, corrugated board or paper board to be made by wet machine and the start of production.
Remarks		Improvement of facilities and recovery of production capacity in the existing paper mill. Confirmation of comprehensive instruction policies for the pulp & paper industry.	Full operation of all paper mills with the exception of the Martapura paper mill. Studies on the advisability of sharing production of specific items among papermills and establishment of target. Addition of paper processing department. Level-up of technical standards. Improvement of infrastructures. Implementation of promotion measures.	Display of characteristics and features of each papermill.

3) The pulp and paper industry is the industry having a high ratio of domestic production (The reciprocal of the ratio of dependency on import in the production cost). In this country which is following the course of further economic growth, the promotion of this industry will bring about most efficient and immediate effect on the saving of foreign exchange, increase of employment and the acceleration of regional development.

4) The pulp and paper industry, along with the cement manufacturing industry, uses the primary commodity for its raw material and is able to manufacture finished goods in its own plant. The growth of this industry stimulates the related industries which manufacture chemicals and other commodities for pulp and paper industry and promotes the growth of paper processing industry, thus contributing greatly to the progress of a refinal development. In this respect also, the need for giving priority to the promotion of the pulp and paper industry of this countcountry must be stressed.

3. Course of Development

As previously stated in the chapter for demand and supply, the largest share in the supply of paper in Indonesia is held by news-print, cyclostyle paper and writting paper. In recent years, however, demands for kraft paper in cement industry, fertilizer industry, light electric industry and food industries including sugar, rice, etc are increasing steadily. With the emergence of the corrugated board industry near Djakarta at the beginning of the year, demands for corrugated board have developed all at once. Following the increased production of the primary commodities and the growth of other industries, it has become necessary for the pulp and paper industry to change its structure centering on the production of cyclostyle paper and writing paper to the structure which places emphasis on the development of industrial papers such as kraft paper and corrugated board. Also, the progress of various industries will inevitably accelerate the production of papers of high class and diversified type and the industry will not be able to remain content itself with the production of low class paper.

In the past the pulp and paper industry in this country has been depending solely on rice straw and bamboo for the supply of raw material. Products from thse raw materials were mainly the cyclostyle paper and writing paper and in very few cases they were thin paper and note-book cover. It is obvious that it is in no reason to expect any other products from these raw material.

As the kraft paper and paper board are the packing material, they are not required to possess white color and high density as in the case of the cyclostyle paper but are strongly required to possess durability. Also, when the diversification and level-up of products are to be attempted, the improvement of product quality can hardly be expected from these pulps. In other words, there must be a positive effort on the development and utilization of wood pulp. Domestic production of newsprint and cigarette paper is extremely small compared with growing demand and the majority of the requirement is being covered by import. Production of these items from rice straw and bamboo is almost impossible from the standpoint of product quality and therefore will have to depend on wood pulp. This vast country has rich unexploited forest resources and is the only country in Southeast Asia that has needle leaved

trees which may be used as raw material for strong pulp. The hardwood, which may also be said to have an unexhaustible supply, can also be used as raw material for packing paper depending on the way it is used. The bagasse produced by sugar plant can also be used as raw material for the production of medium board. Research on the use of tropical broad leaved trees such as waste rubber and mangrove will also be important for the production of cyclostyle paper and low grade paper.

From the above point of view, we support the fundamental policy of the Five Year Economic Development Project which envisages in its lon-range plan the development of wood pulp and the construction of paper mills intended for mass production of kraft paper and news-print as part of the measures to save foreigh exchange. In this connection, we recommend the following as the course to be followed by Indonesia's pulp and paper industyr.

1) Production of industrial papers such as kraft paper and corrugated board.

2) Level-up and diversification of product type.

3) Utilization of wood pulp.

4) Reduction of production cost for low grade paper and research on the use of bagasse, rubber wood and mongrove for pulp production from the standpoint of effective utilization of untapped resources.

4. Stages of Development

Standstill is not allowed in the development of industry which supports the growth of nation's economy. Steady and continuous progress must be maintained toward the object under careful planning. Out of planless pursuit of hasty progress of development, various essential requirements and conditions for the development work must not be neglected. A combination of human power and material resources under appropriate leadership of the government can only win the growth of the nation. We recommend that the Five Year Pulp and Paper Industry Development Project be given another review and that its implementation be made systimatically and gradually in the following three stages.

1) Urgent Plan (Improvement and rehabilitation of production capacity in each paper mill).

Of the six existing paper mills, the Padalarang and Letjes paper mills are suffering from the deterioration of their old machines and the four new paper mills are experiencing a des crease in their production, though there may be various reasons for this, and are facing the danger of collapsing. Thus, the Five Year Project is on the verge of collapse immediately after its start. The urgent necessity of the day is to make an immediate investigation, grasp actual conditions of each individual paper mill and make an all out effort for the improvement of the situation and rehabilitation of the production capacity.

2) Short-Range Plan (With the target set at the last year of the Five Year Project)

Following the previous stage, emphasis will be placed on the improvement of situation and rehabilitation of the production capacity and the expansion of facilities will be attempted for some mills on a small scale. At the same time, the responsibility and the role of each

individual paper mill will be determined with the establishment of a centralized management structure. Necessary research and studies will be continued in preparation for the future expansion.

3) Long-Range Plan (Upon completion of Five Year Project)

Upon satisfactory completion of the short-range plan, a new extension (expansion) program (installation of new machine for thin paper, mass production of packing paper and paper board) will be implemented.

Detailed discussion will be made on this subject in the following section by dividing it into three stages.

4-1 Urgent Plan

A Padalarang paper mill

The exististing facilities are becoming obsolete as a whole and it is evident that the mill will not be able to survive future competition and will follow the course of destruction if left alone. However, the site condition of the mill is far better than that of other mills in the country and the mill possesses excellent abilities in the management, technique and administration based in their long tradition and experiences. It is necessary for the mill to take steps for the improvement of old facilities along with the urgently needed rehabilitation work and make a positive effort for the expansion of production and the level-up of product quality in order to realize increased profits.

It will also be improtant for this mill to extend cooporation to the Bandung Textile Research Institute in their research on the development of new resources and products and give support to the expansion of other paper mills.

B Blabak Paper mill

It is regrettable that the mill is still lingering on the boarder of 50% of the design capacity ever since its inaguration. Efforts should be made to remove all obstacles step by step and attain the required production goal as early as possible. The problem on pulp digestion by Pomilio Method, which is considered to be the greatest obstacle, should be solved with the assistance from foreign countries. As for auxiliary facilities, improvements of generator efficiency and elimination of defects in finishing process must be contemplated in order to establish a structure for the daily production of 20 tons.

C Letjes paper mill

Attention should be focused on the full operation of new machines. Vigorous efforts should be made for the expansion of production both in old mill and in new mill. With regard to raw material, research on the use of bagasse should be continued.

D. Banjuwangi Paper Mill

Because of a short history in operation, spare parts and stand-by equipment are not provided adequately and unfamiliarity with operating technique and unskilled management practices are conspicuous. It is of urgent necessity for the mill to take steps to insure improved and stable operation by reinforcing facilities, providing adequate spare parts and conducting training on the operating techniques.

E. Gowa Paper Mill

Because of the suspension of operation since the middle of March 1970, the moral of the employees is very low and the state of desolation is quickening its pace. An all-out effort must be made for the rehabilitation of existing facilities as first and then for the procurement of spare parts, chemicals and materials, with the aim of resuming operation within the year by all means. After that, construction of water intake facilities and improvements of forest road should be planned to create a better environment. Along with this, effort should also be made for the training of employees on the operating techniques. A careful planning must be made for the procurement of funds necessary for these undertakings.

F. Pematang siantar

This paper mill is equipped with GP facility and produces such low priced product as newsprint on the production scale as low as 15 tons a day with the use of imported pulp.

The problem this mill has is a very serious one. This problem will be discussed emphatically at a later stage but unless the present situation, in which the price of newsprint is set at an extremely low level compared with the price of other commodities, particularly that of H.V.S., is improved, the mill will not be able to survive future competition.

The only conceivabl way that the mill can survive will be the following.

(1) Until the conditions surrounding this mill have been improved, the production should be held at the level which only satisfies demands in Medan district or Central Sumatra at the most and continue to receive subsidies from the government for deficit covering.

(2) If this is not practical, the mill should be closed down temporarily and the conversion to other types of product should be contemplated in relation to the evolution of the long-range plan.

G. Martapura Paper Mill

Facilities of the mill are not completed yet even though it is already 10 years since the inauguration of the project. It is said, however, the facilities will be completed around the end of the year. This mill is an integrated mill equipped with K.P., G.P. facilities but its design capacity is only 10 tons a day. Conditions surrounding the mill are such unfavorable ones as

the restriction on the type of product imposed by the conversion of raw material from Agathis to rubber wood, greater distance from the market, a shortage of skilled workers, difficulties in procuring spare parts, supplies and chemicals and maintenance of facilities, almost similar to the conditions for the Siantar Paper Mill, it will be unaboidable for the mill, therefore, to show deficits in its operation. However, the attempt to produce K.P. from rubber wood is very significant as a test case for the pulp and paper industry in this country.

In view of its position as a pioneer industry for the regional development of remotely located Kalimantan, this mill should be placed under strong protection of the government for the time being and at the same time, effort should be made for the conversion of products.

4.2 Short-range Plan (Until the last yerar of the Five Year Project).

A. Padalarang Paper Mill

A drastic decision should be made for the installation of new machines to be used specifically for the production of thin paper. The mill should concentrate its efforts on the production of thin paper, particularly the cigarette paper, by making the best use of its tradition and experience.

B. Blabak, Letjes and Banjuwangi Paper Mills

(1) Each mill should concentrate its efforts on the discharge of its present abilities to the fullest extent.

(2) Improvement of management efficiency and simplification of administrative organization should be contemplated.

(3) For the Letjes paper mill, the Second Expansion and Rationalization Project should be implemented along the line of the Five Year Project.

(4) For other two paper mills, expansion of production should be contemplated to the extent, the raw material such as rice straw, bamboo and bagasse and water supply are permissible.

(5) Coordination should be made between paper mills on the type of products and the market route and if possible, exchange of pulp and operating technique between mills should be contemplated to create cooporative relations.

(6) Installation of paper converting machines should be contemplated. Blabak and Letjes paper mills have been turning out note-books but further expansion of production, diversification of product type and advancement into the production of wood free paper should be contemplated.

Process manufacture of envelopes, cards, cover paper and files, other than note-book making, does not involve too much difficulty in respect of equipment and technique.

C. Gowa Paper Mill

Every possible effort should be made to improve operation ratio and raise technical level. At the same time, systematic planting of bamboo forest should be encouraged to secure the supply of raw material and prepare for the future expansion of production. During this period, research on the use of wood pulp and the installation of paper converting facilities should also be planned.

D. Martapura Paper Mill

Efforts should be made to acquire necessary operating techniques and raise the level of technical standard.

In view of its small scale and the location being far from the market, it will be extremely difficult for the mill to realize a profit if the mill continues to rely on the production of low grade paper. Therefore, research on the intensive use of rubber pulp should be promoted as an attempt to find a means of converting the mill to the production of other type of products.

In view of the fact that waste rubber wood is available at extremely low prices and its supply is abundant, the future of this mill may be said to be very promising if a structure for the use of rubber wood is firmly established.

E. Siantar Paper Mill

If the prices of low grade cyclostyle paper and newsprints are changed for the better in the future, increased production will be contemplated after rehabilitation of its facilities. In that case business of the mill will take a favorable turn.

F. New Projects

For the Takengon Project and Notog Project or other new projects which may be planned in the future, a thorough feasibility study must be made in advance prior to the preparation of construction work.

All of these five paper mills in "A" "B" and "C" groups mentioned above, particularly the three mills except the Padalarang and Letjes paper mills, should return to normal operation as early as possible and should have their production and sales activities on the right track in the last year of the current Five Year Project so that they may be able to contribute to nation's economy as successful enterprises. In other words, each paper mill should work out careful and practical production and sales plans and profit planning every month and year. These programs should be put into practice by making adjustments to these plans as necessary to seek maximum proft. At the same time, on utmost effort must be made for the promotion of technical level and the improvement of the quality of products.

4-3 Long-Range Plan (After 1974)

A. Exsisting Paper Mills

The Padalarang paper mill should strengthen its characteristics as a specialty mill for the production of thin papers including typewriting paper and dictionary paper with the emphasis placed on the production of cigarette paper.

The Blabak and the Letjes paper mills will be able to put the use of bagasse on the right track with the stable quality and cost and will play a central role in the production and distribution of cyclostyle paper and writing paper in this country along with the Banjuwangi and Gowa paper mills, both of which will use bamboo as raw material. These paper mills will also have some type of paper converting machines added to their facilities. A coater will be installed in one of the two mills using bamboo pulp for the production of coated paper. It is desirable that each mill displays its characteristic features to some extent even while maintaining production of cyclostyle paper and writing paper as its main product line.

The Martapura paper mill will be required to further improve its technical standard and expand the scope of product positively so as to be able to meet any demands in its own area.

B. Takengon Project

A survey made on the Takengon Project, a long pending project since 1964, particularly the probe into the Merkusii forest which is called "A forest of illusion" with the intention of confirming the state of the forest and its resources, revealed that the forest, even though once totally destroyed by a forest fire, still possesses wood stock sufficient for a daily production of 100 tons or more of kraft pulp.

This project in no way conflict with the rosin project in Lampahan district and co-existance of both projects is considered quite possible. As Merkusii is not considered to be appropriate for use as saw timber, the rich resources of Merkusii in Atjeh Province should be utilized as pulp wood. It is needless to say, however, that planting should be made after cutting.

As for the mill site, it is desirable to locate the mill near the logging operation area from the standpoint of raw wood supply, but when the required water supply, anticipated pollution problems on waste discharge, and transportation problems are taken into consideration, it seems more appropriate to locate the mill in Tepinmane near Bireuen rather than in the proposed site.

As for the type of products, the geographical location of Takengon should be taken into consideration and the products which will be in growing demand and which can be produced in large quantity and delivered directly to large users, kraft paper and kraft liner for example, should be selected.

For the realization of the Takengon Project, however, lack of adequate road and port facilities for the transportation of construction machinery, logs and products are detrimental. The shortage of labor, particularly the skilled workers, is also a major obstacle. Any way, the fate of this project depends entirely on the sucess or failure in the improvement of infrastructure. Therefore, a plan should be worked out immediately for the improvement of port facilities in relation with sugar plant, and the production of pine resin, rubber, palm oil and coffee and appropriate measures should be taken to secure the means of transportation and reduce production cost.

When these problems are solved, the Takengon Project may become a major source of pulp supply to other paper mills and the first and only bulk product manufacturing plant in this country. It is hoped that a detailed project covering a series of operating processes from logging operation to the delivery of products be worked out and a careful feasibility study be carried out to determine the profitability of the project.

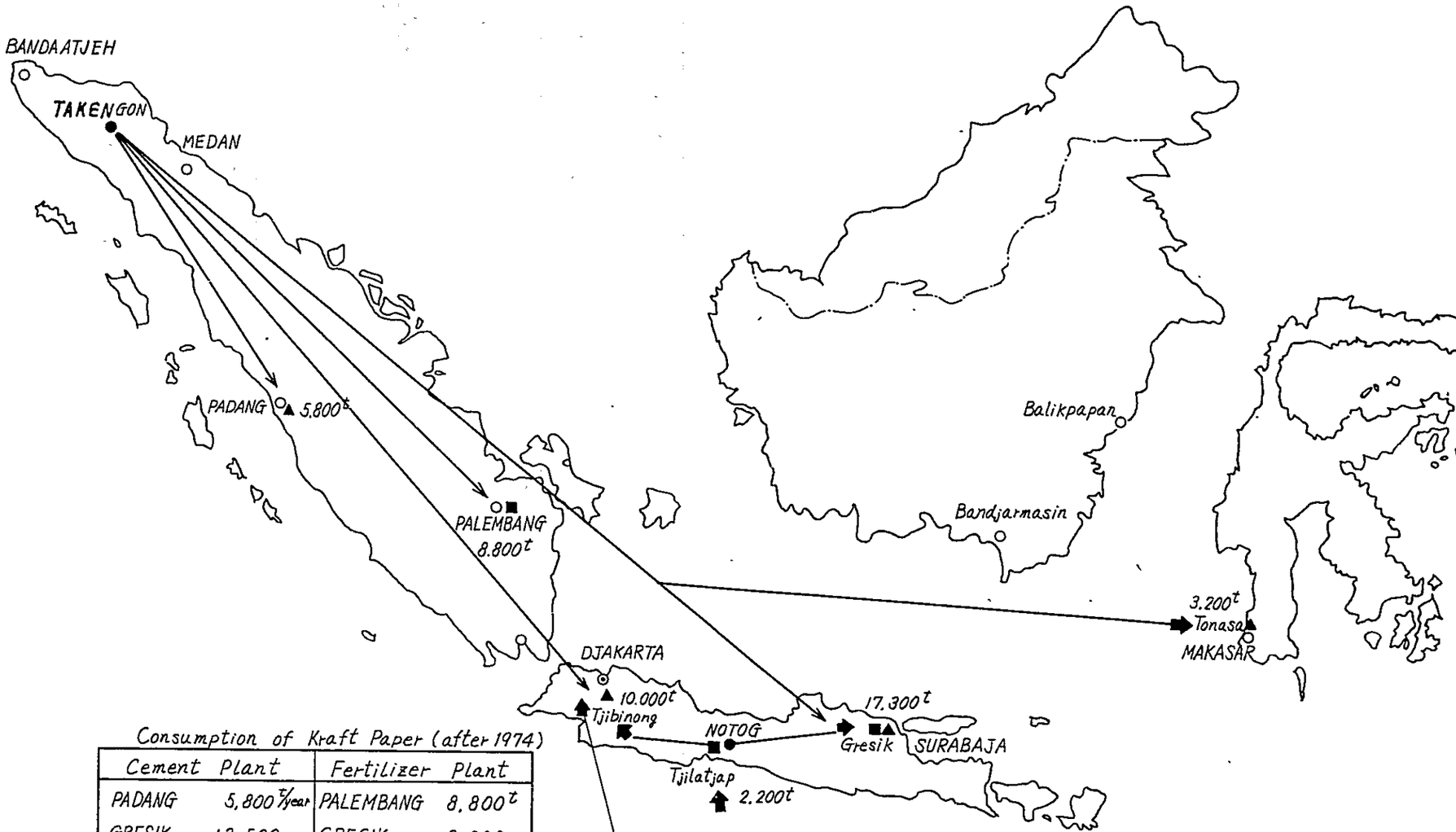
C. Notog Project

This project is considered to be advantageous in respect of geographical location compared with other projects in other territories. That is to say, the site is located south of Purwokerto and convenient for both railway and land transportation and at a distance of 50 km from the Port of Tjilatjap. Water supply is also sufficient for the daily production of 100 tons of pulp and paper. Being located in densely populated Central Java, required labor force is also available without difficulty. The greatest advantage of the mill is, first of all, that the mill is situated fairly close to the markets of Djakarta, Sumaran and Surabaja, all of which are the largest consuming areas in the country.

Pulp wood resources available are the Pinus Merkusii and Agathis forests spread along the foot of Mt. Sulamet. A survey of these forests revealed that the volume of pulp wood is sufficient for the production of 37 t/day of pulp for the time being. However, judging from the current increment rate, these forests will be able to supply pulp wood for the production of 100 t/day or more after 1987 if systematic planting is maintained. In view of the necessity of securing the supply of pulp wood from these forests and implementing required planting, it is essential for this project to obtain cooperation from Perhutani.

As to the type of product, it may be advisable to add to the regular products the white paper board and other medium board by making the most of such advantages as the availability of soft wood, hard wood, rubber wood and bagasse.

A lot covering 51/ha has already been purchased at the proposed mill site. However, when the transportation of hard wood from the outer territories and the future sea transport are taken into consideration, it may be advisable to review the site plan again and seek appropriate site around the port of Tjilatjap of venture to see the mill site north of Mt. Sulamet, close to the Port of Tjirebon.



Consumption of Kraft Paper (after 1974)

Cement Plant		Fertilizer Plant	
PADANG	5,800 t/year	PALEMBANG	8,800 t
GRESIK	13,500	GRESIK	3,800
TONASA	3,200	TJILATJAP	2,200
TJIBINONG	10,000		
	32,500 t		14,800 t

Base Paper for Corrugated Board
(Djakarta District)
K-liner 13,500 t/year
Medium Board 12,600 t

In promoting the project the fact that Takengon is far from the consuming market must be taken into consideration and for this reason, improvements and expansion of infrastructure including port facilities and road network will be indispensable.

On this matter it is hoped that a fair and partial comparative study be made again on various conditions of both projects to determine feasibility of the project and that the order of priority and timing of construction be properly determined.

5. Course to be followed for development

It is recommended that the following points be given special attention as the steps for the promotion of the pulp and paper industry following the principle which has been discussed previously.

1) Priority of Economic Feasibility

In the past there have been many cases in which a number of projects were planned not on the economically justifiable ground but from political reasons. As a result, paper mills constructed during the post-war period have been troubled by obstacles in the operation and management because of their disadvantages in location condition.

For the future project a through feasibility study should be made on the timing of construction, procurement of Rp funds, construction procedure, management abilities, availability of manpower, particularly the skilled worker, and even the question of infrastructure to say nothing of the appropriateness of location condition to ensure economically justifiable and effective implementation of the project.

2) Administrative Guidance and Protective and Promoting Measures to be taken by the Government.

The pulp and paper industry of Indonesia is still in its infancy and has not gained power to stand on its feet. To foster this industry to make it self-sufficiency, several protective and promoting measures must be taken by the government along with strong administrative guidance.

A. Establishment of Head Office

Though all of these paper mills are independent enterprises, they are owned by the government and all the responsibilities for the project from the planning to its completion, trial operation, inauguration of operation and the management of the mill are borne by the government.

The agency directly responsible is the Ministry of Industry. The Chemical Industry General Bureau of the Ministry has four departments – Planning, Construction, Management and Finance – in laterally distributed functional system, and each department is respon-

sible for the project according to its progress. These departments, however, are also responsible for other industries such as fertilizer, cement, soda, and automobile tire manufacturing industries in addition to the pulp and paper industry.
In short, the present structure is not such that can provide consistent supervision oever the pulp and paper industry.

It is recommended, therefore, that all the paper mills be integrated into one state-owned enterprise with the head office located in Djakarta, which provides overall supervision over all the paper mills in the country and that a structure responsible for providing consistent vertical administrative guidance on the project planning, construction and operation be established.

Through such reorganization each paper mill will be able to emerge from its present status as a disorganized and small scale integrated paper mill. This will also result in the the creation of organic relations between the paper mills and make each paper mill display its own merits in its right place, right type of product and right marketing activity. Form a political point of view distribution of responsibility to the Ministry of Trade for the matter concerning tariff, to Kehutanan for the supply of pulp wood and to the Ministry of Public Works or the Ministry of Transport for the matter concerning the transportation will provide a means of strong political negotiations among the agencies.

B. Preferential Protective Measures for Tax System

For the promotion of the pulp and paper industry it is desirable to provide special measures for the exemption or reduction of corporate income tax and selling tax for a certain period. For the products which are to be increased in the share of home production in the future, import of competing products should be restricted and appropriate measures such as import restriction or increased tariff should be provided.

The present rate of corporate tax and selling tax is excessively high compared with the capability of today's paper industry in Indonesia. Concerning the products for which no import duties are imposed, the paper industry of Indonesia will never be able to compete in the international market.

C. Control of Distribution System

At present, almost all the distribution channels for paper are under the complete control of Chinese traders. This is probably due to the fact that over 80% of the total demand have to depend on import. Apart this, the fact that the will of paper mills is almost ignored in the market is a serious problem for the future growth of the industry. With the increase in the share of domestic product in the future, it will be important to establish a firm distribution system which is capable to implement its own policy for the marketing of domestic products. It is hoped that the responsible government agencies also take the same degree or more interest in the distribution system as they do in the production aspect.

In this connection, there is a movement in some of the Chinese traders responsible for the distribution of paper products toward the change from the present state of "A Jack of All Trades" to "A specialty dealer of paper". It will be advisable for the industry, therefore, to gain control over reliable persons among these Chinese traders and foster them as the mainstay of the distribution system for the time being.

D. Paper Mills Characterized by Product.

Under the existing circumstances all the five existing paper mills and the Martapura paper mill which is now under construction, with the exception of the Siantar paper mill which specializes in the production of news print, lean to the production of cyclostyle paper and writing paper and their products are substantially the same. Unless a careful observation is made on the trend of demand in Indonesia and special consideration is given so as to avoid the standardization of products through region, market and paper mill and unless efforts are made to characterize each will with its product, there will only be a weak competition among the paper mills and sound growth of the industry may not be expected.

3) Procurement of Required Funds (For construction, maintenance and Operation)

Construction of a paper mill must be accomplished in the shortest possible period by mobilizing all available manpower and material resources in any project. A prolonged time from the start to the completion of the project will often cause not only a great loss of manpower and material resources but also a decrease in the original economic value of the project as a result of changes in the situation. There might have been unavoidable reasons for the delay in the past projects but for the future project it is important to keep in mind that speedy construction is essential for the effective implementation of the project. For this purpose, there must be a careful financial plan for the construction program along with a feasibility study at the initial stage of the project planning.

Since the pulp and paper industry is the so-called "basic industry", "integrated indu industry" and also an "installation industry" which requires a large quantity of raw material, water and energy and large scale machinery, its construction requires an enormous initial investment. On the other hand, the sales of this industry is not so large and its capital turnover is extremely low compared with other industries. Therefore, it is unavoidable for those existing paper mills having a short history to lack the power to produce and accumulate rehabilitation and operating funds.

This is the reason for the urgent necessity of providing systematic supply of long-term loans of low interest rate and special budgetary measures to cover accumulated deficits since the inauguration of the project.

4) Guidance on Management and Operation Techniques

In the paper industry of this country, which is still in its infancy, the lag is particularly conspicuous in the management and operating techniques. With the paper mills

constructed in the postwar period in particular, new machines and equipment were introduced but the basic techniques for the operation of these facilities were not provided adequately. As a result, these mills were unable to attain their design capacity and today their production achievements are far below the design capacity.

The management of the pulp and paper industry, the basic and integrated industry, must be based on the combination of every available human and material resources and on the comprehensive evaluation of external and internal conditions. It is regrettable, however, that the personnel capable to bear these responsilities are not available at the present stage.

It is needless to say that raw material, supplies and facilities are the important factors but the requirement for the completeness of the technology as mentioned above is far greater. For this reason, it is important to direct attention to the investment in human aspect as the invitation of qualified instructor-engineers and the implementation of training of employees on the operating technique for these paper mills.

5) Effort of industry for self-sufficiency

5-1) Expectation for the Pulp and Paper Industry Association

Until such time of the establishment of "Head Office" as stated previsouly, the function of the Indonesia Pulp and Paper Industry Association, established last year under strong back-up of the Ministry of Industry, should be expanded and its activities should be initiated immediately.

A. Market Research. State of domestic demands (Comprehension of the size of demands by region and product type, market condition, state of users and distribution system and the prospects of future trends)

B. Measures to provide competitive power against imported products. A constant watch must be maintained on the movement of paper industries in other countries and an utmost effort should be made to obtain information from foreign countreis to counter w export offense of foreign countries.

C. Establishment of distribution system. All the paper mills should unite their efforts to reaffirm the state of the existing distribution system for their products from both personnel and material point of view and make studies to develop the most reasonable and effective distribution system.

D. Product Planning. Product plans which will satisfy market demands and which will also bring advantageous for the paper mill must be worked out. For this purpose, it may be necessary in some instances to coordinate the interest of individual paper mill.

E. Joint purchase and circulation of raw material and supplies. Cooperative and mutual assistance system should be established as a means of obtaining raw material and supplies necessary for the operation of paper mills in most advantageous ways.

F. Control of selling prices and users. With the gradual control of the distribution system, the will of the sellers will penetrate into the market and the business of the paper mill will be improved.

G. Technical training and exchange of technology. Efforts should be made to raise technical standard of the paper industry as a whole by providing instructions on the management and operating techniques for the paper mill and promoting exchange of information and technology under the leadership of the Association. It is of special importance to obtain technical assistance from the paper mills having advanced technology.

H. Cost Control. Profit control system such as the standard cost control system and the target control system should be established for each mill. This system must be implemented and the evaluation of the result must be made without fail.

I. Contact with government agencies and financial institutes. Contact with these agencies should be maintained to seek government policies and measures for the promotion of the paper industry and to obtain long-term low interest loans and other necessary support.

J. Preparation of various statistical data.

5)-2 Development of New type of Raw Materials and Their Effective Utilization

Pulp resources in the tropics presents many questions to be answered at present and in the future on the quality, cost, prospects for mass production and other aspects. For the present, however, continuous efforts should be made to obtain full advantage from low cost material such as bamboo, rice straw and bagasse on the one hand and vigorous research should be made on the use of hardwood including rubber wood on the other hand.

5)-3 Advancement into Paper Converting Industry

Though the paper mills which produce cyclostyle paper and writing paper are also engaged in the production of note-books, it will be advisable for them to expand their activities including expanded production, diversification of products and level-up of quality standard.

Growth of demands for paper will inevitably bring about divisions and diversification in the quality of demand. The paper is a production good and always requires primary process (cutting ruling, printing, pressing, etc.) and the secondary process (The primary processed items are further treated for pasting, combination with other materials, box making and book-binding). To avoid duplication of products and unnecessary competition

among the paper mills within Java Island, to withhold added value within the enterprise by means of processing and to simplify delivery route to the end users, a comprehensive paper converting industry should be contemplated. When these paper mills make advancement into industrial paper in the future, a wide range of process industry including paper bag making and paper ware making will be ready for receiving these mills.

5)-4 Effort For the Realization of Cost Reduction

The purpose of a business activity, whether it is a private enterprise or state-owned enterprise, is to produce surplus value. Today's pulp and paper industry of Indonesia comprises independent state-owned paper mills and it is doubtful if any positive efforts have ever been made to produce surplus value or profit on the part of the management.

Particularly, those paper mills established in the post-war period seem to have been pressed by production requirement and have hardly had the time to check their balance sheet.

For the rehabilitation of Indonesia's pulp and paper industry, however, it will be necessary for all the employees of each mill including the mill manager to make an utmost effort for the realization of profit, together with appropriate measures taken by outside organs.

It is recommended that the profit budget aystem be established and that the profit target control system also be introduced.

6) Improvement of Infrastructure

Among many agonies the existing paper mills and the new projects are suffering, the disadvantage in the location condition is felt most strongly and it is one of the most conspicuous features. Judging from the natural conditon of this country which has more than 13,000 islands scattering over a vast ocean covering 5,100 km^2, it may be unavoidable to some extent that the paper mills are dispersed over a wide area. For this reason, however, the sea freight is extremely high and this fact is a major obstacle to the reduction of the production cost. The disadvantage in the location condition must be compensated for by the improvement of road, port facilities and sea transport. Particularly, the improvement of port facilities, augmentation of sea vessels, and the reduction of sea freight will contribute to the level-up of the economy of this sea nation and therefore are the essential factors for the growth of the nation. Expansion of infrastructure such as the development of power resources and the improvement of communication facilities is an urgent necessity and may be said to be a decisive factor for the success or failure of each mill and project.

7) Acceptance of Foreign Aid

Frankly speaking, the paper industry of Indenesia is still in its infancy and its technical standard is not high. For this reason, we pay our respect to the Government of Indonecia for its efforts to positively seek assistance from foreign countries in the financial and technical fields in its drive for the industrialization and modernization of the country.

From a review of the transition of the past projects of the paper industry it may be said that the capital and technology were not necessarily provided as one body in the past, though this may be partlly due to the fact that the mojority of the projects were planned in a peculiar form of "Reparation" between this country and Japan. For the future project, economic cooperation and technical assistance should not be provided as a separate form but the project planning should incorporate effective combination of human resources and material resources. In other words, unless the supply of equipment or material provided in the form of construction is accompanied by technical instructions and a comprehensive technical assistance including instructions on construction, start-up after the completion of construction and further on the operation and management of the will, there can not be true economic cooperation. On this point, it will be necessary for the Government of Indonesia to take a moderate attitude so that the assistance of this type may be introduced into the country without friction.

VIII. REPORT OF AERIAL SURVEY ON MERKUSII FOREST IN NORTH SUMATRA

Prior to the departure from Japan, the survey team was told that "there is an enormous Merkusii forest covering an area of 150,000 ha in the hinterland of Atjeh Province, North Sumatra". It is also said that the feasibility of the Takengon Project came into limelight because of the availability of this rich forest resources.

In the latter part of June a five-member group made a field investigation of the Pematang Siantar Paper mill and Takengon district, as well as an aerial survey of the Merkusii forest in the mountain area of North Sumatra on two occasions from a chartered small aircraft.

First aerial survey	:	June 24, 08.00 – 14.00
Member	:	Ohsako, Matsunoo Ir. Adi Sumarid (Ministry of Industry) Ir. Wattimena (" ")
Survey route	:	Medan → Bidin → Burnitelong → Baleg → D. Tawar → Isaq → Uwak → Blangkedjeran → Oneng → Medan
Second aerial survey	:	June 30, 08.00 – 11.30
Member	:	Muramatsu, Matsunoo, Mori, Shibata
Survey route	:	Medan → P. Siantar → Shimalungun → D. Toba. P. Samosir → Bidin → Burnitelong → Baleq → D. Tawar → Isaq → Uwak → Blangkedjeran → Oneng → Medan

The first aerial survey was for the observation of geographical location of the forest in relation to the Takengon Project and the second aerial survey was made to observe and reaffirm the forest type in P. Siantar and Takengon districts after completing the field investigation.

On June 24, the weather was fine but on the June 30 there was a light rain and the visibility was poor at times. Fortunately, we did not encounter any turbulence and our Six-seater Super Skymaster continued flight in excellent condition. Relying on the experience of the pilot from Garuda, who had several thousand hours of flying record, we were able to observe the forest type in details from the aircraf which were skimming the trees.

1. Merkusii Forest in Central Atjeh

1-1 Bidin District

In the east half of this district there are many grasslands and the Merkusii forests were observed only in the mountain ridges. The forests in the western district are fully grown but there are swamps cutting deep into this district. This district is on the upstream of the

Pevtoe River and counter sloped from the side of Takengon. It was considered, therefore, that log transportation would be difficult unless otherwise forest road are built across the mountain ridge. Since this is a mountain forest, it will be necessary to provide ropeway and yarder.

1-2 Burnitelong. Baleq

Forest on the southeast side of Mt. Geureudong, 2,855 m above sea-level, is the Burnitelong forest and the forest at the foot on the northwest side is the Baleq forest and both of them are field forests. Except a few sparsely vegetated forests seen in the area further west of Baleq, the forests in these districts are generally in excellent condition in respect of tree height and diameter and are the source of pine resin for the Lampahan Rosin Factory.

Because of the flat terrain of the district, new forest roads may be built without difficulty and the felled trees may be readily loaded on the truck, as confirmed by the filed investigation. After all, this forest is closest to Takengon Town and therefore will be counted on most by the Takengon Project.

1-3 Area around Lake Tawar

There is a long narrow strip of pure forest running from eas. to west on the steep slope along the northern shores of Lake Tawar which is 1,250 m above sea-level. Because of a small forest area, much can not be expected from this district. There are not any significant Merkusii forests on the southern shores of the lake. This may be due to sterile soil in the district.

1-4 Isaq. and Uwak Districts

Forest in Uwak district is seen along the Djambo Ajeh River and is situated downstream from Isaq. In the east a vast mixed forest of hard wood is also seen. The forests in this district are better in forest type and volume compared with the forest in Isaq district. However, the forests are at a distance from Takengon and in view of the fact that there are no forest roads are provided, this forest is still far from the object of cutting.

The forest in Isaq is a little to the side of Takengon and should be the object of logging. However, it was felt after an aerial survey that there was need for providing several branch forest roads and for the installation of ropeways and yarders, which are the requirements for a mountain forest.

Forests in Isaq and Uwak districts are rather young and therefore an increase in the volume may be expected in the future.

1-5 Blangkedjeran and Oneng Districts

Blangkedjeran is situated on upstream bank of the Tripa River which flows into the Indian Ocean and Oneng is the upstream area of the Simpankanan River which flows into the

Malacca Strait. Forests in these districts are all sparsely vegetated forests and grasslands are frequently seen in the forest. These districts are in the further depth of the mountain and considerably far from Takengon (about 100 km from Lake Tawar). This area may be the so-called "Forest of illusion". According to Ir. Adi Sumarid who flew with the team, a forest fire destroyed the entire area around 1948 – 9 (In the midst of Independence War). It is natural that the forest is young and sparse because the forest was naturally regenerated after the fire. Any way, this is a backwood and inconvenient for transportation. Therefore, it can not be a wood supply forest for the moment. These forests may be trackless but smoke rises, probably grass fires or forest fires, were observed in the forest area during the aerial survey.

2. Pinus Merkusii around Lake Toba

2-1 Simalungun District

This district is close to the eastern shores of Lake Toba and a uniform forest of pinus merkusii fully is grown in respect of tree height and diameter and falls in the category of field forest.

In Prapat district in the southeastern part a cut-over area was seen frequently but there was a beautiful forest preserved in the north western part. Logging operation will be easily accomplished only with the extension of forest road.

2-2 Island Samosir and Shores of Lake Toba

The shore of P. Samosir forms a cliff and the logging operation seems to be quite difficult. Because of dense fog, visibility was hampered and a detailed observation was not possible. However, it seemed that the forest was still young and the forest type was rather poor. However, the whole island seemed to be suitable for the growth of pinus merkusii.

From these two aerial observations it is believed that the team was able to see an overall picture of the condition of the Merkusii forest in North Sumatra, though it fell short of satisfaction.

Results of the survey on the Merkusii forest may be summarized as follows:

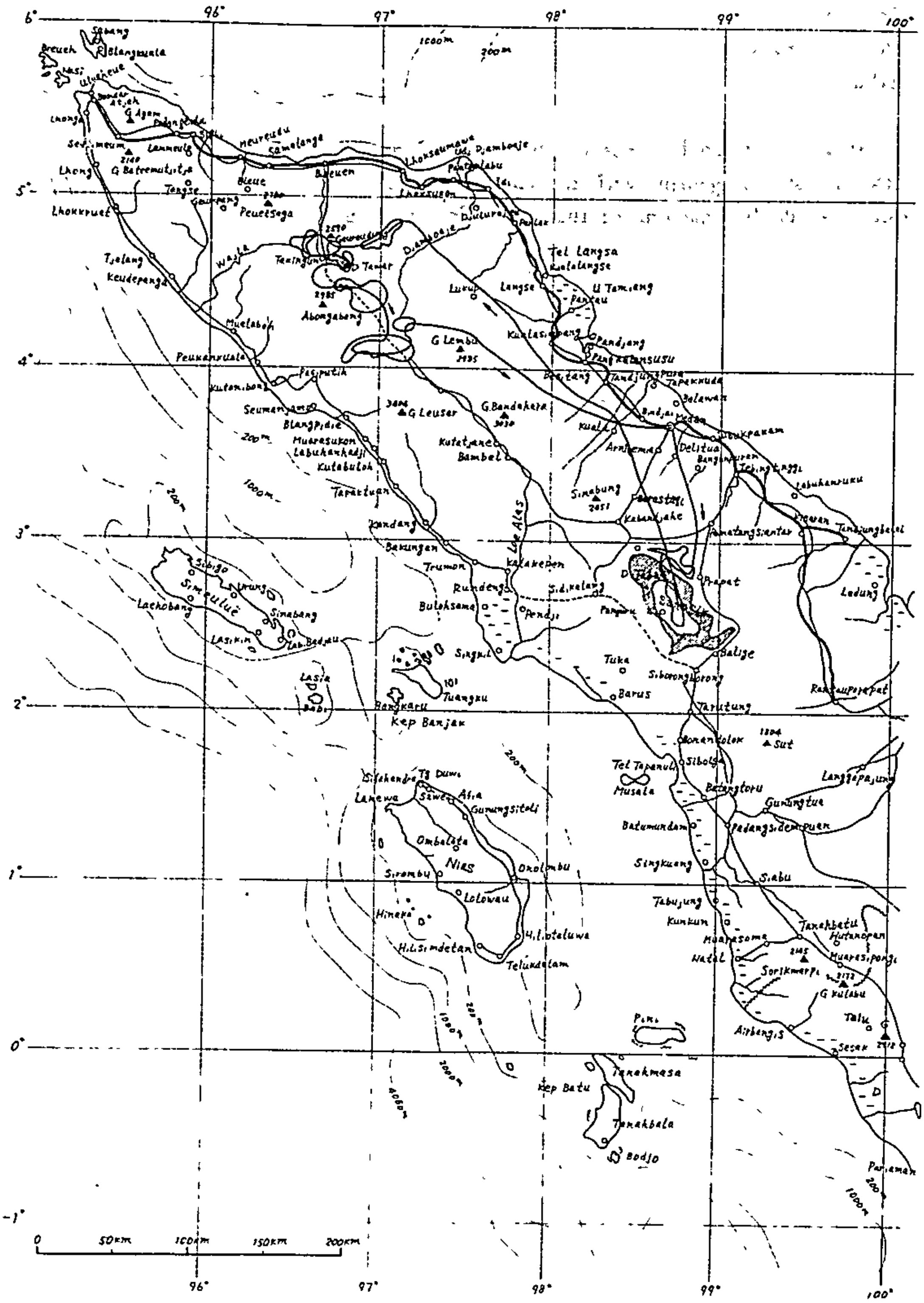
(1) The land 800 m or more in elevation is suited for the growth of pinus merkusii.

(2) Pinus Merkusii forms a pure forest.

(3) Pinus Merkusii in Central Atjeh forms sparse forests and grasslands are conspicuous.

(4) Some are seen as field forests and others as mountain forests. The rumored "Thick forest of illusion" was not observed but the mountain area of North Sumatra was indeed extensive and there seemed to be many tablelands suitable for the growth of Merkusii.

It was considered, therefore, that with the opening of forest road, positive planting and better forest management with the employment of a large number of forest labourers, this district would become one of the best pulp wood supply bases in Indonesia.



6°
96°
97°
98°
99°
100°
5°
4°
3°
2°
1°
0°
-1°
Sabang
Breueh
Blangkuala
Ulèëlheue
Lhonga
Lhong
Lhokkruet
Tangse
Beureunun
Meureudu
Samalanga
Bireuen
Lhoksumawe
Lhoksukon
Djambo Aje
Tjalang
Keudepanga
Takingeun
Tamar
Abongabong
Peuetsagoe
Tel Langsa
Kualalangsa
Langsa
Lukup
Kualasimpang
G Lembu
Meulaboh
Peukanbaro
Kutanibong
Seumanyam
Blangpidie
Muarasukon
Labuhanhadji
Kutabuloh
Tapaktuan
Kandang
Bakongan
Trumon
Rundeng
Buloksama
Singkil
G Leuser
G Bandahara
Kutatjane
Bambel
Kuala
Arnhema
Medan
Belawan
Lubukpakam
Delitua
Tebingtinggi
Labuhanruku
Sinabung
Berastagi
Kabandjahe
Pematangsiantar
Tanjungbalai
Prapat
Samosir
Balige
Tuka
Siborongborong
Barus
Tarutung
Ledung
Rantauprapat
Le Alas
Simeulue
Sibigo
Sinabang
Lachobang
Lasikin
Lasia
Babi
Bangkaru
Tuangku
Kep Banjak
Sirombu
Lahewa
Sawo
Afia
Gunungsitoli
Ombalata
Nias
Onolimbu
Lolowau
Hinako
Teluk Dalam
Tel Tapanuli
Sibolga
Musala
Batangtoru
Gunungtua
Batumundam
Padangsidempuan
Singkuang
Siabu
Tabujung
Kunkun
Muarasoma
Natal
Tanahbatu
Hutanopan
Muarasipongi
Sorikmarapi
G Kulabu
Talu
Airbangis
Sasak
Pini
Tanahmasa
Kep Batu
Tanahbala
Bodjo
Pariaman
Sut
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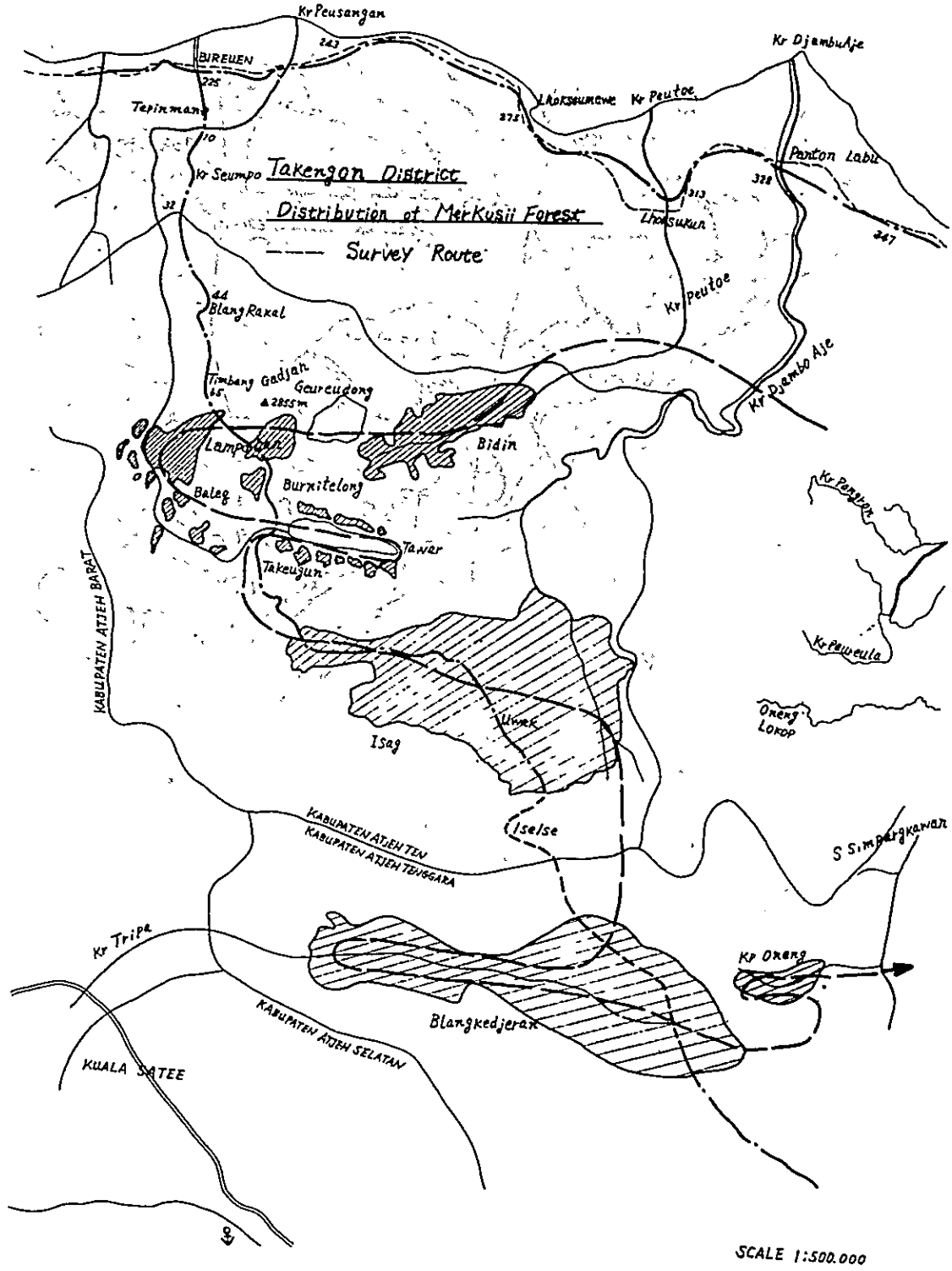
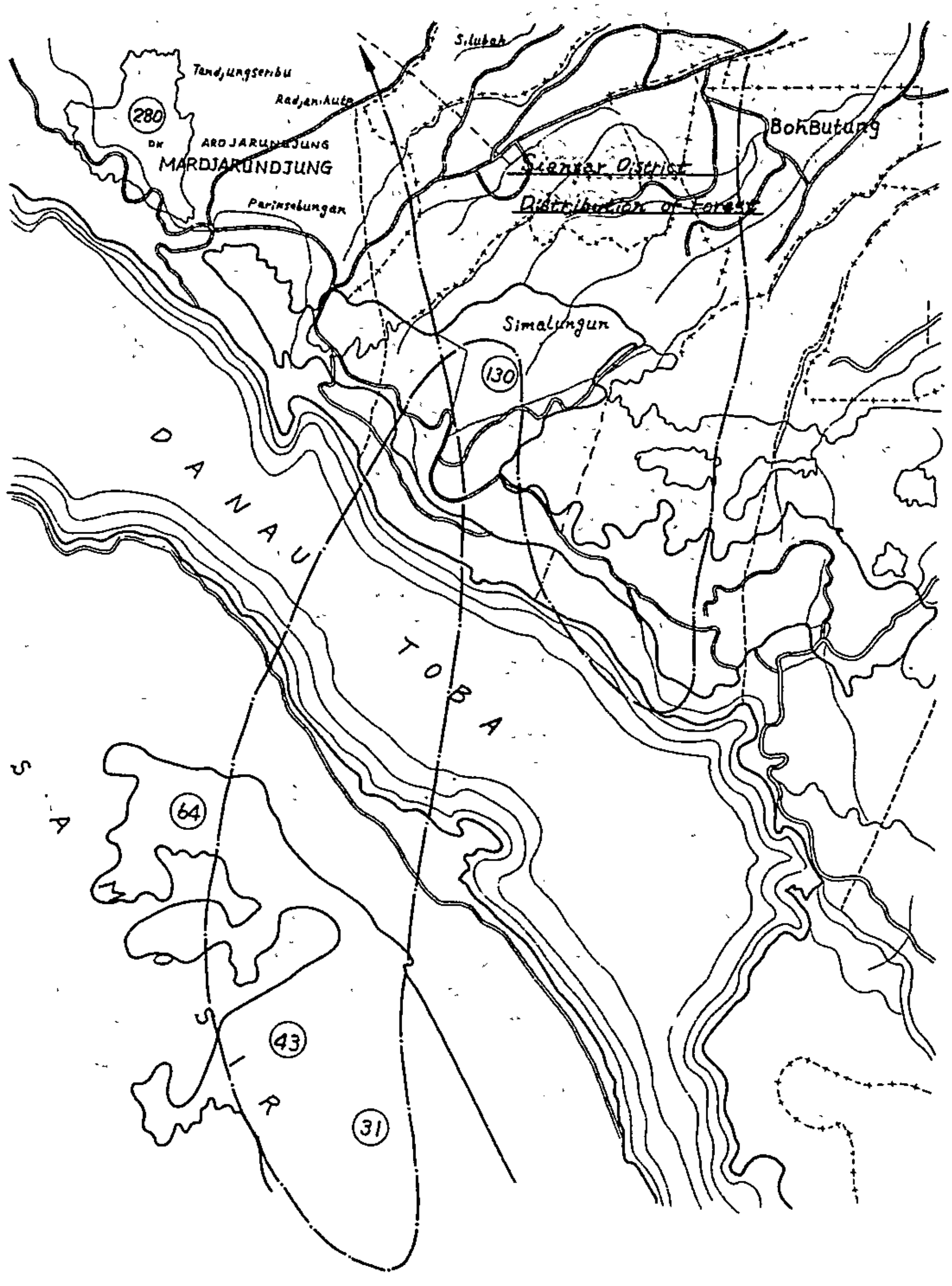
1000m
2000m
4000m
0
50km
100km
150km
200km


Takengon District
Distribution of Merkusii Forest
Survey Route
Kr Peusangan
BIREUEN
Tepinmanah
Kr Seumpo
Blang Rakal
Timbang Gadjah
Gerecudong
2855m
Lampahan
Bidin
Baleg
Burnitelong
Takeugun
Tanier
Kr Djambu Aje
Kr Peutoe
Lhoksukun
Panton Labu
Kr Penyuan
Kr Peweula
Oneng Lokop
Uwak
Isag
Iselse
KABUPATEN ATJEH BARAT
KABUPATEN ATJEH TEN
KABUPATEN ATJEH TENGGARA
KABUPATEN ATJEH SELATAN
Kr Tripa
KUALA SATEE
Blangkedjeran
Kr Oneng
S Simpangkanan
SCALE 1:500.000


Siantar District
Distribution of Forest
Silubah
Tandjungseribu
Radjanihuta
280
MARDJARUNDJUNG
Parinsebungan
BohButung
Simalungun
130
D A N A U T O B A
S A M O S I R
64
43
31