REPORT OF FEASIBILITY SURVEY (SECOND SURVEY) ON SILVICULTURE PROJECT IN INDONESIA (SOUTH SUMATERA)

DECEMBER 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

Foreword

Since the 1974 oil crisis and the resulting increases in raw material prices, many countries have been suffering from rampant inflation whilst, in others, production has become stagnant and, consequently, the economic growth rate has slowed down (drastically).

Reflecting this world economic situation, the Japanese forestry industry, which is already evolving in a global dimension, has encountered an extremely stern reality in the past couple of years. In particular, difficulties have arisen, such as rises in production costs at the source and the stagnant prices of wood products in Japan, owing to imported timber, which accounts for 65% of the total timber supply.

If an attempt is to be made in these circumstances to explore the feasibility of afforestation projects, it is essential to make assessments in a broad-ranging and long-term perspective of forest resouces and the tendency of timber demand and supply on the basis of sound technological studies without being merely influenced by the present industrial fluctuation.

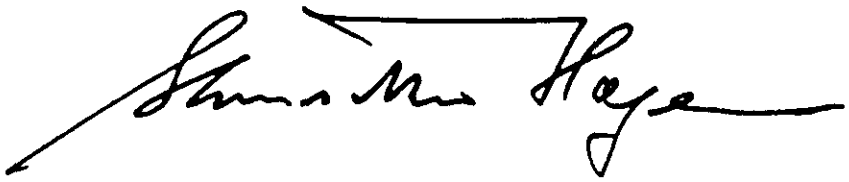
There is no need to point out that the forest resources which may be regenerated and cultured ought to be steadily developed and reasonably utilized in a long-range and systematic perspective. For this reason, sufficient surveying and planning as well as relevant tests and research should be carried out before any afforestation project is initiated. Therefore it is hoped that close collaboration will be maintained between Indonesia and Japan in the survey and research phase.

With the above in mind, the preliminary and second surveys have been conducted, and we sincerely hope that the final survey will also be carried out in accordance with this spirit.

The second survey was conducted from November 26 to December 21, 1975, under the leadership of Mr. Kishio Ofuku, Vice-President of the Japan Pulp and Paper Association. This survey followed the preliminary survey conducted in June of the same year. It is our sincere hope that this report will prove useful for the personnel concerned as a reference and that the afforestation project will be realized on a firm basis.

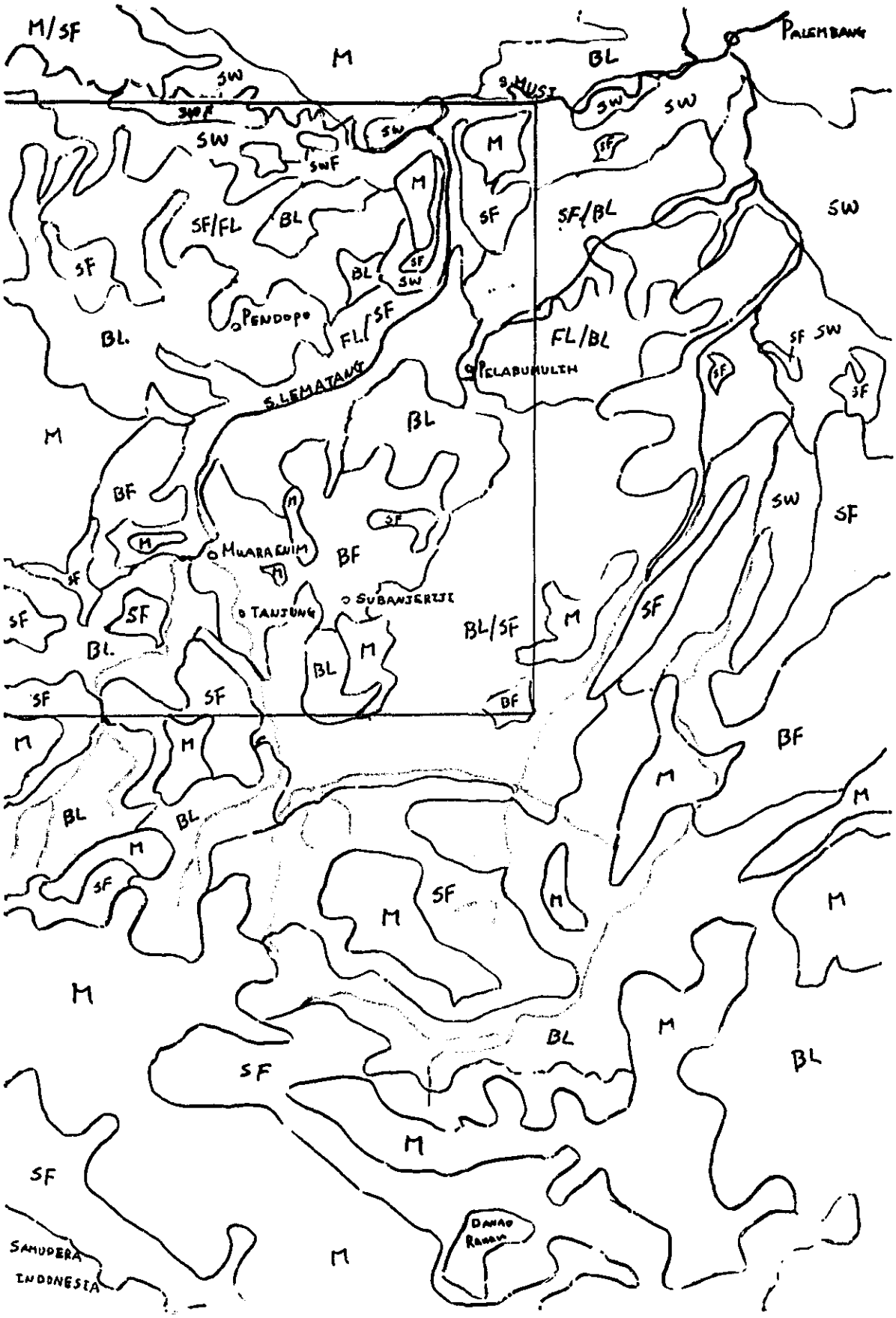
Last but not least, we would like to express our most sincere appreciation to the Directorate General of Forestry and other agencies concerned of the Indonesian Government and also to the Ministry of Foreign Affaris, Ministry of Agriculture and Forestry and other Japanese Government agencies concerned for their generous support in the present survey.

December 1976



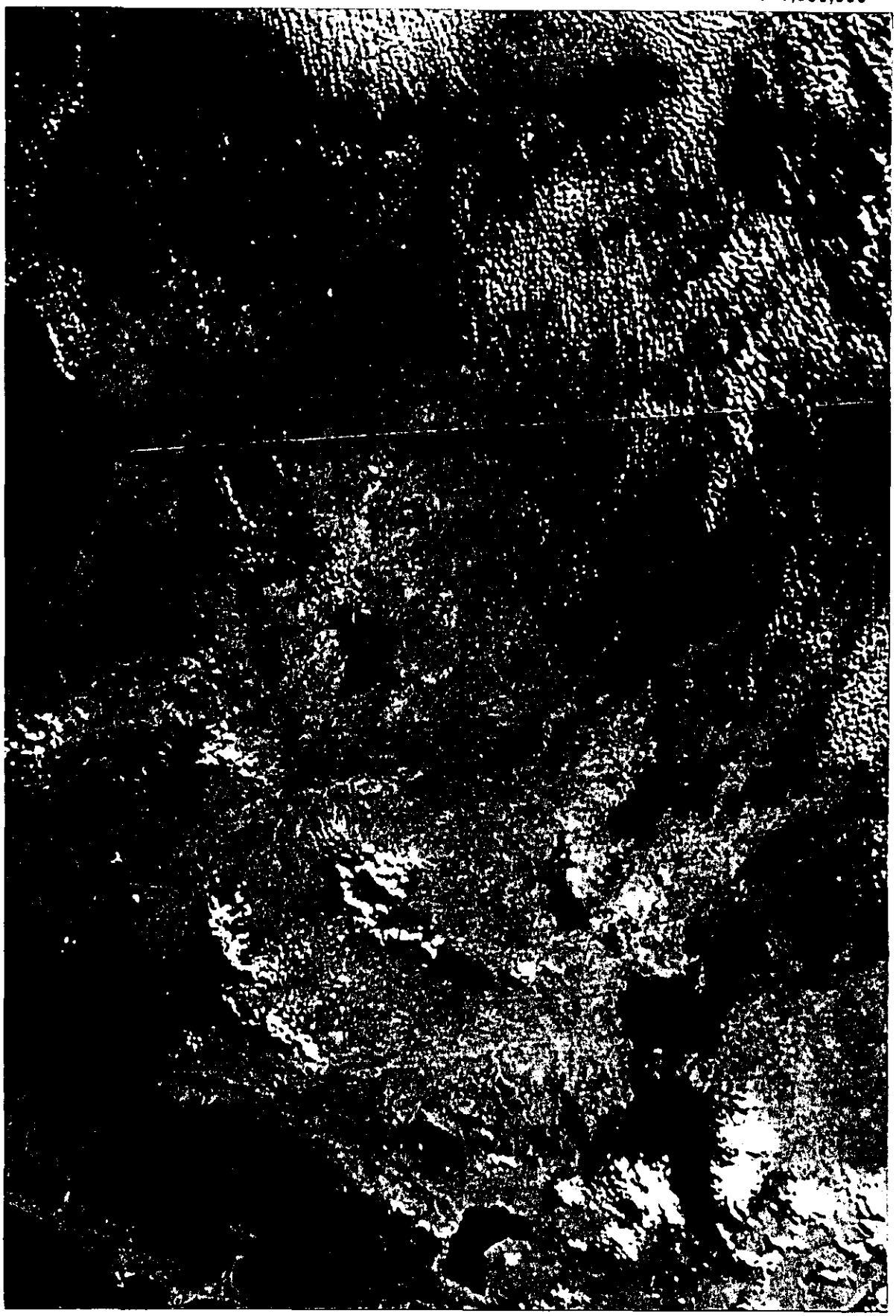
Shinsaku Hogen
President
Japan International Cooperation Agency

ERTS Photograph



ERTS Photograph (infrared color)

SCALE 1:1,000,000



SYMBOL	VEGETATION	SYMBOL	VEGETATION
M	dense forest	FL	cropland
SF	secondary forest	BF	bare land
SWF	swamp forest	SW	swamp
BL	grass land		

The preceding photograph taken by ERTS (Earth Resources Technology Satellite) in "infrared colors" shows some environmental factors on the projected area "Lematang River Watershed".

This infrared color photograph was analized together with other multi-band photographs (wave length: 0.5μ, 0.7μ and natural color) to assess natural condition such as vegetation, water distribution, land uses and so on.

On this photograph we could interpret as follows:

Dark Redish Brown - - - - - - - - - dense forest

Light Redish Brown - - - - - - - - - secondary forest

Grayish Red Brown - - - - - - - - - swamp forest

Light Vermillion - - - - - - - - - grass land

Vermillion - - - - - - - - - - - - cropland

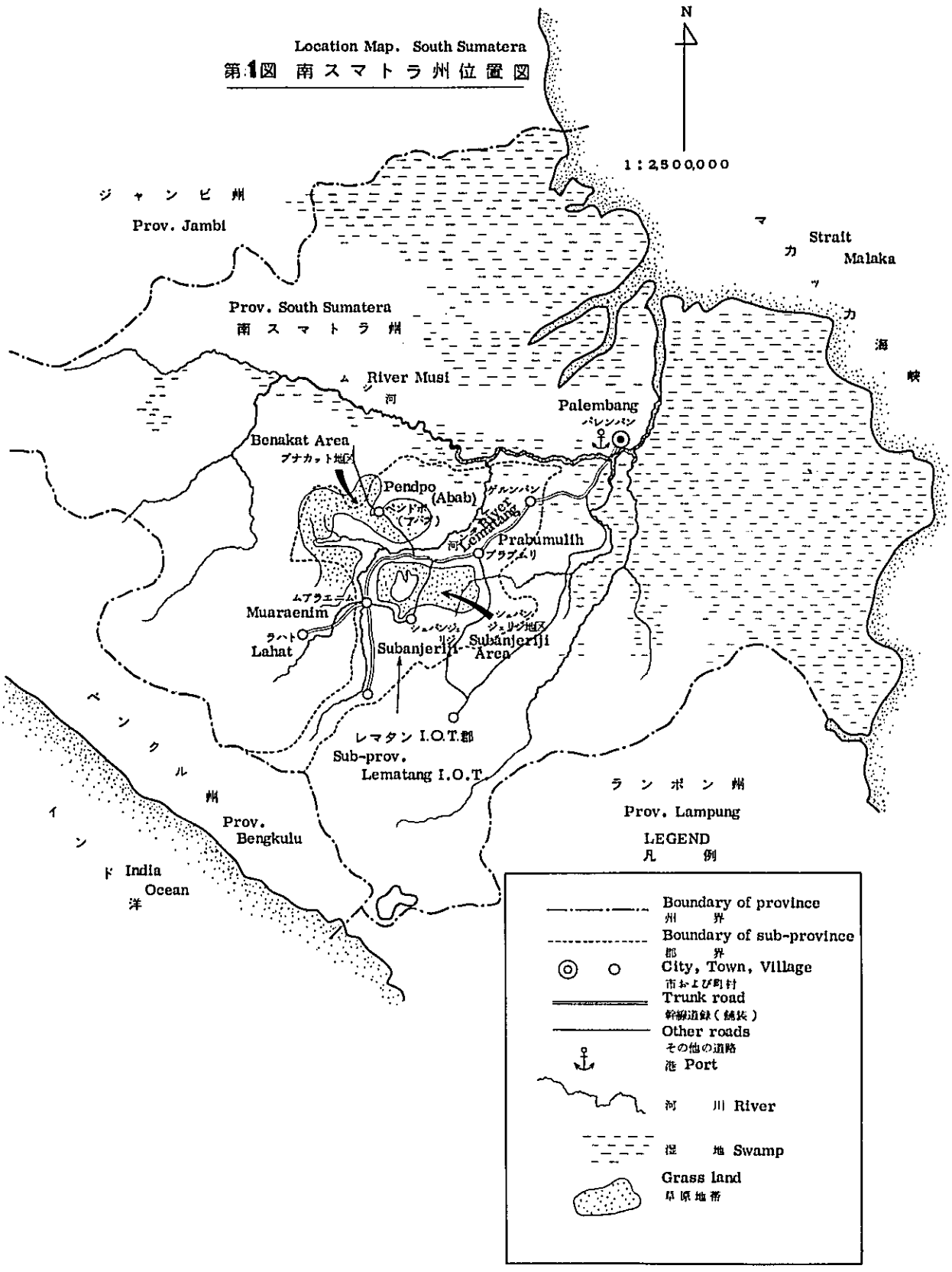
Pale Greenish Blue - - - - - - - - - bare land

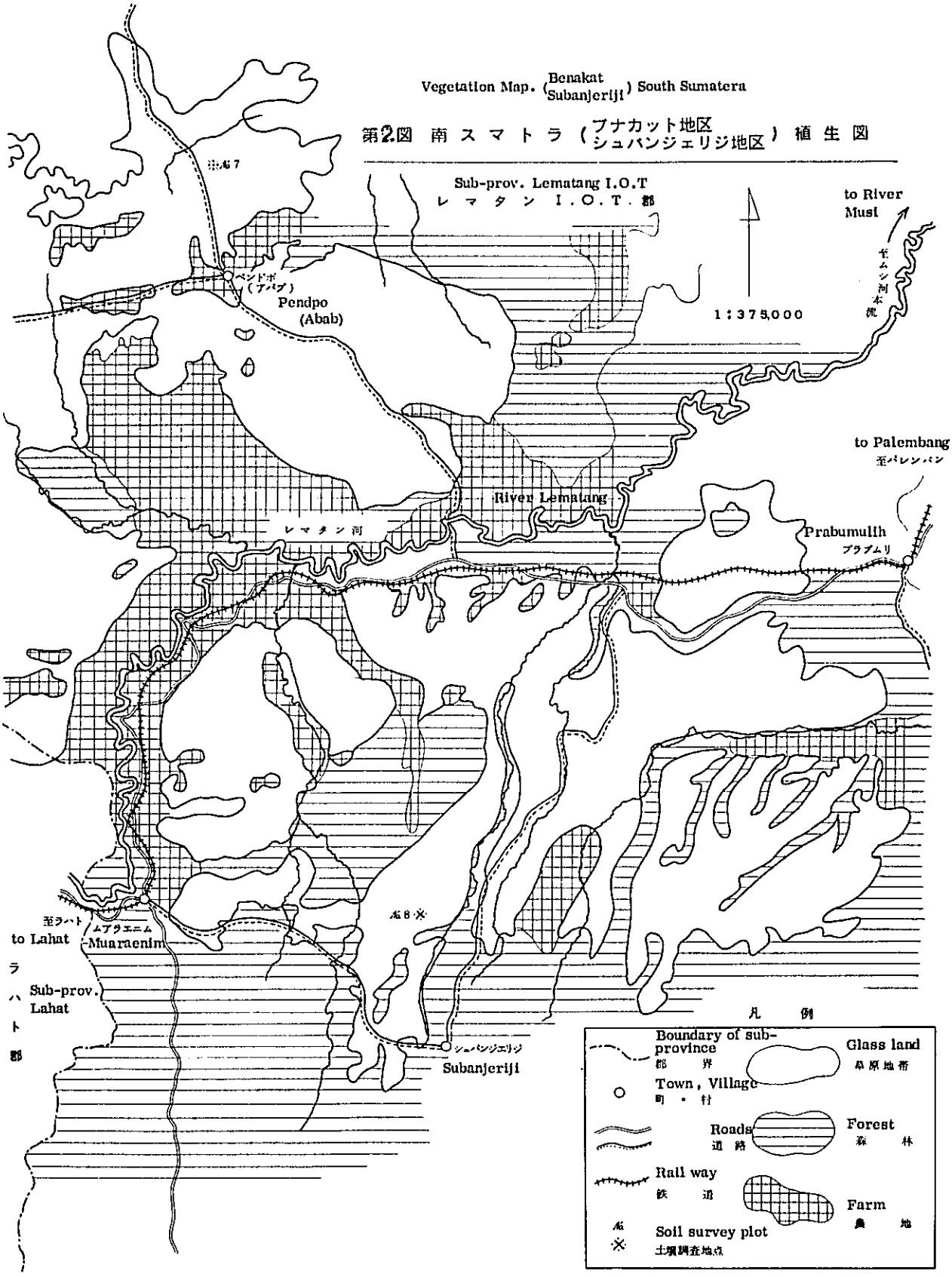
Dark Blue - - - - - - - - - - - - river, lake, sea

Dark Green - - - - - - - - - - - - swamp

Location Map. South Sumatera

第1図 南スマトラ州位置図




Vegetation Map. (Benakat Subanjeriji) South Sumatera
第2図 南スマトラ（ブナカット地区 シュバンジェリジ地区）植生図
Sub-prov. Lematang I.O.T
レマタン I.O.T. 郡
to River Musi
至ムシ河本流
1:375,000
ペンドポ（アバブ）
Pendpo (Abab)
to Palembang
至パレンバン
River Lematang
レマタン河
Prabumulih
プラブムリ
至ラハト
ムアラエニム
to Lahat
Muaraenim
Sub-prov. Lahat
ラハト郡
シュバンジェリジ
Subanjeriji
凡例
Boundary of sub-province 郡界
Town, Village 町・村
Roads 道路
Rail way 鉄道
Soil survey plot 土壌調査地点
Glass land 草原地帯
Forest 森林
Farm 農地

Contents

Introduction: Purpose and Outline of the Survey

0-1 Preface

The rate of imported timber already accounts for 65% of Japan's total demand and supply of timber. Particularly, there has been a sharp rise in the import of Indonesian timber in the last several years. The import of timber from Indonesia has recently become larger than that of any other country.

The fact that re-afforestation will be carried out in Indonesia as a cooperation project under these circumstances is quite significant for a stabilization of the timber demand and supply in Japan as well as from the standpoint of rendering cooperation in the sustained yield of forest resources. In order to realize a re-afforestation project as one of the cooperation projects in Indonesia on the basis of the significance of this cooperation and the past developments which are to be elucidated below, the Japan International Cooperation Agency (JICA) carried out the second feasibility survey in 1975. This report concerns the second survey.

0-2 Chronological Review

(1) In June, 1975, the Japan International Co-operation Agency carried out a basic survey (preliminary) for a afforestation project. The field survey were performed in North and South Sumatera, and the grassland and bush land of South Sumatera were selected as a site proposed for cooperation in afforestation.

(2) In November 1975, the Director General of Forestry and other Indonesian leaders visited Japan. During their visits to the Forestry Agency and the Japan International Cooperation Agency, cooperation in the field of forestry between Indonesia and Japan, centering around re-afforestation, was discussed.

0-3 Outline of the Basic Survey (Preliminary)

The Japan International Cooperation Agency carried out the basic survey (preliminary) for 21 days from June 1 through 20, 1975, and the survey term was headed by Jiro Namura, Director of Forestry Development Cooperation. The outline of this survey is as follows:

(1) Terms of Reference of the Survey (Preliminary) Mission

a. To brief the line of business of the Japan

International Cooperation Agency to the Indonesian side and exchange views on cooperation in forestry between both countires.

b. To exchange views on the feasibility of development cooperation in a re-afforestation project and conduct a field survey for the selection of a place suitable for this project.

c. To exchange views on technical cooperation on a governmental basis.

(2) Talks with the Indonesian Government (Directorate General of Forestry)

a. The Indonesian side basically approved of cooperation between the two countries in cooperation in the field of forestry -- particularly, in a re-afforestation project.

b. For development cooperation in a re-afforestation project, the attention of the Indonesian side was invited to the necessity of regulation in respect of re-afforestation in Indonesia. The Indonesian side was already aware of the necessity and stated that the systematization of the right of re-afforestation (HPH) was under study and that the system take on a concrete shape before the visit of the next Japanese survey team

to Indonesia.

c. In regard to technical cooperation in the overall aspect of forestry, the Indonesian side took a strong interest in analysis with aerial photos, forestry inventories with aerial photos and training on logging techniques in addition to mechanical planting, species elimination tests, and facilities in nurseries (including those for seeds collection and breeding).

d. The Indonesian side hoped to send Indonesian officials to Japan to step up negotiations on development cooperation in b, above, and technical co-operation in c, above.

(3) Field Survey

a. For the initiation of the preliminary survey, the Indonesian side named four places as sites suitable for the survey (where development cooperation and technical cooperation would be feasible). They included North Sumatera, South Sumatera, South Kalimantan and South Sulawesi. The Indonesian side hoped that a field survey be conducted at least in two of these places. The survey team selected North Sumatera and South Sumatera, to which the Indonesian side seemed to have given high priority, and carried out a field

survey.

b. Upon overall assessment on the natural conditions (soil, vegetation, topography, etc.) and the socioeconomic conditions (rights associated with land, infrastructure, manpower for re-afforestation, etc.), South Sumatera (Benakat and Subanjeriji in the Province of South Sumatera) was considered to be a place prospective for development cooperation in afforestation.

c. In the area around the Toba Lake in North Sumatera, afforestation projects are being executed by the Indonesian Government to a considerable extent, and it was concluded that the extension of technical cooperation between Indonesia and Japan would make it possible to replenish these projects, qualitatively and quantitatively.

0-4 Purpose and Other Items of the Basic Survey (Second)

(1) Terms of Reference of the Survey (Second) Mission

The mission aimed to negotiate with the Government of Indonesia and others to promote the cooperative afforestation project in the grassland of Benakat and Subanjeriji (west of Palembang in South Sumatera) which had been considered to be a suitable area for a

afforestation project as a result of the preliminary survey. Moreover the mission aimed at framing a fundamental plan based on more detailed information and data which would be obtained by the field survey.

(2) Composition and Schedule of the Survey Team

The survey was conducted for 26 days from November 26 through December 21, 1975, by a team of six persons headed by Mr. Kisio Ofuku, Vice-President of the Japan Pulp and Paper Association.

The composition of the survey team and the survey schedule are as follows:

Composition of the Survey Team

Assignment	Name	Organization
Leader	Kisio Ofuku	Vice-President, Japan Pulp and Paper Association
Planning	Jiro Namura	Director, Forestry Development Cooperation Department, JICA
Soil Survey	Kazuto Arimitsu	Head, Soil Survey Section, Government Forest Experiment Station, Ministry of Agriculture and Forestry
Silviculture	Kiyoto Funato	Deputy Head, National Forestry Division, Forestry Agency
Aerial Photogrammetry	Tadao Ohara	Asst. Chief, Technical Section, Technical Development Dept., Japan Forest Technical Association
Coordination	Takasi Uesugi	Deputy Head, Development Division, Forestry Development Department, JICA

Survey Schedule

Date	Trip	a.m.	p.m.
11/26 (Wed.) 11/27 (Thu.)	Tokyo - Jakarta	Paid a courtesy visit to the Japanese Embassy.	Talks on the schedule at the JICA office.
11/28 (Fri.)		Paid a courtesy visit to the Directorate General of Forestry and discussed the schedule.	Paid a courtesy visit to the Directorate General of Forestry and discussed the schedule.
11/29	Bogor	Exchanged views with the Director of the Forest Research Institute and discussed aerial photogrammetry at the Office of Planning, Directorate General of Forestry.	Visited the Bogor Botanical Garden.
11/30 (Sun.)	Jarkata - Semarang	The Leader and 4 members moved to Semarang.	Mr. Ohara remained in Jakarta and checked aerial photogrammetry (Nov. 30 - Dec. 4).
12/1 (Mon.)	Semarang - Pekalongan - Tegal	Visited Perm Perkutani Unit 1 in Central Java and conducted a field survey on teak man-made forests of Kendal K.P.H.	Conducted a field survey on a arboretum and nursery of West Pekalongan K.P.H.

Survey Schedule (Cont'd)

Date	Trip	a.m.	p.m.
12/2 (Tue.)	Tegal - Balapulang - Baturaden	Conducted a field survey of teak forests and Tumpangsari system of Bulapulang K.P.H.	Carried out a field survey on a nursery and Agatis man-made forests of East Banyumas K.P.H.
12/3 (Wed.)	Baturaden - Semarang	Visited the East Banyumas K.P.H. and moved to Semarang.	Moved to Semarang.
12/4 (Thu.)	Semarang - Jakarta	Visited and surveyed a woodworking shop.	The leader and 4 members moved to Jakarta and joined Mr. Ohara.
12/5 (Fri.)	Jarkata - Palembang	Moved to South Sumatera.	Discussed the Schedule with counterparts of the Directorate General of Forestry.
12/6 (Sat.)		Paid a courtesy visit to the Director of the South Sumatera Regional Forest Office and discussed the schedule.	Surveyed Pinus merkusii man-made forest in Palembang. Surveyed Kumala Mas Sawmill and Palembang Port.
12/7 (Sun.)	Palembang - Subanjeriji - Tandjung Enim	Moved to Subanjeriji.	Conducted soil survey on grasslands and secondary forests.
12/8 (Mon.)	Tandjung Enim - Muaraenim - Pendopo	Paid a courtesy visit to the Head of L.I.O.T. Sub-province Office.	Conducted soil survey on secondary forests nearby Pendopo.
12/9 (Tue.)		Surveyed the nursery nearby Pendopo and its outlying re-afforestation area.	Conducted forest and soil survey in the outlying forest.

Survey Schedule (Cont'd)

Date	Trip	a.m.	p.m.
12/10 (Wed.)		Surveyed the soil of a natural forest.	Surveyed Swoody's logging camp and log yard. Conducted soil survey on grasslands.
12/11 (Thu.)	Pendopo - Palembang	Conducted soil survey on 7 plots of grassland.	Moved to Palembang.
12/12 (Fri.)		Mr. Namura and Mr. Arimitsu paid a courtesy call to the Governor of South Sumatera.	Leader and 3 others conducted an aerial survey on Pendopo and Subanjeriji area.
12/13 (Sat.)		Collected and sorted out data.	
12/14 (Sun.)	Palembang - Jakarta	Moved to Jakarta.	
12/15 (Mon.)		Briefed at the Director General of Forestry and the Director of the Afforestation on the outline of the results of the survey.	Compiled an interim report.
12/16 (Tue.)	(Bogor)	Visited the Bogor experimental forests. Paid a cortesy visit to the Director of Planning, Directorate General of Forestry.	Discussed aerial photogrammetry at the Directorate of Planning and collected date at the Forest Research Institute.
12/17 (Wed.)		Compiled the interim report and collected and sorted out data.	The same as in the morning.

Survey Schedule (Cont'd)

Date	Trip	a.m.	p.m.
12/18 (Thu.)		Discussed the interim report at the Japanese Embassy and JICA office.	The same as in the morning.
12/19 (Fri.)		Presented the interim report on the results of the survey and exchanged views at the Directorate General of Forestry.	Reported to the Japanese Embassy and JICA office.
12/20 (Sat.)		Collected and sort out data.	
12/21 (Sun.)	Jakarta - Tokyo		

Chapter 1: Results of the Survey

1-1 Outline of the Survey Area

Benaket and Subanjeriji, which constituted the survey area, are situated between latitude 3° and 4° S. and between longitude 103°30' and 104°20' E. Covering more than 400,000 ha. in terms of inclusive area, they are a grassland, bush land and secondary forests. Both areas occupy the greater part of Kapbaten Lematang I.O.T. in the Province of South Sumatera and are situated along the middle and lower reachers of the Lamatang River, a tributary of the huge Musi River whose basin encompasses almost every part of the Province of South Sumatera. Rising about 50 meters above the sea level, both areas are a gently waving plain sandwiched between a swampy zone along the downstreams and a mountainous zone along the upstreams.

The local administrative agency which exercises jurisdiction over both areas is the Lamatang I.O.T. Sub-province Office under the provincial Government of South Sumatera situated in the city of Palembang. The Lematang I.O.T. Sub-province Office is situated in Muaraenim. Both areas in which the survey was conducted

extend over the three villages of Gnung Megang, Perabumulih and Talang Ubi.

Both areas are situated within a radius of 100-180 kilometers of Palembang, the capital of the Province of South Sumatera. A national highway and a railway run through the center of both areas and a water transportation runs into the city of Palembang by way of the Lamatang River and the main stream of the Musi River. Benakat is situated along the left bank of the Lematang River, or northwest to the national highway, railway and Lematang River, whereas Subanjeriji is located along the right bank of the river, or southeast to the national highway, railway and Lematang River. Communities are situated along roads in both areas, and shifting cultivation lands, farmlands, rubber plantations, grasslands, brushlands and secondary forests spread in an interlacing pattern. Grasslands, however, account for most of their total area. Incidentally, many oil wells are situated in both areas, and the roads linking these oil wells have been developed to a considerable degree.

Viewed from these geographical conditions as well as the population and industry which will be elucidated later, it might be said that these areas, albeit not

developed as highly as Java Island, are fairly developed in comparison with areas of outer Java and comparatively convenient for living.

1-2 Natural Conditions of Location

Subanjeriji and Benakat, for which afforestation was originally planned, is a long stretch of hills with diluvial deposits. Rising about 50 meters above the sea level, this area takes on the character of a series of gentle undulations with a difference of about 10 meters in height.

Vegetation is composed mainly by grasslands of Imperlata cylindrica, which are believed to have resulted from a repetition of shifting cultivation after the felling of tropical rain forests. In addition, brushlands (Bruhkal mudah and Bruhkal) and secondary forests sporadically exist in the grasslands and are considerably large in area.

In regard to the climatic conditions, the annual precipitation, as shown in Table 1, stands at about 3,000 mm in Gunung Megang, about 3,200 mm in Muara Enim and about 2,100 mm in Sekajn. The monthly everage precipitation is relatively small at the three points from May

through September, reaching about 100 mm in July. This period, therefore, may be looked upon as a dry season. The prevailing wind is from the southwest in the rainy season and from the southeast in the dry season, the wind velocity being registered at 3-6 m/sec. The monthly average temperature in Muara Enim is given in Table 2. This area is known for its few monthly changes in temperature like any other tropical rain forests.

There seems to be not so much difference in climatic conditions between Subanjeriji and Benakat.

The soil is mostly red yellow podzolic soil whose parent material is diluvial deposits, but the soil structure differs to a fairly great extent, depending on the granuity of deposits and the location. However, the systematic relation between soil structures and deposits could not be verified in the latest geological survey.

In any event, the soil is all clayey. What appeared to be an iron or manganese cementation (laterite?) sporadically exists in the lower B layer, thus hindering the growth of root systems. This phenomenon is conspicuously observed in the soil of the area near Palembang Airport (Pinus merkusii man-made forest) and also

Table 1 Precipitation and Number of Rainy Days in and around Benakat

Place		Annual total	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Gnung Megang	mm Precipitation	3,048	386	335	357	327	149	156	110	148	171	236	298	375
	Number of Rainy days	145.1	18.3	15.8	16.4	14.8	9.3	7.7	6.0	6.8	8.8	11.3	14.0	15.9
Mura Enim	mm Precipitation	3,191	422	355	357	323	217	150	113	145	176	225	301	407
	Number of rainy days	176.8	20.2	15.8	13.3	15.0	14.0	12.6	8.4	11.6	13.6	15.8	18.3	17.9
Sekaju	mm Precipitation	2,862	329	250	350	309	195	127	99	148	160	266	285	344
	Number of rainy days	131.6	14.9	12.8	15.2	13.0	8.9	6.6	5.9	6.8	8.7	11.2	13.1	14.5

Table 2 Mean Temperature in Nuaraenim nearly Benakat

Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
26.5	25.8	26.4	6.0	25.8	26.5	27.4	28.0	26.8	26.5	26.4	25.7

in the area where the survey was conducted in Subanjeriji. One of the common characteristics of red yellow podzolic soil with diluvial deposits is that a layer with red clayey deposits exists in the lower stratum. This layer is believed to have developed in water bearing conditions, but where it has developed in the existing environment has yet to be clarified. If probably formed during the process of accumulation in the diluvium age. In terms of the present landform, this layer is observed in shallow places in some cases, and in others, in depths of 70-80 meters. If this heavy clayey layer is found in a shallow place, the growth of forest trees will be hampered.

Aside from the layer of red clayey spots, gray, deoxidized spots are frequently observed in the outer stratum -- to be more exact, in the A stratum or the upper part of the B stratum, and this is believed to have developed as a result of the insufficient drainage of the clayey soil in the existing environment. The extent to which the growth of forest trees will be efected by dioxidized conditions, as indicated by dioxidized spots, remains unknown.

Owing to the intense flowout of soil in grasslands,

the A stratum is light in color, and the outer layer of the soil looks pale gray, as the clay has dispersed and flowed out and quartz sand has remained.
The A stratum is relatively thick in secondary forests and the soil aggravation is not so conspicuous as in the grasslands. In any event, the soil is generally shallow and this restricts the distribution of root systems and eventually the growth of forest trees. This coincides with the discovery from the growth surveys conducted on existing man-made forests that the growth of forest trees will suddenly slow down when the age exceeds 15 years.

On the field they say that the accumulation of litter and raw humus of pine trees is associated with an aggravation of the soil, but this theory could not be verified in the latest survey. (The form of the soil profile checked in the latest survey is shown in a table given at the end of this report).

1-3 Economic Conditions of Location

The socieconomic conditions of Lamatang I.O.T. in the Province of South Sumatera, where the latest survey was conducted, will be elucidated below from the standpoint of forestry and forest industry:

1-3-1 Public Welfare

The Province of South Sumatera had a population of 3,620,309 in 1973. Checked by age bracket, the polulation is of the juvenile and youth type; those 20 years of age and down account for 59%, and those 40 years of age and down 86%. In addition to the city of Palembang, the Province of South Sumatera has another city and eight sub-provinces. The sub-province of Lematang I.O.T. is of the intermediate size among these city and sub-provinces in terms of population.

The sub-province of Lematang I.O.T. had a population of 372,987 in 1972. The population of three villages (Gnung Megang, Perabumlih and Talang Ubi) including the Subanjeriji area, where the survey was conducted, stood at 201,115, accounting for more than half of the sub-province's population.

In regard to the educational affaris of Lematang I.O.T., there were 42,880 primary school pupils and middle and high school students, 1,642 teachers and 209 schools (173 primary schools, 27 middle schools and nine high schools) in 1972. Many of these pupils, students and schools are concentrated in the three villages.

In respect of the medical care services of this country, there are five hospitals, two of which are situated in Pendopo, which was included in the survey area, and Perabumlih, an associated village. In addition, the sub-province has 30 clinics and 17 maternal and child clinics, to which six doctors, 16 midwives and six nurses are assigned.

1-3-2 Land Uses

The total area of Lamatang I.O.T., to which Benakat and Subanjeriji belong, is 657,500 ha. and the present land uses is as follows:

Forests	102,741 ha
Croplands & Plantations	313,375
Paddy Fields	49,618
Secondary Forests and Grass Lands	491,766
Total	957,500

Aside from the forests, the distribution of land use is as follows:

a. The area on the right bank of the Musi River consists of paddy fields, rubber plantations, swamps and secondary forests.

b. The areas on both sides of the Lamatang River consist of paddy fields, rubber plantations and cultivated lands.

c. The areas on both sides of the Belida River consist of rubber plantations, coffee plantations, paddy fields and cultivated lands.

d. The areas on both sides of the Bambang River consist of rubber plantations and cultivated lands.

e. Areas on both sides of the Enim River consist of rubber plantations, coffee plantations, paddy fields and cultivated lands.

Incidentally, the administrative authorities think of the utilization of land in ways suitable for its functions. There are no established plans for land use, nor may the land utilization be considered intensive. The conventional method in which forests are cut over and turned into arable lands eventually leads to the conversion of shifting cultivated lands into grasslands, brushlands and secondary forests. In other words, communities of farmers engaged in shifting cultivation sporadically exist in the grasslands, shrublands and secondary forests of the survey area, and burning is

done in this area before the rainy season. After farming in one or two years, the farmers abandon the fields and are engaged in shifting cultivation in some other places, and this series of actions is repeated.

This type of farming is put to widespread use in various places of Indonesia other than Java as a kind of extensive agriculture for relatively less populated and vast lands. In addition to this type of shifting cultivation, burning is done in an offhand manner on an irregular basis in order to renew berbage for deers and other animals for hunting purposes in this area.

These types or burning result not only in the loss of secondary forests, planted forests and other forests but also in the degeneration of the soil conditions. The Indonesian Government places a ban on burning in this shifting cultivation and makes it a policy to convert shifting cultivation into settled farming. As no substitutes are available to take the place of shifting cultivation and enable inhabitants to make a living, however, the only concrete measure taken by the Government is to prevent shifting cultivation from being spread into the national lands, which are distinguished

1-3-3 Forest Exploitation

(1) Timber Production

The output of forest products in the Province of South Sumatera from 1969 to 1973 is shown in Table 3.

Table 3

Year / Product	1969	1970	1971	1972	1973
Round wood (m^3)	105,610	373,378	303,664	234,427	661,177
Lumber (m^3)	41,710	78,656	103,580	140,729	373,188
Fire-wood (m^3)	21,504	28,104	40,420	35,862	33,450
Charcoal (ton)	3,438	1,965	5,708	7,264	2,517

The output of forest products in the Sub-Province Lematang I.O.T. from 1969 to 1973 is shown in Table 4.

Table 4

Year / Product	1969	1970	1971	1972	1973
Round wood (m^3)	2,226	1,355	274	275	2,922
Lumber (m^3)	278	190	6	20	158
Fire wood (m^3)	798	794	914	971	614
Charcoal (ton)	6	8	6	4	7

Of the 611,777 m^3 of round wood produced in the Province of South Sumatera, 619,355 m^3 (94%) were exported and the remaining 41,432 m^3 (6%) was diverted for domestic use. The all producted lumbers were diverted for domestic use.

(2) Lumber Transportation

As the Palembang market deals with lumber produced in the survey area, the transportation of produced lumber will be elucidated below:

a. Roads

For road transportation, national, province

and country roads are available as public roads, and an oil-well drilling company's roads are also available as private roads.

The maintenance and control of public roads other than the trunk roads are not fully conducted, nor are the surface conditions good.

The conditions of some bridges are not adequate. Oil pipelines are buried under public roads in some places. In view of this situation, tonnage restrictions are placed on vehicles passing public roads.

For land transportation from the Benakat area, vehicles must cross the Lematang River at some point in making a trip between Palembang and Benakat.

The existing river-crossing point by ferryboat is Bernge, about 120 km away from Pelambang.

It takes about $2\frac{3}{4}$ hours by car from Palembang to Bernge in the dry season and about four hours in the rainy season; by truck, about $3\frac{1}{2}$ hours in the dry season and about five hours in the rainy season.

b. Rivers

The rivers which exist in the Sub-province of Lematang I.O.T. include the Musi River and

its tributaries, Lematang, Enim, Rambang and Belida. The Musi and Lematang Rivers are usable for the transportation of commodities between Benakat and Palembang. Under the consideration of road construction to reach these rivers, it will be more convenient to go by way of the Lematang River than to make direct use of the main stream of the Musi River.

The distance between Bernge (crossing point of the Lematang River) and Palembang is about 150 km by way of the main stream of the Musi River.

The Lemantang River is 30-50 meters wide and 3-10 meters in depth. Tugboats of the 5-10 ton class may go upstream as far as Kota Muraenim in the rainy season and Ulakbandung in the dry season.

c. Lumber Transportation Methods

The following two methods of lumber transportation from Benakat to Palembang are conceivable.

* Lumber will be transported by truck from Benakat to a log pond of the Lamatang River and then in floats to Palembang.

* Lumber will be transported by truck from Benakat all the way to Palembang.

Which method is advisable will be determined, depending on the tonnage restrictions for the public road to be used, yearly (monthly) lumber transportation volume, cost and other factors.

d. Conditions of Palembang Port

Palembang Port is situated 80 kilometers up the Musi River from its estuary. The Musi River is shallowest at its estuary with a depth of 4 meters and is 7-8 meters deep in other places. The depth must be added by 2.2-3.4 meters at high water. At present, the ships going in and out of Palembang Port are limited to less than 160 meters in length and less than 7 meters (21 feet) in draft. The dredging of the shallowest part of the estuary began in 1976 to assure a depth of 7 meters. Upon completion, the depth at high water will be about 10 meters. However, an oil pipeline was laid across the main stream of the Musi River at a point about 10 kilometers down from Palembang Port where the Musi River meets the Gerong River. As the depth of this point is 4.2 meters (7.2 meters at high water). Even if the estuary is dredged to a depth of 7 meters (will be about 10 meters at high water), the drat of incoming and outgoing vessels will remain at 7 meters,

as long as the oil pipiline is left as it is.
For entries up to the pipeline, the draft will possibly be up to 10 meters.

(Note) Specifications for tip carriers of 10m in load line assignment: 183m in overall length, 28m in breadth, 174m in length between perpendiculars, 18.5m in depth, 25,526 gross tons, 30,967 dead-weight tons.

1-4 Silviculture

1-4-1 Species for Planting

The following information was obtained from Mr. Soediarto, Director of the Forest Research Institute, on the tree species for planting in Indonesian grasslands.

From the standpoint of securing logs for pulp production, the tree species for planting may be divided into long fiber tree species and short fiber tree species. According to this classification, the following five species may be picked up as the possible trees for planting in each category:

The category of long fiber tree species includes: (1) Pinus merkusii (or good growth at 200-600 meter above the sea. Seeds at high altitudes preferable. Capable of growing even in low-altitude areas at 15 m^3/ha/yr); (2) Pinus carbaea var. hondurensis (faborable results of growth from past experiments. However, they suffer from fox tail damage in Bogor where they grow as fast as Pinus merkusii, but the damage is not so consicuous in East Kalimantan. Seeds must be imported but the formalities are not complicated); (3) Pinus oocarpa (capable of growing good on highlands in East Jave but not planted

in low-altitude areas); (4) Araucaria cunninghamii (they grow as fast as pine trees, but there are no existing man-made forest. Seeds are received from West Irian); and (5) Agathis loranthifolocia (capable of growing at 15 m^3/ha/yr and over and fitted for plantation in fairly high areas. In Kalimantan, however, we can find their natural growthese in low-altitude areas. They prefer good soil fertility and the precipitation must be uniform. The shade is required, but if it is too dark, they will suffer from fungi damage).

The category of five short fiber tree species include: (1) Encalyptus deglupta (capable of growing at 30 m^3/ha/yr under good soil conditions. A yield table is available); (2) Alibizia falcata (of quick growth. When they are 10 years old and up, they will suffer from insect damage and be unsuitable for construction purposes); (3) Gmelina arborea (man-made forests available in East Kalimantan. Many branches); (4) Anthocephalus cadamba; and (5) Enterolobium cyclocarpium (of extremely quick growth. However, seeds are not obtainable in massive quantities).

The existing man-made forests in South Sumatera are extremely small in area and number. It would not necessarily be advisable to refer to the results obtained

from these areas for any prospective afforestation project, but a small number of samples are cited below from the results of a field survey.

First, in regard to the growth of tree height, the tree height curves of Pinus merukusii, Albizia falcata and Anthocephalus cadamba were illustrated, but their introduction is omitted here.

The growth of Pinus merukusii in South Sumatera is as follows: (1) 23-year-olds in Palmebang City: $\overline{H}$. 23 m, $\overline{D.B.H.}$ 34 cm, tree density 300 trees/ha, stock 300 m^3/ha; (2) 10-year-olds about 20 km west to Pendopo: $\overline{H}$. 17 m, $\overline{D.B.H.}$ 23 cm, tree density 700 trees/ha, stock about 250 m^3/ha; (3) 15-year-olds in a nursery about 12 km away from Pendopo: $\overline{H}$. 15 m, $\overline{D.B.H.}$ 27 cm, tree density 750 trees/ha, stock about 300 m^3/ha; (4) 10-year-olds in the same nursery: $\overline{H}$. 14 m, $\overline{D.B.H.}$ 18 cm, tree density 1,000 trees/ha, stock about 180 m^3/ha; (5) 5-year-olds in the same nursery: $\overline{H}$. 10 m, $\overline{D.B.H.}$ 12 cm, tree density 1,000 trees/ha, stock about 60 m^3/ha.

The areas indicated above are at altitudes of less than 50 m.

According to a survey conducted on Albizia falcata in the aforementioned nursery in South Sumatera, the

13-year-olds are 25 m in $\overline{H}$., 28 cm in $\overline{D.B.H.}$, 500 trees/ha in tree density and 390 m^3/ha. In regard to the damage caused by bark beetles, no conspicuous damage was observed, nor were there any extermination measures.

1-4-2 Silviculture Techniques

In South Sumatera, Pinus merkusii, Albizia falcata Personema canescens are all the species which are considered for planting. Unlike Central Java, their planting will be conducted under direct management. It is reported that several hundred hectares to 1,000 hectares of planting have been conducted in the past, but most of them have been destroyed by fires (burning in shifting cultivation). At present, no man-maid forest of good-sized are observed except one (35 and 23 years old), several hectares in area, near Palembang Airport. At present, afforestation is being carried out as part of the afforestation project (of the central Government with a budget of 150-200 million Rupiah a year for 3,000 ha a year of planting in 18 Provinces) which was started in 1969. Particularly in the areas concerned, afforestation is being carried out as part of the Musi River Basin Afforestation Program (initiated in 1975).
The planting of 1,000 ha of Personema canescens was

planned in 1975 and 80% has already been completed. In addition, the planting of Albizia felcata and Pinus merkusii was also scheduled, and they are being bred in a nursery about 12 km west to Pendopo. This nursery has been used on an experimental basis since 1964 until 1975 when its full-fledged use was begun for business purposes, so much so that it still remains small in size and has yet to be completed in terms of organization and facility, being inferior to those in Central Java.

In other words, Pinus merkusii which have once been planted are put to use as shade trees, and there are no worthwhile facilities except a reservior tank for watering and a workers' station. From the standpoint of the climatic conditions -- particularly, the precipitation in the dry season (84 mm in July and 65 mm in August according to observations at Perabumlih), the replenishment of nursery facilities, such as shades, is desirable. There is also room for an improvement in the nursery practice using pots. An actual practice of the present afforestation of Personema canescens in grasslands is that the grassland is cleared with a width of 1 m, planting done at intervals of 2 m (the planting distance is about 3 x 2 m) and weeding done once a year for three years. As regards Pinus merkusii, nursing

is done for six months, Pinus merkusii will be planted outwhen they grow as high as about 20 cm. In view of the situation in which most of the planted areas have been destroyed by fires, it seems indispensable to work out anti-fire measures. At present, no worthwhile measures are being implemented, but it is understood that plans are afoot for the development of fire break tree belts. No special cautions are being taken for the protection of trees from pests. The wage in the forest industry of South Sumatera is 750 Ru./day with lunch for surveying and 500 Ru./day with lunch for planting.

1-5 Conclusion of the Survey

On the basis of the results of the aforementioned survey, it may be concluded that a man-made afforestation project is technically feasible in Benakat and Subanjeriji.

A comparison of these two areas reveals that Benakat, in general, has better soil conditions and attempts are being made for the development of nursery techniques in the nursery nearby Pendopo under the jursidiction of Semangus B.K.P.H. and also for some man-made afforestation projects. If an afforestation project is carried out, precedence should be given to Benakat, rather than

Subanjeriji.

The soil of Benakat is not necessarily favorable, as it consists mostly of red yellow podoslic soil, but its improvement is feasible with the planting of fertilizing trees and other measures. The annual precipitation is 2,500-3,000 mm, so that Benakat, albeit situated in a grassland, is a part of the tropical rain forest zone. Topographically, Benakat is a bast stretch of hills with gentle undulations. On the basis of these factors, it might be said that Benakat is blessed with relatively better natural conditions than other areas in the tropical zone.

On the basis of these natural conditions and the growth of Pinus merkusii (15 m^3/ha in annual growth·in the aforementioned nursery), (25 m^3/ha in annual growth· in Palembang City), (25 m^3/ha in annual growth·in the central mountain area of Java) as well as growth of some species of pine trees in the experimental forest of the Bogor Forest Research Institute, it was concluded that it would be possible to develop large-scale, good-quality, man-made pine tree forests in this area, if appropriate species and varieties were selected and an appropriate system of silviculture techniques was developed.

Of the soils in this area, however, the soil of the real Alang Alang land is inferior to that of the brushland (Belukar) and secondary forest (Hutan muda) in terms of humus and soil structure. Even in the real Alang Alang land, the soil conditions seem to differ to a considerably degree, depending on the topography and the history of grasslands (history of shifting cultivation). In regard to the meteorological conditions, no detailed observation data are available in the area. For this reason, there will be a need to accurately measure and survey these natural conditions, when an attempt is made to determine the species (variety) best fitted to the environmental conditions of this area as these for industrial planting. Also on the basis of the data currently obtainable simultaneously with the results of these surveys, a bold attempt should be made to conduct "species elimination trial" on a trial-and-error basis.

This trial should be targeted at the development of silviculture techniques which will make it possible to: (1) select Pinus caribaea and other pine species vable in tropical lowlands, (2) several species of eucalyptus and (3) suitable species locally obtainable for planting as fast growing species; and assure their growth

at least up to 200 m^3/ha in 10-15 years.

The question which is more important than the aforementioned conclusion concerns social conditions as described below:

Practically every man-made forests in this area has been destroyed by field fire ascribable to shifting cultivation. It must be described as a great tast to create a relationship of mutually supplementary co-existence between cultivation and afforestation with the assurance of settled farming and forestry job opportunities, instead of shifting cultivation being set up against afforestation.

In other words, when an man-made forest is to be developed, it is absolutely essential that fore prevention facilities, such as fire break belts and roads, and at the same time an attempt should be made to enable local inhabitants to convert from shifting cultivation to settled farming. The conversion from shifting cultivation to settled farming contributes to the upgrading of farm production and the elevation of their living standards with increased cash incomes from forestry work.

In regard to economic conditions for afforestation

projects, the tree species which are fitted for the speedy development of afforestation in this area are fast growing species, which include those for pulp and wood tip production. Essentially, the wood thus produced must be competitive in price as materials for the production of pulp and paper. No afforestation project will be profitable unless the planting cost and the logging cost at the harvest time are considerably low. When an attempt is made for industrial planting in the future, the costs for the depreciation and management of machinery and facilities will have to be taken into consideration, as well as the burden of long-term interests. When a forest development project is initiated and when logging is carried out at the harvest time, there will be a need to provide economic and institutional incentives, such as the exception of taxes and duties.

Chapter 2: Conception of the Afforestation Project

2-1 Basic Concept

The concept of the South Sumetera afforestation project associated with the latest survey is to develop man-made forests in the grasslands, brushlands and secondary forests which wastly extend over this area and develop highly valuable forest resources as rapidly as feasible. In regard to the large-scale afforestation project, the possibility of carrying out the so-called Development Cooperation Project (which is called "Business Cooperation" on the Indonesian side) -- the project in which private enterprises in both countries will play a major role under the leadership of the Indonesian and Japanese government authorities concerned -- is being explored. In this instance, the authorities concerned of both countries should study the possibility of technical cooperation in the field of basic technology prior to the large-scale afforestation. There will also be a need to replenish institutional conditions, such as the right of re-afforestation (HPH) and incentives to the re-afforestation project as well as social conditions, such as the measures for shifting cultivation. At the same time, it will be an important condition that private

businesses in both countries are fully equipped to carry out this project in terms of organization, funds and functions.

2-2 Outline of the Project

The results of the latest survey and the outline of the reafforestation project which could be hypothesized according to the aforementioned basic concept are as follows:

In the survey area, there remain many questions that have yet to be solved in conjunction with natural and socioeconomic conditions and conditions associated with legal institutions.

Consequently, it would be difficult to embark immediately on industrial planting on a large-scale, in order to carry out the industrial planting in a steady and efficient manner in the future, it is desirable that trial planting be initiated through the cooperation of Indonesia and Japan as early as feasible.

On the basis of the specific techniques as the results of this trial planting, it is desirable that pilot planting be initiated to establish a systematic silviculture techniquest necessary for the afforestation

project and to explore profitability of the project on a business basis, and that after the establishment of these technologies and the rearrangement of social, economic and institutional conditions are completed, large-area industrial planting be carried out.

Judging from various conditions, Pendopo and its periphery in Benakat and the area along the upper reaches of the Benakat River are suitable as prospective places for the aforementioned trial-planting and pilot forests.

In these districts, three types of vegetation -- real Alang Alang land, brushland (Beluker) and secondary forest (Hutan muda) -- are observed, as earlier described. As the natural conditions differ, depending on each of these types of vegetation, it is conceivable that trial planting could be conducted to establish technologies required for each of the three types in the trial-planting forest.

2-3 Substance of the Project

The substance of the aforementioned trial-planting and pilot forests is as follows:

a. Trial-planting Forest

(1) Scale: 500-1,000 ha. The area of afforestation is about 100 ha at the beginning but will be increased to about 300 ha in years to come.

(2) Period: 3-5 years.

(3) Location: Grasslands, brushlands and secondary forests around Pendopo (which centers around the nursery and the basin of the Benakat River, Lematan I.O.T., Province of South Sumatera.

(4) Species for planting: Pinus merkusii, Pinus caribea, Eucalyptus group, Albizia falcate, Enterlobium cyclocarpum and the Accasia group will be planted as the objective species. Calliandra group, Leucanea glauca and Darpentia latifolia will be planted in the fire break tree belt, and leguminous bushes, wherever necessary, between rows

as soil improving trees.

b. Pilot Forest and Industrial Planting

(1) Scale: Judging from actual examples in Japan, a pilot forest covering an area of 10,000 ha will be required.
As regards industrial planting, 50,000 ha, including the pilot forest will be locked upon as one unit.
The area of planting a year will be about 1,000 ha in case of pilot forest and 3,000 ha in case of industrial planting.

(2) Period: The development of a pilot forest will be initiated three years after the initiation of trial planting, and the development period will be 5-10 years.
Industrial planting will be initiated, depending on the results of the pilot forest. The rotation will be 15 years and one cycle will consist of 15 years in normal growing stock.

(3) Location: The same as the trial-planting forest. With the trial-planting forest as its nucleus, the pilot forest will be enlarged.

(4) Species for planting: The appropriate place and species will be selected, depending on the results of the trial-planting forest.

2-4 Executive System of the Project

Basically, it is considered appropriate to adopt the following system of cooperation for this project.

(1) Body for Execution of the Project

In regard to the pilot forest and industrial planting under this project, it is conceivable that private organization comprised of enterprises in Indonesia and Japan could become a body for the execution of the so-called cooperation project (which is called "Business Cooperation" on the Indonesian side). In this instance, the participation of a paper and pulp company or plural companies (including those in lines of business other than paper and pulp) from the Japanese side is conceivable. According to the opinion of the Indonesian

Directorate General of Forestry, the semi-governmental body such as Indonesian Lumber Association (M.P.I.), C.V. Hutan Baru (a mixed forestry development company), Agroforestry, P.T. Silvasaki P.T. Inhutani and others may be picked up as possible candidates from the Indonesian side, but the selection depends on deliberation of both sides.

(2) Technical Cooperation

The ultimate objective of this project is to convert timeworn grasslands into man-made forests for the development of new forest resources. In this instance, there will be a need for planned and systematic technologies unlike the past cases in which planting was sporadically and separately carried out. For this purpose, there will be a need for experiments and technical development in the basic field with special reference to nursery practice, mechanical re-afforestation, soil survey and fertilization.

It will be necessary to examine technical cooperation between the two government in the field of basic experiments of specific technologies and technical development, if requested by the Indonesian side.

2-5 Economy of the Project

Due to the facts that a system of technology has not been developed for afforestation and there has been no experience in the sales of planted trees under large-scale afforestation systems, it is extremely difficult to evaluate the precise economic aspects of this project, but the economic values will be cited below while an attempt is made to calculate back to the market prices.

This type of calculation is greatly influenced by scale of project, species for planting, tree growth, logging cost and selling price. As it would be impossible to obtain fixed values for these factors, the following model computation is made as a work hypothesis. Here, three different prices of round wood on a factory yard (imagine in Palembang) -- $\$7/m^3$, $\$8/m^3$ and $\$9/m^3$ -- are hypothesized.

When the stock for the cutting age of 15, 20 and 30 years is hypothesized as 200 m^3/ha, 250 m^3/ha and 300 m^3/ha, respectively, the limit of afforestation cost may be computed as shown in the following table:

Limit of Afforestation Cost per Hectare

Cutting age (Years)	Growing stock (m^3/ha)	Price of round wood on factory yard		
		$7/$m^3$	$8/$m^3$	$9/$m^3$
		Limit of re-afforestation cost per hectare in above cases		
18	200	60.0$	146.7$	236.7$
	250	73.7	183.3	293.3
	300	90.0	220.0	353.3
20	200	50.0	120.0	193.3
	250	60.0	150.0	243.3
	300	73.3	183.3	290.0
30	200	40.0	100.0	160.0
	250	50.0	126.7	200.0
	300	60.0	150.0	260.0

(Note) The cost per cubic meter, including the logging cost and other expenditures, is hypothesized as $6.33.

Incidentally, this computation has been done on the assumption that 70% of the afforestation funds will be invested at an annual interest of 3.5% and the remaining 30% at 5.5%.

This table indicates, for example, that if the cutting age is 15 years, the growing stock 250 m^3/ha and the price of round wood on a factory yard \$8/m^3, the project will not be payable unless the afforestation funds are kept within \$183.3/ha.

The following table indicates the limit of afforestation cost in terms of yield volume per cubic meter.

Limit of Afforestation Cost per Cubic Meter of Yield Volume

Cutting age (Years)	Growing stock (m^3/ha)	Price of Round Wood on a Factory Yard		
		\$7/m^3	\$8/m^3	\$9/m^3
		Limit of afforestation cost in above cases		
		\$/m^3	\$/m^3	\$/m^3
15		0.30	0.73	1.18
20	200-300	0.25	0.60	0.97
30		0.20	0.50	0.80

As in discernible from this table, the afforestation cost bearable per cubic meter of yield volume at the time of logging is extremely low with $0.20 - 1.18, it would become economically difficult to carry out this project, if royalities or various taxes and other charges are added to the cost of $6.33/$m^3$ cited in the footnote of the preceding table.

Chapter 3: Aerial Photographs

3-1 Necessity of Aerial Photogrammetry

The area in which afforestation is planned is vast, measuring about 50,000 hectares, but the topographical maps, which will form a basis for the afforestation project, is not kept up to date.

For the execution of any project, it is vitally essential to familiarize with the actual conditions of the whole area.

Aerial photographs document, reproduce and record actual conditions. Particularly in this area, aerial photographs are indispensable.

For this area, the aerial photographs taken in 1961 are available, but no photographs have been taken after that. There is a need to purchase these aerial photographs to know the conditions prevalent in 1961 (transition and transformation of the grasslands, secondary forests, shifting cultivation and other factors).

For the initiation of the afforestation project, including trial planting, it will be necessary to grasp the overall picture of the area, actual conditions of

land uses, actual conditions of the grasslands, forest and ground conditions, and the actual status of farmers. It will also be necessary to take new aerial photographs for the compilation of topographical maps necessary for the formation of plans for this project, and for the execution of the project.

It is vitally essential to the formation of plans for this project to survey the last 15 years' changes in this area (changes in the grasslands and secondary forests, migration in shifting cultivation and other factors) with the old and new aerial photographs.

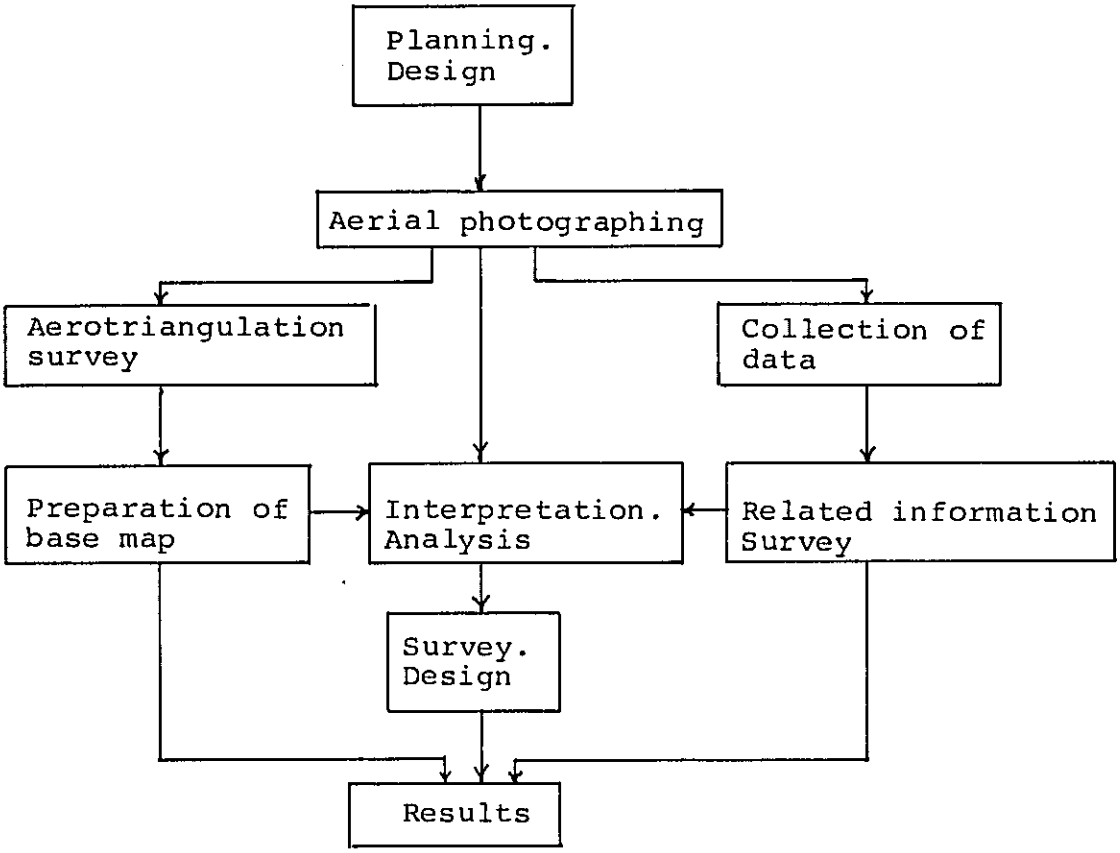
3-2 Substance of Aerial Photogrammetry

3-2-1 System of Aerial Photogrammetry

Aerial photogrammetry includes photographing, mapping, interpretation and analysis. These are a series of work, and the aerial photographs may be put to effective use after its mapping, interpretation and analysis.

The system of aerial photogrammetry is as follows:

System of Aerial Photogrammetry



3-2-2 Taking of Aerial Photographs (Photographing)

The plans for taking aerial photographs of this area are as follows:

a. Area photographed: About 50,000 ha.

b. Period photographed: Four months in the dry season. (Precipitation data on Benakat and its periphery are given in Table 3.)

c. Photo-scale: 1/10,000 - 1/20,000

3-2-3 Preparation of Base Maps (Mapping)

The scale of 1/20,000 or over is desirable for the preparation of base maps. As this area features neither conspicuous differences in altitude nor changes in topography, it would be considerably difficult to delineate the landform to the full extent with smaller than 1/20,000-scale maps. It is advisable to delineate as many features of the landform as possible with maps, greater than 1/20,000 in scale.
The prepared base map must show principal points, natural features on the land, land uses and all other features.

The existing triangulation points which are required for mapping are small in number and not kept in good order, so much so that there is a need to conduct the surveying of datum points within the mapping area in a simplified method.

3-2-4 Interpretation and Analysis of Aerial Photographs

The interpretation and analysis of aerial photographs may be conducted in respect of the following matters:

a. Interpretation on the present status of land uses.

b. Interpretation and analysis of forests: Interpretation of forest conditions and forest types, estimation of growing stocks, interpretation of tree species, and estimation of tree growth with aerial photographs at two points of time.

c. Interpretation of vegetation.

d. Various surveys for the formation of plans for the project.

For these interpretation and analysis, field work is naturally required to collect date.

Particularly in this area, there is a need to grasp the actual conditions of shifting cultivation and those of farmers gradually engaged in settled farming.

3-2-5 Reproduction of Aerial Photographs

According to the information of the Directorate General of Forestry, the aerial photographs covering

this area total 184 sheets on 10 courses. The details are given in the following table:

Details on Aerial Photographs

(Taken in 1961)

Course No.	Photo No.	Number of Sheets
X	26-43	18
XI	30-48	19
XII	27-44	18
XIII	26-45	18
XIV	22-40	19
XVI	13-32	20
XVII	20-39	20
XVIII	1-16	16
XIX	22-40	19
Total		184

Annex : Interim Report

Jakarta, December 20, 1975

Mr. Soedjarwo
Director General of Forestry
Deaprtment of Agriculture

Re : The Basic (Secondary) Survey for Afforestation Project in the Republic of Indonesia. (Interim Report by the Mission of Japan International Cooperation Agency.)

Dear Sir,

We would like to submit herewith our interim report of secondary survey for the afforestation project in the Republic of Indonesia, which was performed from November 27 to December 19, 1975, including field trip for five days in Central Java and field survey for ten days at several potential areas in South Sumatera.

By the initial survey worked formerly, grassland areas at Lematang I. O. T. subprovince in South Sumatera have been selected as suitable for cooperational afforestation project. This secondary survey intended to have consultation and implement field survey with the Indonesian Government for investigating detailed feasibility to realize the cooperational afforestation project at the above mentioned area.

The field survey of the secondary mission was carried out in Alang Alang land, bush land, and secondary forest in Benakat

and Subanjeriji at Lematang I. O. T. subprovince in South Sumatera.

This items of the survey are :

(1) Natural Conditions ----- soils, geology, geography, climatic condition, growth of planted trees, etc.

(2) Social and economical conditions ----- state of shifting cultivation, infrastructure, local regulation, labor cost, plantation cost, logging cost, activities of related industries with wood, etc.

Some important findings of the survey are as follows:

(1) Natural conditions.

The soils of the surveyed area are mostly Red Yellow Podzolic soils. The soils have thin topsoil and clayey hard subsoil. This soil feature restrains the roots distribution only in the thin surface horizons. Some soils have the gley mottles in surface horizons reflecting the influence of seasonally stagnated water.

Detail survey and investigation should be carried out prior to the implementation of afforestation to these soils.

Soil conditions are considered to be much better in Benakat area than in Subanjeriji and those of real Alang-Alang land area are worse than those of bush land and secondary forest.

The intended afforestation project aims to make plantation of fast growing tree species and to get the wood of 200 cubic meters per hectare in 15 years.

(2) Social and economical conditions.

Much of the area afforestated in the past have been suffered and extinguished by wild fire caused by shifting cultivation.

Consequently, prior to the afforestation, fire line such as fire break tree belt or road network should be made and shifting cultivators should be settled.

Conversion of shifting cultivation to settled cultivation encourages the agricultural productivity and results the increase of income from the forest lavor and then contributes to make living standard of inhavitants higher.

Planting trees are thought to be the species for pulp and wood chip and they should be low price. Therefore, planting cost and logging cost at the future harvesting time should be considerably low for the profitable industrial plantation. Although direct expenses of plantation at present is rather inexpensive, the forthcoming industrial planting, which is now under consideration, will inevitably requires considerable amount of indirect expenses such as interest or depreciation of equipment and facilities. Accordingly, economical and institutional incentives such as reduction or exemption of tax and duties are considered to be necessary to encourage the business of plantation and logging in the future.

According to the results of the secondary survey, we may refer to the following idea of plantation project.

Although the feasibility of plantation project by the business cooperation is noted in the surveyed area, many natural, social, economical, legal or institutional conditions are seemed to be remained unsolved.

Therefore, it is not advisable to begin the large scale industrial planting at present at once.

Instead, preferable way is that the trial planting under the joint cooperation of Indonesia and Japan is taken place at first, as soon as possible, as the initial step for making technical, economical, and institutional conditions ready for the steady, efficient, and successful implementation of the proposed industrial plantation.

The suitable areas for the trial planting may be proposed in the vicinity of Pendopo and the upper streams of Benakat river in the Benakat district.

In the area mentioned above, vegetation can be devided into three types, i.e. real Alang-Alang, bush land, and secondary forest. As soil conditions and other natural conditions differ greatly among these three vegetation types, trial planting to find the necessary techniques for the plantation should be done in each vegetation type respectively.

The scale of the trial planting may be between 500 to 1,000 hectare and the trail period is thought necessary for between 3 to 5 years. Not only the above mentioned trial planting but forthcoming industrial planting will be done by the business cooperation of private sectors in both Indonesia and Japan sides. However, considering the public aspect of the afforestation,

full understanding and acknowledgement between the Indonesian Government and the Japanese Government should be made concerning the execution of the proposed plantation project.

We are expecting to dispatch a team of experts in the first half of the next year for programming and consulting for taking air-photo of the proposed area for the plantation project.

After the appraisal of the findings of the secondary survey and the possibility of the trial planting is confirmed, the third mission for formulating the plan for the project shall be sent to Indonesia.

I wish to extend my gratitude to KEHUTANAN and Indonesian counterparts for this mission for their help and assistance. May we expect your continued support and cooperation for this project.

Respectfully yours,

KISHIO OOFUKU
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