Report of Development Planning Survey for Afforestation Project in Benakat District, South Sumatera, The Republic of Indonesia

June, 1979

Japan International Cooperation Agency

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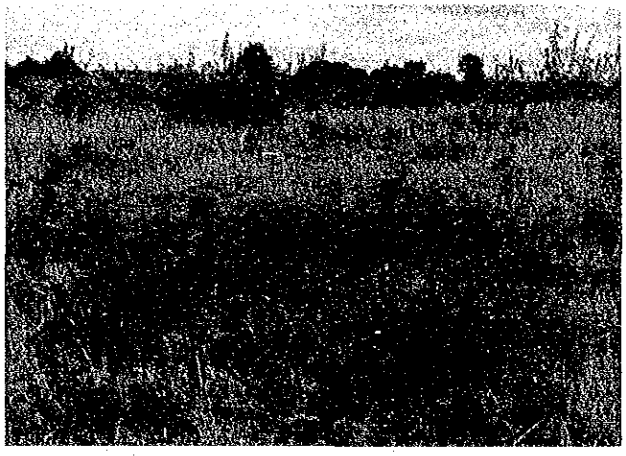
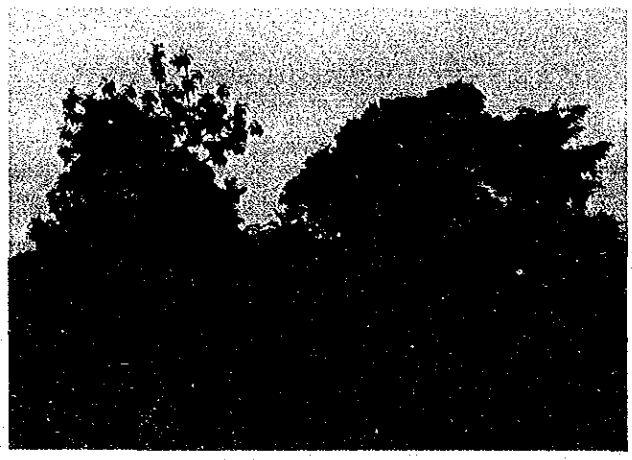
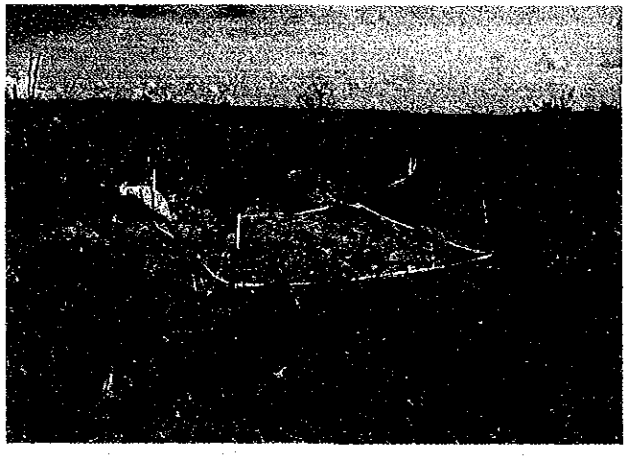
Soil Survey



Alang^2 glassland



Secondary forest left in Alang^2 galssland

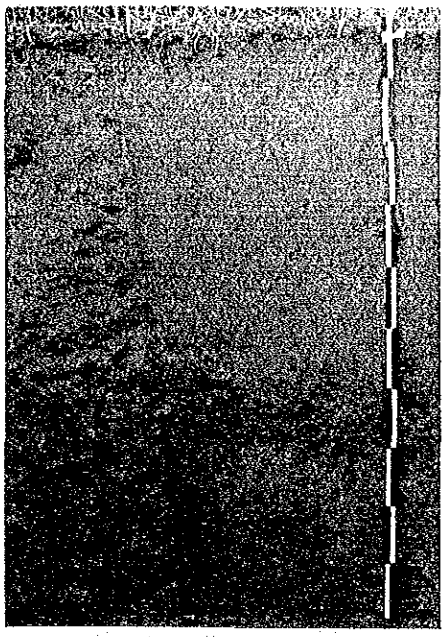


Productivity survey

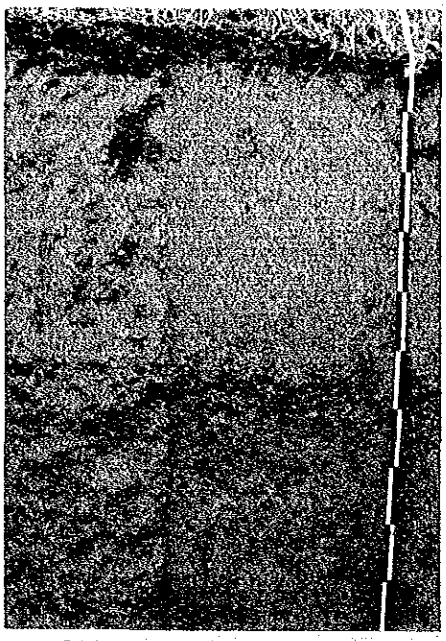
Result of burning

Sungkai (one year after planted)

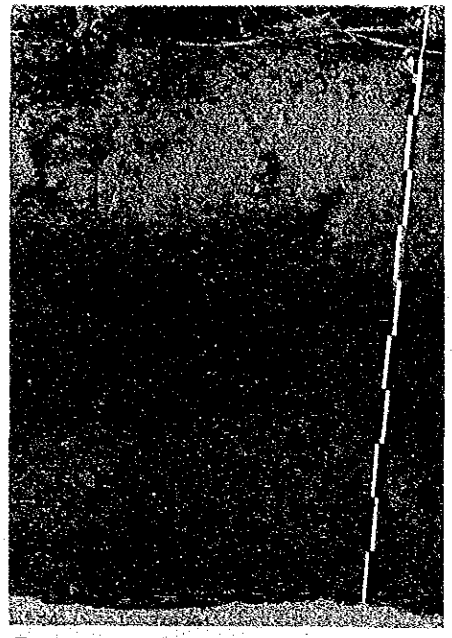
Supply of mycorrhiza to Merkusii pine



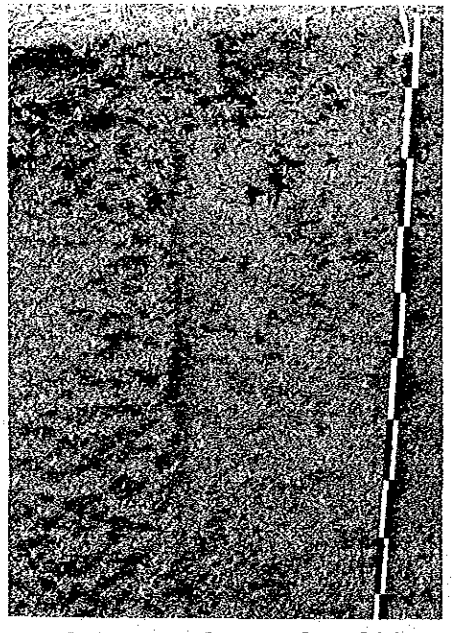
Profile at top of rolling terrain; iron concretion gravel layer exists at the depth of 70 cm, some gley mottle appears evenly



Profile at slope of rolling terrain; iron stone gravel layer is relatively thin, some gley mottle exist



Profile at slope of rolling terrain; thick iron stone gravel layer exists from 40 cm to 70 cm depth under the ground



Profile at slope of rolling terrain; more gley soils appear in deeper layers

Profile at slope of rolling terrain; B soil zone, C soil zone appears at the depth of more than 80 cm under the ground

Profile at flat valley floor; layer is sandy, stone gravel layer does not exist

Preface

There are vast grasslands in Sumatera and other islands of Indonesia, but they are not contributing to the sustained yield of forest resources, but constitute a serious problem in terms of land conservation and watershed management. The Government of Indonesia is planning to afforest the areas as quickly as possible. However the afforestation of tropical rain regions is not easy for financial and technical reasons. Under such circumstances, the Government of Indonesia has requested the Government of Japan for economic and technical cooperation in carrying out the afforestation project.

Following the above request, the Japan International Cooperation Agency dispatched to Indonesia the first and the second preliminary survey teams in June and in November, 1975, which have identified the need for conducting a technical survey and research before embarking on a full-scale afforestation.

This report has been formulated as a result of the survey on soil conditions and afforestation made by the team, headed by Dr. Katsumi Sakaguchi, for 40 days from June 20 and for 25 days from July 5, 1978.

I hope that the report will serve as a useful guide for the development of the afforestation project.

I wish to express my sincere appreciation to officials concerned of the Directorate General of Forestry and others of the Indonesian Government for their close cooperation extended to the survey team.

Shinsaku Hogen

President
Japan International
Cooperation Agency

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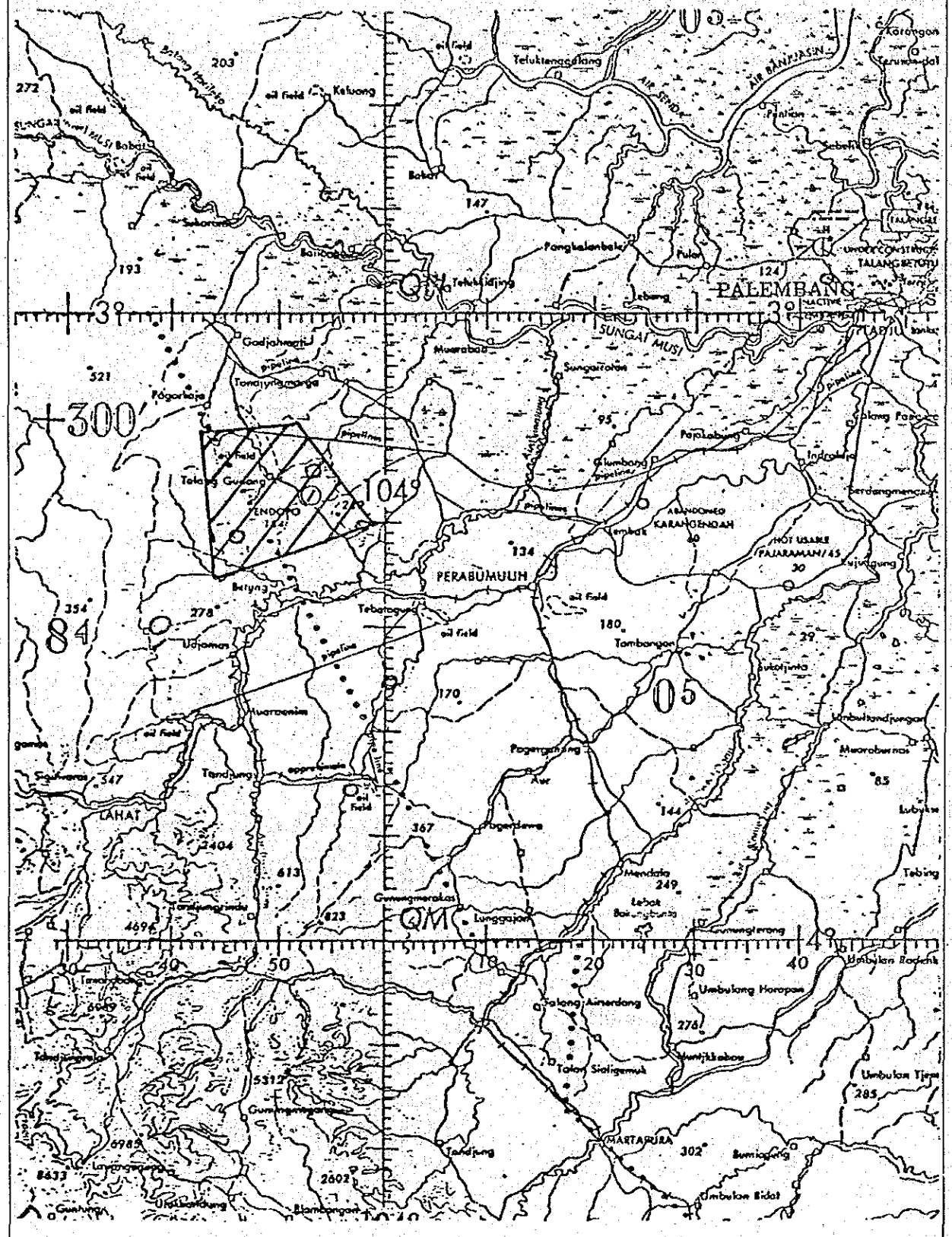
The following maps have prepared separately:

1. Land Use Map of Benakat Area
2. Morphographic Map
3. Vegetation Map of Benakat Area
4. Map on Afforestation of Site Classification
5. Soil Map in Trial Planting Area

Fig.I LOCATION MAP



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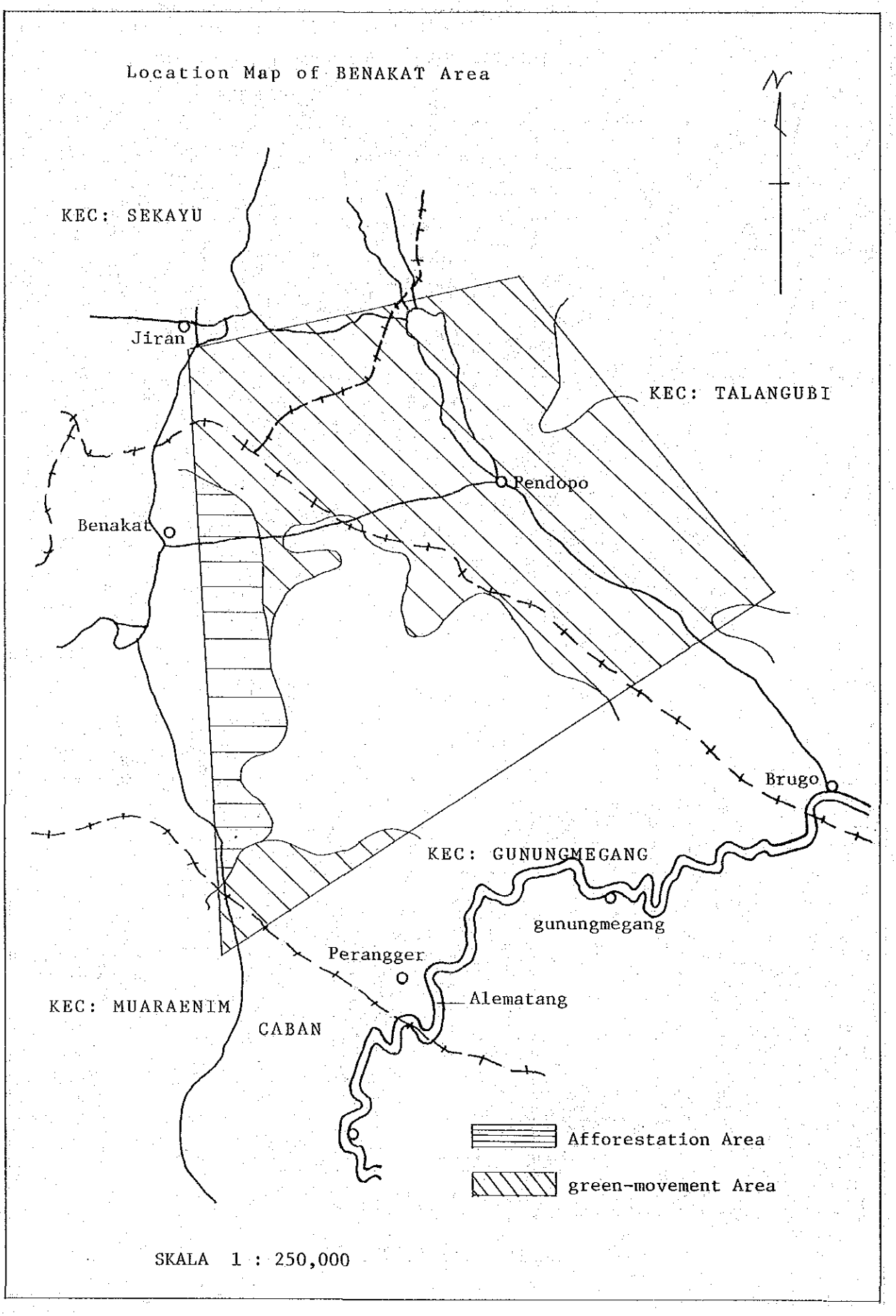

Location Map of BENAKAT Area
N
KEC: SEKAYU
Jiran
KEC: TALANGUBI
Pendopo
Benakat
Brugo
KEC: GUNUNGMEGANG
gunungmegang
Perangger
Alematang
KEC: MUARAENIM
CABAN
Afforestation Area
green-movement Area
SKALA 1 : 250,000

Introduction

Introduction

1. Purpose of the Planning and Its Meaning

About 16 million ha grassland exists in Sumatera and in other overseas areas of Indonesia. The grassland has been induced as a result of shifting cultivation for long years. And this area is not only unproductive but also must be afforested rapidly from soil conservation and flood control points of view. Then, Indonesian Government strives with this point in "The 2nd 5 Year Plan (1974-1979)".

Grassland about 550 thousand ha exists in Sumatera Island, but the shortage of labour is an obstacle to the large scale afforestation of the grassland.

Java has a dense population with its abundant farmers having only a little cultivation area, and its soil is fertile. For these reasons, the fine Teak plantation has been promoted with the Tumpangsari method in Java. On the other hand, the grassland region of Sumatera has a small population and its soil is not fertile. Under those circumstances, it is necessary to promote the mechanical technique system for grassland afforestation in Sumatera.

So, the development of grassland afforestation with mechanization has been requested of Japan by the Indonesian Government. With the Scope of Work between Indonesia and Japan agreed on Sept. 1, 1977, this plan, inside the area of about 50 thousand ha (refer to Fig. I), aims at offering the original sample of mechanical grassland afforestation in South Sumatera.

Before they start promoting the afforestation in Benakat area, there are many technical problems to be solved. So, we recommend to develop the technique for the afforestation in this area through the establishment of trial plantation as a part of the technical cooperation project between the two countries.

2. Implementation of the Investigation

2-1 Member of Survey Team

This survey was carried out by 3 members of soil survey group and 4 members of afforestation planning group, and the survey team was headed by Dr. K. Sakaguchi.

Member of Survey Team

Staff and Assignment	Name	Occupation
Leader over all Management	Dr. Katsumi SAKAGUCHI	Research consultant of Japan Forest Technical Association (JFTA)
Member of Soil Survey	Dr. Nobuyoshi HASHIMOTO	Former professor of SHIZUOKA University
	Tadao OHARA	Chief of Technical Development Section, Survey Division, JFTA
	Teruomi SUGITA	Member of Survey Division, JFTA
Member of Afforestation Planning	Shozo YONEKURA	Technical Director of SHINWA Industrial Company
	Taichi WATANABE	Assistant Chief of Survey Division, JFTA
	Toshihar FUKUYAMA	Member of Survey Division, JFTA

2-2 Itinerary for Survey of Afforestation Planning

Soil survey for this planning was carried out for 40 days, from June 20th to July 29th, 1978, and investigation for afforestation was carried out for 25 days from July 5th to July 29th, 1978.

Itinerary

(1) Soil Survey Group

Day	Date		Stage	Contents of Survey and Others
1	Jun. 20	Tue.	Tokyo-Jakarta	
2	21	Wed.		Courtesy call to the Japanese Embassy and JICA, and consultation with them
3	22	Thu.	Jakarta-Bogor	Courtesy call to the Directorate General of Forestry, Indonesia, and consultation with them
4	23	Fri.		Information collection at the Directorate General of Forestry, Indonesia
5	24	Sat.	Bogor-Jakarta	

Day	Date		Stage	Contents of Survey and Others	
6	June.25	Sun.	Jakarta-Palembang	Moved to Palembang	
7	26	Mon.		Courtesy call to the South Sumatera Province Forest Office and consultation with them	
8	27	Tue.		Information collection and preparations for survey at the South Sumatera Province Forest Office	
9	28	Wed.	Palembang-Pendopo	Moved to Pendopo	
10	29	Thu.		Field survey; - Soil survey of grassland mostly in the proposed trial afforestation site. Number of sampling: 12 (No. 1 - 12) - Soil survey in natural and secondary stands	
11	30	Fri.			
12	Jul. 1	Sat.			
13	2	Sun.			
14	3	Mon.			
15	4	Tue.			
16	5	Wed.			
17	6	Thu.			
18	7	Fri.			
19	8	Sat.	Pendopo-Palembang	In the p.m., Moved to Palembang	Group member, Mr. SUGITA continued the soil survey at Pendopo. Number of sampling: 6 (No. 13-18)
20	9	Sun.		Arrangement of the itenerary with the afforestation planning group	
21	10	Mon.		Previous arrangement with the South Sumatera Province Forest Office. Observation of Merkusii pine manmade forest	
22	11	Tue.	Palembang-Pendopo		
23	12	Wed.		Field survey Soil survey in the trial afforestation site, along the main roads and the cutting surface of the roadsides. Number of sampling: 13 (No. 19-31)	
24	13	Thu.			
25	14	Fri.			
26	15	Sat.			
27	16	Sun.			
28	17	Mon.			
29	18	Tue.			

Day	Date		Stage	Contents of Survey and Others
30	Jul.19	Wed.		
31	20	Thu.		
32	21	Fri.	Pendopo-Palembang	Moved to Palembang
33	22	Sat.	Palembang-Jakarta	Report of the completion of the survey to the South Sumatera Province Forest Office. In the p.m., moved to Jakarta.
34	23	Sun.		Data arrangement of field survey. Preparing a draft of the interim report.
35	24	Mon.		Information collection at the Bogor Forest Research Institute
36	25	Tue.		Writing up the original draft of the interim report
37	26	Wed.		Discussion concerning the original draft of the interim report with the Japanese Embassy and JICA
38	27	Thu.		Writing up the interim report. Reporting to the Japanese Embassy and JICA
39	28	Fri.	Jakarta	Presentation and explanation of the interim report to the Directorate General of Forestry, Indonesia. Leave for home.
40	29	Sat.	Tokyo	

(2) Afforestation Planning Group

Day	Date		Stage	Contents of Survey and Others
1	Jul. 5	Wed.	Tokyo-Jakarta	
2	6	Thu.	Jakarta-Bogor	Courtesy call to the Japanese Embassy and JICA. Courtesy call to the Directorate General of Forestry, Indonesia.
3	7	Fri.	Bogor-Jakarta	Discussion with the Directorate General of Forestry, Indonesia
4	8	Sat.	Jakarta-Palembang	Discussion with JICA. Moved to Palembang. Join with the soil survey group.
5	9	Sun.		Arrangement of the itenerary with the soil survey group

Day	Date		Stage	Contents of Survey and Others
6	Jul.10	Mon.		Discussion with the South Sumatera Province Forest Office. Observation of Merkusii Pine man-made forest
7	11	Tue.	Palembang-Pendopo	Moved to Pendopo
8	12	Wed.		Field survey Investigation upon; - Increments of man-made forest (Sungkai, Merkusii pine and Albizzia) - Nersery - Natural and secondary forest stands - Land use classification - Vegetation
9	13	Thu.		
10	14	Fri.		
11	15	Sat.		
12	16	Sun.		
13	17	Mon.		
14	18	Tue.		
15	19	Wed.		
16	20	Thu.		
17	21	Fri.	Pendopo-Palembang	Moved to Pendopo
18	22	Sat.		Same schedule as the above mentioned soil survey team
19	23	Sun.		ditto
20	24	Mon.		ditto
21	25	Tue.		ditto
22	26	Wed.		ditto
23	27	Thu.		ditto
24	28	Fri.	Jakarta-	ditto
25	29	Sat.	-Tokyo	

Chapter I

Investigation of Afforestation Environment

Chapter I

Investigation of Afforestation Environment

1. Preliminary Work

The area under survey is about 50,000 ha and is divided into 3 blocks by the great rivers which run through this area.

Block I is a south-western district which involves the afforestation area, Block II is a northern district of green-movement area, and Block III is an eastern, southern and central district which involves the Pendopo town.

Each block was further divided into compartments of about 2,000-3,000 ha in area. The number of compartments in each block is 3 in Block I, 5 in Block II and 12 in Block III.

The distribution of blocks and compartments is shown in the attached map, "Location Map of Blocks and Compartments". (see Fig. I-1)

2. Land Use Classification

2-1 Present Situation of Land Use Classification

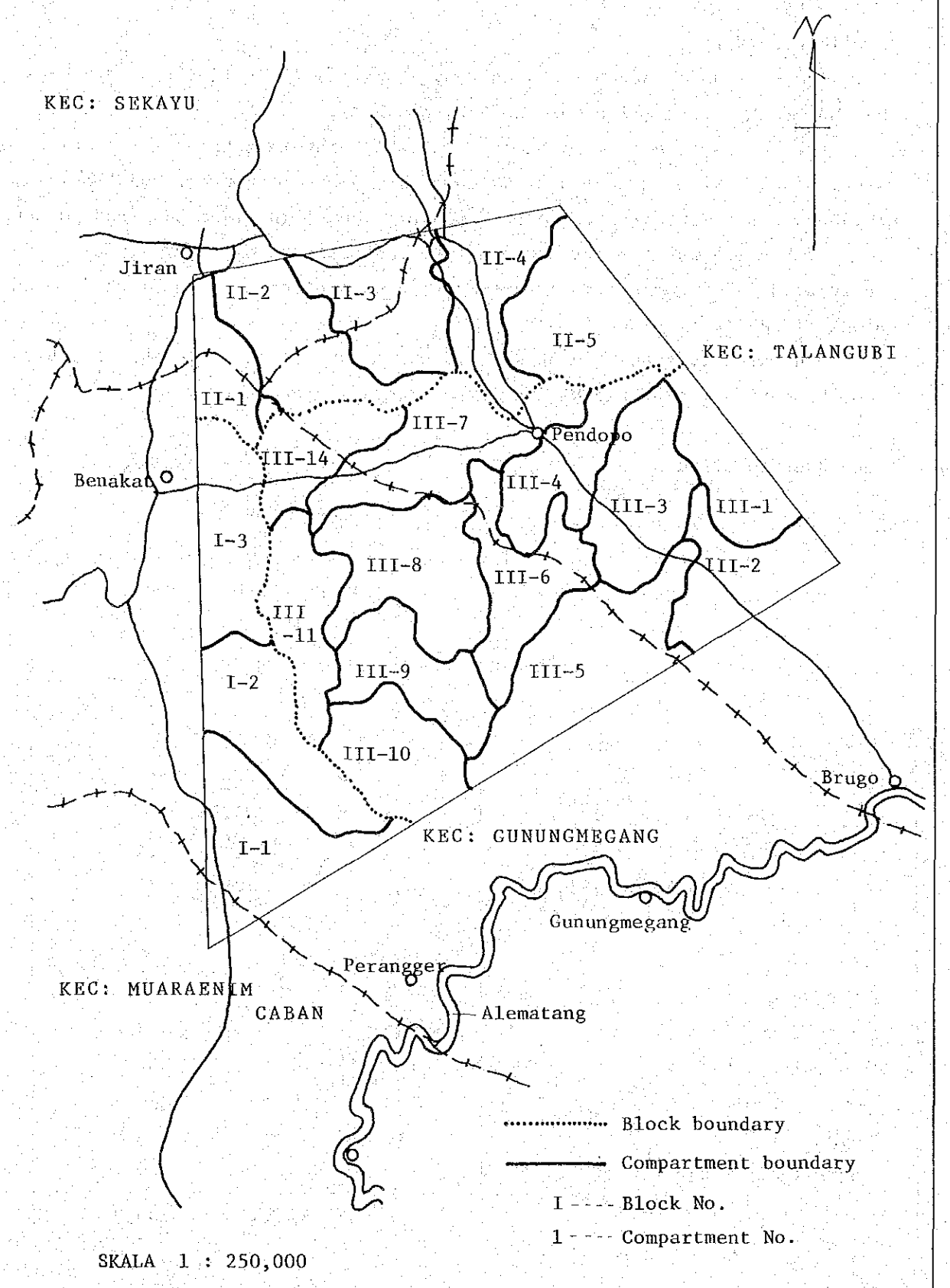
Present situation of land use classification was investigated by field survey and by making out of aerial photographs which were taken in 1978.

The area of each land use classification is shown in the following table.

Kind		Area (ha)	Percentage (%)
Natural forest	(Hr)	3,127.5	6.0
Man-made forest	(Ht)	1,597.5	3.1
Secondary forest, brushland	(Hb)	16,697.5	32.1
Grassland	(Al)	22,500.0	43.2
Bareland	(Tk)	807.5	1.6
Shifting cultivation land	(Sc)	1,932.5	3.7
Agricultural land	(Tg.Sw)	1,115.0	2.1
Plantation, etc.	(Pk)	4,015.0	7.7
Town, community	(Kp)	230.0	0.4
Swamp	(r)	0.0	0.0
Others (golf field and others*)		65.0	0.1
Total		52,087.5	100.0

Note: * is the area of 35.0 ha which could not be made out due to the presence of clouds.

Fig. I-1 Location Map of Block & Compartment



This includes grassland, bareland and shifting cultivation land, and the area of these 3 kinds is 25,240.0 ha in all, which accounts for 49%, that is, nearly half of the total area.

The land is not used effectively since the productivity of this area is very low.

The area and the map of land utilization of every block and compartment are shown in attached "Area Table of Land Use" and separate "Land Use Map".

(a) Natural forest, man-made forest and secondary forest and brushland.

Among the natural forest of 3,127.5 ha, 2,350.0 ha of forest exists as massive group only in south-western district and the remaining 822.5 ha is scattered on a small scale.

Man-made forests which exist in Block I have been planted since 1971. The planted species are mainly Sungkai. Species such as Merkusii pine, Albizzia, Eucalyptus are planted on a small scale.

Secondary forest and brushland account for 32.1 % of this area. These areas are located along the rivers, abandones area of rubber plantation, and the areas which were scarcely affected by burning.

(b) Grassland

Grassland accounts for nearly half of this area, and it spreads out around Pendopo town.

This grassland is a result of shifting cultivation which was carried out frequently in very wide range. At present, these areas are used as grazing for cattle, and burnings are carried out for the purpose of getting soft sprouts of Alang[2] as feed for cattle.

(c) Shifting cultivation

At present, there exists shifting cultivation area of 1,932.5 ha within this area. These are scattered in the secondary forest and brushland around the grassland. The transition of forest into grassland is caused by the shifting cultivation.

(d) Agricultural land

Among the agricultural land of 1,115.0 ha, the paddy field area is 15.0 ha, existing in only 2 places near Pendopo town. The rest of the area is dry rice fields and farm.

(e) Plantation, etc.

Plantation area of 4,015.0 ha accounts for 7.7% of this area. In this area, mainly rubber trees, coconut palms and coffee trees are planted. Clove trees have recently been introduced to the land of this type. Rubber trees are considerably scattered in the grassland.

2-2 Transition of Land Use Classification

Transition of land use classification during 17 years (1961-1978) was investigated by comparing the reading of land use classification by aerial photographs taken in 1961 and that of 1978.

The results are as follows.

Kind		Area (ha)		Increase (+) or Decrease (-)
		1978	1961	
Natural forest	(Hr)	2,145.0	3,830.0	-1,685.0
Man-made forest	(Ht)	1,563.5	0.0	+1,563.0
Secondary forest, brushland	(Hb)	14,425.5	22,727.5	-8,302.0
Grassland	(Al)	18,878.5	11,862.0	+7,016.5
Bareland	(Tk)	792.5	684.0	+108.5
Shifting cultivation	(Sc)	1,466.0	1,608.5	-202.5
Agricultural land, plantation, town, community, etc.		4,607.5	3,106.5	+1,501.0
Lack of data*		8,209.0	8,209.0	-
Total		52,087.5	52,087.5	-

Note: Lack of data* is due to the lack of the aerial Photographs taken in 1961.

These data on each block area are as follows (except*).

(a) Block I

Kind		Area (ha)		Increase (+) or Decrease (-)
		1978	1961	
Natural forest	(Hr)	1,442.5	2,942.5	-1,500.0
Man-made forest	(Ht)	1,556.0	0.0	+1,556.0
Secondary forest, brushland	(Hb)	2,056.0	2,722.5	-666.5
Grassland	(Al)	1,358.0	82.5	+1,275.5
Bareland	(Tk)	67.5	237.5	-170.0
Shifting cultivation	(Sc)	77.5	367.5	-290.0
Agricultural land, plantation, town, comminity, etc.		102.5	307.5	-205.0
Total		6,660.0	6,660.0	0.0

The transition of land use classification during 17 years in Block I is as follows.

Since 1961, natural forest, secondary forest and brushland were cut over, then shifting cultivation was carried out there. As a result of shifting cultivation, grassland increased rapidly at once. However, since afforestation in grassland was carried out from 1971 as a part of the afforestation project, the above-mentioned grassland has changed into man-made forest. At present, the area of this man-made forest is 1,556.0 ha.

(b) Block II

Kind		Area (ha)		Increase (+) or Decrease (-)
		1978	1961	
Natural forest	(Hr)	130.0	450.0	-320.0
Man-made forest	(Ht)	0.0	0.0	-
Secondary forest, brushland	(Hb)	2,417.0	4,868.0	-2,451.0
Grassland	(Al)	3,876.0	1,357.5	+2,518.5
Bareland	(Tk)	137.5	160.0	-22.5
Shifting cultivation	(Sc)	468.5	320.0	+148.5
Agricultural land, plantation, town, community, etc.		937.5	811.0	+126.5
Total		7,966.5	7,966.5	0.0

This Block II is the area where the green-movement project will be promoted.

As this area is very near from Pendopo town, there are a lot of opportunities for land utilization by local people. In this respect the natural forest, secondary forest and brushland decreased by about 2,800.0 ha, and were changed into grassland, thus resulting in the increase of the grassland.

In this area, shifting cultivation is still carried out at present.

(c) Block III

Kind		Area (ha)		Increase (+) or Decrease (-)
		1978	1961	
Natural forest	(Hr)	572.5	437.5	+135.0
Man-made forest	(Ht)	7.5	0.0	+7.5
Secondary forest, brushland	(Hb)	9,952.5	15,137.0	-5,184.5
Grassland	(Al)	13,644.5	10,422.0	+3,222.5
Bareland	(Tk)	587.5	286.5	+301.0
Shifting cultivation	(Sc)	920.5	981.5	-61.0
Agricultural land, plantation, town, community, etc.		3,567.5	1,988.0	+1,579.5
Total		29,252.5	29,252.5	0.0

Block III includes the area where the green-movement project will be promoted, and the future of the land is not yet to be decided.

This area includes Pendopo town and the communities which are scattered along the road extending to west of Pendopo town. For this reason, it seems that the large scale shifting cultivation was also carried out in this area since 1961. As a result, secondary forest and brushland decreased by about 5,200 ha, and grassland and bareland increased by about 3,500 ha.

3. Soil Survey

3-1 Selection of Sample Plots

Sample plots for soil survey were selected, by means of the aerial and mosaic photographs, in the representative places in natural forest, secondary forest, man-made forest and grassland. Then, sample plots were decided after grasping general condition of

places through the field survey of selected places.

3-2 Survey of Soil Profiles

At the sample plots which were decided by above-mentioned process, survey of soil profiles was carried out.

Items of the survey are as follows:

1) Description of soil profile
2) Thickness of horizon
3) Distinctness of horizon boundaries
4) Color
5) Humus
6) Gravel
7) Texture
8) Structure
9) Consistency
10) Porosity
11) Moisture condition
12) Leaching and illuviation
13) Root (herbacea, ligneous plant)

Collection of soil samples was carried out by sampling core from each horizon, and their permeability was examined.

The position of soil profile investigation plots is shown in soil map (Fig. I-2).

3-3 Classification of Soil Zones

Soil in this area is divided into 3 zones according to the geological structure and topography.

(a) Soil zone where iron stone gravel layer lies (A)

- Parent rock is clay stone

This zone is located in the east of the watershed which exists at the central part of this area.

There is a rolling terrain which was divided by many small rivers which run east or north-east on the terrain at 80-90 m above sea level. Original geographical features of flat or gentle slope surface remain.

Relief in this zone could be divided into top, slope, foot slope of rolling terrain and flat valley floor.

(b) Soil zone where iron stone gravel layer lacks (B)

- Parent rock is clay stone