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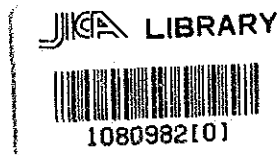
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THE FEASIBILITY STUDY  
ON  
INDUSTRIAL PLANTATION FOREST DEVELOPMENT PLAN  
IN  
SOUTH SUMATERA AREA  
IN  
THE REPUBLIC OF INDONESIA

ANNEX REPORT



20945

MARCH, 1990

JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)

国際協力事業団

20945

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## I. BASIC STUDIES AND PREPARATION OF MAPS





I-1 CONTENTS OF THE STUDY

(1) Overall Study Schedule and Contents

The implementation of the Study is planned in 2 fiscal years with the following contents for each year.

1) Study in Fiscal 1988

The following activities were conducted in the period between November 1988 and March 1989.

- preliminary preparations in Japan
- first phase field survey and second phase field survey
- preparation of topographic maps (1:20,000)
- preparation of land use-vegetation maps and soil maps (1:20,000)

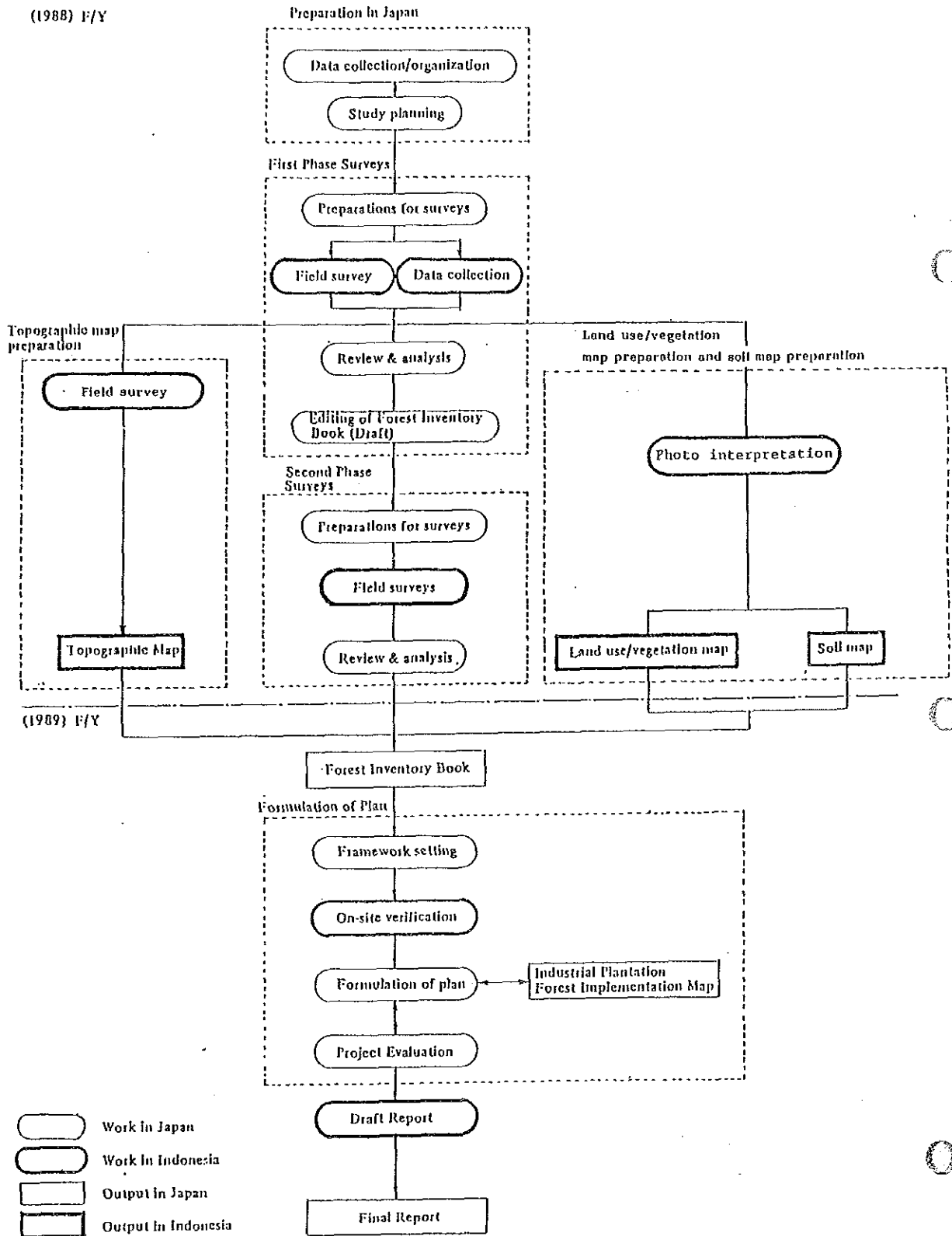
2) Study in Fiscal 1989

The following activities commenced in July 1989 with planned completion in March 1990.

- compilation of Forest Inventory Books
- formulation of the Plan and Project evaluation
- submission of Draft Final Report
- submission of Final Report

The study flow of the above activities is shown in Fig. 1-3.

(1988) F/Y



Attached Fig. 1-1 Study Flow

(2) Study in Fiscal 1988

1) Work in Japan

① Data Collection and Compilation

Relevant data was collected, sorted and compiled.

② Study Planning

The overall study plan covering the policy, methodology and schedule, etc. was made and the Inception Report was prepared.

2) First Phase Field Survey

① Survey Preparations

The field survey schedule and the equipment required for the field survey were prepared.

② Data Collection

Data for topographic mapping and data relating to the natural and socioeconomic conditions, forestry and forest industry was collected in Indonesia.

③ Surveys

Field surveys were conducted in the Study Area and its vicinity on the current conditions of land use, vegetation, forests, soil, forestry, forest industry and local life, etc. In addition, the Study Area boundaries were confirmed and on-site pricking for topographic mapping was conducted.

④ Analysis

The collected data and field survey results were sorted and analyzed.

⑤ Preparation of Forest Inventory Books (Draft)

The Forest Inventory Books (Draft) were compiled based on the First Phase Field Survey Results.

3) Second Phase Field Survey

① Survey Preparations

The schedule and survey items for the Second Phase Field Survey were determined based on the First Phase Field Survey results.

② Surveys

Based on the First Phase Field Survey results, the Forest Inventory Books (Draft) and aerial photographs, field surveys were conducted with a view to forest inventory, selection of suitable plantation sites, selection of tree species, selection of nursery sites and determination of forest road routes, etc. to obtain concrete data for the Industrial Plantation Forest Development Plan.

③ Analysis

The collected data and field survey results of both the First and Second Phase Field Surveys were sorted and analyzed for the preparation of the Progress Report.

4) Preparation of Topographic Maps

The local consultant commissioned by the Survey Team conducted on-site pricking and aerial triangulation under the supervision of the Survey Team and topographic maps of the Study Area were prepared.

5) Preparation of Land Use-Vegetation and Soil Maps

The local consultant commissioned by the Survey Team conducted aerial photo interpretation, field surveys and cartographic work under the supervision of the Survey Team and land use-vegetation maps were prepared. As to soil maps, the local consultant conducted the cartographic work using the manuscript soil maps prepared by the survey team from the soil survey results.

(3) Study in Fiscal 1989

Compilation of the Forest Inventory Books, determination of the plan framework, on-site verification, formulation of the implementation plan and project evaluation were conducted in fiscal 1989 based on the study results in fiscal 1988.

1) Compilation of Forest Inventory Books

The Forest Inventory Books were compiled using the topographic, land use-vegetation and soil maps prepared in fiscal 1988, field survey results, examination results on the inventory item.

2) Determination of Plan Framework

The plan framework was determined on the following items based on the analyze and examination of the study results in fiscal 1988, etc.

- basic items relating to the plan goals
- main components relating to the plan contents
- tentative project evaluation

3) On-Site Verification

The plan framework and other important aspects of the Plan were explained to the Indonesian side and the suitability of the Plan was verified.

4) Formulation of Implementation Plan

The following items relating to the implementation of the plan were prepared based on the study results in fiscal 1988, on-site verification results and various maps and data.

- basic policy
- implementation plan for each project
- industrial plantation forest implementation maps
- financial plan
- project evaluation

5) Draft Report

All the study findings and achievements in fiscal 1988 and 1989, including the filed survey results, will be compiled in the Draft Final Report which will then be submitted to the Indonesian side. Following examination of the comments made by the Indonesian side on the Draft Final Report, the Final Report will be prepared and subsequently submitted.

I-2 NATIONAL ECONOMY AND FORESTRY

Attached Table 1-1 GENERAL CONDITIONS OF INDONESIAN ECONOMY

Year	Population 1,000	GDP 1 Billion Rp	Relative Ratio of Expenditure (%)										Fiscal Year (April 1 - March 31) Revenue 1 Billion Rp	Fiscal Year (April 1 - March 31) Expenditure 1 Billion Rp	Official Rate Annual Interest Rate (%)	Foreign Exchange Rate Rp = 1 US\$									
			Personal Consumption Expenditure	Government Expenditure	Total Fixed Capital Formation	Imports (Deduction)	Agriculture, Forestry & Fisheries	Mining & Industry	Manufacturing	Relative Ratio by Industry (%)	Direct Tax	Indirect Tax					Relative Ratio	Education	Defence	Relative Ratio					
1960	91,506	0.4	75.0	...	...	...	...	...	...	...	...	...	...	4.40	18.2	29.5	17.1	10,764.7	5.8	2.4	37.9	3.00	...	...	
1965	104,879	23.5	88.9	5.5	...	...	...	...	...	...	...	...	...	1,546.50	17.2	42.5	...	2,894.45	1.0	12.5	...	...	...	...	
1970	137,880	3,340	80.6	8.8	13.6	12.8	15.8	47.2	14.6	9.3	...	...	...	243.60	37.6	36.9	...	334.60	2.3	...	...	...	362.83	...	
1975	135,670	12,643	69.2	9.9	20.3	22.6	22.0	31.7	23.5	8.9	...	...	...	1,753.60	70.1	13.4	...	1,977.90	2.0	0.3	...	...	...	425.00	
1980	146,360	45,446	60.5	10.3	20.9	30.5	22.2	24.8	37.3	11.6	...	...	...	10,344.2	78.5	17.1	...	10,764.7	8.4	13.6	...	...	...	626.99	
1981	149,703	54,027	65.8	10.7	21.4	27.6	25.5	25.3	34.8	10.8	...	...	...	13,691.7	72.9	13.7	...	14,174.5	8.0	12.8	...	...	...	631.76	
1982	153,040	59,623	69.9	11.5	22.6	22.4	26.3	26.3	22.5	12.9	...	...	...	10,728.4	77.2	16.4	...	11,481.4	8.5	14.0	...	...	...	661.42	
1983	156,450	73,698	61.0	11.0	25.7	27.7	26.8	24.0	30.1	11.6	...	...	...	15,569.5	...	...	...	15,611.2	9.4	11.8	...	...	...	909.26	
1984	159,690	87,055	59.0	10.5	22.5	26.4	21.4	23.4	31.1	12.7	...	...	...	17,451.3	...	...	...	17,948.1	11.3	12.9	...	...	...	1,025.94	
1985	163,290	94,492	60.2	11.5	20.8	22.9	21.0	23.7	29.8	13.5	...	...	...	20,940.1	...	...	...	21,221.9	10.4	10.6	...	...	...	1,110.60	
1986	166,940	96,489	63.9	11.7	20.8	20.9	22.7	25.8	35.5	14.4	...	...	...	20,710.2	...	...	...	21,253.5	8.5	9.3	...	...	...	1,282.60	
1987	170,180	...	...	...	...	...	...	...	...	...	...	...	...	26,562.9	...	...	...	28,518.5	...	...	...	...	...	...	1,643.80

Year	Million US\$				Million US\$				Million US\$				Relative Ratio (%)				Consumer Price Index 1980=100		
	Total Export Amount	Natural Rubber	Oil & Oil Products	Natural Gas	Total Import Amount	Oil & Oil Products	Machinery	Current Balance of Payments	Trade Balance	Long-Term Capital Balance	Basic Balance	Total Balance	Foreign Reserve	Trade Conditions Index	Work Force	Agriculture Forestry & Fishing		Mining & Industry	Manufacturing
1960	841	376	221	...	578	26	132	-58	120	179	120	96	352	...	...	...	...	...	...
1965	708	222	272	...	695	12	24	-222	24	246	24	45	21	...	...	...	...	...	0.2
1970	2,108	249	346	...	1,002	15	57	-310	-30	290	-30	12	160	...	...	...	...	...	20.0
1975	7,103	361	5,338	...	4,770	258	1,419	-1,109	-66	1,043	-66	-2,052	586	...	...	...	...	...	48.6
1980	21,950	1,174	12,859	2,881	10,834	1,744	3,827	2,084	9,170	2,156	5,021	2,428	6,500	73	51,553	55.9	9.8	9.1	100.0
1981	25,164	835	14,393	3,366	15,272	1,721	4,619	-566	6,806	2,161	1,585	-374	6,076	100	59,323	61.5	8.5	8.0	112.2
1982	22,338	607	15,458	2,906	16,859	3,545	6,260	-5,324	1,893	5,096	-228	-1,853	4,196	...	57,803	54.7	11.1	10.4	122.9
1983	21,146	848	13,558	2,583	16,352	4,244	5,684	-6,338	963	5,767	-1,015	183	4,814	108	62,206	...	...	...	137.4
1984	21,888	952	12,477	3,541	13,882	2,697	5,037	-1,856	5,707	2,981	-1,125	981	3,720	...	62,929	...	...	...	151.7
1985	18,590	716	9,083	3,635	10,259	1,275	3,617	-1,923	5,822	1,880	-43	510	5,880	...	62,457	54.7	9.9	9.3	158.9
1986	14,805	...	...	...	10,738	...	...	-3,911	2,458	2,882	-1,029	-1,003	5,411	...	...	...	...	...	188.2
1987	...	...	...	...	...	...	...	-1,678	4,968	2,572	-894	629	6,951	...	...	...	...	...	183.9

Source: Overseas Economic Cooperation Guidebook 1989, OECF

- Note: ① Inventory increase included.  
 ② Calendar year upto 1965. After 1983, cited from IMF "International Financial Statistics", January, 1989.  
 ③ Iran Jaya not included before 1972.  
 ④ Machines and transportation equipment.  
 ⑤ Number of population 10 years old and over, including those in the Army. Estimates for years before 1982.

Attached Table 1-2 EXPORT AMOUNT 1984/85 - 1988/89

(Unit: million dollars)

	1983 /84	1984 /85	1985 /86	1986 /87	1987 /88	1988 /89 (Est.)	Average Annual Growth(%)
A Oil/Gas (Gross)	14,449	13,994	12,437	6,966	8,341	7,478	-12.3
1. Oil & Oil Products	12,050	10,625	8,816	4,798	6,159	5,012	-16.1
2. LNG	2,399	3,369	3,621	2,168	2,628	2,403	0.0
3. LPG	-	-	-	-	54	63	
B Non-Oil/Gas	5,367	5,907	6,175	6,731	9,502	11,225	15.9
1. Logs	250	135	2	3	3	-	
2. Rubber	984	856	714	752	1,041	1,161	3.4
3. Coffee	506	568	659	752	491	541	1.4
4. Tea	156	211	134	106	115	131	-3.5
5. Cocoa	43	60	65	58	70	88	15.5
6. Tobacco	50	44	55	78	56	62	4.5
7. Palm Oil & Kernels	96	100	174	114	213	268	22.7
8. Copra	34	19	35	34	40	47	7.0
9. Pepper	58	66	82	152	155	177	25.1
10. Other Seasonings	47	44	53	79	91	109	18.5
11. Tapioca & Other Raw Food Materials	135	129	164	141	192	203	8.6
12. Prawns	276	219	272	380	461	537	14.2
13. Rattan	87	96	80	99	160	231	21.7
14. Leather	26	40	37	45	59	158	43.8
15. Other Agricultural Products	21	44	40	38	99	122	42.4
16. Tin	309	252	248	156	143	174	-10.9
17. Copper	88	132	133	144	186	214	19.5
18. Aluminium	165	208	223	201	245	266	10.0
19. Nickel	162	121	140	112	146	170	1.0
20. Gold	-	-	-	61	286	293	
21. Bauxite & Other Minerals	76	62	63	51	51	56	-5.9
22. Plywood	579	697	845	1,156	1,832	2,104	29.4
23. Sawn Timber	332	336	367	433	623	697	16.0
24. Steel Products	4	14	49	81	211	319	140.1
25. Chemical Raw Materials	22	53	60	49	69	94	34.2
26. Paper	9	22	21	42	115	137	72.8
27. Textiles (Fibre, etc.)	151	209	302	269	535	666	34.5
28. Apparel	191	315	428	469	648	817	33.8
29. Urea Fertilizer	50	31	109	97	100	161	26.3
30. Other Industrial Products	460	824	621	579	1,066	1,222	21.6
Total	19,816	19,901	18,612	13,657	18,343	18,703	-1.1



Attached Table 1-3 Forest Area by Category (Unit: ha)

Island	Total National Land	Protection Forest	National Park & Reservation Area	Limited Production Forest	Non-Convertible Production Forest	Convertible Production Forest	Total Forest Area
Sumatera	46,949,328	7,093,600	3,683,000	7,578,500	6,820,600	5,031,500	30,207,200
Java	13,218,970	554,000	444,615	-	2,014,400	-	3,013,315
Kalimantan	54,824,700	6,923,700	4,100,700	11,415,400	14,234,500	8,293,400	44,967,700
Sulawesi	19,661,451	3,867,200	806,300	3,925,500	2,092,400	1,993,200	13,284,600
Bali	563,286	84,100	32,000	5,700	3,900	-	125,700
Nusa Tenggara	6,754,235	1,159,300	266,700	621,800	502,200	2,997,500	5,547,500
Maluku	8,572,800	1,550,400	441,000	2,075,600	1,029,900	436,400	5,533,300
Irian Jaya	41,066,000	8,648,500	8,311,800	4,732,300	7,123,500	11,775,400	40,591,500
Timur	1,460,937	435,300	38,800	170,500	45,200	10,000	699,800
Total	193,071,707	30,316,100	18,725,215	30,525,300	33,866,600	30,537,400	143,970,615

Source: Forestry Statistics of Indonesia 1987 - 1988

Attached Table 1-4 Standing Stock by Province

No.	Province	Standing Stock (1,000m <sup>3</sup> )
1	D.I. Aceh	162,098
2	North Sumatra	92,400
3	West Sumatra	80,625
4	Riau	383,250
5	Jambi	170,833
6	Bengkulu	42,875
7	South Sumatra	102,374
8	Lampung	11,538
	Sumatra	1,045,993
9	West Kalimantan	473,918
10	Central Kalimantan	759,561
11	South Kalimantan	113,554
12	East Kalimantan	1,751,313
	Kalimantan	3,098,346
13	North Sulawesi	59,537
14	Central Sulawesi	203,191
15	South Sulawesi	64,106
16	South East Sulawesi	37,084
	Sulawesi	363,918
17	West Nusa Tenggara	1,573
18	Maluku	321,658
19	West Irian	651,570
	Total	5,483,058

Source: Forestry Statistics of Indonesia 1987/88

Attached Table 1-5 PRODUCTION VOLUMES OF MINOR FORESTRY PRODUCTS (YEAR: 1985/86 - 1987-88)

	Species	Unit	1985/1986	1986/1987	1987/1988
1	2	3	4	5	6
1.	Singles	Keeping / Piece	33.845.000	38.646.926	19.174.000
2.	Charcoal	Ton	43.038	32.145	23.632
3.	Fuel Wood	Sm	254.933	102.388	*
4.	Rattan	Ton	40.422	58.222	199.144
		Batang / Stalk	2.284.395	4.135.033	*
5.	Gun Resin	Ton	6.551	16.468	8.182
6.	Turpentin	Litter	854.095	592.103	1.180.905
7.	Cayuput Oil	Litter	106.181	195.123	41.875
8.	Silk	Kg	1.804	7.466	624.000
9.	Bamboo	Batang / Stalk	72.158	24.444	*
10.	Dipterocarpacea Resin	Ton	4.704	350.384	3.179

Source: Forestry Statistics of Indonesia (1987/88)

Note : \*) No Figure

Attached Table 1-6 Information on Projected Pulp Mills in Indonesia

NAME OF COMPANY	MILL LOCATION	PRODUCT	CAPACITY - t -	RAW MATERIAL	OTHER INFORMATION
<b>A. PULP MILL PROJECTS</b>					
1. PT Astra Scott	Irian Jaya River Digul	Chip Pulp	300,000	MTH Euca	Scott withdrawn, new partner sought, capital investment board's (BKPM) approval obtained
2. PT Nur Sukses	Irian Jaya Wanibiri/Kokepani	Pulp Rayon	165,000	MTH Euca	PFS approval obtained
3. PT Iriana Lestari P & P (Kayu Lapis Group)	Irian Jaya Sorong	Pulp/Chip Paper	350,000 150,000	MTH	PFS approval obtained
4. PT Indah Kiat	Riau	Pulp	350,000	MTH Plantation	Expansion of pulp capacity and plantations
5. PT Arara Abadi	Riau	Pulp/Rayon Viscose Rayon	76,000 (40,000)	MTH	Permit BKPM
6. PT Riau Pulp & Paper (PT Inti Indorayon Lestari)	Riau S. Rokan	Pulp Paper Paper	100,000 80,000 70,000		PFS approval obtained
7. PT Perawang Sukses Surya Dumai Group	Riau Maridan	Pulp Paper	200,000	MTH Plantation	PFS approval obtained Report submitted to MOF
8. PT Inti Cellulosa Utama Indonesia	Riau	Pulp	440,000		Request for PFS approval
9. PT Teknik Umum	Riau	Pulp	300,000		Request for PFS approval

Attached Table 1-6 (Cont.)

NAME OF COMPANY	MILL LOCATION	PRODUCT	CAPACITY --t--	RAW MATERIAL	OTHER INFORMATION
10. PT Barito Pacific	South Sumatra Blimbing	Pulp	300,000	MTH Plantation	PFS has been made
11. PT Pola Pulpindo	Lampung	Pulp\Board Duplex	30,000	Bgs./Kraft Waste	Permit BKPM 50% sc-bgs/40% waste/ 10% NBKP
12. PT Wira Karya Sakti	Jambi	Pulp	200,000 300,000	MTH	PFS has been made Trial plantation permit by MOF
13. PT. Sumatra Timber Utama Damai	Jambi	Pulp	200,000 300,000		Request for PFS rejected by MOF
14. PT Kamiata Surya	Jambi	Pulp	300,000		Request for PFS approval
15. PT Indorayon	(1) North Sumatra Padang Lawas (2) Riau, Dumai	Pulp Rayon	N.A.	Plantation	N.A.
16. PT Sumalindo Lestari (Astra Group)	East Kalimantan	Pulp	300,000		PFS approval obtained Timber estate are under survey
17. PT Rimba Belañara Pertiwi (Kalamur Group)	East Kalimantan	Pulp	350,000		PFS approval in process
18. Sasayap Project	East Kalimantan	Pulp	155,000	MTH	Due to high infrastructure investment withdrawn
19. PT Kiani Lestari Fibre	East Kalimantan	Pulp	350,000	MTH	PFS approval obtained

Attached Table 1-6 (Cont.)

NAME OF COMPANY	MILL LOCATION	PRODUCT	CAPACITY - 1 -	RAW MATERIAL	OTHER INFORMATION
20. PT Santi Murni (PT Alias Heliau)	East Kalimantan Balikpapan	Pulp	350,000	MTH	PFS approval obtained
21. PT Sumalind Lestari (Astra Group)	East Kalimantan	Pulp	300,000	MTH	PFS approval obtained
22. PT Dharma Trieka	East Kalimantan	Pulp/ Rayon	155,000	MTH	PFS approval obtained
23. PT Multi Pulp	East Kalimantan Samarinda	Pulp	175,000		Sawmill on the same site Concessions existing
24. PT Indoverse Multi Pulp	East Kalimantan	Pulp	264,000		Study approval in process
25. PT Makmur Jaya Utama	Central Kalimantan South Sulawesi	Pulp	300,000	Pine/Euca/ MTH	MOF proposed South Sulawesi forest study approval obtained
26. PT Bumi Sekaraji	S./E. Kalimantan	Pulp	240,000		Request for study approval
27. PT Kayu Mas Group	Central Kalimantan	Pulp	240,000		Request for study approval
28. PT I.J.U. Lestari	South Kalimantan South Sulawesi	Pulp/Rayon	100,000 200,000	Pine/Euca	Study approval obtained
29. PT. Parisindo Pratama	West Kalimantan Riau/Jambi	Pulp	90,000		Study approval in process
30. PT Sinar Kaibar Raya (Bumi Raya Group)	West Kalimantan Pontianak	Futing Board	150,000	Waste wood	Pending due to high infrastructure, investment

Attached Table 1-6 (Cont.)

NAME OF COMPANY	MILL LOCATION	PRODUCT	CAPACITY - t -	RAW MATERIAL	OTHER INFORMATION
31. PT Indo Bharat Rayon	South Sulawesi (Sumsel)	Pulp Rayon	90,000	Pine Euca	Forest study approval obtained
32. PT Lematang P & P	South Sulawesi (Sumsel)	Pulp	300,000	MTH	Joint venture Inhutani II/Finland Forest study approval obtained
33. PT Emaci	South Sulawesi	Pulp	165,000	MTH	Forest study approval obtained
34. PT West Kalindo P & P	West Kalimantan	Pulp/Wood Pulp/Jute	33,000 6,600	MTH Import Jute	Permit BKPM obtained
35. PT Kenas Krratt Cilacap	Central Java Cilacap	Pulp	150,000	Pine	Project cancelled

Source : Directorate General of Forest Utilization (1989)

Attached Table 1-7 EXPORTS OF SAWN TIMBER

(Unit: m<sup>3</sup>, (US\$))

	1983/84	1984/85	1985/86	1986/87	1987/88*
Japan	255,041 (34,705,261)	182,253 (23,556,836)	226,590 (28,844,836)	157,304 (26,245,140)	207,650 (42,225,140)
Hong Kong	92,539 (12,997,252)	94,531 (9,291,596)	89,381 (10,975,146)	91,381 (15,719,540)	75,060 (14,456,919)
Korea	117,531 (18,199,376)	136,301 (17,140,715)	152,462 (20,173,063)	89,436 (15,796,460)	78,970 (16,515,241)
Taiwan	153,317 (23,362,805)	186,864 (24,509,628)	197,318 (28,188,805)	312,414 (49,575,060)	211,580 (41,738,521)
Singapore	318,807 (50,330,935)	437,482 (65,086,266)	456,174 (66,867,163)	1,008,190 (161,046,760)	599,460 (114,440,354)
Other Asian Countries	427,553 (59,379,539)	667,039 (90,063,577)	597,915 (88,895,052)	146,690 (29,631,460)	381,080 (88,187,204)
Holland	49,683 (10,926,766)	43,868 (5,682,726)	41,514 (8,477,785)	28,004 (12,989,990)	21,000 (7,927,988)
Italy	242,924 (48,867,573)	252,178 (45,913,924)	237,762 (51,980,790)	300,817 (81,613,390)	282,300 (86,451,705)
Other European Countries	100,119 (18,980,110)	106,361 (16,198,291)	95,815 (19,592,183)	307,127 (80,179,260)	91,340 (32,691,287)
U.S. & Canada	32,864 (5,321,688)	43,968 (5,231,600)	55,573 (7,891,438)	26,761 (5,582,550)	20,960 (4,430,341)
Australia	3,279 (829,587)	17,587 (2,561,345)	15,932 (2,753,318)	8,576 (1,875,630)	4,060 (979,344)
Others	—	—	—	164,690 (42,492,260)	88,610 (17,348,319)
Total	1,793,656 (248,880,892)	2,198,432 (305,236,504)	2,166,436 (334,639,579)	2,641,890 (522,747,500)	2,062,170 (466,402,363)

\* Upto March, 1988

Source: Fifth 5 Year Plan Paper



Attached Table 1-8 EXPORTS OF PLYWOOD

(Unit: m<sup>3</sup>, (US\$))

	1983/84	1984/85	1985/86	1986/87	1987/88*
Japan	21,594 (4,513,146)	145,397 (29,370,194)	273,303 (54,045,484)	482,790 (122,995,790)	178,300 (56,665,798)
Taiwan	17,382 (3,650,220)	110,840 (22,500,520)	124,421 (23,369,384)	280,470 (722,366,280)	136,060 (46,355,040)
Hong Kong	194,214 (71,494,002)	673,759 (146,858,185)	969,160 (210,290,065)	582,010 (147,695,180)	827,220 (282,948,682)
Singapore	346,720 (83,559,520)	463,561 (101,202,054)	471,786 (89,885,753)	364,400 (89,337,280)	574,900 (194,970,911)
Middle East	456,475 (111,248,600)	417,259 (91,710,985)	370,206 (71,428,618)	598,820 (151,428,618)	511,730 (176,716,157)
Other Asian Countries	179,328 (44,832,800)	150,495 (33,249,395)	165,412 (36,556,952)	—	185,400 (64,145,176)
U.K.	117,903 (28,832,800)	124,315 (26,726,725)	165,363 (36,213,963)	318,990 (82,820,300)	152,140 (51,468,264)
Holland	6,207 (1,502,094)	8,333 (1,791,595)	7,511 (1,604,865)	—	9,720 (3,422,766)
Belgium	11,415 (2,806,090)	223,160 (5,002,560)	24,472 (5,385,952)	—	—
U.S.	589,879 (144,520,355)	819,533 (178,019,081)	945,159 (229,965,321)	1,086,070 (293,011,690)	1,020,100 (347,854,473)
Canada	8,011 (1,834,519)	12,392 (2,527,968)	15,133 (2,918,500)		**
Other Western European Countries	58,972 (11,226,826)	96,598 (18,850,260)	71,584 (15,766,013)		41,120 (13,944,603)
Eastern European Countries				313,830 (81,024,350)	
Africa				125,980 (32,175,160)	
Australia				5,400 (1,139,150)	
Others				83,270 (29,390,950)	101,300 (32,199,357)
Total	2,008,100 (510,020,974)	3,034,642 (657,820,222)	3,603,510 (777,430,870)	4,242,030 (1,093,383,000)	3,737,990 (1,267,691,227)

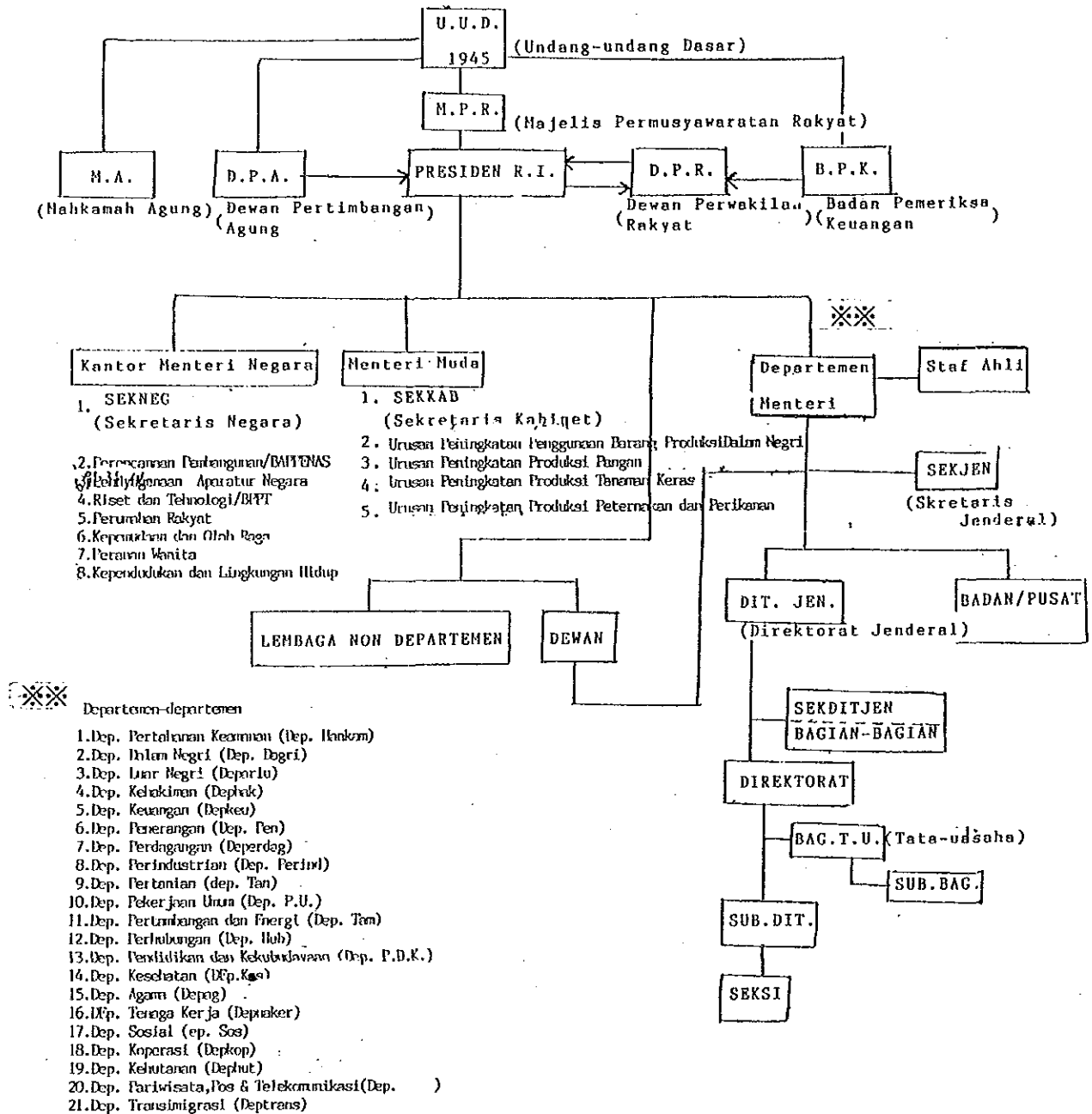
\* Upto March, 1988

\*\* Included in the figures for the U.S.

Source: Fifth 5 Year Plan Paper

I-3 ADMINISTRATIVE ORGANIZATION AND ACTS

BAGAN / SITEM PEMERINTAHAN NEGARA R.I.

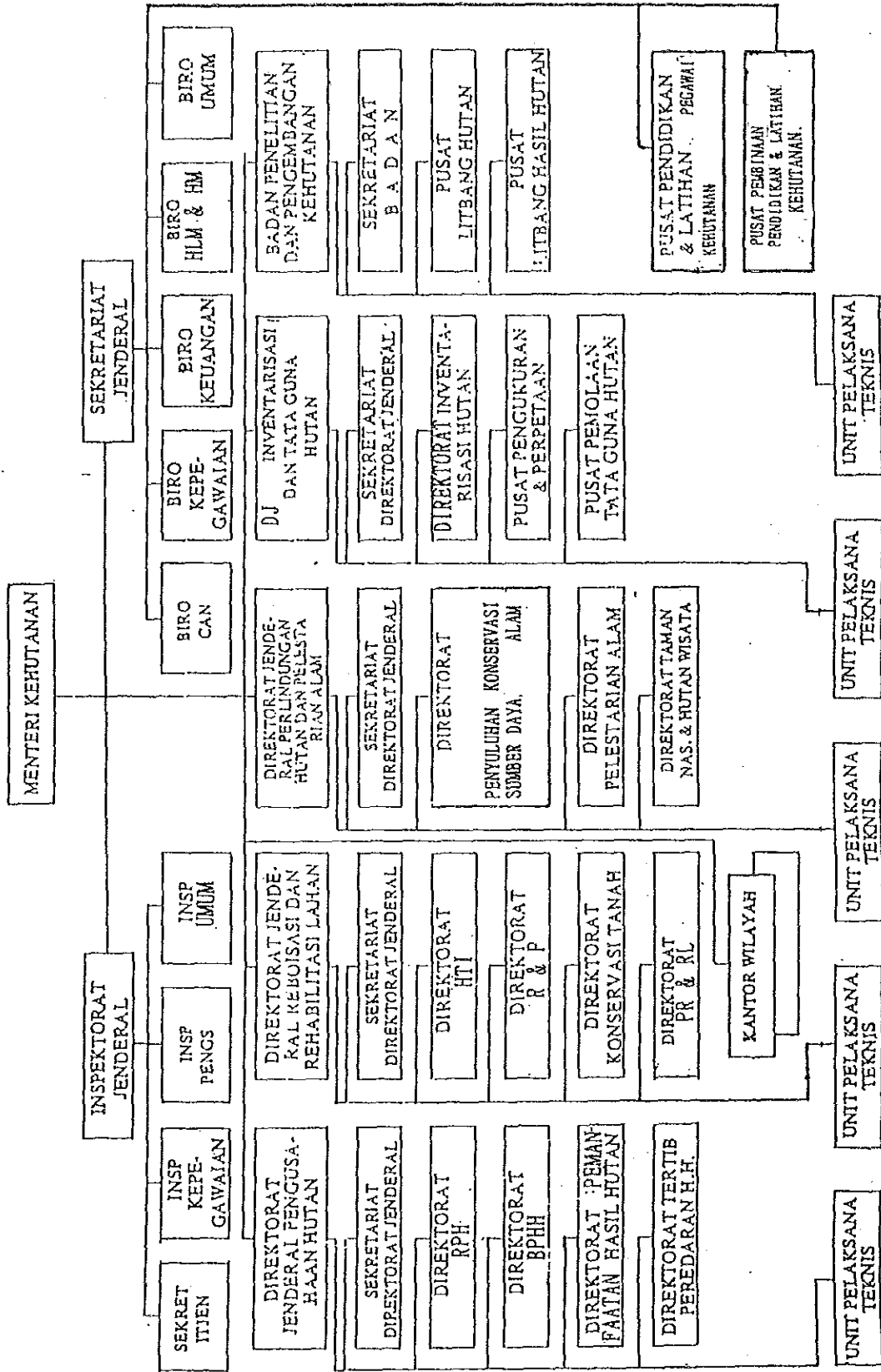


Attached Fig. 1-2 Administrative Structure of the Republic of Indonesia



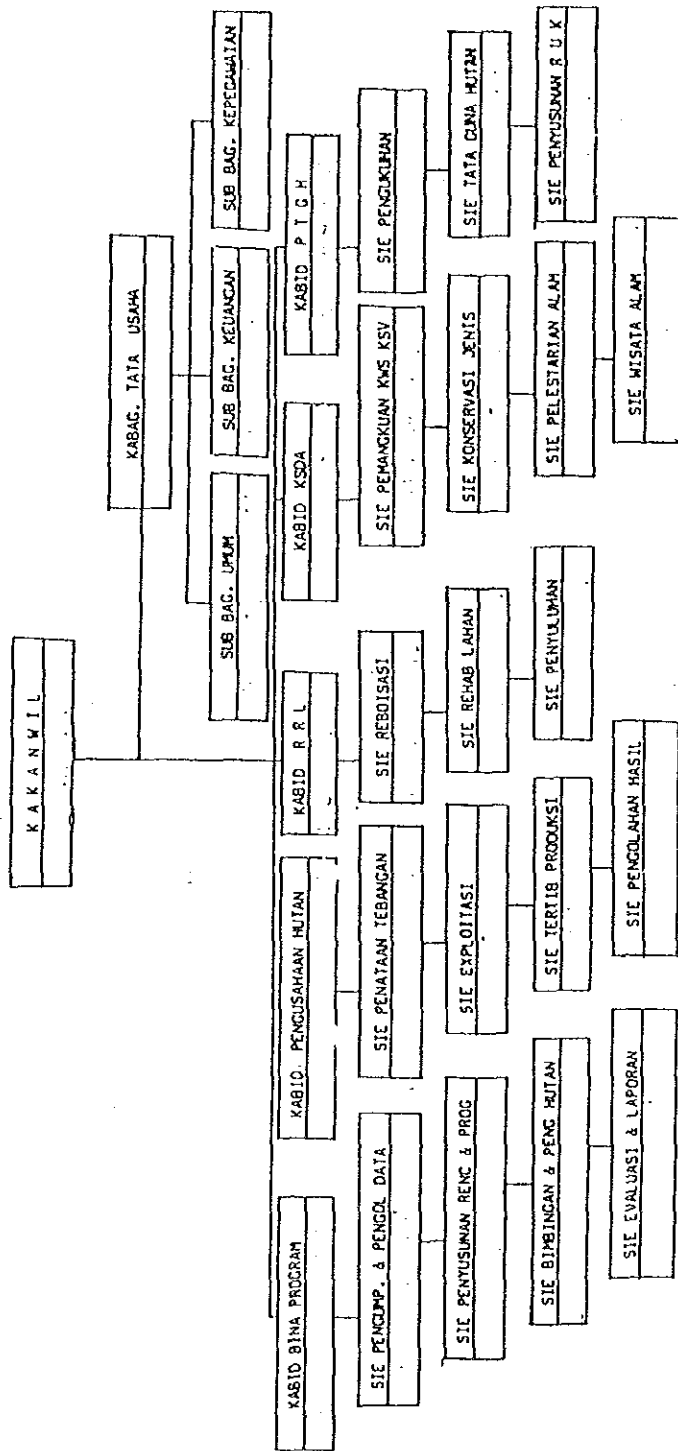
Attached Fig. 1-4: Organization of Ministry of Forestry

BAGAN ORGANISASI DEPARTEMEN KEHUTANAN



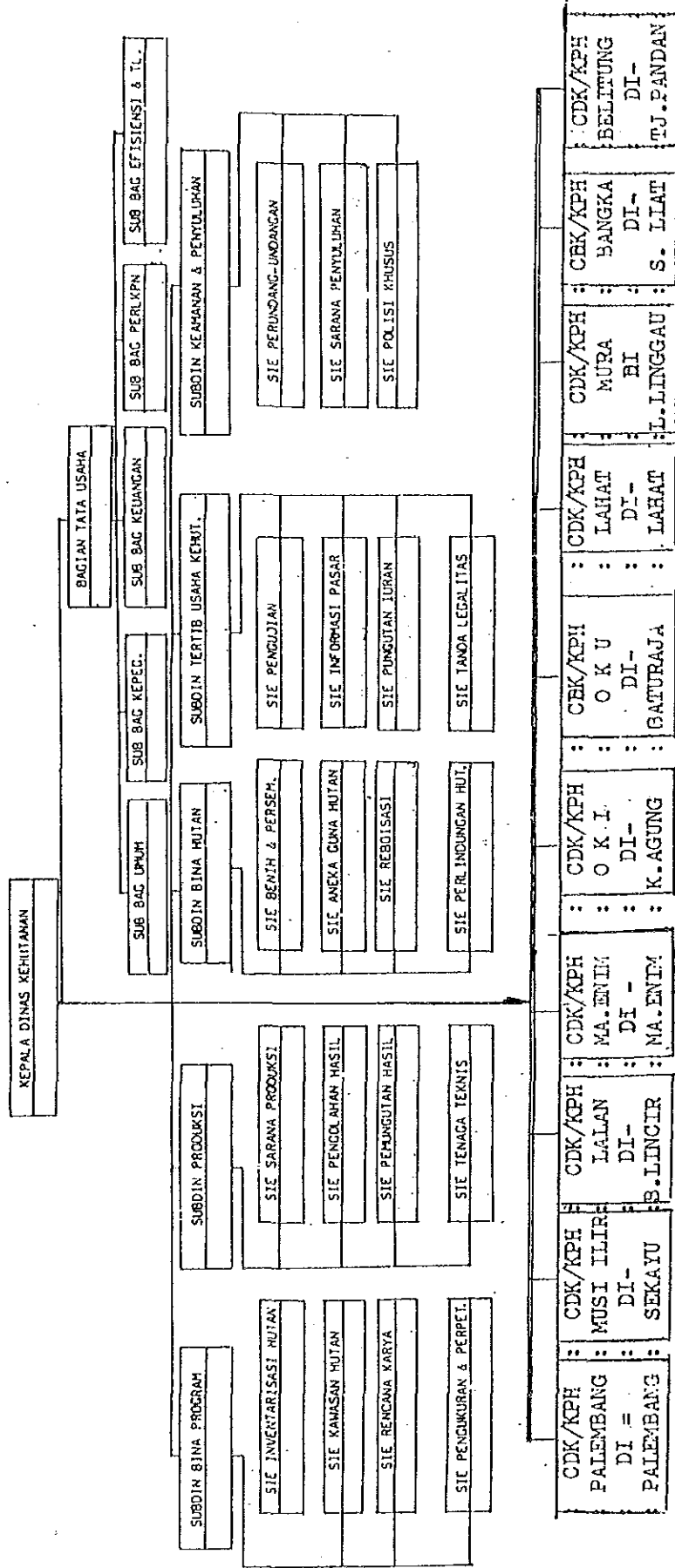
Attached Fig. 1-5 Organization of Ministry of Forestry Administration,  
South Sumatera Provincial Government

STRUKTUR ORGANISASI KANTOR WILAYAH DEPARTEMEN KEMENTERIAN PROPINSI SUMATERA SELATAN



Attached Fig. 1-6 Organization of South Sumatera Provincial Forestry Service

STRUKTUR ORGANISASI DINAS KEHUTANAN PROPINSI DAERAH TK I SUMATERA SELATAN



Attached Table 1-9 LAWS AND REGULATIONS RELATING TO FORESTS,  
FORESTRY AND FOREST INDUSTRY (1/3)

Item	Laws and Regulations
Basic forestry law	Law No.5, 1967
Investment	Law No.1, 1967 (Foreign Investment) Law No.6, 1968 (Domestic Capital Investment) Decree No.40/KPTS/DJ/I/1979, by the Director General of Forestry Presidential Decree No.53 and No.54/1977 The Basic Industry Law Act No.5/1984
Land legislation	The Basic Agrarian Law of 1960, Law No.5 Presidential Decree No.23/1980 Regulation No.3/1984, by the Minister of Home Affairs Article 33 of the Constitution of 1945 Local "adat" Law
Land use of production forest	Decree No.683/KPTS/Um/8/1981, by the Ministry of Agriculture
Recreation forest	Decree No.133/KPTS/04/I/80, by the Director General of Forestry in the Ministry of Agriculture
Conversion forest	Decree No.681/KPTS/Um/8/1981 and No.682/KPTS/Um/ 8/1981, by the Minister of Agriculture Decree No.343K/10/MPE./1986 and 67/KPTS/11/1986, by the Ministry of Forestry, the Ministry of Mining and Energy Decree KB550/246/KPTS/4/1984 and 082/KPTS-11/1984, by the Ministry of Forestry and the Ministry of Transmigration
Forest utilization	Government Regulation No.64/1957 /KPTS/DD/I/1975, by the Director General of Forestry Decree No.3226/KPTS/11-1/1981, by the Director of Forest Planning
Wood processing	Decree No.124/KP/VII/78/1978 Decree No.291/KPTS/Um/5/1979 and No.80/M/SK/5/1979 Decree No.292/KPTS/Um/5/1979 and No.81/M/SK/5/1979 Decree No.317/KPTS/VM/5/1980 and No.182/M/SK/5/1980, by the Ministry of Agriculture and the Ministry of Industry Decree No.78/KPTS/DJ/1981 Decree No.054/DJAI/SK/IV/1981 Decree No.051/DAGRI/KP/IV/1981 Decree No.07/DAGLU-33/KP/IV/1981

Attached Table 1-9 LAWS AND REGULATIONS RELATING TO FORESTS,  
FORESTRY AND FOREST INDUSTRY (2/3)

Item	Laws and Regulations
Wood processing (cont.)	Decree No.305/KP/X/86, by the Ministry of Trade Decree No.274/KP/X/86, by the Ministry of Trade
Standardisation and quality control in trade	Decree No.378/KP/X/82, by the Ministry of Trade Decree No.207/KPTS/DJ/I/75, by the Director General of Forestry
Forest exploitation licence fee	The Basic Forestry Law No.22/1967 Decree No.830/Mentan/VIII/1979
Forest product royalty	The Basic Forestry Law No.22/1967 Decree No.257/KPTS-II/1984 Decree No.158/KPTS-II/1984
Additional forest products royalty	Decree No.396/1977
Reforestation fee	Presidential Decree No.35/1980 Decree No.729/KPTS/Um/10/1980 Forest Laws No.223 and No.224/KPTS/II/1985
Education and training levy	Presidential Decree No.23 Decree No.137/KPTS/DJ/I/1974, by the Director General of Forestry Decree No.114/KPTS/IV-Prog/1984 and No.156/KPTS/II/ 1984
General and special levies for the wood processing industry	Decree No.561/KPTS/IV-Prog/1985, by the Directorate General
Grading fee	Decree No.597/KPTS-II/1985, by the Ministry of Forestry
Compulsory deposit	Decree No.295/KPTS/Um/5/1979, by the Ministry of Agriculture
Export tax and additional export tax	Decree No.28/KMK/011/1982 Decree EKS806, DAGLU/6064/86
Import tax	Decree No.315/KMK.01/1986, No.134/KPB/V/1986 and No.19/4/KEP/SBI/1986, by the Joint Ministry Decision (Ministry of Finance, Ministry of Trade and Governor of the Bank of Indonesia)
Sea transportation	Government Regulation No.2/1969



Attached Table 1-9 LAWS AND REGULATIONS RELATING TO FORESTS,  
FORESTRY AND FOREST INDUSTRY (3/3)

Item	Laws and Regulations
Forest utilization rights and forest product collection	Government Regulation No.21/1967 Decree No.25/4/1968, by the Director General of Forestry
Forest planning	Government Regulation No.33/1970
General guidance for forest exploitation	Decree No.76/KPTS/EKKU/3/1969, by the Ministry of Agriculture
Work of forest exploitation	Decree No.291/KPTS/Um/7/1970, by the Ministry of Agriculture
Infrastructure of forest utilization	Presidential Decree No.66/1971
Policy and concession rights granting	Presidential Decree No.20/75
Employment of forestry technicians	Decree No.162/KPTS/DJ/I/1976, by the Director General of Forestry
Silviculture systems of salty forests	Decree No.60/KPTS/DJ/I/1978 from 8.5.78, by the Director General of Forestry
Duties of concession-owned sawmills	Decree No.43/KPTS/DJ/I/1979, by the Director General of Forestry
Specification and utilization of logging roads and logging corridors	Decree No.049/KPTS/II/1984, by the Minister of Forestry
Establishment of concession holders associations	Decree No.195/KPTS/IV/1984, by the Minister of Forestry
IHH royalty	Decree No.100/KPTS/IV/1986 and No.16/KPTS/IV/1986, by the Minister of Forestry
Others	Ordinance concerning Wildlife Protection (1931) Ordinance concerning Nature Protection (1941) Monument Ordinance State Gazette 1934 No.238 jo Staatsblad 1934 No.515 Algemeen Water Reglamente 1936 Staatsblad 1936 No.489 jo Staatsblad 1937 No.540 Law and Regulations concerning Economic and Trade Development

Attached Table 1-10 Laws Concerning with Industrial  
Plantation Forest

1. Law No.5, 1967 concerning the Basic Regulation of Forestry.
2. Government Regulation No.21, 1970 concerning Concession area and Forest Product Exploitation rights.
3. Presidential decree No.35, 1980 concerning Reforestation Guarantee and Natural Regeneration of the Concession Area Fees.
4. Agriculture Minister Decree No.729/Kpts/Um/10/1980 concerning Management of the Reforestation Guarantee and National Regeneration of the Concession Area fees
5. Forestry Minister Decree No.320/Kpts-II/1986 concerning the Establishment of Industrial Plantation Forest
6. Forest Inventory's Head Decree No.039/Kpts/VII-3/1986, concerning Forest Boundary Guidance.
7. Director General of Forest Utilization Decree No.108-/Kpts/IV.Prog/1987 concerning Production Forest Utilization Guidance
8. Director General of Reforestation and land Rehabilitation Decree concerning Unit Cost of the Industrial Plantation Forest
9. The decision letter of the President of the Republic of Indonesia No.31/1989 concerning Reforestation fund

10. The decision letter of the Minister of Forestry No.356/Kpts-II/1989 concerning procedures of collections, preparation and distribution of the Reforestation fund
11. The decision letter of the Minister of Forestry No.417/Kpts-II/1989 concerning the utilization of the Industrial Forest Plantation
12. The decision letter of the Minister of Forestry No.418/Kpts-II/1989 concerning the procedure of proposal of the utilization of the Industrial Forest Plantation
13. The decision letter of the Director General of Reforestation and Land Rehabilitation No.043/Kpts/V-/1989 concerning decision of the selected-capable consultant in the field of planning of the Industrial Forest Plantation Establishment
14. The decision letter of the Director General of Reforestation and Land Rehabilitation concerning guidelines of the Industrial Forest Plantation Establishment
15. The decision letter of the Director General of Reforestation and Land Rehabilitation No.056/Kpts/V-/1989 concerning guidelines of making the annual plan of the Industrial Forest Plantation
16. The decision letter of the Director General of Reforestation and Land Rehabilitation No.057/Kpts/V-/1989 concerning guidelines of making the feasibility study of the Industrial Forest Plantation

17. The decision letter of the Director General of Reforestation and Land Rehabilitation No.062/Kpts/V-/1989 concerning guidelines of the establishment of the Industrial Forest Plantation of Hevea (rubber)
18. The decision letter of the Director General of Reforestation and Land Rehabilitation No.159/Kpts/V-/1989 concerning guidelines of making the working plan of the Industrial Forest Plantation
19. The decision letter of the Director General of Reforestation and Land Rehabilitation No.002/Kpts/V-/1990 concerning guidelines of the evaluation of the Industrial Forest Plantation Establishment

Attached Table 1-11 Laws and Regulations relating to  
Environment

1. The Republic of Indonesia's law No.4/1982 concerning the Basic regulations of the Environmental management its explanation.
2. The Government of the Republic of Indonesia Regulation No.29/1986 concerning The Environmental Import Assessment with its explanation.
3. The Minister of Population and Environment of the Republic of Indonesia's decree No.Kep-49/MENKLH/6/1987 concerning Guidelines on Decision of the Important Impact with its appendices.
4. The Minister of Population and Environment of the Republic of Indonesia's decree No.Kep-50/MENKLH/6/1987 concerning Guidelines on the Environmental Impact Assessment with its appendices.
5. The Minister of Population and Environment of the Republic of Indonesia's decree No.Kep-51/MENKLH/6/1987 concerning Guidelines on Making Evaluation Study of the Environmental Impact with its appendices.
6. The Minister of Population and Environment of the Republic of Indonesia's decree No.Kep-52/MENKLH/6/1987 concerning the Limit Time of Making Evaluation Study of the Environmental Impact.
7. The Minister of Population and Environment of the Republic of Indonesia's decree No.Kep-53/MENKLH/6/1987 concerning Guidelines on Membership and Working Procedures of the Committee.

8. The Minister of Population and Environment of the Republic of Indonesia's circulation letter No.03/SE/MENKLH/ 6/1987 concerning Procedure of Overcoming of Pollution and Destruction cases of the Environment.
9. The Minister of Home Affairs's decree No.8/1988 concerning Manual/Technical Guidance of Procedure of the Environmental Impact Assessment of the Foreign-fund Investment and Domestic-Fund Investment Project.
10. Forestry Minister's decision No.229/Kpts-II/1989 concerning Amendment of Forestry Minister's decision letter No.269/Kpts-II/1987 concerning the Establishment of Central Committee of the Environment Impact, Ministry of Forestry
11. Director General of Forest Protection and Nature Conservation's Decision/Head of Analysis of the Environments Impact Ministry of Forestry No.110/Kpts/DJ-VI/1989 concerning Amendment of DG of Forest Protection and Nature Conservation's Committee of Analysis of the Environment Impact concerning the Appointment of Technical Team Analysis concerning analysis of the Environment Impact Ministry of Forestry
12. Forestry Minister's decision No.500/Kpts-II/89 concerning Analysis of the Environment Impact and Evaluation Study of the Environment Impact
13. Minister of Forestry's Decision No.116/Kpts-II/1989
14. Minister of Forestry's Decision No.342/Kpts-II/1989

Attached Table 1-12 Laws Concerning with Transmigration

1. Law No.5, 1960 concerning the Basic Regulations of Agrarian
2. Law No.5, 1967 concerning the Basic Regulations of Forestry
3. Law No.3, 1972 concerning the Basic Regulations of Transmigration
4. Law No.3, 1972 concerning the Basic Regulations of Regional Government
5. Law No.6, 1974 concerning the Social Welfare
6. Law No.5, 1974 concerning the Basic Regulations of Environment
7. Government Regulation No.64, 1967 concerning giving half of the Central Government business, i.e. in the field of sea fishery, forestry and People's rubber plantation to the Provincial Government
8. Government Regulation No.33, 1971 about Forest Planning
9. Presidential Decree No.1, 1978 concerning the Opportunity of the Local inhabitants to move to The Transmigration Project
10. Presidential Decree No.45, 1983 concerning The Development Cabinet IV
11. Presidential Decree No.15, 1984 concerning the Ministries Organization

12. The Joint Decision Letter between the Minister of Agriculture and the Minister of Forestry  
No.SKB.550/246/Kpts/4/1984 concerning Providing Forest  
014/Kpts-II/1984  
Lands for the Development of Agricultural Activities
  
13. The Joint Decision Letter between the Minister of Transmigration and the Minister of Forestry  
No.SKB.057/Men/1984 concerning Guidelines on the  
014/Kpts-II/1984  
Regulation of Cooperation between the Ministry of Transmigration and the Ministry of Forestry
  
14. Circulation Letter of the Minister of Home Affairs  
No.521,52/1329/Bangda and No.475/3403/PUOD to all  
Governors throughout Indonesia
  
15. Letter of the Minister of Forestry No.89/Menhut-V/87 to  
the Chairman of the Indonesian Forestry Association  
concerning Participation of the Indonesian Forestry  
Association in the Activity of Control of Shifting  
Cultivator



#### I-4 MANAGEMENT CONDITION OF PT INHUTANI II

PT Inhutani II was established as a Government-owned limited liability company in 1974 in accordance with Law No.32/1974 taking over the operations of PN Perhutani Kalimantan Selatan. PT Inhutani II has three field offices responsible for operations in the different work areas. There is a work unit in each of South Kalimantan, West Kalimantan and Irian Jaya and East Kalimantan (joint operation with PT Inhutani I). As of 1988, the company had about 600 permanent and 659 casual employees.

PT Inhutani II has concession rights to a total of 754,000ha of production forest located in South Kalimantan, West Kalimantan and Irian Jaya. The company produces annually between 160,000 and 180,000 cu m of logs from its logging areas in the three provinces excluding production from the joint logging operation with PT Inhutani I.

The company operates four sawmills (located in Stagen, Pulau Laut, Pontianak and Manokwari) and a dowel plant (in Pontianak). Total output of sawn timber is about 20,000 cu m per year and of dowels and mouldings is about 3,600 cu m per year.

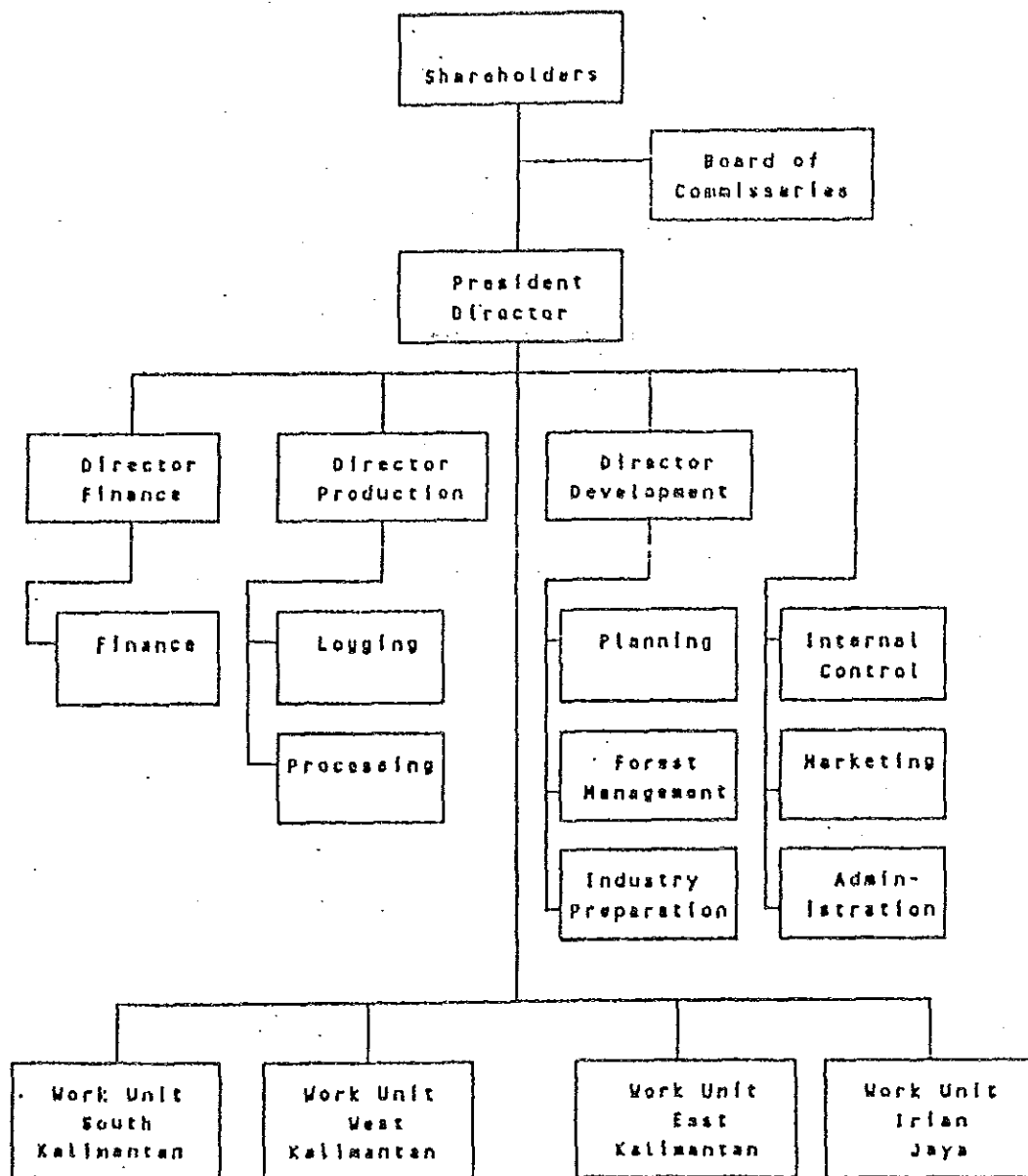
PT Inhutani II sells logs and processed wood products domestically and exports sawn timber, dowels and mouldings to Europe, Japan, Singapore and USA. Other activities of the company are development of timber plantations and forest management including development of cut-over areas. To date, PT Inhutani II has developed 4,500 ha of timber plantation in Pulau Laut.

The results of the financial operations of PT Inhutani II over the past four years are shown in Attached Table 1-13 and 1-14. The company has generated net profits increasing

from Rp 1.2 billion in 1985 to Rp 5.1 billion in 1988. Annual returns on equity have ranged between 14 and 30 per cent.

The company has consistently exhibited healthy financial positions at year ends. On 31 December 1988, its total assets amounted to Rp 31.7 billion. There were no long-term debts outstanding and equity and reserves totalled Rp 24.5 billion accounting for about 77 per cent of total liabilities and equity. Current assets were 5.4 times current liabilities.

PT Inhutani II maintains records of its financial operations on a double entry system. It submits its annual financial statements to the Ministry of Finance and these are audited by the Government audit office, the Agency for Finance and Development Control (BPKP). The company's capital and development budget are reviewed by the Ministry of Finance and the net profits are allocated to: (i) the National Development Fund, (ii) general reserves, and (iii) staff pension and bonuses.



Attached Fig. 1-7 Organization Chart PT Inhutani II

Attached Table 1-13 Balance Sheets PT Inhutani II

(Rp million)

Item/Year	1985	1986	1987	1988
<b>Assets</b>				
Current Assets				
Cash/Bank	730	1636	1510	1225
Time deposits	2202	5134	11052	8776
Receivables	2822	2656	1202	1276
Advances	1009	731	1215	1905
Prepaid Income Tax	362	54		2973
Inventory	3271	2052	2398	2505
Others	42	192	147	101
Subtotal	10440	12455	17525	18760
Investments	317	487	758	758
Fixed Assets				
Gross	18253	19747	26959	32311
Depreciation	13659	15080	18761	21879
Net	4594	4667	8198	10433
Under construction	168	177	822	452
Subtotal	4762	4844	9020	10985
Other Assets	1363	1423	1809	1304
Total Assets	16881	19209	29112	31708
<b>Liabilities and Equity</b>				
Current Liabilities				
Trade payables	343	168	874	451
Other payables				
Advances	286	365	341	119
Income tax payable			1624	
Bank loan	610	237	446	556
Dividend payable	500			
Others	1446	3258	2724	2367
Subtotal	3185	4028	6010	3492
Other Liabilities	350	255	3893	3735
Long-term Debts				
Equity				
Paid-in capital	9000	9000	9000	9000
Reserves	3269	3915	5122	8230
Retained earnings	1077	2011	5087	7250
Subtotal	13346	14926	19209	24480
Total Liabilities and Equity	16881	19209	29112	31708
<b>Financial Ratios</b>				
Current Ratio	3.28	3.09	2.92	5.37
Long-Term Debt/ Equity Ratio	0.00	0.00	0.00	0.00

## Attached Table 1-14 Income Statements PT Inhutani II

(Rp million)

Item/Year	1985	1986	1987	1988
Income				
Logs	3362	5797	8173	5030
Processed products	5592	3470	6503	10568
Others	1193	1476	1917	2331
Subtotal	10147	10743	16593	17979
Production Costs	4001	3681	4706	5199
Operating Profit	6146	7062	11887	12730
Non-Operating Expenses				
Administrative costs	1278	1507	1491	2320
Depreciation	1758	1680	2081	2271
Interest expenses				
Marketing costs	892	826	825	872
Others	1043	651	190	67
Subtotal	4971	4664	4587	5530
Net Income before Tax	1175	2398	7300	7250
Income Tax	0	387	2213	2130
Net Income	1175	2011	5087	5120
Financial Ratios				
Operating Profit to Revenues (%)	60.6	65.7	71.6	71.1
Net Income to Revenues (%)	11.6	18.7	30.7	28.5
Net Income to Average Equity (%)	17.6	14.2	29.8	23.4

## I-5 CLIMATE

Attached Table 1-15 gives the average observation results of 6 observation stations around the Study Area for the period between 1953 and 1982 (see Attached Fig. 1-8 for locations) while Attached Table 1-16 gives the monthly precipitation and monthly rainfall days for the Gunung Megang Station which is the nearest to the Study Area of these 6 stations. Large annual fluctuations in the monthly precipitation can be observed with particularly large fluctuations in the dry season.

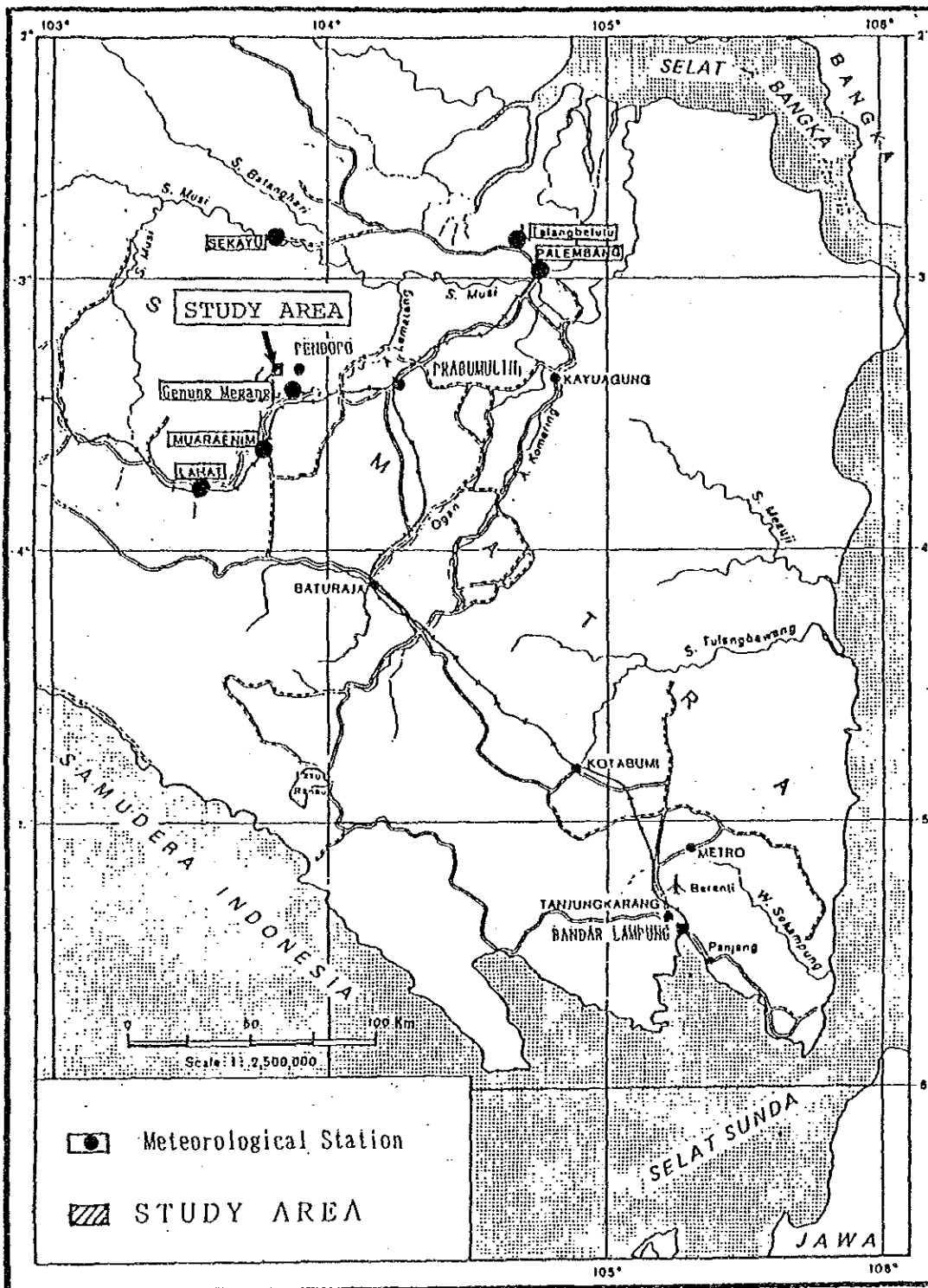
## I-6 SOIL

### (1) Soil Types (Soil Profile Survey)

#### 1) Survey method

Trial pits were selected for the soil profile survey to determine kind of soils existed in the Study Area taking the topography, geology, vegetation, land use conditions and land use history into consideration. The FAO guidelines on soil profile description were referred to in the course of the survey and description. In addition, the hardness was measured using Yamanaka's penetrometer and the pH value was measured using a pocket pH meter.

There are several previous reports on the soil types in the Study Area, most of which used the old or new USDA system for soil classification. For the present survey, however, the soil units suggested by the FAO/UNESCO were employed in accordance with the proposal given in Preliminary Survey Team Report of JICA (September 1988).



Attached Fig. 1-8 Meteorological Stations Around the Study Area

Attached Table 1-15 Climatic Conditions of the Areas Around the Study Area  
(Average Observation Results of 6 Stations)

Month	Temperature (C°)			Humidity (%)			Wind Direction Wind Velocity (mm)	Precipitation (mm)	
	Max	Mean	Min	Max	Mean	Min			
January	30.2	25.9	23.2	97	89	66	NW	1.1	254
February	30.7	25.8	22.6	97	86	63	NW	1.5	229
March	31.4	26.4	23.1	97	86	63	NW	1.3	287
April	31.9	27.1	23.6	96	85	61	SE	1.2	244
May	32.2	27.4	23.9	97	84	60	SE	1.1	177
June	31.7	26.7	23.3	95	83	62	SE	1.0	130
July	31.2	26.3	22.8	97	85	62	SE	1.3	98
August	31.2	26.3	22.8	97	85	62	SE	1.3	120
September	32.7	27.0	23.2	95	83	59	SE	1.5	110
October	32.0	29.9	23.4	96	83	57	SE	1.3	174
November	31.1	26.4	23.7	97	84	61	W	1.6	276
December	30.4	26.0	23.3	97	85	83	W	1.3	284
Mean	31.4	26.6	23.3	97	85	61	-	1.3	238

Note: Data are the averages from 6 stations.

The stations are: Palembang, Talangbetutu, Gunung Megang, Lahat,  
Muara Enim, Sekayu.

Station	Altitude (m)	Duration (year)	Köppen Climate	Schiffman
			Type	Rainfall Type
Palembang	215	20	A	Afa
Talangbetutu	116	18	B	Afa
Gunung Megang	21	18	A	Afa
L a h a t	100	20	A	Afa
Muara Enim	15	20	A	Afa
Sekayu	9	20	A	Afa

Source: LAPORAN SURVEI DAN ANALISA TANAH CALON LOKASI HUJAN TANAMAN INDUSTRI  
DAERAH BENAKAT SUMATERA SELATAN/ 1988/ BINA PROGRAM, RRL, DEPHUT



Attached Table 1-16 Monthly Preparation and Rainfall Days in Gunung Megang

Year	Month												Total													
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.														
	mm	hh	mm	hh	mm	hh	mm	hh	mm	hh	mm	hh	mm	hh												
1978	402	13	352	10	568	18	393	10	158	7	191	7	128	6	29	2	316	8	180	9	263	9	515	12	3.695	111
1979	348	9	337	9	336	13	319	11	129	6	98	5	196	5	220	4	307	8	404	8	177	9	387	10	3.258	97
1980	576	10	393	12	349	12	327	10	179	8	88	4	269	7	159	7	206	9	233	9	528	10	386	14	3.783	112
1981	319	14	268	8	507	10	402	10	208	8	140	5	187	9	128	5	342	15	93	6	191	8	551	15	3.336	113
1982	326	9	248	9	277	9	104	8	181	6	331	7	54	5	10	3	81	5	239	8	105	6	410	12	2.366	87
1983	463	12	275	11	194	7	291	8	147	6	54	5	43	8	87	6	35	8	346	20	248	23	242	20	2.425	134
1984	308	25	331	19	575	26	357	22	308	19	166	9	85	8	345	11	334	16	234	14	433	20	332	16	3.808	205
1985	369	18	233	10	465	18	182	16	86	6	76	7	183	13	77	5	241	12	539	19	262	15	105	8	2.818	147
1986	216	18	271	11	302	17	468	19	111	8	158	7	140	5	171	6	285	21	379	24	144	16	222	19	2.867	171
1987	187	22	176	16	401	17	372	16	181	15	212	12	40	8	10	5	168	7	210	14	81	6	201	23	2.239	162
Mean	351	15	288	12	407	15	322	13	169	9	151	7	133	7	124	5	241	11	286	13	243	12	345	15	3.060	134

Source: Balai Penyuluhan Pertanian Kecamatan Gunung Megang.

mm = millimeter Monthly Rainfall

hh = Monthly Rainfall Days

## 2) Survey results

26 profiles were analyzed in the present survey.

The 26 profiles were classified into 5 soil units as shown in Attached Table 1-17. Acrisols were found to be dominant in the Study Area. In fact, Acrisols are the most dominant soils in the peneplains of the south of Sumatera Island. These soils are one of the most typical in humid tropics and are characterized by well progressed weathering and leaching.

The soil is accordingly acidified and lacks Ca and K. Its activity is low due to deterioration of the clay quality, resulting in a poor water and nutrient holding capacity. The soil structure is unstable and it is easy to disperse in water and vulnerable to erosion.

3 units of Acrisols were observed in the Study Area and all were clayey, compact and strongly reddish and, apart from monadnock areas, were found in thick layers. Despite some varieties, such as that with greyish mottling due to surface reduction and that with a strongly yellowish colour without strongly reddish, the subdivisions of the soil units based on these characteristics were not established.

A thin, dark reddish brown layer with a rich iron content exists in the bedrock and pieces of this layer remaining in the soil are often mistaken for ironstone. In the present survey, however, these were considered as gravel and were distinguished from ironstone. Soil with A horizon but a dark surface were found in alang-alang grassland. Although the existence of such a coloured top soil makes it impossible to classify the horizon as Ochric A horizon in view of the definition,

the colour was considered to be a temporary phenomenon in grassland and was ignored in the classification of the subject soil.

a. Orthic Acrisols (Ao)

Compared to the other 2 types of Acrisols, Orthic Acrisols have no noticeable morphological character and are described as Acrisols of "common occurrence". Orthic Acrisols in the Study Area were found in the flat and gentle slopes on the hill tops and the upper part of the gentle hill side slope. However, they were not found in places of low elevation even though the topographical conditions were similar. An irregular mixture of Ferric Acrisols (Af) was generally observed with Orthic Acrisols and it was impossible to clearly distinguish the distribution of these 2 units of Acrisols. The mixture rate appears to be relatively high in hills and rolling land in the western part of the Study Area.

b. Ferric Acrisols (Af)

Ferric Acrisols contain an ironstone horizon in the B horizon. The thickness, depth and ironstone volume of the ironstone horizon found in Ferric Acrisols in the Study Area varied. In some cases, the existence of the ironstone horizon appeared to hinder the growth of plant roots although this view cannot be supported. The subdivisions of the soil units based on difference in the ironstone horizon conditions were not established.

While the Ferric Acrisols showed a similar distribution tendency to the Orthic Acrisols, they

were found to be dominant in old geomorphic surfaces believed to be summit levels.

c. Plinthic Acrisols (Ap)

Plinthic Acrisols contain plinthite in the lower horizon. In the Study Area, Plinthic Acrisols were found at the middle and lower gentle hill side slopes and also further flat and lower gentle hill side slopes. In particular, the soil cover of undulating land almost exclusively consisted of these Acrisols.

d. Plinthic Gleysols (Gp)

Plinthic Gleysols contain plinthite in the lower horizon and were only found near swamps in the Study Area.

e. Dystric Fluvisols (Jd)

The parent materials of Dystric Fluvisols are flood deposits and these Fluvisols were found along the main rivers in the Study Area. Since Acrisols were the origin of the deposits, the chemical and physical properties of the Fluvisols, while not particularly excellent, were found to be the best in the Study Area. Compared to other soil units, the clay content was found to be relatively low and the horizons were soft. Several deposition layers were observed and fine fragments of carbonized trees and grass were often found.

(2) Soil Distribution (Soil Distribution Survey and Soil Map Preparation)

1) Survey method

The distribution tendency of each soil unit and the relationship between the soil units and the microrelief conditions were studied based on the survey results on 26 profiles and the road cutting observation results. Together with microrelief classification by means of photo interpretation, the border lines of the soil units were inferred and a draft soil map was prepared by drawing these border lines on topographic maps (with a scale of 1: 20,000).

2) Survey results

Since exact mapping using the 5 soil units was found to be difficult due to the time constraint and the inadequate road network, it was decided to use the complex of several soil units as the mapping units.

a. Mapping Unit Af

This unit indicates both Ferric Acrisols (Af) and Orthic Acrisols (Ao). The content of Orthic Acrisols is high at hills and rolling land in the western part of the Study Area. Areas indicated as Af are widely distributed in the southern and western parts of the Study Area and are not often found at the rolling or undulating land between Benakat and Jirak.

b. Mapping Unit Ap

While areas indicated as mapping unit Ap almost totally consist of Plinthic Acrisols, a mixture of Orthic Acrisols is occasionally observed. This

unit is seen all over the maps. However, only extensive areas classified as mapping unit Ap are found between the central and northern parts of the Study Area.

c. Mapping Unit Jd

Areas indicated as mapping unit Jd consist of Dystric Fluvisols. Although there is a possibility of some types of the gley soil being included, this has not yet been confirmed. Areas of mapping unit Jd narrowly stretch along the main rivers and their main tributaries. Only major areas are indicated on the maps with slight exaggeration. Very narrow belts of mapping unit Jd exist between hills but have been omitted from the maps.

d. Mapping Unit S

Swamps and paddy fields are grouped under the S mapping unit. These sites can be classified into several soil units from the pedological point of view. They are, however, classified as mapping unit S for convenience as such classification is unnecessary for the purposes of the present survey. Most of the swamps have been created by road development and, therefore, are located along roads, particularly those in or near oil fields. Paddy fields are mostly seen near Benakat and Jirak. Plinthic Gleysols are also included in this unit.

e. Man-Made Immature Soils

Those soils which have undergone artificial changes due to cutting and banking, etc. for road, housing and oil field construction are classified as man-made immature soils. Soils at afforestation sites are excluded.

Attached Table 1-17 Outline of Trial Pits (1/2)

Profile No.	Soil Unit	Elevation (m)	Landform	Vegetation
01	Af	90	Flat plane on the hilltop	Acacia mangium
02	Ap	70	Gentle slope on the hilltop	Albizia falcataria
03	Ap	80	Middle part of the gentle hill- side slope	Albizia falcataria
04	Ap	19	Lower part of the gentle hill- side slope	Swietenia macrophylla
05	Ap	20	Flat plane on the hilltop	Swietenia macrophylla
06	Af	60	Middle part of the gentle hill- side slope	Peronema canescens
07	Af	75	Upper part of the gentle hill- side slope	Peronema canescens
08	Af	95	Flat plane on the hilltop	Secondary forest
09	Ao	100	Flat plane on the hilltop	Secondary forest
10	Af	60	Flat plane on the hilltop	Rubber
11	Jd	50	Flat plane of the valley bottom	Rubber
12	Ao	58	Flat plane on the hilltop	Albizia falcataria
13	Ao	87	Flat plane on the hilltop	Alang-alang
14	Ap	75	Lower part of the gentle hill- side slope	Alang-alang
15	Ao	85	Flat plane on the hilltop	Pinus merkusii
16	Gp	80	Gentle slope of the valley bottom	Peronema canescens
17	Ap	37	Gentle slope on the hill top	Albizia falcataria

Attached Table 1-17 Outline of Trial Pits (2/2)

Profile No.	Soil Unit	Elevation (m)	Landform	Vegetation
18	Ap	35	Middle part of the gentle hill-side slope	Peronema canescens
19	Ao	65	Upper part of the gentle hill-side slope	Secondary forest
20	Ap	71	Flat plane on the hilltop	Secondary forest
21	Ap	70	Flat plane on the hilltop	Secondary forest
22	Jd	55	Flat plane of the valley bottom	Secondary forest
23	Ap	55	Flat plane on the hilltop	Rubber
24	Ap	41	Lower part of the gentle hill-side slope	Bush
25	Ao	78	Gentle slope on the hilltop	Secondary forest
26	Ap	78	Lower part of the gentle hill-side slope	Secondary forest

Note: Ao: Orthic Acrisols, Af: Ferric Acrisols, Ap: Plinthic Acrisols  
Gp: Plinthic Gleysols, Jd: Dystric Fluvisols



Representative profile of Orthic Acrisols

Profile No. : 12  
Location : RAMBUTAN  
Altitude : 58m  
Physiography : Flat plane on the hilltop in the rolling land  
Drainage : Moderately well drained  
Parent material: Neogene, Tuff  
Vegetation : Plantation ( Albizia falcataria)

[Profile description]

0		L 6cm, F 1cm
Ag	0- 15cm	Brown (7.5YR 4/3.5) matrix and common mottles of gray and orange colour; silty clay loam; moderate fine angular blocky structure; slightly sticky, plastic and friable; hardness 16; few fine pores; common fine to coarse roots; clear smooth boundary.
Bt1	15- 37cm	Bright reddish brown (5YR 5/6) clay; strong fine to medium angular blocky structure; sticky, plastic and friable; hardness 24; few fine pores; patchy thin clay cutans; few fine to medium roots; gradual smooth boundary.
Bt2	37- 64cm	Bright reddish brown (2.5YR 5/6) clay; weak medium to coarse angular blocky structure; sticky, plastic and friable; hardness 26; few fine pores; patchy thin clay cutans; very few fine roots; gradual smooth boundary.
Bt3	64-130cm+	Bright reddish brown (2.5YR 5/8) clay; weak medium to coarse angular blocky structure; sticky, plastic and friable; hardness 25; few fine pores; patchy thin clay cutans; very few fine roots.

Representative profile of Ferric Acrisols

Profile No. : 10  
Location : SIMPANG SOLAR  
Altitude : 60m  
Physiography : Flat plane on the hilltop in the rolling land  
Drainage : Moderately well drained  
Parent material: Neogene, Claystone  
Vegetation : Plantation (Rubber)

[Profile description]

O		L 1-2cm
A	0- 15cm	Brown (10YR 4/4) silt loam; strong very fine to fine angular blocky structure; nonsticky, nonplastic and very friable; hardness 18; few fine to coarse pores; common fine to coarse roots; abrupt smooth boundary.
Bt1	15- 45cm	Bright brown (7.5YR 5/6) clay; moderate medium to coarse angular blocky structure; slightly sticky, slightly plastic and friable; hardness 21; few fine pores; patchy thin clay cutans; few fine roots; abrupt smooth boundary .
Bt2	45- 66cm	Bright brown (7.5YR 5.5/8) clay; strong fine angular blocky structure; very sticky, very plastic and firm; hardness 25; few fine pores; patchy thin clay cutans; dominant large ironstones; very few fine roots; abrupt smooth boundary.
Bt3	66- 86cm	Bright brown (7.5YR 5/8) clay; strong fine angular blocky structure; very sticky, very plastic and firm; hardness 25; few fine pores; patchy thin clay cutans; frequent large ironstones; very few fine roots; abrupt

smooth boundary.

Bt4 86-130cm+ Bright reddish brown (5YR 5/8) clay; moderate fine angular blocky structure; very sticky, plastic and firm; hardness 25; few fine pores; patchy thin clay cutans; very frequent large ironstones.

## Representative profile of Plinthic Acrisols

Profile No. : 3  
Location : Plantation I, A-1  
Altitude : 80m  
Physiography : Middle part of the gentle hillside slope in the rolling land  
Drainage : Well drained  
Parent material: Neogene, Claystone  
Vegetation : Plantation (Albizia falcataria)

### [Profile description]

O	L 1-2cm.
A	0- 14cm Dark brown (10YR 3/3) clay loam; weak fine crumb structure and strong fine to coarse angular blocky structure; slightly sticky, slightly plastic and firm; hardness 20; common fine to coarse pores; common fine to coarse roots; abrupt smooth boundary.
AB	14- 28cm Brown (10YR 4/5) clay; strong medium to coarse angular blocky structure; sticky, plastic and firm; hardness 25; few fine to medium pores; few fine roots; clear smooth boundary.
Bt1	28- 50cm Bright brown (7.5YR 5/5) clay; moderate coarse angular blocky structure; sticky, plastic and very firm; hardness 26; few fine pores; continuous moderately thick clay cutans; very few fine roots; gradual smooth boundary.
Bt2	50- 82cm Reddish brown (5YR 4/8) clay; weak coarse angular blocky structure; sticky, plastic and very firm; hardness 25; few fine pores; continuous moderately thick clay cutans; very few small ironstones; very few fine roots;

gradual smooth boundary.

BCg 82-120cm+ Light yellow (2.5Y 6.5/3) matrix, many medium prominent mottles of colour of bright reddish brown (5YR 5/6), plinthite; clay; weak, coarse angular blocky structure; sticky, plastic and firm; hardness 25; few fine pores; very few fine roots.

## Representative profile of Plinthic Gleysols

Profile No. : 16  
Location : Petro station 3  
Altitude : 80m  
Physiography : Gentle slope of the valley bottom in the undulate land  
Drainage : Poorly drained  
Parent material: Neogene, Claystone  
Vegetation : Plantation ( Peronema canescens)

### [Profile description]

O		L 3cm.
A	0- 18cm	Brown (7.5YR 4/3.5) clay; weak fine to coarse angular blocky structure; slightly sticky, plastic and friable; hardness 22; few fine pores; common fine to coarse roots; clear smooth boundary.
Bt	18- 36cm	Yellowish brown (10YR 5/6) clay; weak medium to coarse angular blocky structure; sticky, plastic and firm; hardness 25; few fine pores; patchy thin clay cutans; few fine to medium roots; clear smooth boundary.
Btg	36- 67cm	Dull yellow orange (10YR 6.5/3) matrix, common coarse mottles of bright brown (7.5YR 5/6); clay; massive; very sticky, plastic and firm; hardness 25; few fine pores; patchy thin clay cutans; very few fine roots, gradual smooth boundary.
CBr	67-120cm+	Grayish yellow (2.5Y 7/2) matrix, common coarse mottles of reddish brown (5YR 4/8), plinthite; clay; massive; very sticky, plastic and firm; hardness 20; few fine pores; water table 110cm.

## Representative profile of Dystric Fluvisols

Profile No. : 22  
Location : ENAU AREA  
Altitude : 55m  
Physiography : Flat plane of the valley bottom in the rolling land  
Drainage : Poorly drained  
Parent material: Alluvium , Flood deposit  
Vegetation : Secondary forest

### [Profile description]

O		L, F 1-2cm.
A	0-10 cm	Brown (7.5YR 4/4) clay loam; moderate fine angular blocky structure; slightly sticky, plastic and very friable; hardness 18; common fine to coarse pores; common fine to coarse roots; abrupt smooth boundary.
AB	10-26 cm	Brown (7.5YR 4/7) clay loam; weak fine angular blocky structure; slightly sticky, plastic and very friable; hardness 20; few fine to coarse pores; common fine to coarse roots; abrupt smooth boundary.
2Bg1	26- 44cm	Brown (7.5YR 4/6) matrix, few coarse mottles of grayish yellow (2.5Y 6/2); clay loam; weak medium subangular blocky structure; sticky, plastic and very friable; hardness 18; few fine to coarse pores; few fine to coarse roots; many fine fragments of carbonized grass; abrupt smooth boundary.
3Bg2	44- 63cm	Bright reddish brown (5YR 5/6) matrix, few coarse mottles of grayish yellow (2.5Y 6/2); clay loam; weak medium angular blocky structure; sticky, plastic and very fri-

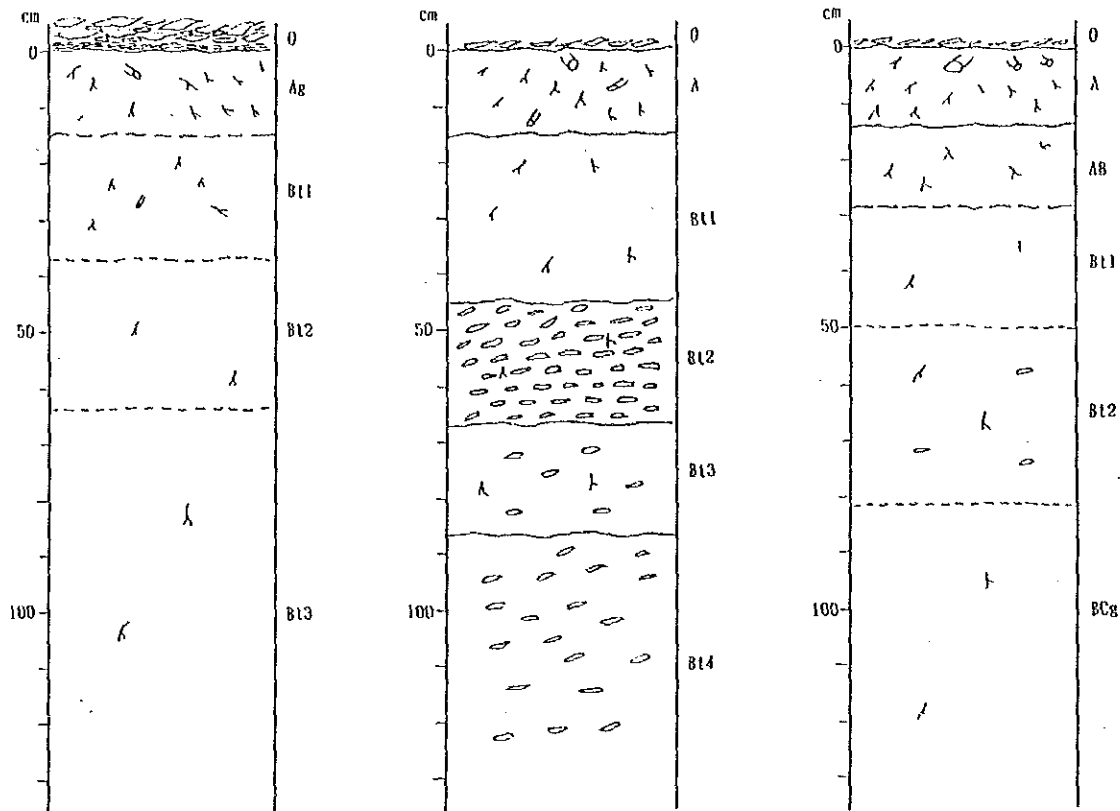
able; hardness 20; few fine pores; very few fine roots;  
few fine fragments of carbonized grass; abrupt smooth  
boundary.

4Bu1 63- 84cm Bright reddish brown (5YR 5/6) sandy clay loam; massive;  
slightly sticky, slightly plastic and very friable; hard-  
ness 20; few fine pores; very few fine roots; clear smooth  
boundary.

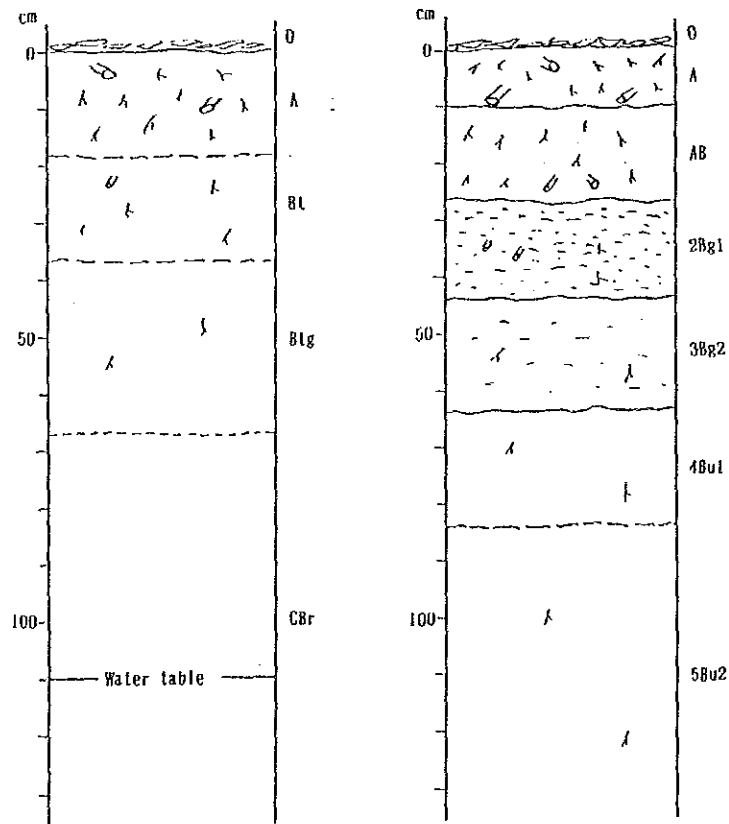
5Bu2 84-120cm+ Bright brown (7.5YR 5/6) sandy clay loam; massive;  
slightly sticky, slightly plastic and very friable;  
hardness 20; few fine pores; very few fine roots.

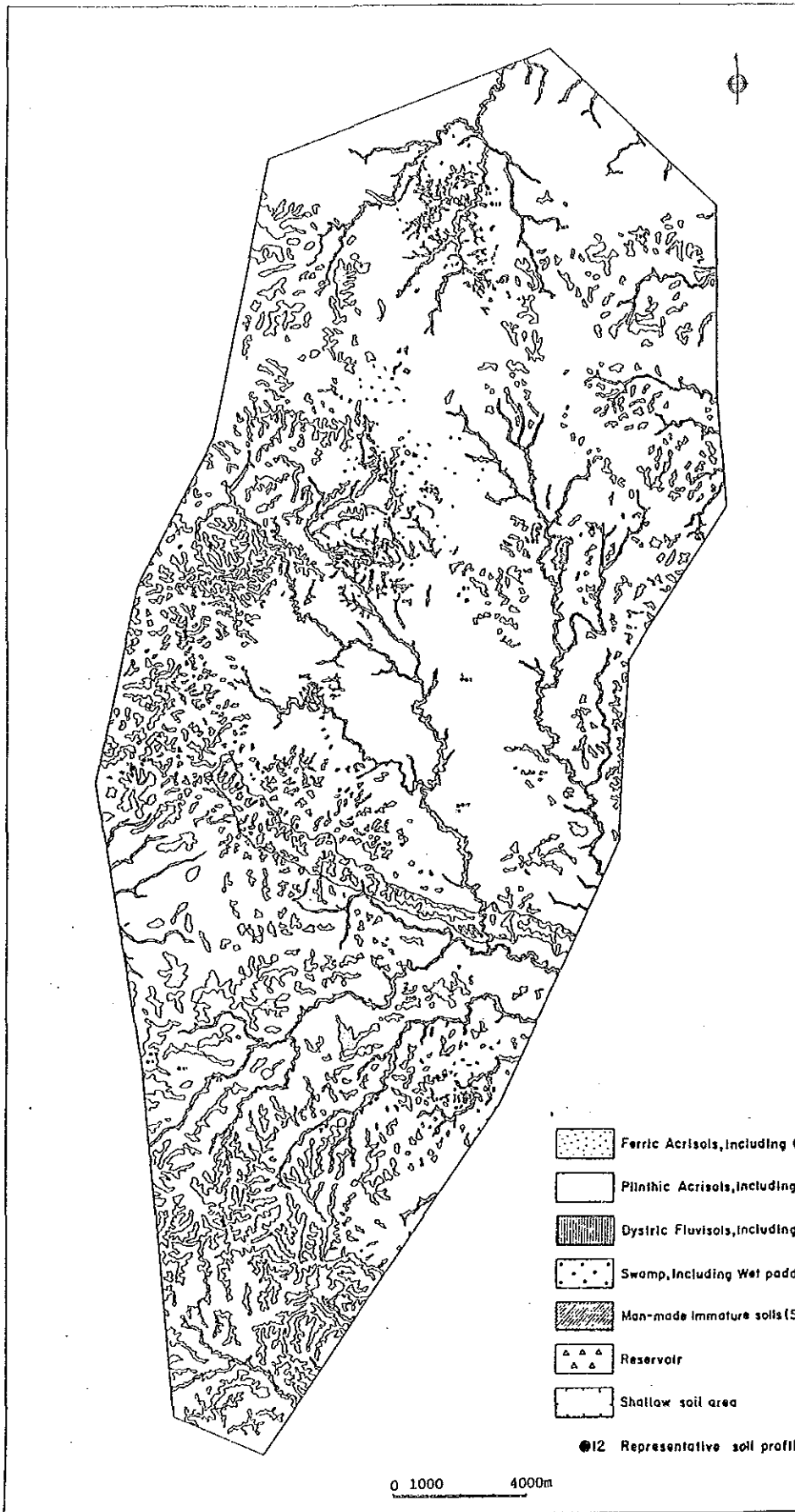


Orthic Acrisols, Profile No. 12    Ferric Acrisols, Profile No. 10    Plinthic Acrisols, Profile No. 3



Plinthic Gleysols, Profile No. 16    Dystric Fluvisols, Profile No. 22





Attached Fig. 1-9 SOIL MAP

## I-7 LAND USE - VEGETATION/FOREST

### (1) Land Use and Vegetation

#### 1) Land use and vegetation survey

Survey of existing land use and vegetation situation and setting of criteria for photo interpretation to be applied in landuse vegetation mapping were performed.

##### a. Survey of existing land use and vegetation

The Study Area, which is national land property, was surveyed on-site for land use in terms of the following, using aerial photographs, field verification, and interviews.

- Distribution of villages and settlements
- Farming situation
- Utilization of forests
- Pasturage condition
- Existing vegetation

b. Preliminary aerial photo interpretation was attempted and the results were checked in the field, before the criteria were finalized. The minimum unit size for interpretation were applied to be 5mm x 5m (1ha) on the aerial photo (1:20,000). shown below is the classification suggested for land use/vegetation.

Land use/Vegetation Classifications (Suggested)

Forest : Natural forest, secondary stand, coppice, planted forest, etc.

Grassland : Axonopus compressus grassland and Alang-alang (Imperata cylindrica) grassland, etc.

Burnt field: Scatteredly distributed among grassland, secondary stands, coppice, not as much in order as regularly cultivated fields.

Cultivated land: Paddies, vegetable fields, etc.

Plantation : Plantations of rubber trees and coconut palms, etc.

Cities, towns and villages

Roads

Oil fields

Water bodies: Lakes, swamps, rivers

2) Survey results

Area of each land use class and their distribution in the Study Area were described in the main report and the land use/vegetation maps.

### 3) Forest survey

The existing forests in the Study Area were surveyed for stand volumes, and planted forests for growth status. the survey was conducted on natural forests, and planted forests, respectively, at sample plots.

The standard sizes of sample plots were 20m x 40m (0.08ha) for planted forests, and 20m x 100m (0.20ha) for natural forests. As for planted forests, every tree was subject to the survey whereas, for the natural forests, trees of 35cm or more in diameter breast height (D.B.H.) were surveyed. Survey items were tree species, tree height, diameter breast high or basal diameter (planted trees of 1.3m or less in height).

#### (2) Forest inventory by sample plots

Those stands for which such basic data as the number of planted trees per ha and the weeding frequency was available were firstly selected and aerial photographs were then used to finalize the locations of the sample plots.

A plot size of 0.08ha (20m x 40m) was decided for man-made forests and 0.2ha (20m x 100m) for secondary forests. In the case of man-made forests, the diameter of all the planted trees was measured and a sample tree from each diameter class was selected for the measurement of its height. In the case of secondary forests, the diameter and height of all the trees with a diameter of 35cm or more were measured.

The trial plantation area of the JICA project was selected as the main subject area for man-made forests as the inventory of aged stands was stressed in view of estimating the future yield and desirable spacing of trees. 10 species from among those planted in the trial plantation area were

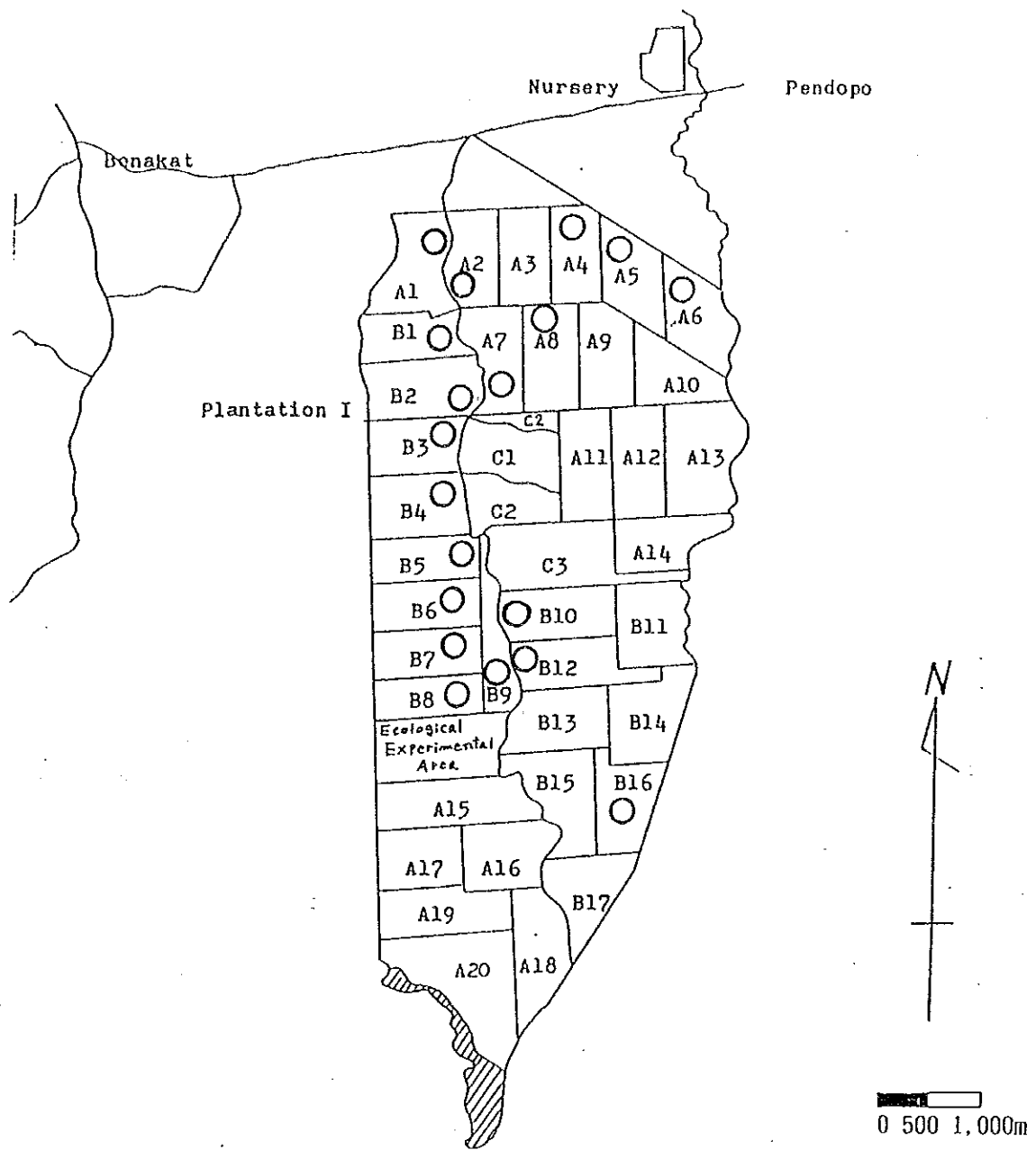
selected for measurement based on the survey principle that data on as many species as possible should be collected.

Attached Table 1-18 gives the number of sample plots by species. The locations of the sample plots in Plantation I are given in Attached Fig. 1-10 while the survey results are given in Attached Table 1-19.

With regard to growing stock, the volume tables for some species were obtained from the South Sumatera Reforestation Technical Center (Benakat) and from the Forest Research and Development Center (Bogor) for use in growing stock calculation. The trial calculation on Albizia falcataria (planted in December, 1980 and now 8 years old) in the trial plantation area resulted in some 150m<sup>3</sup>/ha for stands without thinning.

Attached Table 1-18 Number of Survey Plots in Each Tree Species

Class	Tree Species	Number of Plots	Remarks	
			Plantation I	Other than Plantation I
Man-made forest	<i>Albizia falcataria</i>	4	3	1
	<i>Swietenia macrophylla</i>	5	5	
	<i>Eucalyptus deglupta</i>	2	2	
	<i>Pinus merkusii</i>	9	6	3
	<i>Anthocephalus chinensis</i>	1	1	
	<i>Schima wallich</i> var. <i>bancana</i>	4	4	
	<i>Peronema canescens</i>	3	2	1
	<i>Acacia auriculiformis</i>	4	2	2
	<i>A. mangium</i>	6	4	2
	<i>Dalbergia latifolia</i>	2	2	
Secondary forest		2	Central part, Swody area	
Total		42		



Note: • ○ : Sample plot

• In general in each compartment 2 plots were surveyed.

Attached Fig. 1-10 Location Map of Sample Plots in Plantation I

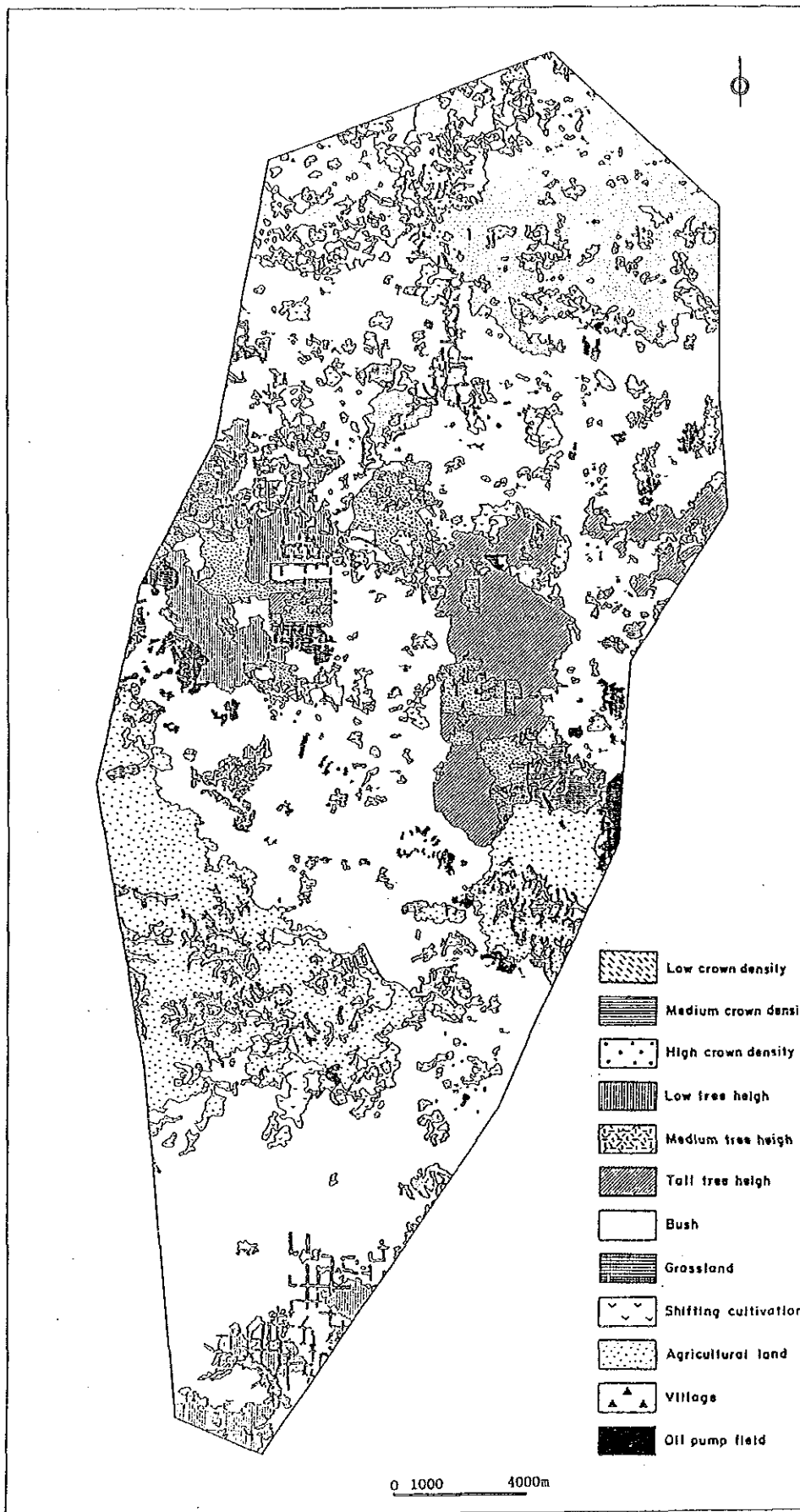


Attached Table 1-19 Forest Survey Results (Plantation I)

1988/89

Tree species	Compartment No.	Planted			Treatment		Surveyed			Mean and range of height of trees of which D.B.H. is from D.B.H. up to m	Remarks
		Year	Spacing m	Number of trees/ha	Weeding (times)	Others	Number of trees/ha	Mean D.B.H. cm	Total height m		
<i>An. chinensis</i>	A-5	11/81	4 x 2	1,250	2		425 (0.34)*	12.9	13	15/13 - 18	
<i>Peronema canescens</i>	A-7	10/81	4 x 2	1,250	5		625 (0.50)	8.3	7	8/7 - 9	
			4 x 3	833	5		462 (0.55)	11.4	8	9/8 - 9	
<i>Peronema canescens</i>	B-16	6-7/84	4 x 2	1,250	5		550 (0.44)	4.0	4	-	
<i>Daibergeria latifolia</i>	B-8	2/83	4 x 3	833	7		506 (0.61)	8.1	9	11/9 - 13	
<i>Acacia auriculiformis</i>	B-6	1/83	4 x 2	1,250	6		865 (0.68)	10.7	13	16/13 - 18	
	A-8	11/81	4 x 2	1,250	4		337 (0.27)	10.7	13	15/13 - 16	
<i>Schima bancana</i>	A-6	12/81	4 x 1	2,500	5		2,012 (0.81)	7.0	9	11/9 - 14	
	B-5	3/83	4 x 2	1,250	7		1,093 (0.87)	9.8	11	12/11 - 14	
<i>Swietenia macrophylla</i>	A-2	1/81	4 x 2	1,250	6		962 (0.97)	13.4	12	15/12 - 18	
	B-4	12/82	4 x 3	833	6		739 (0.89)	6.5	7	11/7 - 14	
	B-10	1-2/84	2 x 2	2,500	5		1,368 (0.54)	6.0	7	9/7 - 11	
<i>Eu. deglupta</i>	B-1	12/81	4 x 2	1,250	5		881 (0.70)	7.6	10	14/10 - 17	
<i>Pinus merkusii</i>	A-4	3/81	4 x 1.5	1,667	6		774 (0.46)	12.5	11	14/11 - 16	
	B-3	1/82	4 x 2	1,250	5		887 (0.71)	14.4	12	13/12 - 15	
	B-9	2/83	4 x 2	1,250	7		962 (0.77)	13.1	11	13/11 - 15	
<i>Al. falcata</i>	A-1	12/80	4 x 2	1,250	3		887 (0.71)	15.2	17	22/19 - 25	
	B-2	12/81	4 x 2	1,250	3		1,068 (0.85)	13.6	16	20/16 - 24	
<i>Acacia mangium</i>	B-7	4/83	4 x 2	1,250	6	Thinning	812 (0.65)	14.1	19	21/19 - 22	
	B-12	1/84	3 x 2	1,666	5		1,375 (0.83)	12.5	19	21/19 - 27	
			4 x 2	1,250	5		975 (0.78)	13.9	19	21/19 - 22	

\* A parenthesized figure shows survival rate.



Attached Fig. 1-11 LAND USE / VEGETATION MAP

I-8 FARMING CONDITION

Attached Table 1-20 Collection and Consumption of Fuelwood  
in Simpang Solar and a Part of Pabil

Items	Contents	
Number of household members (average)	4 persons	
Consumption of fuelwood	4 bundle/week (1 bundle = 13 kg) 2,700 kg/year/household 6.75 m <sup>3</sup> (assumed specific gravity 0.4)	
Distance from living place to the source of fuelwood	0.8 km	
Time spent to collect the fuelwood	2.4 hours/week	
Frequency of collection of fuelwood	2 times/week	
Method of transport	On shoulder 10%, in basket (female) 90%	
Tree species	<u>Local name</u>	<u>Scientific name</u>
	Atuman	Clibadium surinamense Eupatorium palescens
	Leban	Vitex pubescens
	Kelampis	(unknown)
	Gondong	Ficus variegata
	Tepungan	Callicarpa tomentosa

Attached Table 1-21 Cattle Raising at Benakat

	Type I	Type II	Type III
Purpose	<ul style="list-style-type: none"> <li>o Cash Income To obtain a stable income.</li> </ul>	<ul style="list-style-type: none"> <li>o Saving (Asset Maintenance) To prepare for such occasions as childbirth, weddings and funerals, etc. when a large sum of money is required.</li> </ul>	<ul style="list-style-type: none"> <li>o Transport and Saving Used to transport firewood and agricultural products. Saving is also regarded as a purpose in many cases.</li> </ul>
Number Owned	<ul style="list-style-type: none"> <li>o For breeding: 5 - 20 The cattle are grouped for breeding purposes. For example, each group consists of 2 bulls, 2 - 5 cows, 2 - 3 young cows and 2 - 5 calves.</li> <li>o For raising: 5 - 10</li> </ul>	<ul style="list-style-type: none"> <li>o For raising: 1 - 5</li> </ul>	<ul style="list-style-type: none"> <li>o For raising: 1 - 3</li> </ul>
Method	<ul style="list-style-type: none"> <li>o Grazing on alang-alang grass-land watched by an adult or child; grazing ground shifted to find new shoots of alang-alang.</li> </ul>	<ul style="list-style-type: none"> <li>o Grazing near the settlement if the number is small; cattle freely graze on grass and return to the barn in the evening.</li> <li>o Grazing on alang-alang grass-land watched by a child of 10 - 15 years when the number is relatively large; the number may exceed 100 when 4 - 7 groups are raised together; the child is responsible not only for his parents' cattle but also for those of neighbours.</li> <li>o A group of as many as 100 may be watched by an adult who is entrusted by some 10 - 20 households; the raising fee is said to be Rp 250/head/month.</li> </ul>	<ul style="list-style-type: none"> <li>o Raised near the working place of the owner and tied to a tree, etc.; the owner often collects alang-alang on the way home from farming or firewood collection to feed the cattle.</li> </ul>
Relationship with Agricultural Income	<ul style="list-style-type: none"> <li>o Farmers with a relatively high income.</li> </ul> <p>Price: Calf Rp 100,000 - 150,000 (takes 3 - 5 years to become an adult) Adult Rp 300,000 - 350,000 Average income of farmer: Rp 300,000 - 500,000/year</p>	<ul style="list-style-type: none"> <li>o Farmers with a high or middle income.</li> </ul> <p>(Farmers with a low income do not have the cash to buy calves.)</p>	<ul style="list-style-type: none"> <li>o Farmers with a middle or low income.</li> </ul>
Relationship with Burning	<ul style="list-style-type: none"> <li>o Burning anywhere to get new shoots of alang-alang in the dry season.</li> </ul> <p>(Type I and II have a high potential risk for the spread of fires to afforestation sites).</p>	<ul style="list-style-type: none"> <li>o Same as left; burning may be carried out by children.</li> </ul>	<ul style="list-style-type: none"> <li>o Extensive burning is not conducted.</li> </ul>
Others	<ul style="list-style-type: none"> <li>o According to Mr. Ujang, the headman of Benakat Village, some 50 out of 200 households in Benakat Village own cattle although the total number is unknown.</li> <li>o Cattle are the Indian type (with a bump on the shoulder and hanging front chest skin; mostly white or grey) and the Ilocos type originating from Luzon Island in the Philippines (red or yellowish brown). Both are relatively small and are used for labour and meat. They have a strong tolerance to heat because of their thick skin and numerous sweat glands.</li> </ul>		

## I-9 ACTUAL CONDITION OF AFFORESTATION WORK

The actual conditions of afforestation projects, nurseries (seed production) and forest industry in and around the Study Area were surveyed and relevant data was collected.

### (1) Subanjeriji afforestation project

This project was conducted by the Dinas Kehutanan between 1978 and 1987 with a presidential instruction budget.

#### (Technical Aspects)

##### ① Locationing conditions

Location : Subanjeriji, Kab. Muara Enim,  
South Sumatera Province

Total Area : 50,000ha

Planting Area : 22,670ha

Transport : 170km from Palembang (4 hours by  
car) and 30km from Muara Enim (30  
minutes by car)

Topography : mostly flat

Soil : Yellowish Red Padzolic

Vegetation : alang-alang grassland (60%),  
secondary forests (10%), rubber  
plantations and orchards (30%)

##### ② Main species

Eucalyptus deglupta : 61%

Acacia auriculiformis : 15%

Pinus merkusii : 20%

③ Survival and growth of planted trees

The average survival rate is some 80%. The survival rate for those areas damaged by forest fires in 1987 is around 25%. In general, the planted trees show normal growth.

④ Site preparation, planting and weeding

Site preparation using machines consisted of land clearing (once), ploughing (twice) and harrowing (once). Planting was conducted manually and weeding was conducted twice a year in the first two years.

⑤ Tending

Only weeding around the planted trees within a 50cm radius was conducted.

⑥ Seeds

All seeds were acquired from a private company in Java and no special storage facility was provided.

⑦ Nurseries

A temporary nursery with an area of some 0.6ha was introduced for every 500 - 1,000ha of afforestation area. These nurseries were of a temporary type and only a workshop and irrigation pump were provided.

⑧ Transport of seedlings

30 potted seedlings were placed in a wooden box and were transported by tractor or truck. The

transportation distance was an average of some 10km.

⑨ Protection measures

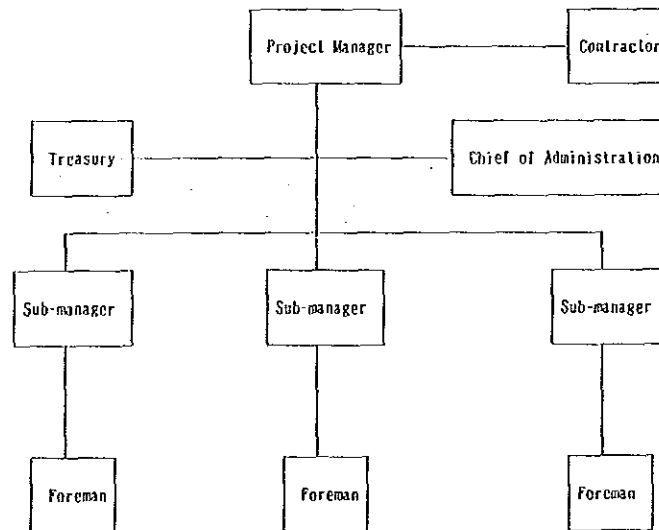
Watch towers were constructed and patrols were intensified in the season dangerous for forest fires. A number of Acacia mangium were planted to form firebreaks. However, these firebreaks proved ineffective vis-a-vis the forest fires in 1987.

⑩ Machinery

Site Preparation : tractors and bulldozers  
Seedling Transportation : trucks  
Forest Road Construction : bulldozers  
Forest Road Repair : motor- graders

(Operational Aspects)

① Implementation system



Each foreman was in charge of each site of 200-300ha.

② Employment

Local inhabitants near the project area and settlers from other areas were employed and the peak employment was 600 people per day. The actual work was conducted on either a daily wage basis (planting and nursing) or a subcontracting basis (site preparation and forest road construction, etc.)

③ Wages

The daily wage was between Rp 1,000 and Rp 1,500.

④ Work standards

Mechanical Site Preparation	: 1.3 hours/ha
Planting	: 300 seedlings/person
Weeding	: 7 persons/ha

⑤ Beneficial measures for local communities

No special measures for the local communities were employed. However, the local communities welcomed the project in view of an additional source of income through employment.

(2) Lampung afforestation project

This project commenced in 1987 as a mechanized afforestation project with Japanese grant aid. The performance in Fiscal 1987 and Fiscal 1988 were examined in the present survey.



(Technical Aspects)

① Locationing conditions

Location : Lampung Tengah and Lampung Utara,  
Lampung Province  
Total Area : 31,414ha  
Planting Area : 30,636ha (planned)  
Transport : 60km from Bandal Lampung (2.5 -  
3.5 hours by car)  
Topography : flat  
Soil : Yellowish Brown and Brown  
Podzolic  
Vegetation : alang-alang grassland (19%),  
secondary forests (46%), other  
forests (35%)

② Main species (1987 and 1988 planting results)

Mahogany : 86%  
Acacia mangium : 7%  
Peronema canescens (sungkai) : 7%

③ Survival and growth of planted trees

The survival rate is 80 - 85%. The height of the trees planted in 1987 is 80 - 150cm and that of trees planted in 1988 is 50 - 60cm.

④ Site preparation, planting and weeding

Site preparation using machines consisted of land clearing (once), ploughing (once) and harrowing (once). Planting was conducted manually and manual weeding are conducted 4 - 6 times in the first 4 years.

⑤ Tending

No special tending is planned as the afforestation site is still young.

⑥ Seeds

Mahogany seeds are purchased from Java and stored in a thermostatic chamber for upto 2 months. Acacia mangium seeds are obtained from the seed orchard in Subanjeriji.

⑦ Nursery

The nursery area is 4ha and water is sprinkled twice a day. The nursery facilities include an office building, workshop, warehouse and meeting hall and a water pump and trucks, etc. are provided.

⑧ Transport of seedlings

Seedlings are placed in a basket and are transported by truck or by hand. The transportation distance is some 10km.

⑨ Protection measures

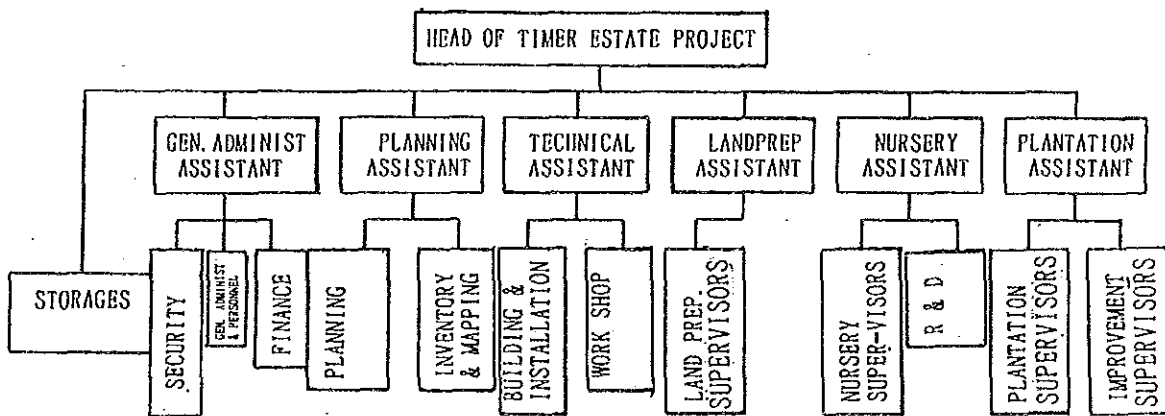
The Forest Research and Development Center is contacted for advice in the case of problems. However, no problems have yet arisen due to the site's young age.

⑩ Machinery

	<u>Unit</u>
o Heavy machinery	
Bulldozer (Komatsu D65 E-8)	4
Motorgrader (Komatsu GD 500R)	1
Backhoe type excavator (Komatsu PC120)	1
Farm tractor (Komatsu DF800)	10
Wheel-loader (Komatsu WA100:1)	1
Wheel-loader (Komatsu WA150:1)	1
Dumptruck (Mitsubishi FM516F)	1
o Other machinery	
Jeep	3
Motorcycles	7
Generator set (Yanmar TS-180-C)	1
Diesel boat (Yanmar TS-70)	1
Motor boat (Yanmar E-25)	1
Water pump (Yanmar TS-105-C)	1
Welder Machine (Mitsubishi 240)	1
Cargotruck (Mitsubishi FM114)	1
Pickup type truck (Mitsubishi PE114)	1

(Operational Aspects)

① Implementation system



② Employment

Local inhabitants are employed and the peak employment is some 400 persons/day. As in the case of the Subanjeriji Project, the actual work is conducted on either a daily wage basis or sub-contracting basis.

③ Wages

The daily wage in 1988 was Rp 1,750 plus allowances.

④ Work standards

Site Preparation : manual (weeding, ploughing) -  
25 persons/ha  
mechanical (land clearing,  
harrowing) - 0.5 hour/ha  
Planting : 200 trees/person  
Weeding : 10 persons/ha

⑤ Beneficial measures for local communities

As in the case of Subanjeriji, the local communities welcome the project as an additional source of income.

## I-10 SEED COLLECTION AND STORAGE

A field survey and data collection were conducted on the subjects described below at the Seed Technology Center and the Forest Research and Development Center in Bogor in view of securing the necessary seeds for the Industrial Plantation Plan. The subject species were mostly those used for industrial plantation in Indonesia.

### 1) Seed collection time/method and storage method

The seed collection time/method and storage method for each species are given in Attached Table 1-22.

#### a. Collection time

While the time for collecting seeds varies according to the species, the standard times are between February and March and between June and August. In the case of some species, including Acacia mangium, the seeds can be collected three times a year. According to a report of the South Sumatera Reforestation Technical Center, seed collection is possible throughout the year for Eucalyptus deglupta and Melaleuca leucadendron.

#### b. Collection method

For all species, workers climb the trees and collect the seeds using trimming scissors fixed to the top of a pole. When the seeds are contained in a sheath, as in the case of Acacia mangium, the sheath is exposed to sunlight for 1 - 2 days (3 - 4 days at longest exposure) before removing the seeds from the sheath.

Seedlings of Peronema canescens are grown from cuttings.

When seeds are required, the dry inflorescence is collected and crushed in a dry bag.

c. Storage method

The seeds of most species are sealed and stored in a thermostatic chamber where a low temperature and low humidity are maintained. In the case of the seeds of Schima wallichii var. bancana, the humid storage method is employed. The storage period varies depending on the species. The maximum storage period is 10 years for the seeds of Albizia falcataria and Acacia mangium. In comparison, the seeds of Swietenia macrophylla can only be stored for upto 2 - 3 months.

d. Number of seeds and germination rate

The maximum number of seeds per kg is 60,000 - 80,000 for Eucalyptus deglupta and the minimum number is 2,500 - 3,000 for Swietenia macrophylla.

The highest germination rate in the sowing bed is 80% for Acacia auriculiformis and the lowest rate is 40% for Peronema canescens and Schima wallichii var. bancana.

2) Tree seed orchards and cutting orchards

9 tree seed orchards have been established in Indonesia since 1978. However, there are no cutting orchards.

The tree seed orchards are classified into progeny test forests and mass selection forests. The former grow

Pinus merkusii and Eucalyptus urophylla while the  
latter grow Eucalyptus urophylla and Eucalyptus  
deglupta.

Attached Table 1-22 Seed Collection and Storage

Tree species	Seed collection time	Seed collection method	Seed storage	Storage period	Number of seeds / kg	Germination rate
<i>Acacia mangium</i>	February - March August - September	Climbing tree, pruning branches, picking pods using ladder or poles attached with roped scissors. Capsule 'dry in direct' the sunlight for 2-3 days.	Air tight containers. Stored in air conditioned room or at room condition.	Up to 10 years	90,000 - 100,000	70%
<i>Swietenia macrophylla</i>	June - August	Climbing tree, picking the stones using hand or poles attached with roped scissors.	Seeds are mixed with absorbent material (coal powder, sawdust) plus fungicide. Placed in air tight containers. Stored in wet cold storage at 15 °C.	2 to 3 months storage only	2,500 - 3,000	70%
<i>Eucalyptus urophylla</i>	July - August	Climbing tree, pruning branches, picking pods. Dry in the sunlight for 1-2 days.	Air tight containers. Stored in dry cold storage room at 3-5°C and 40% relative humidity.	Up to 2 years storage only	200,000 - 250,000 (prickable seedlings)	50%
<i>Albizia falcataria</i>	July - August February - March	Climbing tree, pruning branches, picking pods. Dry in the sunshine for 2-3 days.	Air tight containers. Stored in room condition	Up to 10 years	50,000 - 60,000	80%
<i>Pinus merkusii</i>	February - June	Climbing tree, picking cones using poles attached with roped scissors. Matured cones are splitted using knife. Seeds are extracted by hand.	Air tight containers. Stored in the dry cold storage at 3-5 °C and 40% relative humidity.	Up to 12 months storage only	40,000 - 50,000	60%
<i>Eucalyptus deglupta</i>	April - September	Climbing tree, pruning branches using poles attached with scissors. Collect the capsules. Dry in the direct sunlight for 1-2 days.	Air tight containers. Stored in the dry cold storage at 3-5 °C and 40% relative humidity.	Up to 2 years storage only	600,000 - 800,000 (prickable seeds)	50%
<i>Acacia auriculiformis</i>	February - March August - September	As same as <i>Acacia mangium</i>	As same as <i>Acacia mangium</i>	Up to 12 years storage	50,000 - 60,000	80%
<i>Schinus molle</i> var. <i>bancana</i>	April - August	Climbing tree, picking the fruit. Dry in the direct sunlight for 3-4 days. Collect seeds.	Air tight containers stored in the wet cold storage at 15°C and 60-80% relative humidity.	Up to 12 years storage only	300,000-400,000	40%
<i>Peronema canescens</i>	August - November	Climbing tree, picking the dry inflorescens. Crush in the dry bag under direct sunlight.	Air tight containers. Stored in dry cold storage room at 3-5°C and 40% relative humidity.	---	15,000 - 20,000	40%

Source: Seed and Seedling Section, General Cutting Directorate of Reforestation and Land Rehabilitation, Ministry of Forestry / 1989.



Attached Table 1-23 Seed Orchards in Indonesia

Kind of Seed Orchard	Tree Species	Location	Area (ha)	Established Year
Progency test seed orchard	Pinus merkusii	West Jawa	96	1978
		Central Jawa	96	1978
		East Jawa	96	1978
	Eucalyptus urophylla	South Sumatera	13	1982
		Yogyakarta	5	1983
		East Nusa Tenggara	16	1982
Mass selection seed orchard	Eucalyptus urophylla	South Sumatera	62	1981
		East Nusa Tenggara	109	1981
	Eucalyptus deglupta	South Sulawesi	10	1981

Source: Seed and Seed Production Selection,  
 Directorate General of Reforestation and Land  
 Rehabilitation, 1989.

The West Java Progeny Test Forest which is controlled by the Seed Production and Testing Technology Center in Bandung is located in the Chijambu National Forest to the north of Bandung. This progeny test forest consists of Pinus merkusii of over 13 years of age and the seeds collected in this forest undergo germination tests at the Seed Technology Center in Bogor.

In addition to seed orchards, Indonesia also has seed supply forests. There are a total of 15 of these forests in west Java covering a total area of some 950ha and supplying the seeds of Pinus merkusii and Tectona grandis, etc.

South Sumatera Province has 1 progeny test forest and 1 mass selection forest, both of which grow Eucalyptus urophylla.

According to information provided by the South Sumatera Seed Production and Testing Technology Center, a tree seed orchard growing Acacia mangium (12ha) has been newly established in South Sumatera Province in addition to those orchards already growing Eucalyptus urophylla. The Center has also established seed supply forests which include an Acacia mangium forest (300ha), a Eucalyptus urophylla forest (75ha) and a Eucalyptus deglupta forest (100ha). It plans to establish a cutting orchard (25ha) for Peronema canescens in 1990.

In the field of seed improvement, the Kaliurang Tree Improvement Center in the suburb of Yogyakarta is conducting tree improvement experiments through tissue culture in cooperation with the Faculty of Forestry of the University of Gadjahmada.

3) Seed and cutting production volumes

The seed production volumes for the 10 years between 1978 and 1988 and the planned seed production volumes for the 10 years between 1989 and 1999 are given in the following table. The planned production figures for the next 10 years generally show flat movement or an increase on the previous 10 years except in the case of Pinus merkusii and Acacia auriculiformis. The planned seed production volumes for the next 10 years, particularly for Acacia mangium, Eucalyptus deglupta and Peronema canescens, will be double those of the previous 10 years.

Attached Table 1-24 Amount of Seeds Produced and Planned to be Produced

Tree Species	Produced (1978-1988) Kg	Planned (1989-1999) Kg
Acacia mangium	2,000	5,000
Swietenia macrophylla	20,000	20,000
Eucalyptus urophylla	5,000	5,000
Albizia falcataria	10,000	15,000
Pinus merkusii	15,000	5,000
Eucalyptus deglupta	2,500	5,000
Acacia auriculiformis	3,000	2,500
Schima wallichii var. bancana	200	500
Peronema canescens	4,000,000*	8,000,000*

\* : Cutting

Source: Seed and Seedling Section, General Directorate of Reforestation and Land Rehabilitation, Ministry of Forestry

According to data provided by the Seed Production and Testing Technology Center in Bandung, the seed production volumes between Fiscal 1988 and Fiscal 1992 will be as shown in the following table. Excluding the seed production volume of Jati (teak; *Tectona grandis*) which is by far the largest of all the species, the production of 17.4 tons of seeds is planned for industrial plantation purposes upto the year 2000.

Attached Table 1-25 Seed Production Plan in West Jawa

Tree Species	Production (kg)					Total
	1988/1989	1989/1990	1990/1991	1991/1992	1992/1993	
1. Jati ( <i>Tectona grandis</i> )	72,709	64,457	52,635	184,890	25,039	399,730
2. Mahoni ( <i>Swietenia macrophylla</i> )	14,014	8,252	8,148	8,148	8,148	46,710
3. Pinus merkusii	1,057	951	886	845	832	4,571
4. Rasamala ( <i>Altingia excelsa</i> )	49	47	48	49	49	242
5. Damar ( <i>Agathis lorantifolia</i> )	345	168	125	-	-	-
6. Rotan ( <i>Callamus Sp</i> )	1,000	1,000	1,000	1,000	1,000	5,000
7. Acacia mangium	7.42	-	-	-	-	-
8. Lantoro gung ( <i>Leucaena leucophala</i> )	640	640	640	640	640	3,200
9. Calindra sp.	640	640	640	640	640	3,200
10. Gleresidea	640	640	640	640	640	3,200

Source: Bandung Seed Production and Testing Technology Center

The South Sumatera Seed Production and Testing Technology Center gives the following total seed production figures in South Sumatera Province upto the Fourth 5-Year Development Plan.

Acacia mangium : 1,780.88kg  
Eucalyptus urophylla : 148.75kg  
Eucalyptus deglupta : 12 kg

In comparison with the production performance in Fiscal 1988 (1988/89), the production plan for fiscal 1990 (1990/1991) shows a general increase except for Eucalyptus urophylla. The Center plans the production of 3,000kg of Dipterocarpaceae seeds and 500kg of Palaquium rostratum seeds in Fiscal 1990.

Attached Table 1-26 Seed Production Plan in South Sumatera

	1988/89 (kg)	1990/91 (kg)
E. deglupta	12.0	25.0
E. urophylla	62.5	50.0
A. mangium	835.5	1000.0

Source: South Sumatra Seed Production Experimental Center, report 1989

4) Seed exports and imports

In general, seed procurement not only in South Sumatera but also in Indonesia as a whole is conducted on a self-supply basis. However, the seeds of some species, including Eucalyptus spp. are imported. In comparison, the seeds of Leucaena leucocephala and Calliandra callothyrsus are exported to countries in Africa. The following table shows the seed exports and imports in 1988.

Attached Table 1-27 Export and Import of Seeds

Import			Export		
Tree Species	Quantity(kg)	Country	Tree Species	Quantity(kg)	Country
Eucalyptus Spp.	50	Brazil Australia Africa	Leucena leucocephala	200	Africa
Gmelina arborea	30	Malaysia	Calliandra callothyrsus	300	Africa
Pinus caribea	30	Netherland			
P. oocarpa	30	Netherland			

Based on 1989 data from: Seedling Section, General Directorate of Reforestation and Land Rehabilitation, Ministry of Forestry

## I-11 PREPARATION OF MAPS

### (1) Topographical Maps

#### 1) Methodology

The Survey Team collected the data and information listed below from the department of Forestry and made preparations for the subsequent work, including on-site pricking.

- aerial photographs (take in 1988, scale - 1: 20,000)
  - contract prints (1 each) 185 prints
  - twice enlarged prints (1 each) 185 prints
  - positive films (1 each) 185 copies
- orthophoto maps (drawn in 1981, scale - 1: 50,000)
  - sheets (1 each) 119 sheets
- field survey results (survey in 1981)
  - existing control points 22 points

#### a. On-site pricking

22 control points (Attached Fig. 1-12) were identified on-site using the 1988 aerial photographs of a scale of 1: 20,000 (Attached Table 1-30). Eccentric pricking was conducted at clearly recognizable points on the 1: 10,000 aerial photographs. The coordinates and heights were computed by measuring the eccentricity in accordance with Article 31 of the JICA Specifications for Overseas Mapping Projects.

#### b. Field verification

Field verification was conducted at the same time as on-site pricking. The selection of applicable items, surveys on place names unidentifiable in

aerial photo interpretation and identification of vegetation and administrative boundaries were conducted in accordance with the specified map symbol and the keys for phot interpretation required for mapping were determined. Prior to the field survey, the Survey Team conducted reconnaissance using aerial photographs and data in accordance with the items to be prepresented as agreed with the Indonesian side. The reconnaissance findings were verified on-site and represented in the photographs.

Attached Table 1-28 The Quantity of Models for Each Flight Run

RUN	Models	RUN	Models
10	2	71	6
20	5	80	12
21	0	81	0
30	9	90	10
40	11	100	12
41	0	110	11
50	11	120	10
51	0	130	9
60	7	140	7
61	7	150	7
70	8	160	5
		Total	149 model

2) Preparation of topographical maps

The topographic maps were prepared through the following process using existing data and the results of the on-site pricking and verification.



a. Aerial triangulation

Aerial triangulation was conducted on the positive films of the pricked aerial photographs (1:20,000) and the pass points, tie points and control points were measured using a precision plotting instrument. Following the block adjustment computation of independent models, the horizontal positions and heights of the pass points and other orientation elements were computed in accordance with articles 108 - 115 of the JICA Specifications for Overseas Mapping Projects. The adjustment computation of 149 models was conducted using the PAT-M43 Aerial Triangulation Block Adjustment Program.

Attached Table 1-29 Accuracy of Land Survey

Number of Model	Number of Benchmark		Residual Benchmark (Horizontal)		Residual Benchmark (Vertical)	
	Surface	Height	Standard Deviation	Maximum Error	Standard Deviation	Maximum Error
149	22	27	1,371 <sup>m</sup>	3,558 <sup>m</sup>	0.6769 <sup>m</sup>	1,670 <sup>m</sup>

Residuals of ground control points used for transformation from model coordinates to geodetic coordinates were planned to be less than 0.8 per mil of the flight height for both planimetry and altitude, and the maximum error to be less than 1.6 per mil of the flight height. The precision was given as Attached Table 1-29.

b. Plotting

o Method

Using aerial photographs (1:20,000) and the aerial triangulation and field survey results, restitution manuscripts were prepared by the Wild A-8 precision plotter on polyester bases at a scale of 1:20,000 with contours and other features represented as specified in Articles 119 -

126 of the JICA Specifications for Overseas Mapping Projects. A contour interval of 10m was adopted and the map sheet size was 120cm x 75cm (inside neat lines).

o Inspection

The following were inspected by the supervisor.

- plotting of control points
- residual parallax
- positions and heights of control points, elevation control points and pass points, etc.
- missing parts
- matching
- contours relative to elevation control points and errors in lines and figures
- notations

c. Cartography

o Method

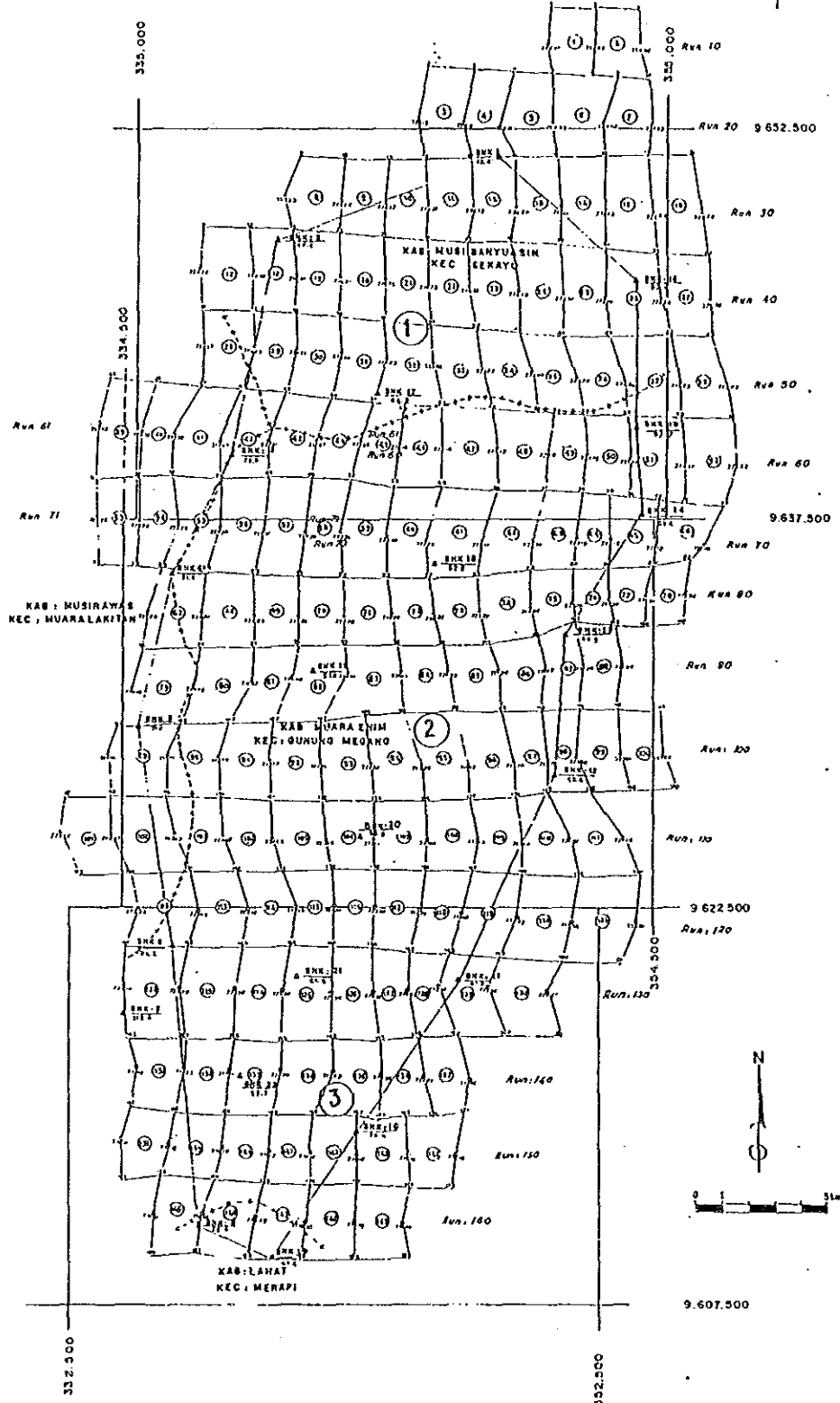
Topographic maps on a scale of 1:20,000 were prepared based on the restitution manuscripts. The specifications for map symbols and marginal information were as agreed with the Indonesian side.

o Inspection

The following were inspected by the supervisor.

- missing parts
- map symbols
- notations
- picture lines

TECHNICAL SPECIFICATION OF 1 : 20000 SCALED MAPPING  
 PROJECT IN SOUTH SUMATRA  
 AERIAL TRIANGULATION INDEX CHART

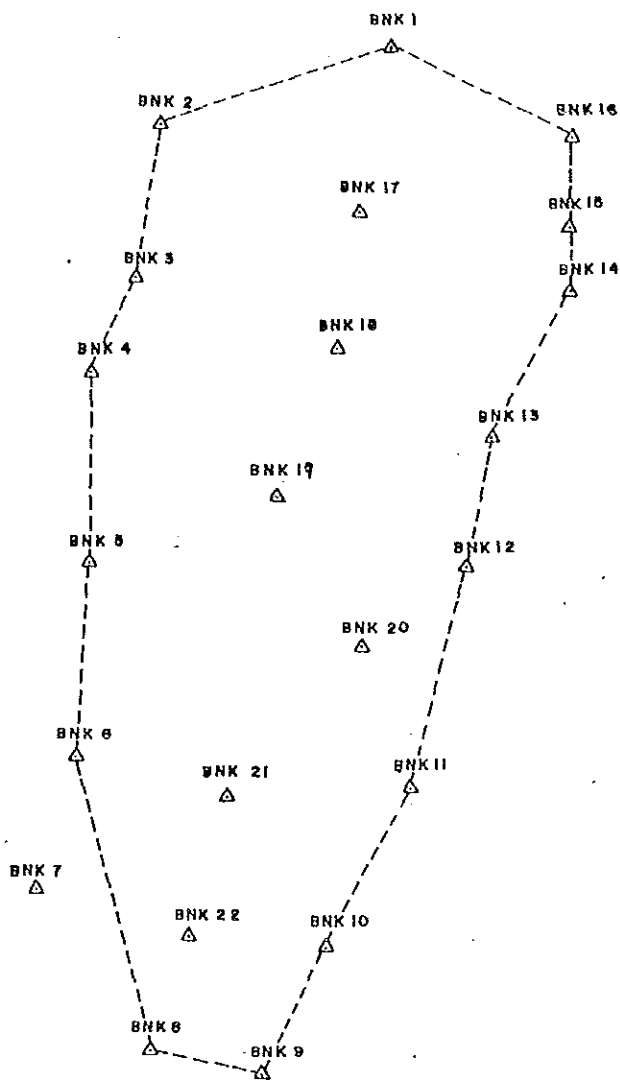


Attached Fig. 1-12 Aerial Triangulation Index Chart

Attached Table 1-30 Coordinate of Control Points (Benchmarks)  
in the Study Area

No.	BM	X (m)	Y (m)	Z (m)
1	BN.K 01	348,695,543	9,651,438,770	45,443
2	BN.K 02	340,193,740	9,648,233,790	67,371
3	BN.K 03	338,610,890	9,639,874,202	72,482
4	BN.K 04	336,380,660	9,635,467,709	81,099
5	BN.K 05	335,131,140	9,629,500,446	70,996
6	BN.K 06	336,539,300	9,621,031,050	94,245
7	BN.K 07	334,551,660	9,618,374,400	113,431
8	BN.K 08	337,524,090	9,610,484,320	70,385
9	BN.K 09	340,209,180	9,609,310,740	45,357
10	BN.K 10	343,411,370	9,613,998,040	75,430
11	BN.K 11	347,278,687	9,619,720,880	61,229
12	BN.K 12	350,833,400	9,627,592,222	47,372
13	BN.K 13	351,159,097	9,632,984,657	56,936
14	BN.K 14	354,104,167	9,637,699,896	55,577
15	BN.K 15	353,832,490	9,641,099,296	57,727
16	BN.K 16	353,776,972	9,646,754,742	57,378
17	BN.K 17	344,149,389	9,642,317,297	64,211
18	BN.K 18	346,370,957	9,636,326,242	62,753
19	BN.K 19	341,736,446	9,631,580,227	51,041
20	BN.K 20	343,514,440	9,625,273,790	58,883
21	BN.K 21	341,162,125	9,619,827,562	61,847
22	BN.K 22	339,022,750	9,616,141,610	87,694

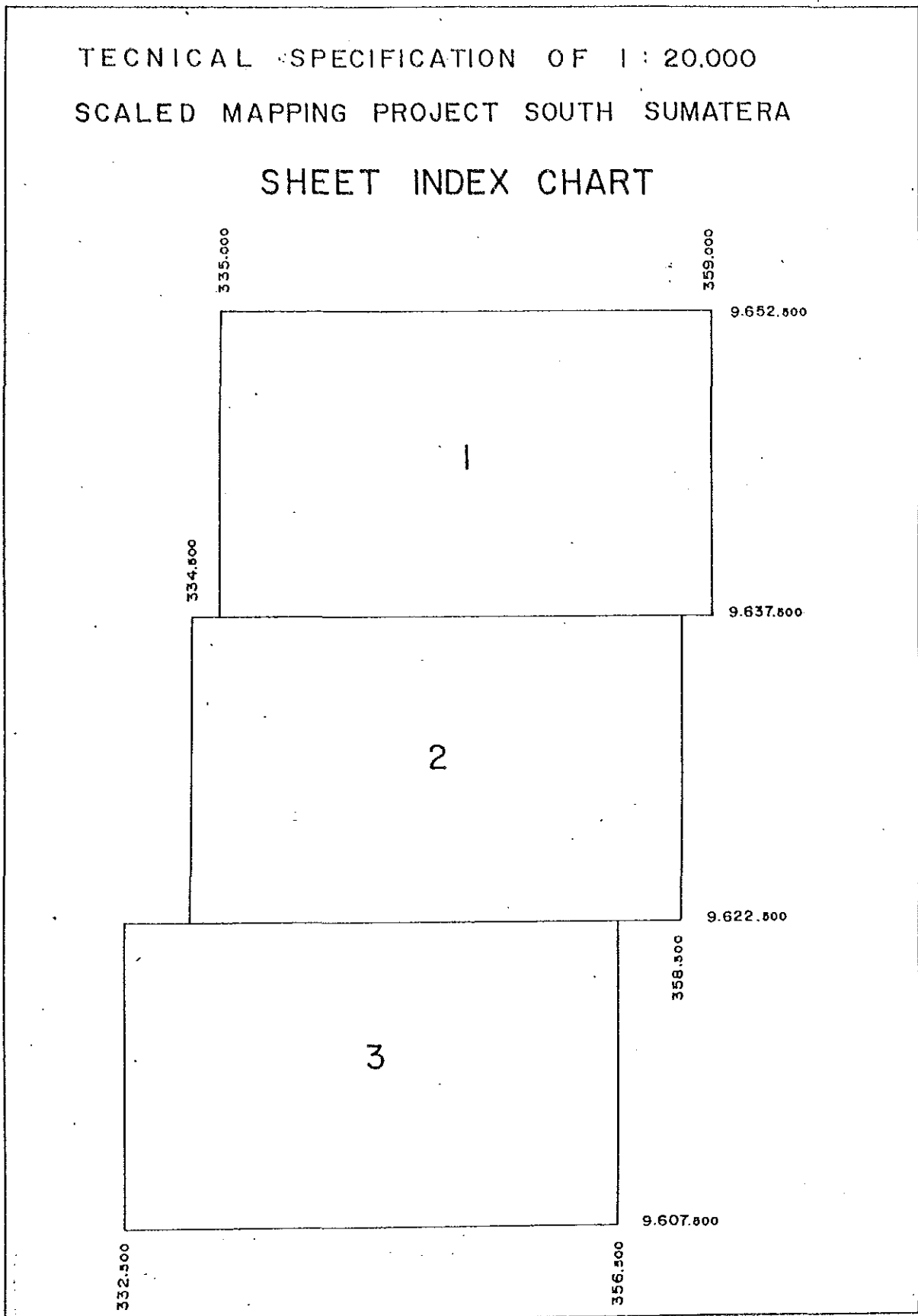
TECNICAL SPECIFICATION OF 1:20,000  
SCALED MAPPING PROJECT IN SOUTH SUMATERA  
CONTROL POINTS INDEX CHART



Attached Fig. 1-13 Control Points Index Chart

TECNICAL SPECIFICATION OF 1 : 20.000  
SCALED MAPPING PROJECT SOUTH SUMATERA

SHEET INDEX CHART



Attached Fig. 1-14 Sheet Index Chart

The actual preparation of the topographic maps was conducted by Aerokarto Indonesia Ltd. under the supervision of the Survey Team.

(2) Land Use/Vegetation Maps

1) Methodology

The land use/vegetation maps were prepared through the following process.

a. Determination of photo interpretation classification criteria

The land use and vegetation classification criteria were determined based on the existing data and field survey results.

b. Photo interpretation

In accordance with the classification criteria, the aerial photographs (1:20,000, taken in February, 1988) were interpreted for land use and vegetation classification.

The minimum unit size for interpretation was 5mm x 5mm (equivalent to 1ha) on the aerial photographs (1:20,000).

c. Field verification

The interpreted classifications were verified on-site and adjustments were made as required.

d. Preparation of manuscript maps

The classifications represented on the aerial photographs were transferred onto topographic maps (1:20,000) to prepare the manuscript maps.

e. Preparation of original maps

The original maps were prepared on polyester bases at a scale of 1:20,000 based on the manuscript maps which was modified to incorporate the field verification results.

2) Inspection

The actual preparation of the land use/vegetation maps was conducted by Aerokarto Indonesia Ltd. under the supervision of the Survey Team. The following were inspected by the supervisor.

- errors in classification boundary lines
- errors in transfer
- missing parts
- map symbols
- notations
- picture lines

(3) Soil Maps

1) Preparation of manuscript maps

The distribution tendency of each soil unit and the relationship between the soil unit distribution and the topographic characteristics were analyzed using both the soil survey results and the observation results of cuttings. The soil unit boundaries were then determined based on the findings of the above analysis



together with the topographic classifications made by aerial photo interpretation. These boundaries were transferred onto topographic maps (1:20,000) to prepare the manuscript soil maps.

2) Field verification

The manuscript maps were verified on-site by observing the cuttings and adjustments were made as required.

3) Preparation of original maps

The manuscript maps were transferred onto polyester bases to prepare the original soil maps.

The actual preparation of the soil maps was conducted by Aerokarto Indonesia Ltd. under the supervision of the Survey Team.

4) Inspection

The following were inspected by the supervisor.

- missing parts
- map symbols
- notations
- borderlines



## II. WORK PLANS AND PROJECT COST



## II-1 FOREST INVENTORY

The compartments and sub-compartments for each working unit have been decided as follows.

### 1) Compartments

Compartments have been decided using such topographical features as ridges and valleys, etc. as the main factors with the area of a single compartment being around 500 - 1,000ha.

### 2) Sub-Compartments

Sub-compartments have an area of less than 100ha and have been decided on the basis of topographical features. Sub-compartments are further divided in terms of the land use and vegetation.

The present conditions of the compartments and sub-compartments have been compiled in the Forest Inventory Book which is presented separately from the Report.

### 1) Current Land Use Conditions

The current land use conditions in each sub-compartment have been surveyed using the land use/vegetation maps and the area of each land use class has been determined.

### 2) Site Conditions

#### a. Altitude

The altitude of the central point in each sub-compartment has been determined in units of 10m using the already prepared topographic maps.

b. Aspect of Slope

The aspect of slope has been determined as the direction from the central point of a sub-compartment towards the lowest point of the same sub-compartment and has been expressed in one of 8 different directions.

c. Slope Inclination

The average inclination between the central and lowest points of a sub-compartment has been determined using the topographic maps and the slope inclination has been classified into the following 4 types.

Flat : 10° or less  
Gentle : 11° - 20°  
Medium : 21° - 30°  
Steep : 31° or more

d. Soil Type

The soil units with the highest proportion in a sub-compartment determined based on the soil map represents the soil type of that sub-compartment.

3) Current Forest Conditions

An entry in the current forest conditions column has only been made when the sub-compartment is currently forest.

a. Forest Type

All forests are classified as either man-made forest or secondary forests.

b. Species

The species are only recorded for man-made forests using the field survey results and data provided by the South Sumatera Provincial Forestry Service and others.

c. Proportion of Species

The proportion of species in man-made forests has been recorded based on the field survey results and other existing data.

d. Stand Age

The stand age of man-made forests has been estimated based on existing data and has been recorded.

e. Crown Density

The crown density of secondary forests has been recorded based on the land use and vegetation survey results and the crown density has been classified into the following 3 categories.

Sparce : 40m or less

Medium : 41% - 70%

Dense : 71% or more

f. Mean Total Height

The mean total height of man-made forests has been recorded based on the land use and vegetation survey results and the mean total height has been classified into the following 3 categories.

Low : 10m or less

Medium : 11m - 20m

High : 21m or more

g. Volume

The volume per ha in man-made forests has been decided in consideration of the species and stand age, in turn determined by the forest survey results and collected data. The volume per ha in secondary forests has been decided for each area of different crown density category based on the field survey results and interpreta-

tion of aerial photo interpretation. The total volume has been obtained by multiplying the volume per ha by the forest area.

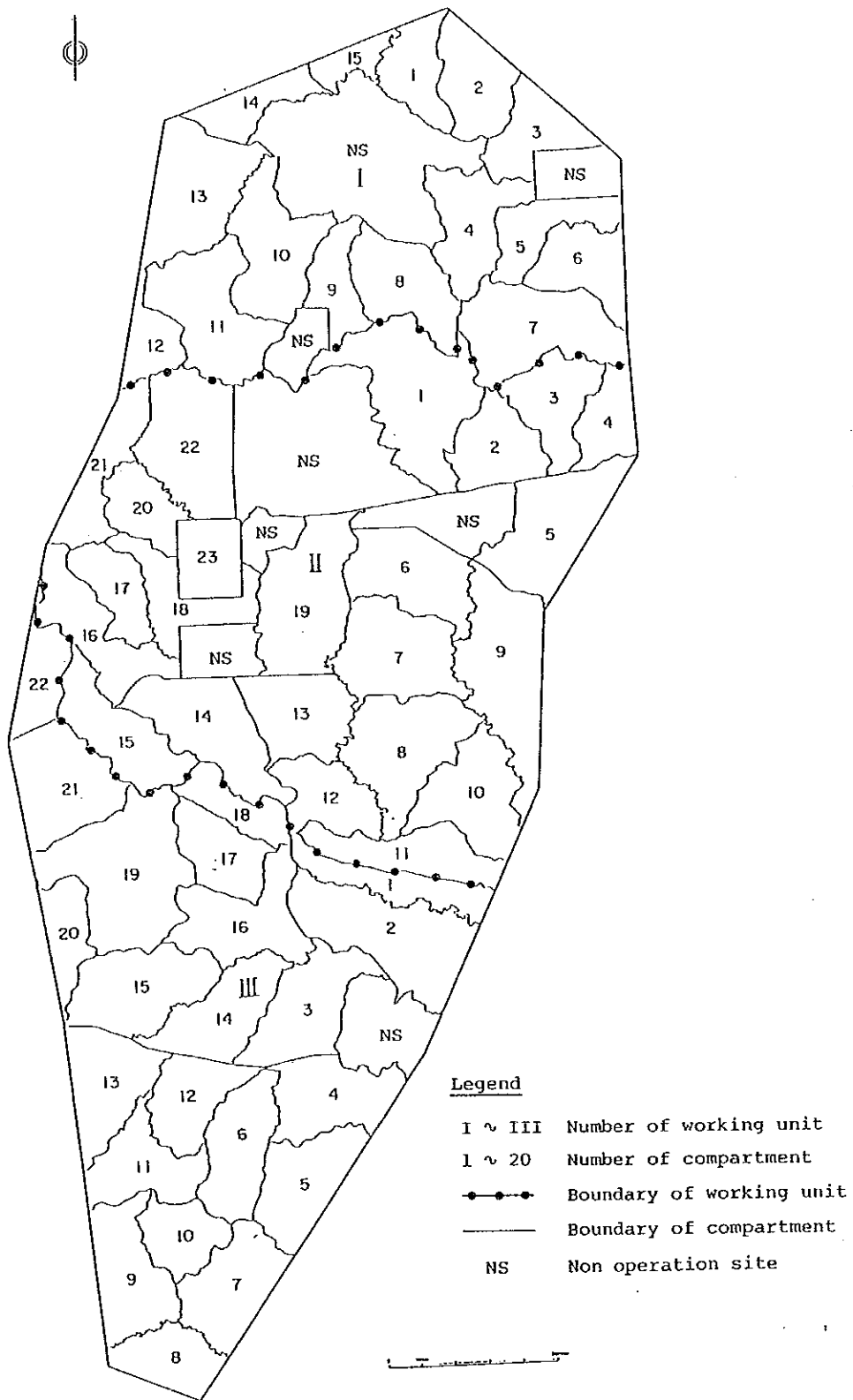
4) Forest Land Classification

The forests in each sub-compartment have been classified into the management types given below in accordance with the plantation plan.

Production forest	:	artificial regeneration	(P-1)
		natural regeneration	(P-2)
Conservation Forest	:	stream conservation	(C-1)
		soil conservation	(C-2)







Attached Fig. 2-1 Forest Compartment Map

II-2 GROWTH ESTIMATE

Attached Table 2-2 Yield Table of Albizia Falcataria

Site Class 3)	Year	Upper- height (m)	MAIN STAND (T.T.)						Thinnings (T.P.)			Total volume (Vol.T.T +T.P.) (m <sup>3</sup> /ha)	Mean annual incre- ment (m <sup>3</sup> /ha)	Current annual incre- ment (m <sup>3</sup> /ha)
			Number of trees/ha	1) %	Average height (m)	Average diameter (cm)	Basal area/h (m <sup>2</sup> )	Thick- wood/ha 2)	Thick- wood/ha	Thick- wood/ha	Tlw/ha (m <sup>3</sup> )			
I	2	4.5	1,240	67.8	2.4	5.3	2.7	5	-	-	5	2.5	-	
	3	8.6	995	39.6	6.7	8.1	5.2	20	2	2	22	7.3	17.0	
	4	12.4	790	30.8	10.8	10.7	7.3	38	8	10	48	12.0	26.0	
	5	15.8	610	27.5	14.4	13.8	9.1	60	15	25	85	17.0	37.0	
	6	19.3	465	25.8	17.8	16.9	10.4	82	24	49	131	21.8	46.0	
	7	22.1	360	25.6	20.8	19.9	11.2	102	36	85	187	26.7	56.0	
	8	24.3	280	26.4	23.2	23.1	11.7	119	46	131	250	31.2	63.0	
	9	26.0	230	27.2	25.0	25.8	12.0	132	50	181	313	34.8	63.0	
	10	27.3	190	28.6	26.6	28.7	12.3	144	53	234	378	37.8	65.0	
	11	28.4	170	29.0	27.8	30.9	12.8	152	54	288	440	40.0	62.0	
	12	29.4	160	28.9	28.6	32.5	13.3	161	53	341	502	41.8	62.0	
	II	2	7.2	1,075	45.6	5.2	7.2	4.4	14	-	-	14	7.0	-
3		12.2	800	31.1	10.4	10.6	7.0	38	7	7	45	15.0	31.0	
4		16.4	595	26.9	14.8	14.0	9.2	63	16	23	86	21.5	41.0	
5		20.0	440	25.6	18.7	17.5	10.6	87	28	51	138	27.6	52.0	
6		23.0	330	25.7	22.0	20.9	11.4	109	40	91	200	33.3	62.0	
7		25.5	250	26.7	24.5	24.7	12.0	128	50	141	269	38.4	69.0	
8		27.1	200	28.0	26.4	28.1	12.4	142	54	195	337	42.1	68.0	
9		28.5	170	28.9	27.8	31.0	12.8	154	54	249	403	44.8	66.0	
10		29.8	150	29.4	29.0	33.6	13.3	164	53	302	466	46.6	63.0	
11		30.7	140	29.6	30.0	35.3	13.7	172	51	353	525	47.7	59.0	
12		31.5	130	29.9	30.9	36.9	13.9	180	50	403	583	48.5	58.0	

Source: TABEL TEGAKAN SEPULUH JENIS KAYU INDUSTRI/1975/DEPARTEMEN PERTANIAN

- Note: 1) % = Average tree distance/Average tree height x 100  
 2) Thickwood volume is the volume of the lower portion of 7 cm in diameter.  
 3) Site class is categorized into 4 classes. Class I is the Lowest productivity.

Attached Table 2-3 Yield Table of Swietenia Macrophylla

Age (Year)	Upper-height (m)	Number of trees/ha	Main Stand				Thinning			Total Volume (m <sup>3</sup> /ha)	Mean annual increment (m <sup>3</sup> /ha)	Mean annual increment (m <sup>3</sup> /ha)	Age (Year)
			S%	Average height (m)	Average diameter (cm)	Basal area/ha (m <sup>2</sup> )	Thick wood/ha (m <sup>3</sup> )	Thick wood/ha (m <sup>3</sup> )	ΣVTw/ha (m <sup>3</sup> )				
5	6.1	2,405	35.9	4.8	6.7	4.2	4	1	1	5	1.0	1.0	5
10	10.4	1,545	26.2	9.2	10.1	9.3	39	10	11	50	5.0	9.0	10
15	13.7	1,065	24.0	12.6	12.8	13.2	75	19	30	105	7.0	11.0	15
20	16.5	780	23.3	15.5	17.1	16.4	112	29	59	171	8.6	13.2	20
25	19.0	575	23.6	18.0	22.0	19.4	149	40	99	248	9.9	15.4	25
30	21.3	450	23.8	20.3	26.5	22.1	188	45	144	332	11.1	16.8	30
35	23.4	365	24.0	22.4	31.1	24.0	227	45	189	416	11.9	16.8	35
40	25.0	305	24.6	24.2	35.1	26.6	262	43	232	494	12.3	15.6	40
45	26.7	265	24.7	25.9	38.9	28.3	294	40	272	566	12.6	14.4	45
50	28.0	230	25.3	27.2	41.8	29.8	323	38	310	633	12.7	13.4	50
55	29.0	210	25.6	28.3	44.1	31.2	348	36	346	694	12.6	12.2	55
60	29.9	190	26.1	29.0	45.6	32.2	368	34	380	748	12.5	10.8	60

Note: S% = Average tree distance / Average tree height x 100

Attached Table 2-4 Forest Survey Results in Plantation I at Benakat

Tree Species	Compartment No.	Planted			Treatment			Surveyed		
		Year	Spacing	Number of trees/ha	Weeding (times)	Others	Number of trees/ha	Mean D.B.H	Total height	
Acacia mangium	B-7	4/83	4x2	1,250	6	Thinning	812	14.1	19	
	B-12	1/84	3x2	1,666	5		1,375	12.5	19	
			4x2	1,250	5		975	13.9	19	
Acacia auriculiformis	B-6	1/83	4x2	1,250	6		865	10.7	13	
	A-8	11/81	4x2	1,250	4		337	10.7	13	
Albizia falcataria	A-1	12/80	4x2	1,250	3		887	15.2	17	
	B-2	12/81	4x2	1,250	3		1,068	13.6	16	
Peronema canescens	A-7	10/81	4x2	1,250	5		625	8.3	7	
			4x3	833	5		462	11.4	8	
	B-16	6 <sup>o</sup> 7/84	4x2	1,250	5		550	4.0	4	
Swietenia macrophylla	A-2	1/81	4x2	1,250	6		962	13.4	12	
	B-4	12/82	4x3	833	6		739	6.5	7	
		B-10	1 <sup>o</sup> 2/84	2x2	2,500	5		1,368	6.0	7
Schima wallichii var. bancana	A-6	12/81	4x1	2,500	5		2,012	7.0	9	
	B-5	3/83	4x2	1,250	7		1,093	9.8	11	

Attached Table 2-5 Increment and Production of  
Acacia Auriculiformis

Age (Year)	Height (m)	Diameter (cm)	Total production (m <sup>3</sup> /ha)	Current annual increment (m <sup>3</sup> /ha)	Mean annual increment (m <sup>3</sup> /ha)
4	9.8	6.6	18.0	-	5.0
5	12.4	9.0	70.0	52.0	13.0
6	14.0	11.4	110.0	42.0	18.0
7	15.2	13.3	145.0	33.0	21.0
8	16.2	15.1	171.0	23.0	23.0
9	17.0	16.6	192.0	15.0	23.0
10	17.6	18.0	210.0	8.0	21.0
11	17.8	19.0	224.0	5.0	20.0
12	18.0	20.0	236.0	3.0	17.0

Source: Vademecum Kehutanan Indonesia,  
Departemen Pertanian Direktorat Jenderal Kehutanan  
1976

Attached Table 2-6 Growth and Rotation Periods of Planting Species

Species	Mean annual increment	Rotation (years)	Age of assessment
<i>Acacia auriculiformis</i>	23.0		at year 8
<i>Acacia mangium</i>	26	8	
<i>Agathis loranthifolia</i>	20	50	
<i>Albizzia falcataria</i>	40	12-15	
<i>Anthocephalus cadamba</i>	12	24	
<i>Dalbergia latifolia</i>	20.4		at year 20
<i>Eucalyptus deglupta</i>	26	5	
	20	20	
<i>Pinus merkusii</i>	15-18	15	
<i>Sesbania grandiflora</i>	20-25	5-10	
<i>Swietenia macrophylla</i>	14.8		at year 35
<i>Tectona grandis</i>	12.8		at year 30

Source: APPANDI MANGUNDIKORO (1985): Pembangunan Timber Estate dan Masalahny, Proceeding Diskusi Kehutanan: Timber Estates, Industri Hasil no Kayu, Departement Kehutanan August 31, 1985

FAO/WORLD BANK COOPERATIVE PROGRAMME Investment Centre  
Forestry Project Plantation Management and Maintenance  
122/85 CP-INS-59 WP.2  
October 1985, Rome

II-3 PLANTING AREA BY YEAR

Attached Table 2-7 Planting Area by Year - Working Unit I

Year	First Group		Second Group/Third Group					Sub Total (ha)	F (ha)	Sub Total (ha)	Total (ha)
	A (ha)	B (ha)	C (ha)	D (ha)	E (ha)	F (ha)					
1	190.50	190.50	183.46	49.39	49.39	42.33	91.72	705.57			
2	317.64	317.64	305.87	82.35	82.35	70.59	152.94	1,176.44			
3	316.69	316.69	304.96	82.10	82.10	70.38	152.48	1,172.92			
4	332.18	332.18	319.88	86.12	86.12	73.82	159.94	1,230.30			
5	335.41	335.41	322.98	86.96	86.96	74.53	161.49	1,242.25			
6	315.90	315.90	304.21	81.90	81.90	70.20	152.10	1,170.01			
7	290.80	290.80	280.02	75.39	75.39	64.63	140.02	1,077.03			
8	278.73	278.73	268.41	72.26	72.26	61.95	134.21	1,032.34			
9	190.50	190.50	183.46	0.00	0.00	0.00	0.00	564.46			
10	317.64	317.64	305.87	0.00	0.00	0.00	0.00	941.15			
11	316.69	316.69	304.96	0.00	0.00	0.00	0.00	938.34			
12	332.18	332.18	319.88	0.00	0.00	0.00	0.00	984.24			
13	335.41	335.41	322.98	0.00	0.00	0.00	0.00	993.80			
14	315.90	315.90	304.21	0.00	0.00	0.00	0.00	936.01			
15	290.80	290.80	280.02	0.00	0.00	0.00	0.00	861.62			
16	373.98	373.98	360.14	0.00	0.00	0.00	0.00	1,108.10			
17	412.89	412.89	397.60	0.00	0.00	0.00	0.00	1,223.38			
18	316.69	316.69	304.96	0.00	0.00	0.00	0.00	938.34			
19	332.18	332.18	319.88	0.00	0.00	0.00	0.00	984.24			
20	335.41	335.41	322.98	0.00	0.00	0.00	0.00	993.80			
21	315.90	315.90	304.21	49.39	49.39	0.00	0.00	985.40			
22	290.80	290.80	280.02	82.35	82.35	0.00	0.00	943.97			
23	373.98	373.98	360.14	82.10	82.10	0.00	0.00	1,190.20			
24	412.89	412.89	397.60	86.12	86.12	0.00	0.00	1,309.50			
25	316.69	316.69	304.96	86.96	86.96	0.00	0.00	1,025.30			
26	332.18	332.18	319.88	81.90	81.90	0.00	0.00	1,066.14			
27	335.41	335.41	322.98	75.39	75.39	0.00	0.00	1,069.19			
28	315.90	315.90	304.21	72.26	72.26	0.00	0.00	1,008.27			
29	290.80	290.80	280.02	0.00	0.00	0.00	0.00	861.62			
30	373.98	373.98	360.14	0.00	0.00	0.00	0.00	1,108.10			
Total (ha)	9606.65	9606.65	9250.89	1232.94	616.47	528.43	1144.90	30,842.03			

A: *Acacia mangium* B: *Acacia auriculiformis* C: *Albizia falcataria*

D: *Peronema canescens* E: *Swietenia macrophylla* F: *Schinus molle* var. *bancana*



Attached Table 2-8 Planting Area by Year - Working Unit II

Year	First Group			Second Group			Third Group			Sub Total (ha)	Total (ha)
	A (ha)	B (ha)	C (ha)	Sub Total (ha)	D (ha)	E (ha)	F (ha)	Sub Total (ha)			
1	255.28	255.28	245.82	756.38	66.18	66.18	56.73	122.91	945.47		
2	314.99	314.99	303.33	933.31	81.66	81.66	70.01	151.67	1,166.64		
3	309.45	309.45	297.99	916.89	80.23	80.23	68.76	148.99	1,146.11		
4	324.15	324.15	312.15	960.45	84.04	84.04	72.03	156.07	1,200.56		
5	390.53	390.53	376.06	1157.12	101.25	101.25	86.78	188.03	1,446.40		
6	418.80	418.80	403.29	1240.89	108.58	108.58	93.06	201.64	1,551.11		
7	434.52	434.52	418.42	1287.46	112.65	112.65	96.57	209.22	1,609.33		
8	409.50	409.50	394.32	1213.32	106.17	106.17	90.99	197.16	1,516.65		
9	255.28	255.28	245.82	756.38	0.00	0.00	0.00	0.00	756.38		
10	314.99	314.99	303.33	933.31	0.00	0.00	0.00	0.00	933.31		
11	309.45	309.45	297.99	916.89	0.00	0.00	0.00	0.00	916.89		
12	324.15	324.15	312.15	960.45	0.00	0.00	0.00	0.00	960.45		
13	390.53	390.53	376.06	1157.12	0.00	0.00	0.00	0.00	1,157.12		
14	418.80	418.80	403.29	1240.89	0.00	0.00	0.00	0.00	1,240.89		
15	434.52	434.52	418.42	1287.46	0.00	0.00	0.00	0.00	1,287.46		
16	537.14	537.14	517.23	1591.51	0.00	0.00	0.00	0.00	1,591.51		
17	442.63	442.63	426.24	1311.50	0.00	0.00	0.00	0.00	1,311.50		
18	309.45	309.45	297.99	916.89	0.00	0.00	0.00	0.00	916.89		
19	324.15	324.15	312.15	960.45	0.00	0.00	0.00	0.00	960.45		
20	390.53	390.53	376.06	1157.12	0.00	0.00	0.00	0.00	1,157.12		
21	418.80	418.80	403.29	1240.89	66.18	66.18	0.00	0.00	1,307.07		
22	434.52	434.52	418.42	1287.46	81.66	81.66	0.00	0.00	1,369.12		
23	537.14	537.14	517.23	1591.51	80.23	80.23	0.00	0.00	1,671.74		
24	442.63	442.63	426.24	1311.50	84.04	84.04	0.00	0.00	1,395.54		
25	309.45	309.45	297.99	916.89	101.25	101.25	0.00	0.00	1,018.14		
26	324.15	324.15	312.15	960.45	108.58	108.58	0.00	0.00	1,069.03		
27	390.53	390.53	376.06	1157.12	112.65	112.65	0.00	0.00	1,269.77		
28	418.80	418.80	403.29	1240.89	106.17	106.17	0.00	0.00	1,347.06		
29	434.52	434.52	418.42	1287.46	0.00	0.00	0.00	0.00	1,287.46		
30	537.14	537.14	517.23	1591.51	0.00	0.00	0.00	0.00	1,591.51		
Total (ha)	11556.52	11556.52	11128.43	34241.47	1481.52	740.76	634.93	1375.69	37,098.68		

A: Acacia mangium B: Acacia auriculiformis C: Albizzia falcataria

D: Peronema canescens E: Swietenia macrophylla F: Schima wallichii var. bancana

Attached Table 2-9 Planting Area by Year - Working Unit III

Year	First Group			Second Group					Third Group			Total (ha)
	A (ha)	B (ha)	C (ha)	Sub Total (ha)	D (ha)	E (ha)	F (ha)	Sub Total (ha)	Total (ha)			
1	171.81	171.81	165.45	509.07	44.54	44.54	38.19	82.73	636.34			
2	295.20	295.20	284.26	874.66	76.53	76.53	65.60	142.13	1,093.32			
3	328.54	328.54	316.37	973.45	85.18	85.18	73.00	158.18	1,216.81			
4	313.27	313.27	301.68	928.22	81.22	81.22	69.61	150.83	1,160.27			
5	318.16	318.16	306.38	942.70	82.49	82.49	70.69	153.18	1,178.37			
6	330.48	330.48	318.24	979.20	85.68	85.68	73.44	159.12	1,224.00			
7	248.01	248.01	238.82	734.84	64.30	64.30	55.11	119.41	918.55			
8	232.12	232.12	223.54	687.78	60.18	60.18	51.58	111.76	859.72			
9	171.81	171.81	165.45	509.07	0.00	0.00	0.00	0.00	509.07			
10	295.20	295.20	284.26	874.66	0.00	0.00	0.00	0.00	874.66			
11	328.54	328.54	316.37	973.45	0.00	0.00	0.00	0.00	973.45			
12	313.27	313.27	301.68	928.22	0.00	0.00	0.00	0.00	928.22			
13	318.16	318.16	306.38	942.70	0.00	0.00	0.00	0.00	942.70			
14	330.48	330.48	318.24	979.20	0.00	0.00	0.00	0.00	979.20			
15	248.01	248.01	238.82	734.84	0.00	0.00	0.00	0.00	734.84			
16	318.03	318.03	306.26	942.32	0.00	0.00	0.00	0.00	942.32			
17	381.10	381.10	366.99	1129.19	0.00	0.00	0.00	0.00	1,129.19			
18	328.54	328.54	316.37	973.45	0.00	0.00	0.00	0.00	973.45			
19	313.27	313.27	301.68	928.22	0.00	0.00	0.00	0.00	928.22			
20	318.16	318.16	306.38	942.70	0.00	0.00	0.00	0.00	942.70			
21	330.48	330.48	318.24	979.20	44.54	44.54	0.00	0.00	1,023.74			
22	248.01	248.01	238.82	734.84	76.53	76.53	0.00	0.00	811.37			
23	318.03	318.03	306.26	942.32	85.18	85.18	0.00	0.00	1,027.50			
24	381.10	381.10	366.99	1129.19	81.22	81.22	0.00	0.00	1,210.41			
25	328.54	328.54	316.37	973.45	82.49	82.49	0.00	0.00	1,055.94			
26	313.27	313.27	301.68	928.22	85.68	85.68	0.00	0.00	1,013.90			
27	318.16	318.16	306.38	942.70	64.30	64.30	0.00	0.00	1,007.00			
28	330.48	330.48	318.24	979.20	60.18	60.18	0.00	0.00	1,039.38			
29	248.01	248.01	238.82	734.84	0.00	0.00	0.00	0.00	734.84			
30	318.03	318.03	306.26	942.32	0.00	0.00	0.00	0.00	942.32			
Total (ha)	9036.27	9036.27	8701.68	26774.22	1160.24	580.12	497.22	1077.34	29,011.80			

A: Acacia mangium B: Acacia auriculiformis C: Albizzia falcataria

D: Peronema canescens E: Swietenia macrophylla F: Schima wallichii var. barcana

II-4 NURSERY STOCK PRODUCTION PLAN BY YEAR

Attached Table 2-10 Nursery Stock Production Plan by Year - Working Unit I

Year	First Group					Second Group Third Group					Total	
	A (1,000 pets)	B (1,000 pets)	C (1,000 pets)	(1,000 pets)	Sub Total (1,000 pets)	D (1,000 pets)	E (1,000 pets)	F (1,000 pets)	(1,000 pets)	Sub Total (1,000 pets)	(1,000 pets)	(1,000 pets)
1	264.3	264.3	254.6	783.2	68.5	68.5	58.7	127.2	978.9			
2	440.7	440.7	424.4	1305.8	114.3	114.3	97.9	212.2	1,632.3			
3	439.4	439.4	423.1	1301.9	113.9	113.9	97.7	211.6	1,627.4			
4	460.9	460.9	443.8	1365.6	119.5	119.5	102.4	221.9	1,707.0			
5	465.4	465.4	448.1	1378.9	120.7	120.7	103.4	224.1	1,723.7			
6	438.3	438.3	422.1	1298.7	113.6	113.6	97.4	211.0	1,623.3			
7	403.5	403.5	388.5	1195.5	104.6	104.6	89.7	194.3	1,494.4			
8	386.7	386.7	372.4	1145.8	100.3	100.3	86.0	186.3	1,432.4			
9	264.3	264.3	254.6	783.2	0.0	0.0	0.0	0.0	783.2			
10	440.7	440.7	424.4	1305.8	0.0	0.0	0.0	0.0	1,305.8			
11	439.4	439.4	423.1	1301.9	0.0	0.0	0.0	0.0	1,301.9			
12	460.9	460.9	443.8	1365.6	0.0	0.0	0.0	0.0	1,365.6			
13	465.4	465.4	448.1	1378.9	0.0	0.0	0.0	0.0	1,378.9			
14	438.3	438.3	422.1	1298.7	0.0	0.0	0.0	0.0	1,298.7			
15	403.5	403.5	388.5	1195.5	0.0	0.0	0.0	0.0	1,195.5			
16	518.9	518.9	499.7	1537.5	0.0	0.0	0.0	0.0	1,537.5			
17	572.9	572.9	551.7	1697.5	0.0	0.0	0.0	0.0	1,697.5			
18	439.4	439.4	423.1	1301.9	0.0	0.0	0.0	0.0	1,301.9			
19	460.9	460.9	443.8	1365.6	0.0	0.0	0.0	0.0	1,365.6			
20	465.4	465.4	448.1	1378.9	0.0	0.0	0.0	0.0	1,378.9			
21	438.3	438.3	422.1	1298.7	68.5	68.5	0.0	0.0	1,367.2			
22	403.5	403.5	388.5	1195.5	114.3	114.3	0.0	0.0	1,309.8			
23	518.9	518.9	499.7	1537.5	113.9	113.9	0.0	0.0	1,651.4			
24	572.9	572.9	551.7	1697.5	119.5	119.5	0.0	0.0	1,817.0			
25	439.4	439.4	423.1	1301.9	120.7	120.7	0.0	0.0	1,422.6			
26	460.9	460.9	443.8	1365.6	113.6	113.6	0.0	0.0	1,479.2			
27	465.4	465.4	448.1	1378.9	104.6	104.6	0.0	0.0	1,483.5			
28	438.3	438.3	422.1	1298.7	100.3	100.3	0.0	0.0	1,399.0			
29	403.5	403.5	388.5	1195.5	0.0	0.0	0.0	0.0	1,195.5			
30	518.9	518.9	499.7	1537.5	0.0	0.0	0.0	0.0	1,537.5			
Total (1,000 pets)	13,329.2	13,329.2	12,835.3	39,493.7	1,710.8	855.4	733.2	1,588.6	42,793.1			

A: *Acacia mangium* B: *Acacia auriculiformis* C: *Albizia falcataria*  
D: *Peronema canescens* E: *Swietenia macrophylla* F: *Schinus molle* var. *baccata*

Attached Table 2-11 Nursery Stock Production Plan by Year - Working Unit II

Year	First Group					Second Group					Third Group					Total	
	A (1,000 pots)	B (1,000 pots)	C (1,000 pots)	D (1,000 pots)	E (1,000 pots)	F (1,000 pots)	G (1,000 pots)	H (1,000 pots)	I (1,000 pots)	J (1,000 pots)	K (1,000 pots)	L (1,000 pots)	M (1,000 pots)	N (1,000 pots)	O (1,000 pots)	P (1,000 pots)	Sub Total (1,000 pots)
1	354.2	354.2	341.1	1049.5	91.8	91.8	91.8	78.7	170.5	1,311.8							
2	437.0	437.0	420.9	1294.9	113.3	113.3	113.3	97.1	210.4	1,618.6							
3	429.4	429.4	413.5	1272.3	111.3	111.3	111.3	95.4	206.7	1,590.3							
4	449.8	449.8	433.1	1332.7	116.6	116.6	116.6	99.9	216.5	1,665.8							
5	541.9	541.9	521.8	1605.6	140.5	140.5	140.5	120.4	260.9	2,007.0							
6	581.1	581.1	559.6	1721.8	150.7	150.7	150.7	129.1	279.8	2,152.3							
7	602.9	602.9	580.6	1786.4	156.3	156.3	156.3	134.0	290.3	2,233.0							
8	568.2	568.2	547.1	1683.5	147.3	147.3	147.3	126.2	273.5	2,104.3							
9	354.2	354.2	341.1	1049.5	0.0	0.0	0.0	0.0	0.0	1,049.5							
10	437.0	437.0	420.9	1294.9	0.0	0.0	0.0	0.0	0.0	1,294.9							
11	429.4	429.4	413.5	1272.3	0.0	0.0	0.0	0.0	0.0	1,272.3							
12	449.8	449.8	433.1	1332.7	0.0	0.0	0.0	0.0	0.0	1,332.7							
13	541.9	541.9	521.8	1605.6	0.0	0.0	0.0	0.0	0.0	1,605.6							
14	581.1	581.1	559.6	1721.8	0.0	0.0	0.0	0.0	0.0	1,721.8							
15	602.9	602.9	580.6	1786.4	0.0	0.0	0.0	0.0	0.0	1,786.4							
16	745.3	745.3	717.7	2208.3	0.0	0.0	0.0	0.0	0.0	2,208.3							
17	614.1	614.1	591.4	1819.6	0.0	0.0	0.0	0.0	0.0	1,819.6							
18	429.4	429.4	413.5	1272.3	0.0	0.0	0.0	0.0	0.0	1,272.3							
19	449.8	449.8	433.1	1332.7	0.0	0.0	0.0	0.0	0.0	1,332.7							
20	541.9	541.9	521.8	1605.6	0.0	0.0	0.0	0.0	0.0	1,605.6							
21	581.1	581.1	559.6	1721.8	91.8	91.8	91.8	0.0	0.0	1,813.6							
22	602.9	602.9	580.6	1786.4	113.3	113.3	113.3	0.0	0.0	1,899.7							
23	745.3	745.3	717.7	2208.3	111.3	111.3	111.3	0.0	0.0	2,319.6							
24	614.1	614.1	591.4	1819.6	116.6	116.6	116.6	0.0	0.0	1,936.2							
25	429.4	429.4	413.5	1272.3	140.5	140.5	140.5	0.0	0.0	1,412.8							
26	449.8	449.8	433.1	1332.7	150.7	150.7	150.7	0.0	0.0	1,483.4							
27	541.9	541.9	521.8	1605.6	156.3	156.3	156.3	0.0	0.0	1,761.9							
28	581.1	581.1	559.6	1721.8	147.3	147.3	147.3	0.0	0.0	1,869.1							
29	602.9	602.9	580.6	1786.4	0.0	0.0	0.0	0.0	0.0	1,786.4							
30	745.3	745.3	717.7	2208.3	0.0	0.0	0.0	0.0	0.0	2,208.3							
Total (1,000 pots)	16,035.1	16,035.1	15,441.4	47,511.6	2,055.6	2,055.6	2,055.6	880.8	1,908.6	51,475.8							

A: Acacia mangium B: Acacia auriculiformis C: Albizzia falcataria  
D: Peronema caescens E: Swietenia macrophylla F: Schima wallichii var. bancana

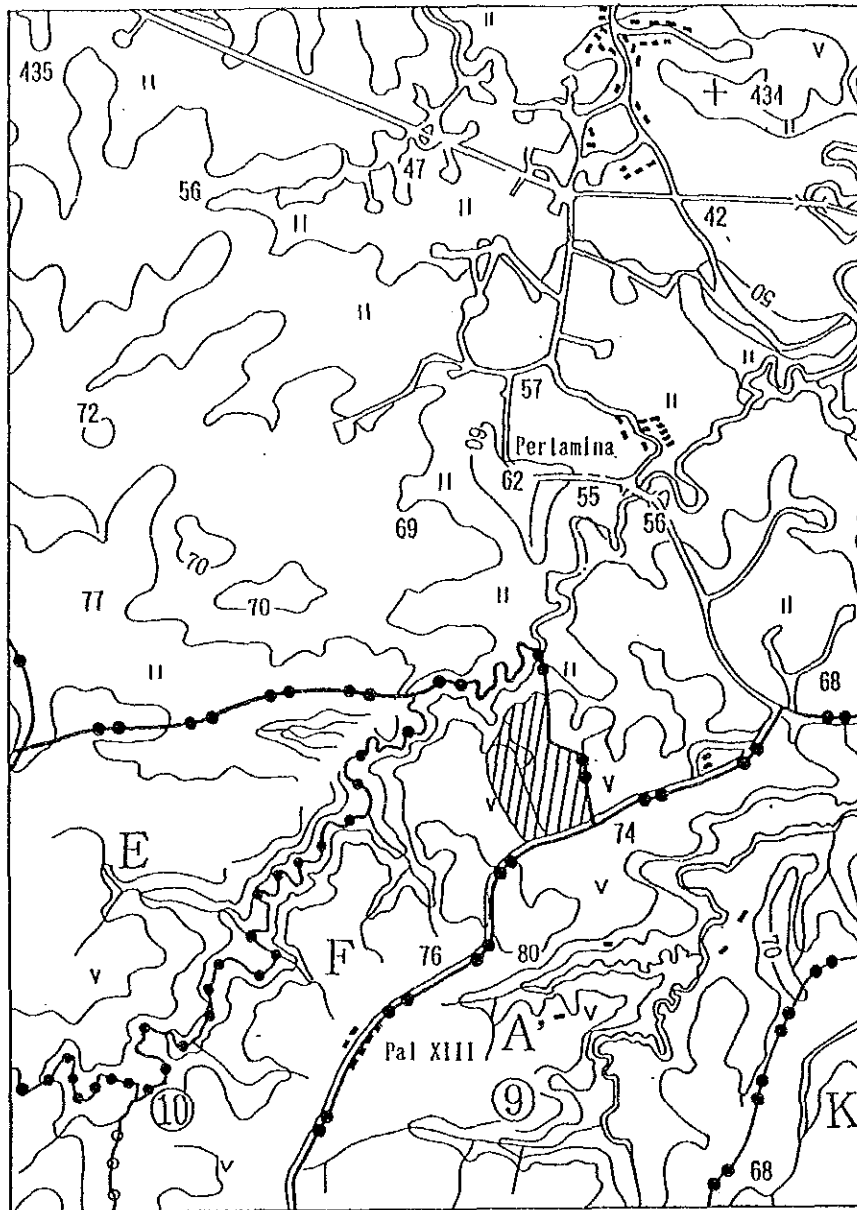
Attached Table 2-12 Nursery Stock Production Plan by Year - Working Unit III

Year	First Group			Second Group			Third Group			Sub Total (1,000 pots)	Sub Total (1,000 pots)	Sub Total (1,000 pots)	Total (1,000 pots)
	A (1,000 pots)	B (1,000 pots)	C (1,000 pots)	D (1,000 pots)	E (1,000 pots)	F (1,000 pots)	G (1,000 pots)	H (1,000 pots)	I (1,000 pots)				
1	238.4	238.4	229.6	706.4	61.8	61.8	53.0	114.8	883.0				
2	409.6	409.6	394.4	1213.6	106.2	106.2	91.0	197.2	1,517.0				
3	455.8	455.8	439.0	1350.6	118.2	118.2	101.3	219.5	1,688.3				
4	434.7	434.7	418.6	1288.0	112.7	112.7	96.6	209.3	1,610.0				
5	441.4	441.4	425.1	1307.9	114.5	114.5	98.1	212.6	1,635.0				
6	458.5	458.5	441.6	1358.6	118.9	118.9	101.9	220.8	1,698.3				
7	344.1	344.1	331.4	1019.6	89.2	89.2	76.5	165.7	1,274.5				
8	322.1	322.1	310.2	954.4	83.5	83.5	71.6	155.1	1,193.0				
9	238.4	238.4	229.6	706.4	0.0	0.0	0.0	0.0	706.4				
10	409.6	409.6	394.4	1213.6	0.0	0.0	0.0	0.0	1,213.6				
11	455.8	455.8	439.0	1350.6	0.0	0.0	0.0	0.0	1,350.6				
12	434.7	434.7	418.6	1288.0	0.0	0.0	0.0	0.0	1,288.0				
13	441.4	441.4	425.1	1307.9	0.0	0.0	0.0	0.0	1,307.9				
14	458.5	458.5	441.6	1358.6	0.0	0.0	0.0	0.0	1,358.6				
15	344.1	344.1	331.4	1019.6	0.0	0.0	0.0	0.0	1,019.6				
16	441.3	441.3	424.9	1307.5	0.0	0.0	0.0	0.0	1,307.5				
17	528.8	528.8	509.2	1566.8	0.0	0.0	0.0	0.0	1,566.8				
18	455.8	455.8	439.0	1350.6	0.0	0.0	0.0	0.0	1,350.6				
19	434.7	434.7	418.6	1288.0	0.0	0.0	0.0	0.0	1,288.0				
20	441.4	441.4	425.1	1307.9	0.0	0.0	0.0	0.0	1,307.9				
21	458.5	458.5	441.6	1358.6	61.8	61.8	0.0	0.0	1,420.4				
22	344.1	344.1	331.4	1019.6	106.2	106.2	0.0	0.0	1,125.8				
23	441.3	441.3	424.9	1307.5	118.2	118.2	0.0	0.0	1,425.7				
24	528.8	528.8	509.2	1566.8	112.7	112.7	0.0	0.0	1,679.5				
25	455.8	455.8	439.0	1350.6	114.5	114.5	0.0	0.0	1,465.1				
26	434.7	434.7	418.6	1288.0	118.9	118.9	0.0	0.0	1,406.9				
27	441.4	441.4	425.1	1307.9	89.2	89.2	0.0	0.0	1,397.1				
28	458.5	458.5	441.6	1358.6	83.5	83.5	0.0	0.0	1,442.1				
29	344.1	344.1	331.4	1019.6	0.0	0.0	0.0	0.0	1,019.6				
30	441.3	441.3	424.9	1307.5	0.0	0.0	0.0	0.0	1,307.5				
Total (1,000 pots)	12,537.6	12,537.6	12,074.1	37,149.3	1,610.0	805.0	690.0	1,495.0	40,254.3				

A: Acacia mangium B: Acacia auriculiformis C: Albizzia falcataria

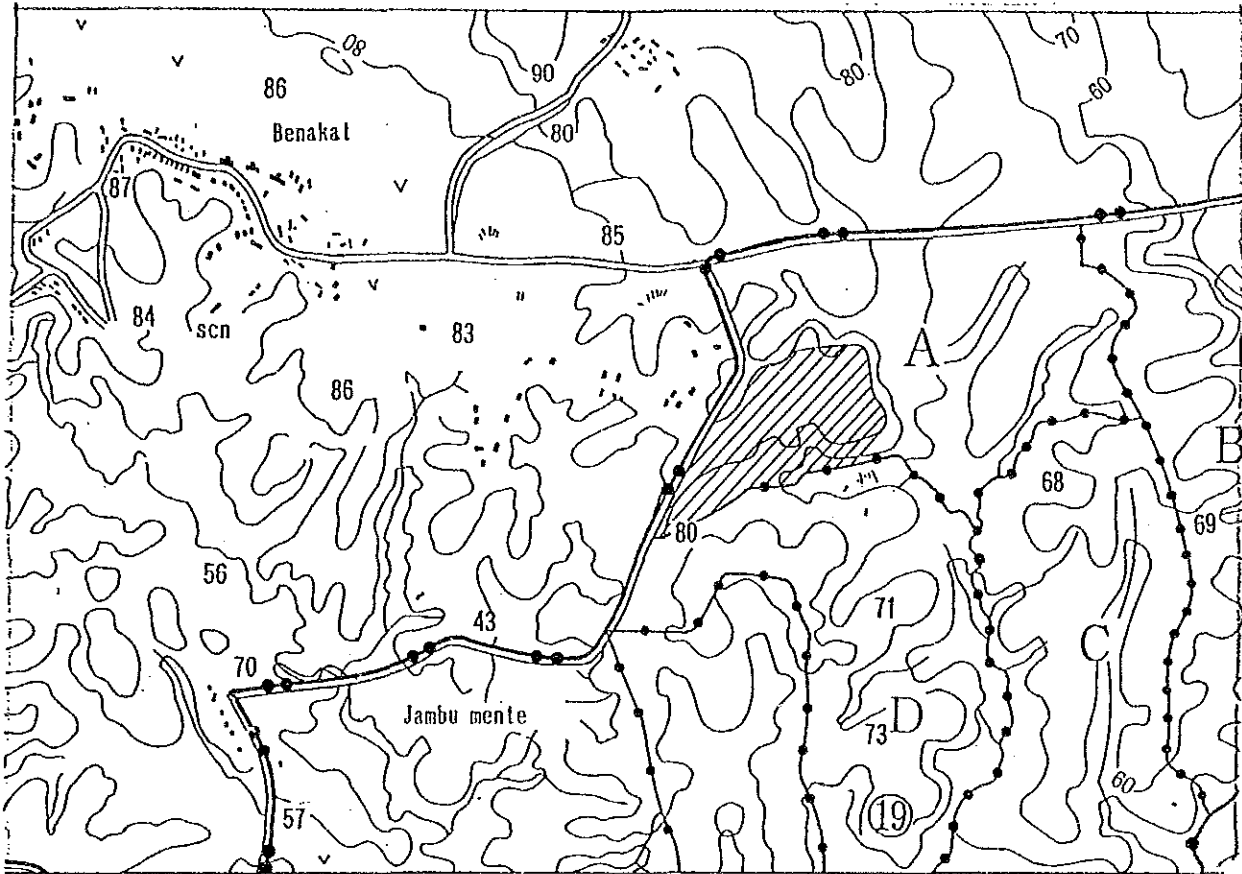
D: Peronema canescens E: Swietenia macrophylla F: Schima wallichii var. bancana

II-5 PLANNED NURSERY SITE IN WORKING UNIT



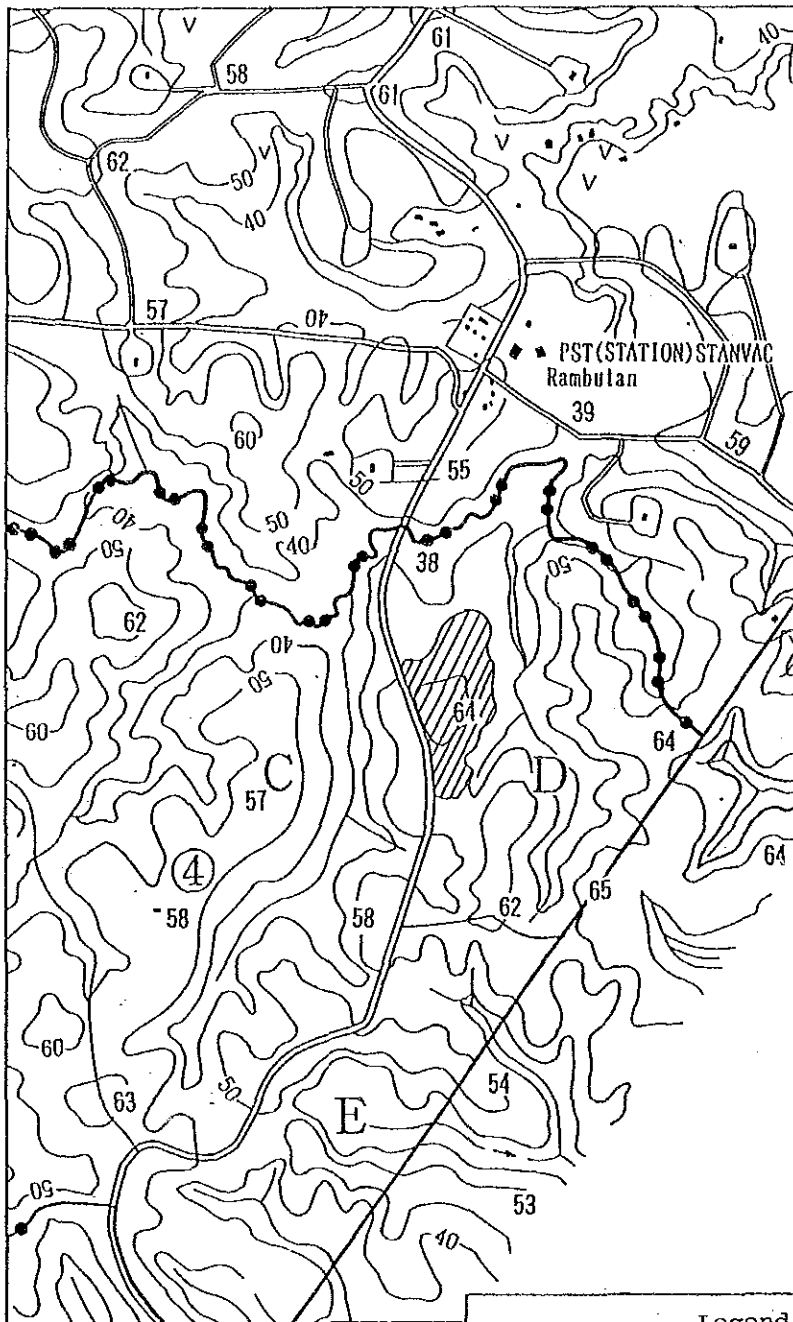
Legend	
	Boundary of compartment
	Boundary of subcompartment
	Number of compartment
	Number of subcompartment
	Public road
	Oil facility
	Settlements
	Planned nursery site

Attached Fig. 2-2 Planned Nursery Site in Working Unit I



Legend	
	Boundary of compartment
	Boundary of subcompartment
	Number of compartment
	Number of subcompartment
	Public road
	Oil facility
	Settlements
	Planned nursery site

Attached Fig. 2-3 Planned Nursery Site in Working Unit II



Legend	
	Boundary of compartment
	Boundary of subcompartment
	Number of compartment
	Number of subcompartment
	Public road
	Oil facility
	Settlements
	Planned nursery site

Attached Fig. 2-4 Planned Nursery Site in Working Unit III



II-6 AMOUNT OF MATERIALS AND INPUTS

- (1) Nursery Stock Production Plan
- (2) Plantation Plan
- (3) Forest Protection Plan
- (4) Forest Road Plan
- (5) Felling Plan
- (6) Skidding and Transportation Plan
- (7) Repair Shop Plan
- (8) Marketing Plan
- (9) Administration and Other General Plan

(1)-1 Nursery Stock Production Plan  
(Facility Installment)

Year Items	Warehouse (m <sup>2</sup> )	Fertilizer storage room (m <sup>2</sup> )	Work house (m <sup>2</sup> )	Water storage tank (tank)
1	680	90	275	10
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	10
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	680	90	275	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

(1)-2 Nursery Stock Production Plan  
(Machinery)

Year / Items	Air conditioner (air conditioner)	Soil heater (heater)	Belt conveyor (conveyor)	Mixer (mixer)	Water pump (pump)	Plastic hose (m)	Hand sprayer (sprayer)
1	3	3	3	2	3	800	15
2	0	0	0	1	0	0	0
3	0	0	0	1	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	3	3	2	0	0	15
7	3	0	0	1	3	800	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
11	0	0	0	1	0	0	15
12	0	0	0	1	0	0	0
13	3	3	3	0	3	800	0
14	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0
16	0	3	3	2	0	0	15
17	0	0	0	1	0	0	0
18	0	0	0	0	0	0	0
19	3	0	0	0	3	800	0
20	0	0	0	0	0	0	0
21	0	3	3	1	0	0	15
22	0	0	0	1	0	0	0
23	0	0	0	1	0	0	0
24	0	0	0	0	0	0	0
25	3	0	0	0	3	800	0
26	0	3	3	0	0	0	15
27	0	0	0	1	0	0	0
28	0	0	0	1	0	0	0
29	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0

(1)-3 Nursery Stock Production Plan  
(Fuel and Lubricant, Amount of Work)

Year/ Items	Fuel ( £ )	Year/ Items (man-day)		Labour	Total
		Foreman	Labour		
1	346.6	2,137	21,359		23,496
2	520.9	3,209	32,084		35,292
3	534.7	3,304	33,013		36,317
4	544.0	3,353	33,532		36,885
5	585.9	3,612	36,107		39,719
6	597.4	3,634	36,337		40,521
7	546.2	3,368	33,680		37,026
8	516.0	3,183	31,829		35,012
9	240.5	1,708	17,087		18,795
10	360.9	2,568	25,668		28,236
11	495.1	2,642	26,412		29,054
12	377.3	2,684	26,827		29,511
13	406.5	2,889	28,885		31,774
14	414.2	2,948	29,471		32,418
15	379.0	2,695	26,927		29,622
16	479.6	3,401	34,006		37,407
17	481.3	3,422	34,214		37,636
18	495.1	2,642	26,412		29,054
19	377.3	2,684	26,827		29,511
20	406.5	2,889	28,885		31,774
21	414.2	3,098	30,966		34,064
22	379.0	2,919	29,173		32,092
23	479.6	3,633	36,316		39,949
24	481.3	3,656	36,561		40,217
25	495.1	2,895	28,949		31,835
26	377.3	2,941	29,405		32,346
27	406.5	3,124	31,241		34,365
28	414.2	3,171	31,699		34,870
29	379.0	2,695	26,927		29,622
30	479.6	3,401	34,006		37,407

(1)-4 Nursery Stock Production Plan  
(Materials)

Year/ Items	Germination cost	Fungicide ( l )	Fertilizer (kg)	Sand (m <sup>3</sup> )	Plastic pot (sheet)	Seed A (kg)	Seed B (kg)	Seed C (kg)	Shading net (sheet)
1	3,941	19	443	50.4	3,173.7	20.7	27.1	170.0	50
2	5,920	28	666	75.8	4,767.9	31.1	40.8	251.0	25
3	6,090	29	685	77.8	4,906.0	32.0	42.0	258.2	3
4	6,188	30	697	79.1	4,982.8	32.5	42.6	262.3	51
5	6,664	32	750	85.2	5,365.7	35.0	45.9	282.5	31
6	6,796	33	765	86.9	5,473.9	35.7	46.8	288.1	4
7	6,212	30	699	79.4	5,001.9	32.7	42.8	263.2	44
8	5,875	28	651	75.0	4,729.7	30.9	40.5	248.9	27
9	2,738	13	353	35.0	2,639.1	20.7	27.1	0.0	0
10	4,111	20	532	52.5	3,814.3	31.1	40.8	0.0	33
11	5,628	27	549	72.0	3,924.8	30.9	42.6	0.0	29
12	4,297	21	557	54.9	3,986.3	32.5	45.9	0.0	1
13	4,628	22	600	59.1	4,292.4	35.0	46.8	0.0	38
14	4,719	23	612	60.2	4,379.1	35.7	42.8	0.0	30
15	4,315	21	559	55.1	4,001.5	32.7	40.5	0.0	0
16	5,452	26	707	69.8	5,053.3	41.3	54.0	0.0	50
17	5,428	26	710	70.0	5,083.9	41.5	54.4	0.0	31
18	5,629	27	549	72.0	3,924.8	30.9	42.0	0.0	0
19	4,297	21	557	54.9	3,986.3	32.5	42.6	0.0	32
20	4,628	22	595	59.1	4,292.4	35.0	45.9	0.0	35
21	4,719	23	642	60.2	4,601.2	35.7	46.8	0.0	5
22	4,315	21	606	55.1	4,335.3	32.7	42.8	0.0	28
23	5,452	26	754	69.8	5,396.7	41.3	54.0	0.0	52
24	5,481	26	760	70.0	5,432.7	41.5	54.4	0.0	6
25	5,629	27	601	72.0	4,300.5	32.0	42.0	0.0	10
26	4,297	21	611	54.9	4,369.5	32.5	42.6	0.0	53
27	4,628	22	648	59.1	4,642.5	35.0	45.9	0.0	11
28	4,719	23	657	60.2	4,710.5	35.7	46.8	0.0	11
29	4,315	21	559	55.1	4,001.5	32.7	42.8	0.0	42
30	5,452	26	707	69.8	5,053.3	41.3	54.0	0.0	27

A: *Acacia auriculiformis* B: *Albizia falcataria* C: *Swietenia macrophylla*

(2)-1 Plantation Plan (Machinery)

Year/ Items	Land Preparation		Attachment		Weeding	
	Farm tractor purchase	Lease	Total	Land clearing		Plowing
1	9	0	9	3	5	42
2	4	0	4	3	3	63
3	0	0	0	3	6	74
4	0	0	0	3	3	69
5	1	0	1	3	6	80
6	0	1	1	3	3	76
7	0	0	0	2	5	77
8	0	0	0	3	2	66
9	0	0	0	0	1	43
10	5	0	5	3	2	54
11	1	0	1	1	1	48
12	1	0	1	2	2	56
13	1	0	1	3	1	53
14	0	0	0	2	2	62
15	0	0	0	2	1	50
16	2	0	2	3	3	70
17	0	0	0	3	0	64
18	2	0	2	1	3	55
19	1	0	1	2	0	50
20	3	0	3	3	3	59
21	0	1	1	3	0	58
22	0	0	0	1	4	59
23	2	0	2	6	0	73
24	0	2	2	0	4	75
25	0	0	0	6	0	58
26	2	0	2	0	2	61
27	2	0	2	6	1	64
28	2	1	3	0	2	65
29	0	0	0	4	1	55
30	0	2	2	1	3	69

(2)-2 Plantation Plan (Fuel and Lubricant)

Year/ Items	Consumption fuel (ℓ)	Lubricant (ℓ)	Consumption fuel (ℓ)	Lubricant (ℓ)
1	259,224	2,345	36,781	32,938
2	389,487	3,524	92,039	82,423
3	401,142	3,629	119,470	106,988
4	406,880	3,682	125,653	112,525
5	438,291	3,965	131,298	117,580
6	447,111	4,045	137,168	122,837
7	408,555	3,696	133,838	119,855
8	386,295	3,495	125,467	112,358
9	146,391	1,324	95,829	85,817
10	219,912	1,990	84,593	75,755
11	226,275	2,047	89,592	80,321
12	226,947	2,053	91,681	82,103
13	247,464	2,239	95,942	85,918
14	252,504	2,285	100,495	89,996
15	234,045	2,118	97,107	86,962
16	291,354	2,636	104,935	93,972
17	293,118	2,652	117,488	105,206
18	226,275	2,047	104,403	93,495
19	222,285	2,011	91,681	82,103
20	247,464	2,239	95,942	85,918
21	265,314	2,400	103,071	92,302
22	249,942	2,261	103,567	92,746
23	311,157	2,815	115,358	103,306
24	313,236	2,834	129,371	115,855
25	247,947	2,243	116,779	104,578
26	250,488	2,266	104,517	93,597
27	267,603	2,421	108,779	97,414
28	271,572	2,457	112,831	101,042
29	230,727	2,088	105,018	94,046
30	281,354	2,636	108,772	97,408

(2)-3 Plantation Plan (Materials, etc)

Year/ Items	Demarcation survey, Surveying equipment (set)	Material (set)	Tool (set)	Fertilizer (kg)
1	3	3	3	114,369
2	0	3	3	171,820
3	0	3	3	176,792
4	3	3	3	178,557
5	0	3	3	193,351
6	0	3	3	187,256
7	3	3	3	180,246
8	0	3	3	170,436
9	0	3	3	91,486
10	3	3	3	137,456
11	0	3	3	141,434
12	0	3	3	143,646
13	3	3	3	154,681
14	0	3	3	157,805
15	0	3	3	144,196
16	3	3	3	182,097
17	0	3	3	183,204
18	0	3	3	141,434
19	3	3	3	143,646
20	0	3	3	154,681
21	0	3	3	165,811
22	3	3	3	156,223
23	0	3	3	194,472
24	0	3	3	195,773
25	3	3	3	154,969
26	0	3	3	157,454
27	0	3	3	167,298
28	3	3	3	169,736
29	0	3	3	144,196
30	0	3	3	182,097



(2)-4 Plantation Plan (Amount of Work)

Year/ Items	Land preparation			Weeding		Foreman	Annual employee	Seasonal employee	Total
	Tractor operator	Assistant	Total	Operator					
1	9	9	18	38	3	23	26		
2	13	13	26	95	6	36	42		
3	13	13	26	124	9	40	49		
4	13	13	26	130	14	42	56		
5	14	14	28	136	17	45	62		
6	15	15	30	142	18	48	64		
7	14	14	28	139	18	43	61		
8	13	13	26	130	18	41	59		
9	5	5	10	99	15	25	40		
10	7	7	14	89	15	32	47		
11	7	7	14	93	14	33	47		
12	8	8	16	95	13	33	46		
13	8	8	16	99	14	36	50		
14	8	8	16	104	14	36	50		
15	8	8	16	101	14	34	48		
16	10	10	20	109	15	41	56		
17	10	10	20	122	16	42	58		
18	7	7	14	108	15	34	49		
19	7	7	14	95	15	34	49		
20	8	8	16	99	16	36	51		
21	9	9	18	107	14	38	52		
22	8	8	16	107	14	36	50		
23	10	10	20	120	15	44	59		
24	10	10	20	134	16	45	61		
25	8	8	16	121	16	38	54		
26	8	8	16	108	17	37	54		
27	9	9	18	113	16	39	55		
28	8	8	16	117	15	39	54		
29	8	8	16	109	15	35	50		
30	10	10	20	113	16	42	58		

(2)-5 Plantation Plan (Amount of Work)  
(man-day)

Year/ Items	Labour				Total
	Demarcation survey	Planting	Climber cutting	Pruning	
1	2,287	48,035	0	0	50,322
2	3,436	72,164	0	0	75,600
3	3,536	74,253	7,320	0	85,109
4	3,591	75,415	12,826	0	91,832
5	3,866	81,208	14,064	1,828	100,967
6	3,945	82,847	14,320	2,749	103,861
7	3,605	75,703	15,247	2,828	97,383
8	3,409	71,582	15,718	2,872	93,581
9	1,829	38,427	14,692	3,034	58,042
10	2,749	57,731	13,792	3,156	77,428
11	2,828	59,402	10,047	2,834	75,161
12	2,872	60,331	10,936	2,727	76,926
13	3,094	64,965	11,315	0	79,374
14	3,156	66,218	11,492	0	80,926
15	2,884	60,562	12,374	0	75,820
16	3,642	76,481	12,624	0	92,747
17	3,664	76,946	11,536	0	92,146
18	2,928	59,402	14,568	0	76,798
19	2,872	60,331	14,656	0	77,859
20	3,094	64,965	11,315	0	79,374
21	3,316	69,639	11,492	0	84,447
22	3,124	65,614	12,374	0	81,112
23	3,890	81,679	12,624	0	98,192
24	3,916	82,226	12,176	0	98,318
25	3,899	65,087	15,530	641	84,357
26	3,149	66,129	15,646	962	85,886
27	3,346	70,265	12,320	980	86,921
28	3,394	71,289	12,574	1,005	88,262
29	2,884	60,562	13,479	1,033	78,008
30	3,642	76,481	13,634	1,105	94,862

(3)-1 Forest Protection Plan

Year/ Items	Look-out tower (tower)	Year/ Items	For Patrol Base machine (unit)	For fire fighting Base machine (unit)	Tank (tank)
1	3	1	3	3	3
2	4	2	0	0	0
3	3	3	0	0	0
4	4	4	0	0	0
5	4	5	0	0	0
6	2	6	0	3	3
7	4	7	0	0	0
8	2	8	3	0	0
9	0	9	0	0	0
10	0	10	0	0	0
11	0	11	0	3	3
12	0	12	0	0	0
13	0	13	0	0	0
14	0	14	0	0	0
15	0	15	3	0	0
16	0	16	0	3	3
17	0	17	0	0	0
18	0	18	0	0	0
19	0	19	0	0	0
20	0	20	0	0	0
21	0	21	0	3	3
22	0	22	3	0	0
23	0	23	0	0	0
24	0	24	0	0	0
25	0	25	0	0	0
26	0	26	0	3	3
27	0	27	0	0	0
28	0	28	0	0	0
29	0	29	3	0	0
30	0	30	0	0	0

(3)-2 Forest Protection Plan (Machinery)

Year/ Items	Fire fighting pump (pump)	Hand pump (pump)	Chainsaw (unit)	Bushcutter (unit)	Farm tractor (unit)	Attachment
1	3	30	3	6	3	3
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	3	6	0	0
6	0	30	0	0	0	0
7	3	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	3	6	3	3
10	0	0	0	0	0	0
11	0	30	0	0	0	0
12	0	0	0	0	0	0
13	3	0	3	6	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	30	0	0	0	0
17	0	0	3	6	3	3
18	0	0	0	0	0	0
19	3	0	0	0	0	0
20	0	0	0	0	0	0
21	0	30	3	6	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0
25	3	0	3	6	3	3
26	0	30	0	0	0	0
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	0	3	6	0	0
30	0	0	0	0	0	0

(3)-3 Forest Protection Plan  
(Materials and Equipments)

(unit)

Year/ Items	Scoop	Slashing Knife	Helmet	Safety shoes	Telescope	Siren	Public- address system	Walkie- talkie
1	15	15	60	60	6	6	6	6
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	15	15	60	60	0	0	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
11	60	60	0	0	0	0	0	6
12	0	0	0	0	0	0	0	0
13	0	0	0	0	0	6	6	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	15	15	60	60	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	15	15	60	60	0	0	0	6
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	6	6	6	0
26	15	15	60	60	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0

(3)-4 Forest Protection Plan  
(Amount of Work)

Year / Items	Vehicle for Patrol				Tank Truck		Weeding		(person)
	Driver	Assistant	Assistant	Assistant	Driver	Assistant	Operator	Assistant	
1	3		3		3	3	3	3	3
2	3		3		3	3	3	3	3
3	3		3		3	3	3	3	3
4	3		3		3	3	3	3	3
5	3		3		3	3	3	3	3
6	3		3		3	3	3	3	3
7	3		3		3	3	3	3	3
8	3		3		3	3	3	3	3
9	3		3		3	3	3	3	3
10	3		3		3	3	3	3	3
11	3		3		3	3	3	3	3
12	3		3		3	3	3	3	3
13	3		3		3	3	3	3	3
14	3		3		3	3	3	3	3
15	3		3		3	3	3	3	3
16	3		3		3	3	3	3	3
17	3		3		3	3	3	3	3
18	3		3		3	3	3	3	3
19	3		3		3	3	3	3	3
20	3		3		3	3	3	3	3
21	3		3		3	3	3	3	3
22	3		3		3	3	3	3	3
23	3		3		3	3	3	3	3
24	3		3		3	3	3	3	3
25	3		3		3	3	3	3	3
26	3		3		3	3	3	3	3
27	3		3		3	3	3	3	3
28	3		3		3	3	3	3	3
29	3		3		3	3	3	3	3
30	3		3		3	3	3	3	3

(4)-1 Forest Road Plan (Machinery)

(unit)

Year/ Items	Bulldozer		Motor grader		Back hoe type excavator		Vibratory roller	
	Purchase	Lease Total	Purchase	Lease Total	Purchase	Lease Total	Purchase	Lease Total
1	3	0	2	0	3	0	0	-
2	0	0	0	0	0	0	0	-
3	1	0	0	0	0	0	0	-
4	1	0	0	0	0	0	0	-
5	1	0	0	0	0	0	0	-
6	0	0	0	0	0	0	0	-
7	0	1	0	0	0	0	0	-
8	0	0	0	0	0	0	0	-
9	3	0	0	0	0	0	0	-
10	0	0	0	0	0	0	0	-
11	1	0	0	0	0	0	0	-
12	1	0	0	0	0	0	0	-
13	1	0	0	0	0	0	0	-
14	0	0	1	0	0	0	0	-
15	0	0	0	0	0	0	0	-
16	0	0	0	0	0	0	0	-
17	3	0	0	0	1	0	0	-
18	0	0	0	0	0	0	0	-
19	1	0	0	0	0	0	0	-
20	1	0	0	0	0	0	0	-
21	1	0	0	0	0	0	0	-
22	0	0	0	0	0	0	0	-
23	0	0	0	0	0	0	0	-
24	0	0	1	0	0	0	0	-
25	3	0	0	0	0	0	0	-
26	0	0	0	0	0	0	0	-
27	1	0	0	0	1	0	0	-
28	1	0	0	0	0	0	0	-
29	1	0	0	0	0	0	0	-
30	0	0	0	0	0	0	0	-





(4)-2 Forest Road Plan (Fuel and Lubricant)

(L)

Year/ Items	Fuel Bulldozer	Motor grader	Back hoe type excavator	Vibratory roller	Total	Lubricant Bulldozer	Motor grader	Back hoe type excavator	Vibratory roller	Total
1	112,425	60,480	54,432	451	227,788	1,574	306	821	6	3,207
2	103,300	60,480	54,432	253	223,465	1,516	806	821	3	3,146
3	141,850	60,480	54,432	319	257,081	1,986	806	821	4	3,617
4	182,575	60,480	54,432	396	297,883	2,556	806	821	5	4,188
5	208,425	60,480	54,432	330	323,667	2,918	806	821	5	4,550
6	227,400	60,480	54,432	297	342,609	3,184	806	821	4	4,815
7	260,575	60,480	54,432	303	375,795	3,543	806	821	4	5,273
8	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
9	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
10	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
11	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
12	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
13	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
14	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
15	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
16	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
17	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
18	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
19	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
20	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
21	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
22	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
23	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
24	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
25	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
26	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
27	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
28	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
29	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459
30	208,525	30,240	9,072	0	247,837	2,919	403	137	0	3,459

(4)-3 Forest Road Plan (Bridge)

(bridge)

Year/ Items	A(15m)			B(10m)			C(5m)			Total		
	I	II	III	Total	I	II	III	Total	I		II	III
1	1	2	2	5	3	9	3	15	7	10	13	30
2	4	0	1	5	0	3	4	7	5	7	4	16
3	0	0	0	0	3	3	4	10	6	7	2	15
4	1	1	3	5	3	5	0	8	4	8	2	14
5	3	1	3	7	3	3	1	7	2	14	4	20
6	0	1	0	1	4	2	4	10	3	10	3	16
7	1	2	0	3	1	3	1	5	7	9	5	21
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0

(4)-4 Forest Road Plan  
(Gravelling)

(m<sup>3</sup>)

Year/ Items	I	II	III	Total
1	5,419	9,187	4,970	19,576
2	5,419	9,187	4,970	19,576
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

(4)-5 Forest Road Plan  
 (Amount of Work) (person)

Year/ Items	Operator			Back hoe type excavator	Sub Total	Assistant		Total
	Bulldozer	Motor grader	Bulldozer			Bulldozer	Total	
1	3	2	3	3	8	3	3	11
2	3	2	3	3	8	3	3	11
3	4	2	3	3	9	4	4	13
4	5	2	3	3	10	5	5	15
5	6	2	3	3	11	6	6	17
6	6	2	3	3	11	6	6	17
7	7	2	3	3	12	7	7	19
8	6	1	1	1	8	6	6	14
9	6	1	1	1	8	6	6	14
10	6	1	1	1	8	6	6	14
11	6	1	1	1	8	6	6	14
12	6	1	1	1	8	6	6	14
13	6	1	1	1	8	6	6	14
14	6	1	1	1	8	6	6	14
15	6	1	1	1	8	6	6	14
16	6	1	1	1	8	6	6	14
17	6	1	1	1	8	6	6	14
18	6	1	1	1	8	6	6	14
19	6	1	1	1	8	6	6	14
20	6	1	1	1	8	6	6	14
21	6	1	1	1	8	6	6	14
22	6	1	1	1	8	6	6	14
23	6	1	1	1	8	6	6	14
24	6	1	1	1	8	6	6	14
25	6	1	1	1	8	6	6	14
26	6	1	1	1	8	6	6	14
27	6	1	1	1	8	6	6	14
28	6	1	1	1	8	6	6	14
29	6	1	1	1	8	6	6	14
30	6	1	1	1	8	6	6	14

(5)-1 Felling Plan  
(Machinery, Fuel and Lubricant)

( 2 )

Year/ Items	Chainsaw (unit)	Year/ Items	Chainsaw fuel	Lubricant
1	5	1	3,663	3,280
2	8	2	9,073	8,125
3	7	3	10,255	9,184
4	34	4	35,998	32,237
5	24	5	51,187	45,839
6	5	6	24,662	22,354
7	25	7	26,049	23,327
8	40	8	56,754	50,824
9	66	9	92,808	83,111
10	78	10	125,780	112,639
11	68	11	129,097	114,713
12	72	12	122,568	109,763
13	87	13	138,123	123,692
14	74	14	141,222	126,467
15	78	15	132,786	118,913
16	108	16	162,903	145,883
17	91	17	174,821	156,558
18	66	18	137,513	123,146
19	108	19	145,508	130,307
20	76	20	154,502	138,369
21	105	21	159,637	142,063
22	89	22	152,364	136,445
23	139	23	182,862	163,757
24	72	24	184,452	165,181
25	100	25	150,085	134,405
26	88	26	164,505	147,318
27	112	27	175,338	157,019
28	83	28	170,645	152,816
29	85	29	147,593	132,119
30	122	30	181,549	162,581

(5)-2 Felling Plan  
(Amount of Work)

(person)

Year/ Operator Assistant Total  
Items

1	4		8
2	9		18
3	11		22
4	37		74
5	53		106
6	26		52
7	27		54
8	59		118
9	96		192
10	131		262
11	133		266
12	127		254
13	144		288
14	146		292
15	138		276
16	169		338
17	181		362
18	143		286
19	151		302
20	160		320
21	164		328
22	158		316
23	189		378
24	191		382
25	156		312
26	171		342
27	182		364
28	177		354
29	152		304
30	188		376

(6)-1 Skidding / Transportation Plan (Machinery)

(unit)

Year/ Items	Tractor		Log loader		Logging truck		Tugboat		Barge		Total
	Purchase	Lease	Total Purchase	Lease	Total Purchase	Lease	Total Purchase	Lease	Total Purchase	Lease	
1	1	0	1	0	1	0	1	1	1	0	1
2	2	0	1	0	2	0	2	0	0	0	2
3	0	0	0	0	1	0	1	0	0	0	1
4	4	0	1	0	4	0	4	0	0	0	4
5	0	2	2	2	0	3	0	1	0	3	3
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	3	0	2	0	8	0	6	1	3	0	9
9	12	0	6	0	15	0	15	1	4	0	19
10	11	0	6	0	13	0	13	2	5	0	18
11	0	0	0	0	5	0	5	0	0	0	5
12	3	0	1	0	1	0	1	0	0	0	2
13	2	0	2	0	9	0	9	0	0	0	9
14	2	3	0	1	15	0	15	0	0	0	16
15	0	0	0	0	10	0	10	0	0	0	10
16	12	0	6	0	15	0	15	0	0	0	21
17	15	0	8	0	2	0	5	0	0	0	13
18	1	0	0	0	0	0	0	0	0	0	1
19	1	0	1	0	16	0	16	0	0	0	17
20	5	0	2	0	13	0	13	0	0	0	15
21	6	0	3	0	19	0	19	2	3	0	22
22	0	0	0	0	0	0	0	0	0	0	0
23	9	0	0	0	11	0	11	0	0	0	11
24	12	0	11	0	16	0	16	0	0	0	27
25	5	0	3	0	1	0	4	0	1	0	5
26	4	0	1	0	22	0	22	0	1	0	23
27	4	0	4	0	4	0	4	0	1	0	5
28	5	1	2	1	12	0	12	1	3	0	15
29	0	0	0	0	7	0	7	0	1	0	8
30	9	0	5	0	13	0	13	4	9	0	26

(6)-2 Skidding / Transportation Plan (Fuel and Lubricant)

( 2 )

Year/ Itmes	Tractor		Log loader		Logging truck		Tug boat		Total	
	Fuel	Lubricant	Fuel	Lubricant	Fuel	Lubricant	Fuel	Lubricant	Fuel	Lubricant
1	41,000	410	18,860	139	29,535	492	342,000	5,062	431,395	6,103
2	101,575	1,016	46,713	345	73,155	1,219	342,000	5,062	583,443	7,642
3	114,800	1,148	52,808	390	82,680	1,378	342,000	5,062	592,288	7,978
4	238,250	2,383	109,595	810	171,615	2,860	342,000	5,062	861,460	11,115
5	325,575	3,256	149,753	1,107	234,495	3,908	684,000	10,124	1,393,823	18,395
6	24,850	249	11,431	84	17,895	298	342,000	5,062	396,176	5,693
7	36,275	363	16,698	123	26,130	436	342,000	5,062	421,103	5,984
8	395,800	3,958	168,268	1,244	263,475	4,391	624,000	10,124	1,481,543	19,417
9	794,825	7,948	347,231	2,586	543,705	9,062	1,026,000	15,186	2,671,761	34,362
10	1,134,025	11,340	521,663	3,856	816,810	13,614	1,710,000	25,310	4,182,498	54,120
11	1,166,850	11,669	536,728	3,967	840,465	14,008	1,710,000	25,310	4,254,043	54,954
12	1,195,100	11,851	545,146	4,029	853,695	14,227	1,710,000	25,310	4,292,851	55,417
13	1,216,125	12,761	587,006	4,339	919,170	15,320	1,710,000	25,310	4,492,301	57,730
14	1,301,900	13,019	598,851	4,426	937,740	15,629	1,710,000	25,310	4,548,491	58,384
15	1,189,625	11,896	547,216	4,045	856,875	14,281	1,710,000	25,310	4,308,716	55,532
16	1,582,300	15,023	691,058	5,108	1,032,070	18,035	2,052,000	30,372	5,327,428	68,538
17	1,630,525	16,305	750,030	5,544	1,174,440	19,574	2,052,000	30,372	5,606,995	71,795
18	1,258,775	12,588	579,025	4,280	906,675	15,111	1,710,000	25,310	4,454,475	57,289
19	1,278,450	12,785	588,087	4,347	920,895	15,348	1,710,000	25,310	4,497,402	57,790
20	1,376,675	13,767	638,269	4,681	991,590	16,527	1,710,000	25,310	4,711,524	60,285
21	1,500,125	15,001	690,069	5,101	1,030,525	18,009	2,052,000	30,372	5,322,719	68,483
22	1,427,075	14,271	656,466	4,852	1,027,890	17,132	2,052,000	30,372	5,163,431	66,627
23	1,768,525	17,685	813,533	6,013	1,273,860	21,231	2,394,000	35,434	6,249,918	80,363
24	1,780,700	17,807	819,122	6,054	1,282,685	21,377	2,394,000	35,434	6,276,457	80,672
25	1,420,525	14,205	653,407	4,830	1,023,180	17,053	2,052,000	30,372	5,149,112	66,460
26	1,513,725	15,137	696,302	5,147	1,030,305	18,172	2,052,000	30,372	5,352,332	68,828
27	1,632,975	16,330	761,157	5,552	1,176,210	19,604	2,052,000	30,372	5,612,342	71,858
28	1,655,625	16,556	761,576	5,629	1,192,515	19,875	2,052,000	30,372	5,661,716	72,432
29	1,392,950	13,930	640,757	4,736	1,003,320	16,722	1,710,000	25,310	4,747,027	60,698
30	1,739,425	17,394	800,124	5,914	1,252,875	20,381	2,394,000	35,434	6,186,424	79,623



(6)-3 Skidding / Transportation Plan (Amount of Work)

(person)

Year/ Items	Tractor	Log loader	Logging truck	Tug boat Captain	Chief engineer	Sub Total	Tractor	Logging truck	Tug boat Crew	Barge Crew	Sub Total	Total
1	1	1	1	1	1	5	1	1	3	2	7	12
2	2	3	3	1	1	10	3	3	3	2	11	21
3	3	2	4	1	1	11	3	4	3	2	12	23
4	7	3	8	1	1	20	7	8	3	6	24	44
5	9	5	11	2	2	29	9	11	6	8	34	63
6	1	1	1	1	1	5	1	1	3	2	7	12
7	1	1	1	1	1	5	1	1	3	2	7	12
8	10	5	12	2	2	31	10	12	6	8	36	67
9	21	10	25	3	3	62	21	25	9	16	71	133
10	32	16	38	5	5	96	32	38	15	26	111	207
11	32	16	39	5	5	97	32	39	15	26	112	209
12	33	16	40	5	5	99	33	40	15	26	114	213
13	35	18	43	5	5	106	35	43	15	28	121	227
14	36	18	43	5	5	107	36	43	15	28	122	229
15	33	17	40	5	5	100	33	40	15	26	114	214
16	42	21	50	6	6	125	42	50	18	34	144	269
17	45	23	54	6	6	134	45	54	18	36	153	287
18	35	17	42	5	5	104	35	42	15	28	120	224
19	36	18	43	5	5	107	36	43	15	28	122	229
20	38	19	46	5	5	113	38	46	15	30	129	242
21	42	21	50	6	6	125	42	50	18	34	144	269
22	40	20	48	6	6	120	40	48	18	32	138	258
23	49	21	59	7	7	143	49	59	21	40	169	312
24	49	25	59	7	7	147	49	59	21	40	169	316
25	39	20	47	6	6	118	39	47	18	32	136	254
26	42	21	50	6	6	125	42	50	18	34	144	269
27	45	23	54	6	6	134	45	54	18	36	153	287
28	46	23	55	6	6	136	46	55	18	36	155	291
29	39	19	46	5	5	114	39	46	15	30	130	244
30	48	24	58	7	7	144	48	58	21	38	165	309

(7) Repair Shop Plan

Year/ Items	Parts warehouse		Repair Bay		Fuel / Lubricant		Amount of work		Total	
	Building construction (240m <sup>2</sup> ) (unit)	Parts/ equipment (set)	Office supply (set)	Building construction (381m <sup>2</sup> ) (unit)	Machinery/ equipment (set)	(L)	Fuel	Lubricant		Engineer Assistant
1	1	1	1	1	1	25,560	180	10	10	20
2	0	0	0	0	0	25,560	180	10	10	20
3	0	0	0	0	0	25,560	180	10	10	20
4	0	0	0	0	0	25,560	180	10	10	20
5	0	0	0	0	0	25,560	180	10	10	20
6	0	0	0	0	0	25,560	180	10	10	20
7	0	0	0	0	0	25,560	180	10	10	20
8	0	0	0	0	0	25,560	180	10	10	20
9	2	2	2	2	2	76,680	540	30	30	60
10	0	0	0	0	0	76,680	540	30	30	60
11	0	0	0	0	0	76,680	540	30	30	60
12	0	0	0	0	0	76,680	540	30	30	60
13	0	0	0	0	0	76,680	540	30	30	60
14	0	0	0	0	0	76,680	540	30	30	60
15	0	0	0	0	0	76,680	540	30	30	60
16	0	1	1	0	1	76,680	540	30	30	60
17	0	0	0	0	0	76,680	540	30	30	60
18	0	0	0	0	0	76,680	540	30	30	60
19	0	0	0	0	0	76,680	540	30	30	60
20	0	0	0	0	0	76,680	540	30	30	60
21	0	0	0	0	0	76,680	540	30	30	60
22	0	0	0	0	0	76,680	540	30	30	60
23	0	0	0	0	0	76,680	540	30	30	60
24	0	2	2	0	2	76,680	540	30	30	60
25	0	0	0	0	0	76,680	540	30	30	60
26	1	0	0	1	0	76,680	540	30	30	60
27	0	0	0	0	0	76,680	540	30	30	60
28	0	0	0	0	0	76,680	540	30	30	60
29	0	0	0	0	0	76,680	540	30	30	60
30	0	0	0	0	0	76,680	540	30	30	60

(S) Marketing Plan

(m<sup>3</sup>)

Year/  
Items  
Pulpwood  
Existing  
man-made  
forest

Timber

	Am	Aa	Af	Sub total	Af	Pc	Sm	Sb	Sub total	Total
1	0	0	0	16,400	0	0	0	0	0	16,400
2	0	0	0	40,627	0	0	0	0	0	40,627
3	0	0	0	45,917	0	0	0	0	0	45,917
4	0	0	0	95,305	0	0	0	0	0	95,305
5	0	0	0	130,224	0	0	0	0	0	130,224
6	0	0	0	9,937	0	0	0	0	0	9,937
7	0	0	0	14,508	0	0	0	0	0	14,508
8	0	0	0	146,316	0	0	0	0	0	146,316
9	101,903	101,903	81,448	285,254	16,682	0	0	0	16,682	301,936
10	153,092	153,092	122,359	428,543	25,062	0	0	0	25,062	453,605
11	157,522	157,522	126,900	440,944	25,787	0	0	0	25,787	466,731
12	159,985	159,985	127,871	447,841	26,191	0	0	0	26,191	474,032
13	172,276	172,276	137,633	482,245	28,202	0	0	0	28,202	510,447
14	175,755	175,755	140,476	491,986	28,772	0	0	0	28,772	520,758
15	180,600	180,600	128,357	443,557	26,290	0	0	0	26,290	475,847
16	202,810	202,810	162,098	567,718	33,201	0	0	0	33,201	600,919
17	220,118	220,118	175,933	616,169	36,035	0	0	0	36,035	652,204
18	169,933	169,933	135,820	475,686	27,819	0	0	0	27,819	503,505
19	172,589	172,589	137,947	483,125	28,254	0	0	0	28,254	511,379
20	185,849	185,849	148,541	520,239	30,424	0	0	0	30,424	550,663
21	189,601	189,601	151,543	530,745	31,039	0	0	0	31,039	561,784
22	173,253	173,253	138,471	484,977	28,362	32,526	0	0	63,565	548,542
23	218,788	218,788	174,859	612,445	35,817	48,867	0	0	84,684	697,129
24	220,118	220,118	175,933	616,169	36,035	50,282	0	0	86,099	702,268
25	169,933	169,933	135,820	475,686	27,819	51,069	0	0	78,888	554,574
26	172,589	172,589	137,947	483,125	28,254	56,103	6,430	5,512	96,299	579,424
27	185,849	185,849	148,541	520,239	30,424	51,263	9,661	8,282	99,630	619,869
28	189,601	189,601	151,543	530,745	31,039	48,474	8,941	8,520	97,974	628,719
29	173,253	173,253	138,471	484,977	28,362	0	10,096	8,653	47,111	532,088
30	218,788	218,788	174,859	612,445	35,817	0	10,372	9,318	55,007	667,452

Am: Acacia mangium Aa: Acacia auriculiformis Af: Albizzia falcata Pc: Peronema canescens

Sm: Swietenia macrophylla Sb: Schima wallichii var. bancana

(9)-1 Administration and Other General Plan (Building)

(unit)

Year/ Items	Office building		Warehouse		Fuel storage		Generator building		Housing		For Director	For Engineer	For Driver
	Industrial plantation Center	Working Unit Management Office	Industrial Plantation Center	Working Unit Management Office	Industrial Plantation Center	Working Unit Management Office	Industrial Plantation Center	Working Unit Management Office	For manager/ Sector chief	For Engineer			
1	1	2	1	2	1	2	1	2	1	2	1	46	4
2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1	2	1	2	1	2	1	2	1	2	1	46	4
27	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0



(9)-1 Cont.  
(Facility)

Year/ Items	Water Storage Tank		Water Work		Electric Work		Fencing	Site Preparation	Radio Communication	
	Industrial Plantation Center	Working Unit Management Office	Industrial Plantation Center	Working Unit Management Office	Industrial Plantation Center	Working Unit Management Office			Center- Palembang	Center- Unit Office
1	1	2	1	2	1	2	3	1	2	1
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	1	2	3	0	0	1
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	1	2	1	2	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	1	2	3	0	0	1
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0

(9)-2 Administration and Other General Plan  
(Vehicle and Machinery)

		(unit)		
Year/ Items	Jeep (jeep)	Motorcycle (motorcycle)	Generator	Water Pump
1	4	12	4	4
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	4	12	4	4
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	4	12	4	4
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	4	12	4	4
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	4	12	4	4
30	0	0	0	0

(9)-3 Administration and Other General Plan (Fuel and Lubricant)

Year/ Items	Generator	Jeep	Truck	Water pump	Motorcycle	Total	Lubricant	Year/ Items	Fuel storage tank
						( \$ )			( tank )
1	172,800	11,520	3,600	36,000	12,000	235,920	11,800	1	10
2	172,800	11,520	3,600	36,000	12,000	235,920	11,800	2	0
3	172,800	11,520	3,600	36,000	12,000	235,920	11,800	3	0
4	172,800	11,520	3,600	36,000	12,000	235,920	11,800	4	0
5	172,800	11,520	3,600	36,000	12,000	235,920	11,800	5	0
6	172,800	11,520	3,600	36,000	12,000	235,920	11,800	6	0
7	172,800	11,520	3,600	36,000	12,000	235,920	11,800	7	0
8	172,800	11,520	3,600	36,000	12,000	235,920	11,800	8	0
9	172,800	11,520	3,600	36,000	12,000	235,920	11,800	9	0
10	172,800	11,520	3,600	36,000	12,000	235,920	11,800	10	0
11	172,800	11,520	3,600	36,000	12,000	235,920	11,800	11	23
12	172,800	11,520	3,600	36,000	12,000	235,920	11,800	12	0
13	172,800	11,520	3,600	36,000	12,000	235,920	11,800	13	0
14	172,800	11,520	3,600	36,000	12,000	235,920	11,800	14	0
15	172,800	11,520	3,600	36,000	12,000	235,920	11,800	15	0
16	172,800	11,520	3,600	36,000	12,000	235,920	11,800	16	0
17	172,800	11,520	3,600	36,000	12,000	235,920	11,800	17	0
18	172,800	11,520	3,600	36,000	12,000	235,920	11,800	18	0
19	172,800	11,520	3,600	36,000	12,000	235,920	11,800	19	0
20	172,800	11,520	3,600	36,000	12,000	235,920	11,800	20	0
21	172,800	11,520	3,600	36,000	12,000	235,920	11,800	21	30
22	172,800	11,520	3,600	36,000	12,000	235,920	11,800	22	0
23	172,800	11,520	3,600	36,000	12,000	235,920	11,800	23	0
24	172,800	11,520	3,600	36,000	12,000	235,920	11,800	24	0
25	172,800	11,520	3,600	36,000	12,000	235,920	11,800	25	0
26	172,800	11,520	3,600	36,000	12,000	235,920	11,800	26	0
27	172,800	11,520	3,600	36,000	12,000	235,920	11,800	27	0
28	172,800	11,520	3,600	36,000	12,000	235,920	11,800	28	0
29	172,800	11,520	3,600	36,000	12,000	235,920	11,800	29	0
30	172,800	11,520	3,600	36,000	12,000	235,920	11,800	30	0



(9)-4 Administration and Other General Plan  
(Personnel)

(person)

Year/ Items	Director	Section chief	Unit manager	Engineer
1	1	3	3	46
2	1	3	3	46
3	1	3	3	46
4	1	3	3	46
5	1	3	3	46
6	1	3	3	46
7	1	3	3	46
8	1	3	3	46
9	1	3	3	46
10	1	3	3	46
11	1	3	3	46
12	1	3	3	46
13	1	3	3	46
14	1	3	3	46
15	1	3	3	46
16	1	3	3	46
17	1	3	3	46
18	1	3	3	46
19	1	3	3	46
20	1	3	3	46
21	1	3	3	46
22	1	3	3	46
23	1	3	3	46
24	1	3	3	46
25	1	3	3	46
26	1	3	3	46
27	1	3	3	46
28	1	3	3	46
29	1	3	3	46
30	1	3	3	46

(9)-5 Consultant: Detail Design

(9)-6 Consultant: Execution Management

Year/ Item	(person)		
	A	B	C
1	1	2	2
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0

- A: Project Manager
- B: Financial and Procurement /Facilities Construction
- C: Civil Work/Machinery

Year/ Item	(person)		
	A	B	C
1	1	2	2
2	1	2	2
3	1	2	2
4	1	2	2
5	1	2	2
6	1	2	2
7	1	2	2
8	1	2	2
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0

- A: Management (General Administration)
- B: Nursery and Planting/Forest Road, Felling, Logging
- C: Equipment/Forest Protection

Year/ Item	Local Development Promotion Measure (household)	Countermeasure for Environ- mental Impact (unit)
2	100	1
3	100	1
4	100	1
5	100	1
6	100	1
7	100	1
8	100	1
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0
18	0	0
19	0	0
20	0	0
21	0	0
22	0	0
23	0	0
24	0	0
25	0	0
26	0	0
27	0	0
28	0	0
29	0	0
30	0	0