REPORT

ON

THE SURVEY FOR THE AFFORESTATION PROJECT

IN PARAGUAY

JULY 1966

OVERSEAS TECHNICAL COOPERATION AGENCY

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F O R E W O R D

At the request of the Paraguayan government, the government of Japan dispatched its survey mission, which consisted of three forestry experts and two market research specialists, making five members in total, in order to conduct the consulting services in connection with the afforestation project in Paraguay for about one month from 29th November 1965.

The mission has carried out the preliminary survey for the purpose of drawing up a plan of afforestation at Yguazu district of Alto Parana, and the construction of the paper and pulp factory in Paraguay.

The results of the field investigation have been reviewed and compiled into the Report that is hereby submitted to your government.

The Overseas Technical Cooperation Agency, as the executive organization of the Government of Japan, has been performing technical cooperations such as the offer of consulting services, dispatch of engineering experts and induction of technical trainees from various developing countries.

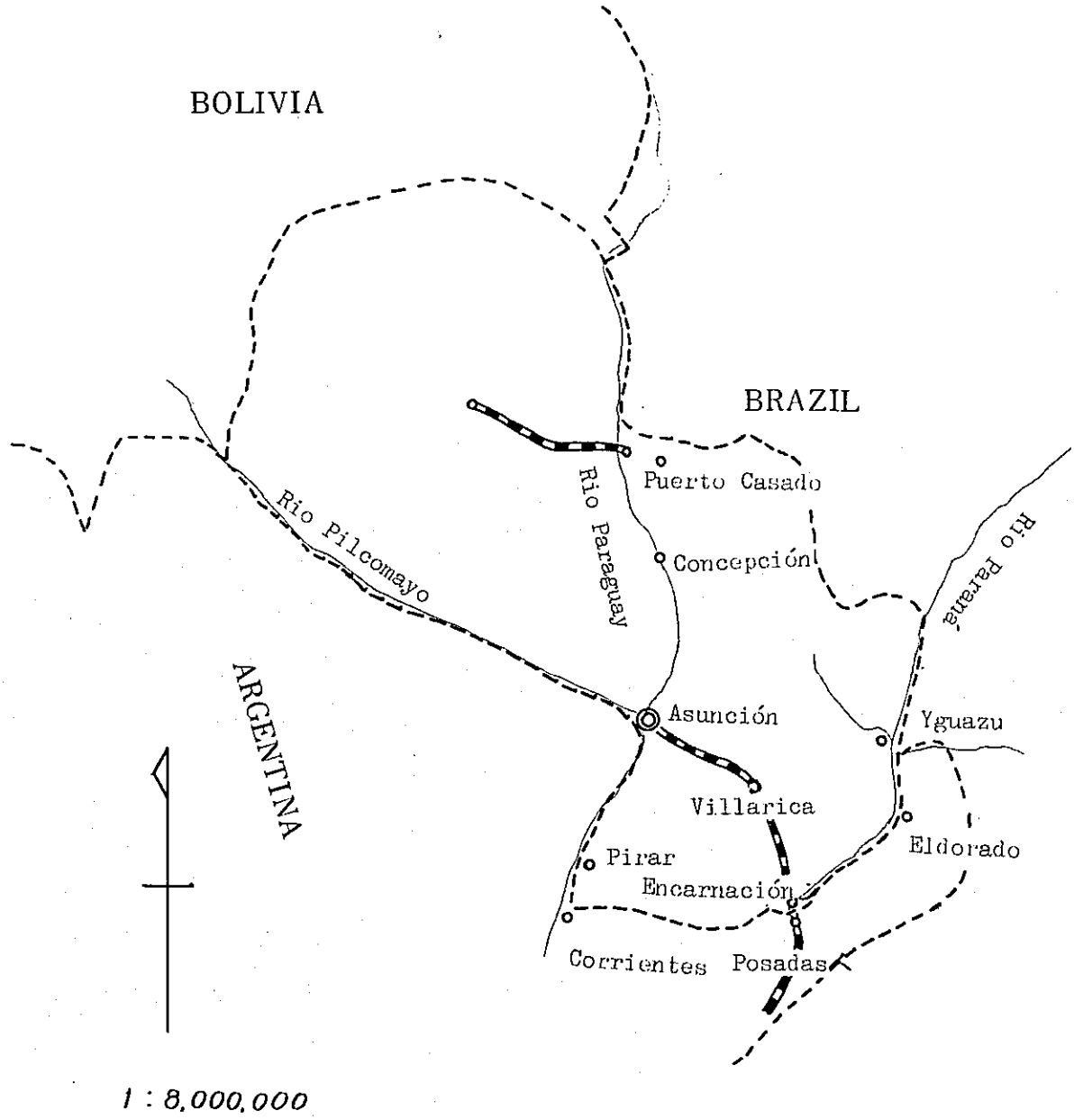
I avail myself of this opportunity at express my great thanks to your government and organizations concerned for their invaluable cooperation and assistance extended to the mission during its stay.

Nothing would be more gratifying to us if his report could be of any contribution to the promotion of the aforestation project in your country as well as in the furtherance of the amity, friendship and economic relations between Paraguay and Japan.

S. Shibusawa

S. SHIBUSAWA
Director General
Overseas Technical Cooperation Agency

MAP OF PARAGUAY



C O N T E N T S

I PREAMBLE

(1) Objective of the Survey

For the development of the nation's economy, the Government of Paraguay is faced with the need of developing the land resources which are abundantly endowed upon her. With view to establishing the forestry as one of the basic industries to support the country, it requested the Japanese Government to study the possibility of afforestation enterprise and find the ways and means to materialize it.

The Paraguayan Government has provided a settlement at Yguazu located about 280 km to the east of the capital, Asuncion. The settlement started plantation in 1961, with its target set at 2,000 settlers from Japan. Nevertheless, the number of Japanese settlers was only 43 households and that of the indigenous settlers was no more than 6 households as of April, 1965. Should this state of the matter continue, it might lead to the problem of whether or not Japan Emigration Service should retain the nearly 90,000 hectare wide settlement it acquired.

There must be various reasons why the settlement does not proceed. The largest problem is that there is no definite answer to the question as to what crops should be taken as the basic items in the farmstead operation plan. In other words, the tungoil tree, mate tea or other permanent crops hitherto raised as basic crops in other settlements are now losing their values for international commodities, so it is problematical to pick them out as basic crops for this settlement. Vegetables or other farm products also have to rely for their market on the limited domestic demand. To be frank, a definite direction in which the farming is to be stabilized seems difficult to find out.

The problem was discussed among the quarters concerned, including the Paraguayan Government and Japan Emigration Service. Incidentally, in May 1965 when Governor Masumi Mizobuchi of Kochi Prefecture visited this country, he saw this state of the settlement and proposed that the afforestation be

introduced as the basic means. He brought this recommendation before the Japanese Government.

With this background, the Survey Team of Afforestation Project in Paraguay was organized for the purpose of studying the possibility of establishing the forest industry and, on its prospect, setting up an afforestation programme.

For this reason, the present investigation is indirectly intended to orient the development of forestry of this country, while it directly aims at the establishment of an afforestation plan for the Yguazu settlement. In other words, the study of possibility of afforestation may lead to find means not only to stabilize the farming of the settlers but also to contribute towards development of economy of Paraguay, and further implies to do something for the promotion of friendly relation between Japan and Paraguay.

With such a background requirement, the report is so prepared that the enterprise plan stated should be the one which will become readily feasible.

(2) Organization of the Survey Team

Head (general administration and forestry investigation):

Masaya KONDO, President of Federation of Forest Owners' Association of Kochi Prefecture; and Member of Kochi Prefectural Assembly.

Member (market investigation):

Yoichi SATO, Chief, Planning Section, Development Survey Division, Overseas Technical Cooperation Agency.

Member (forestry investigation):

Masashi YAMAMOTO, Chairman of Board of the Directors of Yamamoto Forestry Co. Ltd.

Member (market investigation):

Akira OJIMA, Chief, Planning & Investigation Dept. of Japan High Quality Paper Co., Ltd. (Nihon Kodo-shi K.K.)

Member (forestry investigation):

Hiroshi INO, Chief, Forestry Section, Kochi Prefecture.

〔3〕 Survey Schedule

TABLE I. Itinerary of the Team

Date	Forest Survey Team (Kondo, Yamamoto, Ino)		Market Survey Team (Sato, Kojima)	
Nov. 29 (Mon.)	Leave Tokyo			
Nov. 30 (Tues.)	Leave San Francisco			
	Area Surveyed	Subject Matter of Survey	Area Surveyed	Subject Matter of Survey
Dec. 1 (Wed.)	Rio de Janeiro (Brazil)	Collection of data at the Japanese Embassy and Immigration Agency branch	Same as left	Same as left
Dec. 2	Asuncion (Paraguay)	Collection of data at the Japanese Embassy and Emigration Service Branch	Rio de Janeiro (Brazil)	Collection of data at the Japanese Embassy, Emigration Service branch, Japanese trading firms' offices and Brazilian Ministry of Commerce and Industry.
Dec. 3 (Fri.)	"	Same as above Visit to the Director of the Economic Planning Agency of Paraguay for collection of data	San Paulo (Brazil)	Collection of data at the Japanese Consulate General, Emigration Service branch and JETRO
Dec. 4 (Sat.)	"	Collection of data at the Emigration Service branch Visit to the lumber mills	"	Collection of data at Kameda Electronic Industries, Ltd. (associated with special paper)
Dec. 5 (Sun.)	"	Rest	"	Rest
Dec. 6 (Mon.)	Asunción (Paraguay)	Visit to the Minister of Agriculture and Stock Raising and the Director of the Bureau of Resources for collection of data	Montevideo (Urguay)	Collection of data at the Japanese Embassy and LAFTA

	Forest Survey Team (Kondo, Yamamoto, Ino)		Market Survey Team (Sato, Kojima)	
Date	Area Surveyed	Subject Matter of Survey	Area Surveyed	Subject Matter of Survey
Dec. 6 (mon.)		Collection of data at the Japanese Embassy Visit to flooring and plywood wills		
Dec. 7 (Tues.)	Yguazu (Paraguay)	Collection of data at the Yguazu liaison office of Japan Emigration Service	Montevideo (Urguay)	Collection of data at the Japanese and Paraguayan Embassies
Dec. 8 (Wed.)	"	Survey of virgin forests	Buenos Aires (Argentina)	(Removal)
Dec. 9 (Thurs.)	Stroessner (Paraguay)	Survey of afforested areas Survey of afforesting enterpriser Survey of lumbering spots	"	Collection of data at the Japanese Embassy, FETRO, and the offices of Japanese trading firms and lumber importers
Dec. 10 (Fri.)	Hot Yguazu (Brazil) Presidente Flanco (Paraguay) Yguazu (Paraguay)	Survey of lumber product distributing centers Visit to the spots where pieces of pulpwood are formed into rafts Visit to power source developing spots Survey of Japanese immigrants Survey of forest soil	Buenos Aires	Collection of data at Japan Emigration Service branch and the Economic Council of Argentina
Dec. 11 (Sat,)	Asunción (Paraguay)	(Removal)	Asunción (Paraguay)	(Removal)
Dec. 12 (Sun.)	"	Rest	"	Rest
Dec. 13 (Mon.)	"	Collection of data from afforestation engineers sent by FAO	"	Same as forest survey team

Forest Survey Team (Kondo, Yamamoto, Ino)			Market Survey Team (Sato, Kojima)	
Date	Area Surveyed	Subject Matter of Survey	Area Surveyed	Subject Matter of Survey
Dec. 14 (Thurs.)	Asunción (Paraguay)	Survey of trading firms related to paper working	Asunción (Paraguay)	Same as forest survey team
Dec. 15 (Wed.)	Wanda area (Argentina)	Survey of afforested areas	"	Same as forest survey team
Dec. 16 (Thurs.)	El Dorado (Argentina)	Visit to the Federation of Forest Associations of Misiones Province	Same as left	Same as left
	Piray (Argentina)	Survey of pulp mills Survey of afforested areas		
	Garuapé (Argentina)	Visit to the Garuapé office of Japan Emigration Service Survey of the areas afforested by Japanese immigrants		
Dec. 17 (Fri.)	Garuapé (Argentina)	Survey of the nursery of Afforestation Company	Same as left	Same as left
Dec. 18 (Sat.)	Encarnacion	Collection of data at the Japanese consulate and the Encarnacion office of Japan Emigration Service	Same as left	Same as left
	Alto Parana (Paraguay)	Visit to the Japanese immigrant settlements		
	Fram (Paraguay)			
Dec. 19 (Sun.)	Encarnacion	Market survey	Same as left	Same as left
Dec. 20 (Mon.)	Asunción (Paraguay)	(Removal)	Same as left	Same as left

Forest Survey Team (Kondo, Yamamoto, Ino)			Market Survey Team (Sato, Kojima)	
Date	Area Surveyed	Subject Matter of Survey	Area Surveyed	Subject Matter of Survey
Dec. 21 (Tues.)	Asunción (Paraguay)	Collection of data at the Japanese Embassy and Japan Emigration Service office Visit to the chief secretary at the Paraguayan Foreign Ministry for re-collection of data		Same as left
Dec. 22 (Wed.)	"	Visit to the Director of the Economic Planning Agency of Paraguay for collection of data Receipt of a message from the Civil Engineering and Postal Service Minister of Paraguay		Same as left
Dec. 23 (Thurs.)	"	Visit to the Agriculture and Stock Raising Minister of Paraguay for collection of data Final discussions with the Japanese Embassy and Japan Emigration Service branch		Same as left
Dec. 24 (Fri.)	Buenos Aires (Argentina)	Collection of data at the Japanese Embassy and Japan Emigration Service branch		Same as left
Dec. 25 (Sat.)		Buenos Aires --- Sao Paulo		Same as left
Dec. 26 (Sun.)		Stay at Sao Paulo		Same as left
Dec. 27 (Mon.)		Sao Paulo --- New York		Same as left
Dec. 28 (Tues.)		Leave New York for Tokyo		Same as left

Member Sato left Asunción for Tokyo on December 19.

(4) Gratitude

During our field survey in Paraguay, wonderful assistance and cooperations were extended to us by the government of Paraguay and the concerning agencies and the federation of forest owners' association, which helped expedite the survey there greately.

We would like to express our hearty gratitude to all concerned, and hope further advice and cooperations, although there may remain many difficult problems yet unsettled, to realize the tentative plan of business at the spot disclosed in the report.

(5) Summary of the Report

This survey report was drawn up chiefly to form the business plan, simplifying the general description as far as possible. We couldn't fully investigate in some points, because of the limited survey period and lack of data. We would like to point out that in executing this plan, it is imperative to make up the executive plan based on more concrete investigation in details.

1. Outline of Forest Resources and Forest Industry in Paraguay.

The forest area is 24 million hectares, about 60% of the total area of the land of the country. The forests in the eastern district of the country account for 8 million hectares, of which 50% produce high trees as major materials and the rest are low tree forests or grassland, with woods where shrubs are major materials. Useful species of wood are Lapacho, Cedro, Guatambu, etc. But, mature trees which permit felling are found at the rate of merely one or two per hectare. Others are broad-leaved trees of low utility value. Coniferous trees are not found. The reserve per hectare is something like 100 cu.m. in accessible forests, out of which the reserve of useful wood materials are estimated at about 4 cu.m. The forests in the western district account for 16 million hectares, but they are for the most

part grasslands with woods or grasslands on moist, and as such, they are of little value as resources.

The forest industry in Paraguay is the "cut out and get out" forestry where the selective cutting of useful woods is repeated and afforestation is little done. Naturally, the forest phase is getting worse. The quantity of lumber cutting is 780,000 cu.m., and most of excellent woods are exported to Argentina in the form of log. They amount to 250,000 cu.m. The wood shares 22%, being ranked second in the total amount of exports from Paraguay. Sawmills total 470 in this country. Among them 400 are minor shops of a daily output of about one cu.m. Those having a capacity of 15 cu.m. or more per day are only 4.

Other work shops for processing of woods are 4 plywood shops. Generally speaking, capacity of wood processing is very small. This fact indicates how low the domestic demand for broad-leaved trees is.

Artificial reforestation is almost none. The only cases presently mentionable are 1,800 hectares of Eucalyptus plantaion and 200 hectares of conifers planting. The Paraguayan Government does recognize the importance of afforestation. Actually, the Government made nurseries, principally for Parana pine and Pinus elliottii, in 1965. But it is little time since the project was started. Except for this, the Government does not seem to have mapped out any forestry promotion plan.

2. Possibility of Afforestation Considered from Natural Conditions of Yguazu Settlement.

The topography is generally plat, with some wavy undulations, the altitude being 200 to 300 meters. Therefore, in carrying out afforestation work it is not necessary to classify the land by similar topographical types, but rather is there a possibility of simplifying the work.

The climate is subtropical, and the annual rainfall is 1,900 mm. Average temperature in the year is 22°C. The maximum temperature in summer

is about 40°C, and the minimum temperature in winter is -4°C. There is some frost. Though rarely, the low atmospheric temperature causes gust. But such a heavy gust as to cause the damage of windfalls does not occur more than once a couple of decades. Thus the climate is quite favorable to the growth of trees.

The soil is reddish brown clayey soil of weathered Mesozoic rocks, called terra rossa. At forest-landed places, the contents of humus soil are 4%. But when the land becomes bore, the rate rapidly lowers in a few years. Therefore, particular attention must be paid to the preservation of soil. For this reason, it is desirable to convert, before other places, the present forest-landed areas into artificial reforestation areas.

Existing forests have nothing but broad-leaved trees, shrubs and bamboos of low tree species mixing in high tree species, with adhesion of epiphytes. Useful woods are scarce because of the primitive way of selective cutting. As mentioned before, mature trees good for cutting are limited to one or two in one hectare. However, because of the selective cutting, there is no bare land of large area, and organic matters have been fed suitably. Thus the soil keeps good condition so far as the location of present consideration is concerned.

The Team inspected the afforestation plant at Misiones in Argentina for the purpose of studying the possibility of artificial reforestation at Yguazu.

(1) The topography of Misiones is more complicated than that of Yguazu. There are more cobble stones and the soil depth is smaller.

The climatic conditions are much the same as those of Yguazu.

(2) The species of trees for afforestation are mainly Parana pine, Pinus elliottii, Eucalyptus, etc.

(3) The Parana pine likes a gentle slope, of the soil of primary grade in terra rossa, which is good in water permeability, porosity and drainage.

It grows rapidly. At the afforestation area for 12 year raising, which is similar to Yguazu, the mean height is 19 m, the mean diameter 30 cm, and the reserve per hectare is estimated to be about 400 cu.m. However, at places full of cobble stones, the same 12 year trees have a height of mere 14 m, diameter of 22 cm, reserve of about 280 cu.m. The state of growth is much worse than the former. At the age of 15 years or more, the crown is circular, or even shaped like inverted triangle in the worse cases. Both the height growth and the thickening growth seem to become slow.

(4) The Pinus elliotti grows well even where the soil depth is short and there are many cobble stones. It can somehow grow at low moist land or poorly drained land. But its young tree does not grow rapidly, and it is less suitable for pulp wood than Parana pine.

(5) The Eucalyptus grows very quickly, and becomes mature for final cutting at about 6 years. But it is very weak against low temperatures of $-5^{\circ}C$ or below. For this reason it is called the speculative sort of wood.

At Stroessner Settlement adjacent to Yguazu, there are planting beds of Parana pine and Japanese cedar, though their number is small.

(1) The Parana pine at the afforestation area for 3 years seedlings, has a height of 3 m, and its crown shows upright stiffness. Thus its height growth is excellent.

(2) The Cedro is of the Yoshino family. It was planted after one year of seedling raising; and, at 2 years since planting it has grown quite well, rising to the height of 3 m.

(3) Japanese cedar (Origin and species unknown) at 5 years of age in single-tree standing has grown to the height of 8 m and to the breast diameter of 20 cm.

(4) The state of the growth of the Parana pine at the experiment farm of Japan Emigration Service at Yguazu is not much different from the state of Stroessner Settlement.

(5) However, these are a few examples. It is hard to draw a definite conclusion from such examples alone. Nevertheless much better growth could be expected of the trees at the Yguazu Settlement than at the forest of mean edaphic factor at Misiones.

3. Marketability of Forest Products.

The existing forest resources are generally poor in quality and consist mostly of borad-leaved trees which are hard to process at workshop. Their domestic market is small at present. Most of the excellent woods are flowing out in the form of log to Buenos Aires which has economic power.

South America holds about one thousand million hectares of primeval forest, of which about 300 million hectares have mature trees. But the forests are decreasing because of destructive lumbering and shifting cultivation. In Brazil, 42% of the land are forest. But it is difficult to develop the forest resources because most of the forests lie in the basin of Amazon River. Moreover, as the market is located in South Brazil, the forestry along Amazon is handicapped in respect of transport. In south Brazil, useful sorts of trees including coniferous trees exist in fairly good concentration, but about 75% of the cut out area are left as they are without reforestation. Such being the situation, Brazil has to depend for her pine wood on imports.

Argentina is paying an effort to promote afforestation, with Misiones Province as nuclear point. But this country also is far from being able to supply as much wood as it demands. So, Argentina also relies on imported woods.

Consumption of timbers in South American countries is much less than in more advanced countries, and it is bound to increase sharply henceforth. Among others, the demand for pulp woods and timbers for sawing is conspicuous. To look up the paper pulp in particular, the only self-supporting country in respect of paper is Chile. All other countries import a large quantity of paper pulp every year.

Paraguay has no paper pulp mill, and imports all the needs. The

import is estimated to be about 8,000 tons (1964), and the price is nearly twice the international price. If coniferous trees are supplied in Paraguay, the demand for construction materials will expand with great probability, as were the cases with Brazil and Argentina. Further, the boxes will certainly come to derive their material from coniferous trees. Besides these, demand from electric poles can be expected.

In view of her population and economic power, it is not proper for Paraguay to seek the market of forest products at home only. To the contrary she should endeavour to develop overseas market.

4. Establishment of Plans for Afforestation and Forestry Enterprise in the Yguazu Area.

(1) Basic stand for establishment of plan

A) Immediate target is fired at the securing of raw woods for domestic consumption and raw woods for paper pulp. Surplus woods available for export are also counted on. Forest land totalling 12,500 hectares, will be purchased. Afforestation is to be conducted for 10 years at the rate of 1,000 hectares per year.

B) A paper pulp plant of daily output of 20 tons will be established in 7 years after the commencement of the project, in order to meet 80% of domestic demand for paper pulp for the time being. As there will be more than just sufficient sufficient supply of raw woods, the paper pulp plant will be designed in such a way as to allow expansion in future.

C) A sawmill of a 30 horsepower capacity is to be built, where construction materials will be made by sawing natural timbers. After the seventh year, wooden boxes and others will begin to be produced. It will be expanded in future when the supply and demand situation justifies it.

D) The working organization is to be a joint stock company. But,

considering the purpose of this undertaking, it will be so organized as to easily permit the aid of the Japanese Government and any other related organizations.

E) The authorized capital of the said company is to be, say, 400 million yen (U.S. $ 1,110,000), and the work may be started with a paid capital of 100 million yen (U.S. $ 280,000). Part of the working funds could be financed from the Overseas Economic Cooperation Funds or similar sources.

F) The object location is the site of the Yguazu Settlement as proposed, with a total area of 12,500 hectares.

(2) Afforestation plan

A) Facilities for afforestation

a) The major forest road is to be 6 m wide. One each will be arranged at every 1,000 m of distance. The forest section way is to be 4 m wide, and it will be laid at intervals of 500 m.

b) A nursery of 3 hectares is to be installed so as to raise 300,000 seedlings of Parana pine for after-planting and 750,000 seedlings of Pinus elliottii.

c) A line of fire break and shelter belt is to be laid along the ridge.

d) A seed harvesting forest will be planned sometime in future.

e) All sorts of necessary machinery are to be provided.

B) Forest management plan

a) Resources must be conserved and developed, aiming at successive and continuous administration, and the operation plan must be mapped out in consideration of conservation of soil.

b) Afforestation plan must be determined in consideration of the order of cutting in future, with the forest divided into 11 forest compartments and 121 sub-compartments.

c) The species of wood to be planted will be Parana pine (80%) and Pinus elliottii (20%) in view of the conditions attending the Yguazu Settlement.

d) Mechanical planting will be adopted to save labour.

e) Weeding and ants extermination receive due attention.

f) The afforestation cost (in direct expenses) per hectare is 145,000 yen (U.S. $ 403) as to Parana pine, and 144,000 yen (U.S. $ 400) as to Pinus elliottii.

g) The lumbering is planned to be made at 6, 9, 12 and 16 years after planting so far as thinning cut is concerned. The point is laid on the thinning for the sake of tending. Judging from the degree of increment of stand, thinning will be allowed to a major extent. The final cutting will be made in the 20th year. In this connection, alternative cutting sections will be established in order to avoid the clear cutting of big area. For the hauling of woods, a timber-yard will be provided at each sub-compartment and the timbers will be sent on land to pulp plants, and so on. An estimate of harvest per hectare is given in the table below. As shown, 3 or 4 times the harvest in Japan are anticipated.

Time of final cutting	6th year	9th year	12th year	16th year	20th year	Total
Amount of harvest	71 cu.m	89 cu.m	87 cu.m.	172 cu.m	307 cu.m	726 cu.m

h) The sale of trees is performed on the state of standing tree. The woods derived from thinning are to be used for pulp wood. The price of standing timber is counted as 2160 yen (U.S. $ 6) per cu.m., and the prices of timbers of final cutting are

calculated to be 5,400 yen (U.S. $ 9.5) per cu.m. for Parana pine, and 3,600 yen (U.S. $ 10) per cu.m. for Pinus elliottii. However, in actual transaction, some portion of woods derived from thinning will be used for industrial wood. Therefore, the price of woods of thinning will probably be higher than calculated above.

i) Total number of labour will be 92,000 man-days at the busiest time involving planting and tending, which figure will mean 368 persons working 250 days.

j) When afforestation is carried out in accordance with the schedule as stated above, the cutting volume in 30 years will amount to 4.19 million cu.m. of thinning woods and 3.07 million cu.m. of final cutting woods, totalling 7.26 cu.m. The income through cutting will be 9 thousand million yen (U.S. $ 25 million) from thinning and 15.5 thousand million yen (U.S. $ 43 million) from final cutting, totalling 24.5 thousand million yen (U.S. $ 68 million).

The total expense incurred to make this income will be 4.6 thousand million yen (U.S. $ 12.78 million) --- provided that the defrayment on the face of funds plan will be 6.3 thousand million yen (U.S. $ 17.5 million). It means that the balance of profit for current term will be 19.9 thousand million yen (U.S. $ 55.28 million).

The funds required for this operation are 100 million yen (U.S. $ 280,000) in capital, 15 thousand million yen (U.S. $ 4.17 million in the borrowings and 4.7 thousand million yen (U.S. $ 13 million) in the transfer from profit, totalling 6.3 thousand million yen (U.S. $ 17.5 million).

(3) Plans fro constructing paper and pulp mill

A) A paper and pulp mill to use the woods of thinning during the

afforestation are to be constructed in the 6th year of the planting.

B) The plant is to be located in the Yguazu area.

C) The plant is to meet the immediate domestic demand in Paraguay. The monthly output will be 500 to 550 tons. (i.e. a plant of daily output of 20 tons). Taking into account the increase of demand in future and growth of export to abroad, the plant is to be so designed as to easily expand its capacity.

D) The kinds of pulp will be the unbleached, the semi-bleached and the bleached, to be made by the kraft process.

E) The pulp digesting boiler will have a 60 cu.m. capacity.

F) The kinds of paper will be printing paper, stationery paper and others for miscellaneous uses. Two of the Fourdrimier machine capable of making these kinds of paper are to be installed (width 2 m, daily output 10 tons).

G) Chemicals will be imported from abroad.

H) The manufacturing costs will be 85,376 yen (U.S. $ 237) in the case of pure white roll and 72,269 yen (U.S. $ 201) in the case of unbleached kraft wrapping paper.

I) When paper and pulp are manufactured in accordance with the foregoing scheme, the income for 30 years will be 16.3 thousand million yen (U.S. $ 45.28 million) and the expenditure, 12.5 thousand million yen (U.S. $ 34.72 million) --- provided that the defrayment in the funds plan will be 12.6 thousand million yen (U. S. $ 35 million). The profit in balance will be 3.8 thousand million yen (U.S. $ 10.56 million).

(4) Overall income and expenditure

Summing up the foregoing, the total income for 30 years will be 40.8 thousand million yen (U.S. $ 113.33 million) and the total expenditure will be 17.0 thousand million yen (U.S. 47.2 million) --- provided that the

defrayment in the funds plan will be 18.4 thousand million yen (U.S. $ 51.1 million). The profit in balance will be 23.8 thousand million yen (U.S. $ 66.1 million).

5. Problems in Pushing Forward the Work

In pushing forward the present project, particular attention must be given to the state of the locality in question, that is, to the arrangement of working environment of the people to work in and around Yguazu, such as residence, recreational facilities, water service, medical establishment, and so on. Aside from this, the securing of seeds of Parana pine, etc. should largely depend on the cooperation of the Paraguayan Government agencies and United Nations agencies concerned. The last mentioned are the problems calling for further study.

II BODY OF REPORT

(1) Outline of Forest Resources and Forestry of Paraguay

1. Outline

Out of the total area, about 40 million hectares, of the land of Paraguay, 24 million hectares, or 60%, are covered by natural forests consisting of broad-leaved trees. It was impossible to grasp complete details of facts through the present survey, because exact statistical data available to the Team were few and the period of the survey was limited. Actually, there is a big difference between the eastern district and the western district in the ways of vegetation. Judging from the data of standard spots, the forest resources of this country may be broadly estimated as shown in Table 2.

As regards the forest phase, about 50% of the forests in the eastern district have such a composition of stand that high trees constitute major materials and in the rest of the forests in the eastern district are the low tree forest where shrubs constitute major materials, or the grassland forests where shrubs are scattered on grassland. In those poorer forests, the trees of useful species such as Lapacho Tayi, Cedro, Curupaira, Petereby and Guatambu, which are mature and ready for cutting are no more found than at the rate of one or two per hectare, and other trees are coconut trees or those less useful broad-leaved trees such as Laurel-Negro and Roba. The mean reserve per hectare is estimated at about 100 cu. m in the accessible forests, and among them the reserve of mature useful woods good for cutting is estimated to be about 4 cu. m.

In the western district the moist and grassland are predominant, although forest areas also exist at some places. But these areas have inaccessible forests only, and the only useful species is Quebracho for extracting tannin which grows at higher altitudes.

When classified by owners, these forests are divided into government-owned forests and private-owned forests. There are no reliable data in

Table 2 Forest Resources of Paraguay

	Total area	Forest area	Accessible forest area	Reserve	Reserve by locality classes (thousand cu. m)			Reserve of mature useful woods good for cutting annually (thousand cu.m)
					1	2	3	
Unit	1,000 ha	1,000 ha	1,000 ha	1,000 m^3				
Eastern District	16,000	8,000	4,000	400,000	80,000	120,000	200,000	16,000
Western District	24,000	16,000	2,000	200,000	40,000	60,000	100,000	8,000
Total	40,000	24,000	6,000	600,000	120,000	180,000	300,000	24,000

Note; Locality class

1.....Hauling is easy.

2.....Hauling is somewhat difficult.

3.....Hauling is very difficult.

this connection. But, it seems that out of 6 million hectares of the forest area whose development is feasible, the government-owned forests occupy 600,000 hectares, or 10%, and the private-owned forests hold 5.4 million hectares, or 90%. About 2.8 out of this 5.4 million hectares of private-owned forest are owned by 10 big landlords (each in possession of 70,000 hectares or more). It indicates that forests are for the most part in the hands of very big owners.

Briefly stating, the present condition of the forestry in Paraguay is extensive and primitive forestry of "cut out and get out" system. Afforestation is little done, and selective cutting of useful woods is repeated virtually with no silvicultural consideration. Under the circumstances, the forest resources are diminishing and the forest phase is simply going to the worse. Also, the excellent woods cut out are exported in the form of log to Argentina.

The state of timber production is shown in Table 3.

Table 3 Timber production in Paraguay

Use	Quantity of cutting	Quantity exported	Domestic use	Breakdown of Domestic Use		
				Domestic sawing	For support or sleepers	Others
Timber	cu. m 780,000	cu. m 250,000	cu. m 530,000	cu. m 240,000	cu. m 180,000	cu. m 110,000
Fuelwood	2,143,000	---	2,143,000	---	---	2,143,000

The quantity of domestic sawing is somewhere around 240,000 cu. m (80,000 cu. m in terms of quantity of products), of which 118,600 cu. m (35,000 cu. m in products) are exported. The 110,000 cu. m in "others" include raw woods of Quebracho for extraction of tannin.

The number of sawmills and other plants is:

Sawmill ..... 10 each being of a daily output of about 15 cu. m
..... 60 each being of a daily output of about 10 cu. m
..... 400 each being of a daily output of about one cu. m

Tannin plant 4

Plywood shop or other processing shop 4

The sawmills are minor ones equipped with circular saws only. In spite of the fact that the natural conditions in the eastern district are favorable to the afforestation, no artificial reforestation has so far been made. The only mentionable forests are some 1,800 hectares of Eucalyptus plantation and about 200 hectares of coniferous forests.

The forestry labour population is estimated at 83,500. The position of wood in foreign trade is important. Holding 22% of the total amount of export, it ranks second. It goes without saying that forestry is one of the most important industries of Paraguay.

2. Afforestation Plan of the Paraguayan Government

The Government of Paraguay has recently become aware of the real importance of afforestation. It is working to map out an afforestation plan so as to convert the forest lands into artificial reforestation area of high productivity.

To be more precise, the Paraguayan Government planned to make forests of Parana pine and Pinus elliottii, centered on Puerto Stroessner-Oviedo section which is located along the international road, --- a project to be started in fiscal 1966 with the cooperation of UN FAO. In 1965 already, the Ministry of Agriculture and Stock Raising and the Ministry of Internal Affairs made a seedling nursery at Stroessner colony (under charge of the Ministry of Internal Affairs). This nursery was supposed to produce one to 1.5 million seedlings in its first year and distribute them to farmers at low prices.

However, for some reason or other, the work failed to be carried out as planned. The number of seedlings raised in the first year is estimated to be about 240,000. Notwithstanding, the fact that the Government is evidencing its earnest concern in afforestation will give great promise for

the future of Paraguay.

3. What Key Personnel of the Paraguayan Government think about their Forestry.

----- Summary of Conversation -----

(1) Summary of conversation with Director General Mandelburger of Economic Planning Agency, Office of the President:

A) Paraguay has an afforestation plan at any rate, but it is not well established.

B) The only work under way is the 20 hectares wide seedbed of the Forest Experiment Station at Presidente Stroessner Settlement, where the seedlings of conifers to be distributed to its 120 households of settlers are being raised.

C) At present, no particular policy for aid to forestry has been put up. Neither is there any concrete schedule for implementation of a project.

D) When the Japanese Survey Team submits a report on the results of investigation and plant exportation of the like measure is considered in it, if the cooperation and assistance, or concessions, of the Paraguayan Government are requested, the Government will not spare effort in supporting the proposal.

E) Economic Planning Agency has strongly requested Ambassador Ishii of Japan to assign a Japanese planner to EPA.

F) We all pay high respects to the remarkable development of Japan's economy, so much so that we request the Japanese Government to send experts to Paraguay by all means. To be specific, we should like to have experts on forestry.

(2) Summary of conversation with Minister of Agriculture and Stock Raising, E. Gonzales Alsina.

A) Agriculture, live stock raising and forestry are the three supports

of Paraguay. Agriculture and live stock raising of this country have been human activities, but forestry has been left to Providence alone, with no effort paid by ourselves. Now, at this moment, we should like to pray God to take a rest, while we avail ourselves of the economic and technical aid from Japan.

B) When the going abroad of Japanese enterprises, involving forestry, pulp and so on, is considered by Japanese authorities, we will assure them of our complete and strong support in connection with measures to be taken against possible obstacles and with our offer of necessary assistance.

C) Therefore, if necessary, we would make efforts to take such measures, as (a) exemption of land tax levy for 15 years or so; (b) permission of tax-free importation of machinery, equipment, chemicals and other necessary matters; (c) exemption of income tax until factories become operable; and (d) approval of foreign currency remittance of investment funds and interests.

The Minister took a keen interest in the going abroad of Japanese enterprises and stated to the effect that speaking in the interest of the Japanese, the hand-in-hand collaboration with Paraguayan friends or entrepreneurs will leave both always care-free; that we, of pro-Japanese segment, held fast to the immigration of the Japanese when the opposition demanded to let more Europeans come in; and that since the result of our persistence for the Japanese was quite a success, it is desired that Japanese enterprises come to this country and benefit the Paraguayan people and let the opposition know how good the Japanese scheme has been.

(3) Summary of conversation with Minister of Civil Engineering and Postal Service, General Samaniego

We are now conducting a preliminary survey of the so-called delta plan around Asunción, Encarnación, Puerto-President-Stroessner. The nuclear spot

is the section between Encarnacion and Puerto-Presidente-Stroessner. When the Japanese agent sets up a concrete plan for the Paraguayan forestry, we propose, it will cooperate with those concerned in this delta plan, to facilitate exchange of information and eliminate unnecessary duplication of work.

(2) Possibility of Afforestation Considered from Natural Conditions of the Yguazu Settlement

The Yguazu Settlement is an extensive settlement covering 87,763 hectares, located 286 km by the international highway to the east of the capital, Asunción, at 41 km before the frontier (International Bridge, called the bridge of friendship) with Brazil.

This survey team primarily aimed to study the possibility of afforestation of this settlement area. It began with the analysis of the natural conditions of the settlement and then, to draw a comparison, investigated the actual state of afforestation at Misiones in Argentina and at another example in Brazil.

1. Characteristics of Forest Habitat

(1) Topography

The Yguazu area is traversed by Rio Yguazu in its northernmost part, and by Rio Mondau in its southermost part. Many small rivers in the area flow into these two. The topography, therefore, is generally full of wavy undulations, the altitude ranging between 200 and 300 meters. When locally observed, there are naturally some topographical variations. But generally the land is flat, with but mild changes if at all.

This indicates that the erosion was wrought in the very final stage. In this sense, the afforestation enterprise planning does not call for complicated classification of areas by similarity of types of topography. Hence, it indicates the working afforestation plans could be simplified.

(2) Climate

The climate is subtropical. The annual rainfall is 1,900 mm or so, which is nearly equivalent to the average rainfall of the mountainous zone in Japan, and its distributure is comparatively uniform. The maximum temperature in summer (October to April) is often nearly 40°C. The minimum temperature in winter (May to September) is -4°C. It frosts sometimes, though merely several times a year. The average annual temperature seems to be 22 or 23°C.

There is no heavy wind like the typhoon which attacks Japan. Though rarely, the low atmospheric pressure causes gust. But, such heavy gust as may cause the windfall does not occur more than once for several decades.

It may safely be said that the climatic conditions such as this are quite favorable to the growth of plants. However, the foregoing observation is derived from the limited data for a very short period. It is hard to anticipate what climatic anomaly may happen in future. Nevertheless, it is not likely that the prospect as stated above may widely deviate from the normal course, judging from the result of observation of surrounding regions and the opinions of indigenous people.

Table 4 Climate of Yguazu District

Observation at Yguazu Office of Japan Emigration Service

	Average in 11 years in Franco	July 1961 - June 1962	July 1962 - February 1963	March 1963 - December 1963
Mean temperature for the year	23.4°C	22.5°C	20.1°C	22.4°C
Temperature in winter (May - September)	18.6°C			
Temperature in summer (October - April)	24.7°C			
Highest mean temperature		27.3°C	26.6°C	27.8°C
Absolutely highest temperature		36.5°C	37.2°C	37.8°C
Lowest mean temperature		12.6°C	14.2°C	27.7°C
Absolutely lowest temperature		-2.0°C	-1.4°C	-4.1°C
Mean humidity for the year	77%	77.3%	82.7%	87.2%
Mean rainfall for the year	1,540 mm	1,868.1 mm	1,088.7 mm	1,957.4 mm
Mean evaporation per day			4.8 mm	3.1 mm
Mean atmospheric pressure for the year			970.4 mb	749.6 mb
Mean wind velocity for the year		1.6 m/sec	1.14 m/sec	
Mean frequency of frosting for the year			4 - 5 times	10 times

(note) Franco is a border town 40 km on the east of the settlement.

(3) Soil

The soil of the Yguazu area is red soil called the terra rossa. This is reddish brown clayey soil of weathered Mesozoic rocks. The contents of humus soil are 4% in the forest land. There is no division by layers of different geological components, as is often observed in the forest soil in Japan. At some places, weathering has wrought deep down to 30 m below the ground surface, and humus soil is distributed evenly. Therefore, the ground here has small particles of soil, little affected by cobbles or the like.

As a matter of course, the topography varies according to different locations when observed micro-topographically, and the soil nature cannot be the same everywhere. Broadly speaking. Yguazu is a great plain zone. But closer observation will reveal fairly big differences depending on altitudes. To put it concretely, high trees are predominant in vegetation in the Monte Alto area located at the highest altitude, low trees are major materials in the Monte Bau area located lower, grasses are predominant in the Campo Alto area located further below, and the Campo Bau are situated at the lowest altitude shows the state of grassland on moist. Whatever the difference, the altitude does not change more than several decameters, yet there is such variation. The worst is Campo Bau, where the soil is conspicuously acid with its pH. value ranging from meager 4 to 4.5. Unless drainage is provided and some operation is done to heighten the pH. value, the soil of this locality will remain unfit for the growth of plants. From such considerations, it is better to take the Monte Alto area and the Monte Bau area as the objects of afforestation from the viewpoint of forestry management.

Needless to say, afforestation will be technically possible even at Campo Alto and Campo Bau, if proper species of trees are selected and duly conceivable operation is made. But, in this vast land, it does not seem

necessary to dare go so far in an attempt to do something for forestry.

At any rate, the soil at Monte Alto and Monte Bau keeps humus soil in high rate of contents. This is because the past destructive cutting, as it was, was selective felling of useful woods done to merely one or two trees per hectare, and as such, it has not much affected the crown cover, but suitably helped supplement organic matters, and thus the soil has been prevented from turning to the arid land soil. On the other hand, at Campo Alto and Campo Bau, the red soil shows the sign of dissolve-out, and is transforming into black soil of very compact soil nature. Even at Campo Alto, clear cutting, should it last for several years, would reduce the ratio of humus soil contents to about 2%. Therefore, it may be said from the standpoint of soil, that Monte Alto and Monte Bau are ideal objects of afforestation area.

2. Present Structure of Forest Resources

The present land classification of the Yguazu area is as shown below. Most of the land is the forest called the primeval forest.

Primeval forest	62,546	hectares
Shrubs	5,687	"
Grassland	17,788	"
Moist	1,575	"
River area	166	"
Total	87,762	"

These forests have broadleaf trees only. The species of high tree are Lapacho, Cedro, Guatambu, Laurel Negro, Incienso Cancharana, etc., with which mixed growing are miscellaneous low trees and bamboos. Vines and the like epiphtical plants are also adhering. Naturally growing orange trees and palmit coconut trees are locally found here and there. The shrubs are the so-called woods on grassland scattered on grasslands. Data of survey of the resources are quite lacking. But the forest phase is similar in all

areas. Hence, the forest reserve was calculated by employing the sample-lot method. As a result it was revealed that the reserve per hectare must be as small as 100 cu. m or less, and the density of standing trees was low so far as concerns those trees regarded as useful species, such as Lapacho, Cedro, Laurel Negro, Incienso, Guatambu and Guaica.

Moreover, readily harvestable wood of primary grade (see note below) among those useful species does not exists any more than at the rate of one for each hectare, or, even if the specifications are alleviated, two or three trees per hectare.

Note: Lapacho, Cedro, Laurel Negro, Incienso, etc. which allow cropping of a timber of 15' × 15' × 7m or more, or 17' × 18' × 5m or more, in case of straight timbers, and 14' × 14' 8m or more in case of Crooked timber, are of primary species of primary grade but not allowing the cropping of primary grade wood, and also Guatambu, Guaica, Urapta-timbo, etc., which allow cropping of a timber of 13' × 13' × 7m or more or 15' × 15' × 5m or more in case of straight timber, and 12' × 12' × 8m or more in case of crooked timber are of secondary grade. Species of secondary grade but not allowing the cropping of a timber of secondary grade specification are of the tertiary grade. The avobe are application of the Specifications of Japan Emigration Service.

When considered this way, it may be said that the existing forests, if defined as the forests to produce industrial wood, will be of little value. At the same time it may be natural to claim that in view of the vastness of the area the forest resources are abundantly imparted, and it also may be pointed out rightly that the useful wood selectively cut out of this extensive area will amount to a considerable quantity. But, once the productivity per unit area is considered, one can say without exaggeration that those forests are an ensemble of low productive stands.

The reason is simple, it is that these forests do not deserve the name "primeval forests", but are no more than the secondary forests which have long suffered external forces if expressed in bold language. That is to say, in olden times they might have retained climax phase as primeval forests with dense growth of wood of big diameter, whereas, at present, they may be termed the forest lands where marketable, useful woods have been selectively cut and nothing else has been done except the reiteration of this selective felling.

Here we must remind ourselves of the law of plant succession, and let us suppose that human power or any other external force other than human works on a forest and the woods existing in it are removed. Then, the succeeding woods which come in the voids created there will not necessarily be the species useful to man. These must be mostly the active kinds which grow best under the sunbeam. If such a species is to yield useful wood, everything will be all right. But such is not a guaranteed reality. Instead, it often happens that something of little use to man invades and grows to occupy the whole area.

Similar is the case with the forest in question, where large diameter woods of useful species have been cut (probably at a periodic cycle of 10 to 15 years), till at last the forest resources structure as we see it today has turned up.

3. Result of Afforestation at Misiones Province, Argentina

--- reference settlement ---

When an attempt is made to determine the possibility of afforestation enterprise at Yguazu from observation of the natural conditions, it is only too natural to resort to the judgement from the results of afforestation so far made in this area or similar forest areas located nearby. But the fact is that out of the total forest area of 24 million hectares throughout Paraguay, it is in only 2,000 hectares that artificial reforestation is made. Moreover, 1,800 out of this 2,000 hectares are Eucalyptus forests lying in

the periphery of pasture grounds, and the forests where coniferous trees are planted account for only 200 hectares. It is all the more difficult to judge the prospect of afforestation at Yguazu from the results of such meagre forest lands alone because these are scattered in small units in various places.

Hence the present survey team decided to study the possibility of afforestation of the Yguazu area through the investigation of the state of growth of trees in the aforestation area in Miniones Province, Argentina, located on the other side of Parana River which flows bordering Paraguay and Argentina.

Misiones Province has the largest pulp mill in Argentina, called La Cellulosa Argentina, producing 100 tons of coniferous pulp daily. This company owns nearly as large as 8,000 hectares of forests around the factory, and is raising, among others, Parana pine.

But the planted trees obtained from the company-owned forests alone became insufficient to provide as much raw woods as the company needed. This gave impetus to the farmers nearly to begin planting trees. And, now, the company buy the woods those farmers produce from the trees they planted. Thus the newly created demand gave rise to a zeal for the planting of trees, so much so that Misiones Province has become the Mecca of afforestation in Argentina. Actually, the mate tea fields and tung-oil tree fields are changing to afforestation areas one after another in Misiones.

To be noteworthy is that the natural conditions of this Province, somewhat inferior as they may be, are rather similar to those of Yguazu. Therefore, the result of afforestation in this Argentine counterpart should not be overlooked when one is going to start an afforestation enterprise in Yguazu. Fortunately, La Cellulosa Argentina has collected some pieces of information on the afforestation in Misiones Province. Hence, the achievements of afforestation in this area will be analyzed, on the basis of the data summed up

by La Cellulosa Argentina and the results of investigation of the survey team.

(1) Natural conditions

The topography here is more complicated than that of the Yguazu area, with more undulations and a little more steeper slopes. All this indicated that it is still in the course of erosion. The annual rainfall gradually increases from south to north along Parana River, averaging about 1,800 mm, which is roughly equal to the annual precipitation at Yguazu. According to the data of the National Observatory for the past 50 years, October is most rainy, with a precipitation of 200 mm, and August has least rainfall, registering some 90 mm. The rainy season visits twice a year, in April and October, and the spell of rain is longer in autumn than in spring. Winter has least rain, that is, August is the most dry period. Such abundant rainfall, distributed well over the year, is favorable to the growth of plants. As regards the temperature, the average annual temperature in Misiones Province is within a range between 20 and 21°C. There is no severe difference of temperature between the coldest month July (between 14 - 16°C) and the hottest month January (between 25 - 26°C). Accordingly, winter is cool and crisp and does not see much frost, whereas in summer the temperature is high enough, being added by suitable humidity. The minimum temperatures even recorded are -7°C of 1955 and -5°C of 1947. Such low temperature scarcely occur. The frequency of frosting per year seems to be 5 times or so on an average.

The soil is terra rossa, as is the soil of Yguazu. The soil nature is of clay loam full of organic matters, and this clay loam reaches several meters below ground surface. At places it goes down to 28 meters, reaching the country rocks which comprise weathered rocks. But stony soil with shallow soil layer is also seen in steeper slopes. At such places the depth of soil is about 50 cm.

The foregoing natural conditions of Misiones Province may be compared with those of Yguazu as follows:

Misiones is topographically more complicated than Yguazu; the ground has more folds, and therefore is more stony in general outlook. The amount and distribution of rain are much the same in the two areas. With summer temperature higher, the temperature over the year is somewhat higher at Yguazu. But fundamentally it does not make much difference. They are alike in the minimum temperature and the frequency of frosting also. The origin of soil is quite the same, but Yguazu is richer in humus soil and that to a larger depth.

Thus drawing comparison, it may be said that the terrane is simpler and much more plain-like at Yguazu, and the soil conditions also are far better, although the climatic conditions are much the same.

(2) Species of trees planted.

The history of artificial afforestation in Misiones Province dates at the most from 14 or 15 year ago. Hence the final result of growth is not yet known. Judging from the state of growth of the species planted and cultivated there, it does not seem very difficult to form an idea of the right species of tree in the right place.

The principal species of trees planted at Misiones are Parana pine (Pinus araucaria) and Pinus elliottii, Eucalyptus family (Eucalyptus saligna, Eucalyptus grandis, etc.). Other species of trees raised are Pinus taeda, Pinus caribaea, Pinus honduresis, and so on.

Among them, Pinus araucaria likes the first grade soil of terra rossa, particularly a gentle slope of good water permeability, porosity and drainage. The soil depth it requires is 1.5 m or more. Suitable lands are therefore very limited for this particular tree. But, it grows very well unless there is not a mistake in the selection of proper land. Pinus elliottii does not require so much soil depth, but grows fairly well even on stony ground. It can grow also on low, moist ground or poorly drained land. However, this species has so much resin ingredient that it is far less suitable for pulp wood than Pinus araucaria.

Eucalyptus can grow on the land of the red soil of much smaller depth than Pinus araucaria requires, and it grows very rapidly. But it has little adaptability to low temperatures of -5°C or below.

Other species are new in the history of planting and cultivation and their afforestation area is quite small, so these are still in the stage of test.

From the observation thus far made, it may safely be said that the species worthy of consideration in planting trees at Yguazu are Pinus araucaria, Pinus elliottii and Eucalyptus. Among them, Eucalyptus is handicapped in that it is weak to low temperature, so it may be regarded as a speculative species. Also, Pinus elliottii, which is no doubt suitable to the natural conditions of Yguazu, does not deserve all-out afforestation in view of its limited utility. In the light of the natural conditions attending Yguazu, Pinus araucaria can pass for the most promising species. Then, as the primary concern stands, study must be made into the state of growth of this particular species.

(3) Results of Artificial Afforestation of Parana Pine

In Misiones Province, attention is paid solely to the amount of harvest at the time of felling (thinning and final cutting), with little data collected concerning the process of growth. Naturally, survey of stands and related matters has been little done. In the absence of preparation of the so-called harvest estimation, the way of knowing the results of afforestation cannot but be confined to the observation of the growth of real stands and annual rings of wood cut out of forests. Another recourse barely allowed to the survey team was estimating the growth of trees after 15 years of age from the state of growth of single trees left over 15 years or more, because the age of stands at the afforestation area was mostly less than 15 years.

The results of calculation thus conducted will be given in the following passages.

Table 5 List of places surveyed

Item \ Places surveyed		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Place		Garuapé Misiones Province	Garuapé Misiones Province	Garuapé Misiones Province	Eldorado Misiones Province	Wanda District Misiones Province	Piray La Cellulosa *Argentina mill* timber yard, Misiones Province
Soil Condition		Terra rossa Flat(Like in Yguazu)	Terra rossa Flat(Like in Yguazu)	Terra rossa Flat(Like in Yguazu)	Terra rossa(Slope area about 15°) Many stones, Thin soil depth	Terra rossa Flat (Like in Yguazu	
Age of Stand		3 years	4 years	6 years	12 years	12 years	
Number of Stands (per 1 ha)		2,690	2,490	1,200	780	600	
Mean Height		3 m	8 m	13 m	14 m	19 m	
Mean Breast Diameter		2.5 cm	10 cm	20 cm	22 cm	30 cm	
Forest Reserve (per 1 ha)				above 250 m^3	below 220 m^3	below 400 m^3	
Standard Place	Area	0.10 ha	0.10 ha	0.10 ha	0.10 ha	0.10 ha	
	Number of Stands	269	249	120	78	60	
	Forest Reserve			25.59 m^3	21.73 m^3	39.91 m^3	
Remark			Connected to No. 1		Thinning 1st, 7th year 15 m^3 2nd, 10th year 25 m^3 3rd, 12th year 60 m^3	Thinning Twice enforced. Dates and areas of thinnings enforced unknown.	4-year logs are mostly 5 or 6 cm, but in some cases 10 cm in diameter. 5-year logs are mostly about 10 cm but in some cases 15 cm in diameter.

Table 6 List of standard place surveys

No. 1			No. 2			No. 3					No. 4					No. 5				
Diameter	Height	Number	Diameter	Height	Number	Diameter	Height	Number	Single tree volume	Total volume	Diameter	Height	Number	Single tree volume	Total volume	Diameter	Height	Number	Single tree volume	Total volume
cm	m		cm	m		cm	m		m3	m3	cm	m		m3	m3	cm	m		m3	m3
1.0	2.5	11	2	.6	6	12	12	3	0.0715	0.2145	12	12	2	0.715	0.1430	18	18	1	0.2335	0.2335
1.5	2.5	25	4	7	11	14	12	6	0.0975	0.5850	14	13	2	0.1045	0.2090	20	18	1	0.2896	0.2896
2.0	3.0	64	6	7	30	16	13	14	0.1393	1.9502	16	13	7	0.1393	0.9751	22	18	2	0.3549	0.7098
2.5	3.0	93	8	8	55	18	13	25	0.1742	4.3550	18	14	8	0.1862	1.4896	24	19	4	0.4420	1.7680
3.0	3.0	59	10	8	71	20	13	37	0.2160	7.9920	20	14	12	0.2308	2.7696	26	19	6	0.5206	3.1236
3.5	3.5	15	12	8	40	22	13	20	0.2647	5.2940	22	14	21	0.2830	5.9430	28	19	11	0.6090	6.6990
4.0	3.5	2	14	9	21	24	14	12	0.3351	4.0212	24	14	13	0.3351	4.3563	30	19	18	0.6974	12.5532
			16	9	15	26	14	3	0.3947	1.1841	26	15	9	0.4193	3.7773	32	19	10	0.7858	7.8580
											28	15	3	0.4910	1.4730	34	19	5	0.8938	4.4690
											30	16	1	0.5964	0.5964	36	20	1	1.0506	1.0506
																38	20	1	1.1639	1.1639
Total		269			249			120		25.5960			78		21.7323			60		39.9182

Note: 1. Standard place areas are all shown in 0.10 ha.

2. Breast height figures used in volume calculation are based on "No.1" figures prepared by Kunijiro Wada.

From this foundings, we can say that the growth of Parana pine on the artificially afforested soil which bears a close resemblance to that of Yguazu district.

On the other hand, the growth of Parana pine on the soil where there are lot of pebbles and the soil depth is shallow, was rather poor. For instance, mean height and mean diameter of the Parana pine on the soil of the first example which bears a close resemblance to that of Yguazu were respectively 19 meters and 30 centimeters, while, those on the soil of the fifth example which land condition is inferior, were respectively 14 meters and 22 centimeters. The reserve per hectare was 399 cubic meters in the former case and 217 cubic meters in the latter case.

Thinning was conducted twice in the former case and three times in the latter case in the 12th year since the afforestation, accordingly 60 cubic meters of the volume thinned down at the third time should naturally be added to the reserve of 217 cubic meters in comparison. The total volume in the latter case amounts to 277 cubic meters, which is still but 69% of that in the former case. The volume of standing trees in the former case is regarded as 780, and that of latter's is 600. It can hardly be said that the thinning of wood of big-diameter was more conspicuous in the former case than in the latter case. It seems quite clear that this difference comes from the land condition.

As for a single tree, we could not fully ascertain things including age, as it was a partial investigation. But it can be guessed that when a tree is over fifteen years of age, it scarcely make height growth and its crown assumes either round or reversed triangle in the extreme case and there hardly is thickening growth.

4. Results of afforestation in Yguazu Settlement and its surroundings

As we have mentioned before, the aforested area in Paraguay is only 2,000 hectares, of which 1,800 hectares is for Eucalyptus and 200 hectares is for conifers. So it is difficult to find out area of fair size for afforestation

around Yguazu Settlement and its surroundings. But at Stroessner Settlement (in charge of Internal Ministry), adjoining to Yguazu Settlement, 16 Japanese families have settled in and now raising Parana pine and Japanese cedar (cryptomeria) in several hectares from three years ago, after making survey to study the afforestation in Misiones Province, having firm conviction in the promising afforestation there. According to the findings, height of both pine and cedar was 3 meters, Cr. assumes straight and height growth and excellent in both cases. (In case of Parana pine, Brazilian seeds were sown directly, and in case of Cedar, Yoshino lineage was used, and the seedles used were after one year of cultivation and two years after planting.)

Parana pine was planted also between the corn ridges (3m × 1 m) which prevented young pine saplings from drying up and saved trouble of weeding. This was experiment of only 3 years and it is not enough data to decide right here the direction of plant growing here, but it can be said at least that the growing process here these last three years was better than that in other places in Misiones Province. Afforestation record here is promising enough, judging from the fact that the height of Parana pine in Misiones Province after three years of raising was around 2.5 meters.

A single tree of Japanese cedar which lineage was of the district along the Japanese Coast, happened to be planted in the garden of a Japanese settler. After five years of raising, it grew to 8 m. of height and 20 cm. of diameter at the height of man's breast. Such a rapid growth is unthinkable in Japan. It, however, was just a single tree which cannot be by all means compared with the trees composing the forest. The shape of the branches was in most cases round, and we could not foretell how it would grow in the future. (This cedar seems to be a hardy plant of the Japan Sea Coast lineage, and possibly is not suitable to be raised in this place. Then, we can perhaps expect that the adaptability of a cedar of warm place to this place will be very great.)

At the experimental farm in Yguazu Settlement, some Parana pines are

raised, which record is almost the same with that in case of Stroessner Settlement.

5. Possibilities of afforestation from the viewpoint of natural conditions

The condition of nature is completely the same in Stroessner Settlement and Yguazu Settlement, and these two settlements have superior soil quality than Misiones Province. Afforestation can be said to be extremely promising, if it is seen from the point of view of natural condition.

As we have mentioned before, in the article of afforestation record in Misiones Province, it can be assumed the afforestation of Yguazu shows almost the same results as the afforestation at the place in Misiones Province, which soil is almost the same as that of Yguazu. Therefore estimating the prospect of afforestation in Yguazu is not so difficult, if we take that record in Misiones Province, mentioned above, as the highest and average record in Misiones Province as the lowest, accounting the aeverse occasion.

Naturally afforested area in Misiones Province has a short history of only 14 - 15 years, and we can only guess the growing process thence. Rough estimation is still possible, as there are single trees over 15 years in the gardens and farms. The crown of these single trees over 15 years also assumes round, which clearly means the height growth becomes stolid.

It is also clearly observed that compared with the younger trees, the height growth in case of the trees in the plantation about 12 years, is considerably dull. Judging from these facts, final cutting had better be conducted no later than the 20th year, although thickening growth might be expected thence.

(3) Marketability of forest products

However promising the afforestation of conifers from the viewpoint of the natural condition, it is absolutely menaingless if there is no market of the woods.

As we have mentioned before, the forest phase of the primeval forest in Paraguay is far from satisfactory and the reality is that we must look for some useful ones among them. Moreover these are, most of them, broad-leaved woods difficult to process. Considering these facts, it is very difficult to positively utilize these resources for poor domestic economy of Paraguay, and it is not without reason that the superior lumbers are floating out to Buenos Aires which has a stronger economic power.

Accordingly, it is necessary to supply needle-leaved trees which are processed easily and cheap, for the purpose of exploiting the market of timber in Paraguay. At the same time it is imperative to seek market of these conifers overseas with a view to making Paraguay economically strong.

In this sense, we would like to sum up the present condition of forest resources and consumption trend of the forest products in South America, and then closely discuss on the market of paper and pulp industry which can expect the great possibility of exploiting demand and increase of additional value.

1. Present condition of forest resources in South America

There is approximately ten billion hectares of primeval woods, in South America, and most of them are constituted of tropical or subtropical plants. The amount of the forest that can be cut down is estimated at 3 billion hectares, but the forest resources is gradually decreasing owing to distructive lumbering and shifting cultivation. This phenomena is also indicated by our observation in such countries like Brazil and Argentina that are surrounding Paraguay.

Brazil is a country which has a large forest area that is one of the best in the world. That is, 42% of the land is covered with forest, and most of them are placed along the Rio Amazonas, and it is very difficult to cultivate them. Even if the cultivation is possible, it requires a large sum of freight money to send them to South Brazil, the market place of lumber. On the other hand in South Brazil, various pine trees and Puroba (solid lumber for building

belonging to the Brazilian rosewood) are seen fairly-well concentrated, and are used as materials for pulp, upholstery and building, as being near from the market place. Forest resources is on the gradual decrease because of the inactive afforestation that is not catching up with the large volume of cut down.

That is, in Brazil forest of 7,000 hectares was cut down in the last 20 years, but the afforested volume is less than 25% of it. For example, the forest area rate of Sao Paulo State was 64% in 1910, but it rapidly decreased to 9% in 1960. In this way even Brazil cannot help depending on import as for pine lumber.

Also in Argentina, forest resources began to be exhausted. Argentina is very much volitious to proceed afforestation, and, as we have mentioned before, is trying to enlarge the afforestation area around Misiones Province. It is, however, becoming hard to keep up with the rapid growth of demand.

Forest area in South American Countries

(standard is 1,000 km)

Brazil	3,959	Argentina	485
Bolivia	738	Venezuela	483
Colombia	625	Chile	162
Peru	500		

2. Consumption trend of forest products in South America

According to the materials of the FAO, mean consumption per year in during 1957 to 1959 in South America is as the following table.

Average consumption per year in South America (1957-1959)

(standard is 10 thousand cubic meters)

Timbers for sawing	2,800
Timbers for plywood	150
Timbers for pulp	580
Timbers for other purposes	750
Total	4,280

It is said that the consumption will increase in 1970 as table below.

Average consumption per year in South America

(standard ..... 10 thousand cubic meters)

Timbers for sawing	4,200 + 1,400 = ...	1.5 times
Timbers for plywood	340 + 190 = ...	2.3 times
Timbers for pulp	1,200 + 620 = ...	2.1 times
Timbers for other purposes	960 + 210 = ...	1.3 times
Total	6,700 + 2,420 = ...	1.6 times

Moreover, according to the same material, production and consumption of the forest products in the advanced zone including America, European countries, countries around the Pacific Ocean, Japan and Soviet Union is by far greater than those in the underdeveloped zone including South American and Asian countries (excluding Japan). This shows that the consumption of the underdeveloped countries is extremely low. But it can easily be guessed that in these countries too, the consumption will gradually increase, seeing the latest trend of economic growth.

In South American countries, as is clear in the same material, that the total demand in 1970 will amount to 1.6 times compared with that of 10 years ago. Amongst them the demand increase for materials for pulp and for sawing is worth taking note.

In this meaning, forest products are never enough and no surplus will come about. Needle-leaved trees afforestation in Paraguay will never meet any difficulties in seeking market in the future, seeing that the forest resources are gradually decreasing in Brazil and Argentina. According to the above table, the growth rate of timbers for plywood is very high ... 2.3 times. It takes, however, a long while to manufacture timbers for plywood out of needle-leaved trees, and one good way to solve this problem is to plant eucalyptus, that will produce this timber in a short duration.

Eucalyptus can not be the winning horse in the afforestation in Paraguay as the demand for timbers for plywood is not much in quantity and eucalyptus is not strong to low temperature, although it may play the role of stop-gap, for a time being. Perhaps it would be the right way to supply timbers mainly for pulp and sometimes for sawing, by the afforestation of needle-leaved trees.

Table 7 Production and consumption of forestal products

(Mean figures from 1957 to 59)

Item	Unit	Advanced Area (A)	Advancing Area (B)	A/B
Population	1 million	923	1,956	0.5
Production				
Material timber	1 million m^3 (raw wood)	842.9	103.2	8
Sawed timber	1 million m^3 (products)	288.3	33.7	8
Paper	1 million ton	60.0	3.4	18
Consumption				
Sawed timber	1 million m^3 (products)	286.7	35.0	8
Paper	1 million ton	58.1	5.3	11
Consumption per 1,000 persons				
Sawed timber	m^3	310.0	18.0	17
Paper	ton	6.3	0.27	23

Note: Advanced Area; United States, European countries, Japan, Oceanian countries, USSR.

Advancing Area; South American countries, Asian countries (except Japan), African countries.

3. Paper and pulp industries in South America

Of all South America, the country who can domestically supply herself with paper is only Chile. Papers for newspaper, for publication, books and for other uses, and paper board are extremely lacking. There is almost no production of papers for special purpose, and most of the papers are actually counted on import.

Woodfree printing and writing papers are not produced. It is not exaggeration to say that any makeshift papers are used for any temporary use.

Each country is importing a large quantity of paper every year from Northern European countries and from Canada to meet the domestic demand.

Consumption of paper is increasing every year, which accelerates volition to better equipping paper industries.

As for various pulp, the raw materials of paper production, every country cannot but depend on import from three Northern European countries and others, in spite of the reinforcement of equipment.

The absolute quantity of needle-leaved tree pulp especially seems to be lacking.

There is a great difference in the price between domestic products and imports as the table 8.

(1965, Argentina) Table 8

Kind		Domestic products (per kg)	Import (per kg)
News-print	in reel	Cr$ 290 (Klabin Co.)	Cr$ 411 (Chile, Inforca Co.)
	in reel		422 (Sweden)
	in ream, 66 cm x 96 cm	350	480
Printing paper		366	1,234

Table 9 The Supply — Demand Relation of Paper (1962)

(Unit: 1,000 ton)

Products	Argentine			Brazil			Columbia			Chile		
	Demand	Supply	Balance	Demand	Supply	Balance	Demand	Supply	Balance	Demand	Supply	Balance
News print	175	120	-55	334	140	-194	44	-	-44	40	120	+80
Printing Paper Letter Paper	134	124	-10	235	219	-16	46	43	-3	28	26	-2
Other Papers and Paper Board	339	322	-17	531	542	-29	102	97	-5	64	61	-3
Total	648	566	-82	1,140	901	-239	192	140	-52	132	207	+75

Products	Mexico			Peru			Uruguay			Total		
	Demand	Supply	Balance	Demand	Supply	Balance	Demand	Supply	Balance	Demand	Supply	Balance
News print	135	35	-100	30	-	-30	35	-	-35	793	415	-378
Printing Paper Letter Paper	132	123	-9	14	12	-2	15	14	-1	604	561	-43
Other papers and Paper Board	468	445	-23	62	59	-3	32	30	-2	1,638	1,556	-82
Total	735	605	-132	106	71	-35	82	44	-38	3,035	2,532	-503

Table 10 Supply-demand relations of printing paper and letter paper (1965)

Country	Unit (1,000 ton)			%	
	Need	Production capacity	Outputs	Self-support rate	Extent in utilization of production capacity
Argentine	473	524	446	94.3	85.1
Brazil	806	613	761	94.4	124.1
Columbia	148	157	140	94.6	89.2
Chile	92	81	87	94.6	107.4
Mexico	600	455	569	94.8	125.1
Peru	76	84	71	93.4	84.5
Uruguay	47	47	44	93.4	93.6
Total	2,242	1,961	2,118	94.5	108.0

Table 11 List of production data of boards for construction in Lafta nations in 1964

Country	Company	Production capacity (ton/year)	Working ratio (%)	Annual outputs (ton)
Argentine	Fiplasto S.A.	25,000	40	10,000
Brazil	Duratex S.A.	48,000	30	14,500
	Fucatex S.A.	38,000	50	19,000
	Others	4,200	-	-
Columbia	Laminas del Caribes S.A.	9,900	25	2,475
Chile	Maderas Prensadas Cholguan S.A.	22,000	50	11,000
Mexico	Fibrasel S.A.	25,000	20	5,000
Uruguay	Cicsa	2,150	23	500
Total		174,250	35	62,475

Table 12 Quantity of fiber required for paper production planned for 1965

(Unit: 1000 t)

Planned Outputs	Argentine		Brasil		Colombia		Chile		Mexico		Peru		Uruguay		Total	
(Paper)	566		901		140		207		603		71		44		2532	
	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber	fiber (ton) / paper (ton)	required quantity of fiber
Chemical pulp of long-fiber	0.29	162	0.30	273	0.19	26	0.34	70	0.42	256	0.20	14	0.41	18	0.32	819
Chemical pulp of short-fiber and semichemical	0.29	165	0.24	217	0.61	86	-	-	0.23	138	0.55	39	0.23	10	0.26	655
C.P.	0.23	130	0.19	170	0.04	5	0.52	108	0.11	65	0.08	6	0.11	5	0.19	489
Waste paper	0.25	142	0.33	293	0.22	31	0.19	40	0.30	181	0.24	17	0.30	12	0.28	717
Total	1.06	599	1.06	953	1.06	148	1.05	218	1.06	640	1.07	76	1.05	46	1.06	2680

Table 13 Supply-demand relation among raw materials of various fibers

(Plan for the 1965)
(Unit: 1,000 ton)

Species	Argentine			Brazil			Columbia			Chile			Mexico			Peru			Uruguay			Total		
	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance	De-mand	Sup-ply	Bal-ance
Chemical pulp of long-fiber	162	37	-125	273	247	-26	26	0	-26	70	240	+170	256	148	-108	14	0	-14	18	0	-18	819	672	-147
Chemical pulp of short-fiber and semichemical	165	173	+8	217	249	+32	86	88	0	-	-	-	138	89	-49	39	48	+9	10	10	0	655	655	0
GP	130	114	-16	170	170	0	5	0	-5	108	108	0	65	59	-6	6	6	0	5	5	0	489	462	-27
Waste paper	142	142	0	293	293	0	31	31	0	40	40	0	181	181	0	17	17	0	13	13	0	717	717	0
Total	599	466	-133	953	959	+6	148	117	-31	218	388	+170	640	477	-163	76	71	-5	46	28	-18	2680	2506	-174

From data of LAFTA

Statistics on paper and pulp in Brazil

1. Number of paper mill 144
2. Number of pulp mill 33
3. Number of straw and other vegetable fiber mills 25

4. Outputs (Unit: Short ton) Table 14

Article	1963	1964
Paper and paper board	830,000	800,000
Chemical pulp	493,000	435,000
Mechanical pulp	146,000	222,000
Straw, Bagasse and others	135,000	105,000
Pulp total	774,000	762,000
Consumption of waste paper	100,000	109,500

5. Pulp output by kinds (Unit; short ton)

Table 15

Year	Dissolution	SP		KP		Soda	Semichemical	Mechanical pulp	Total
		Bleached	Unbleached	Bleached	Unbleached				
1956	0	54,000	28,000	13,000	10,000	4,000	10,000	100,000	219,000
1957	0	68,000	30,000	4,000	8,000	25,000	49,000	125,000	309,000
1958	0	72,000	50,000	8,000	61,000	25,000	49,000	125,000	390,000
1959	44,000	33,000	55,000	20,000	64,000	25,000	49,000	122,000	412,000
1960	46,100	58,400	37,900	90,800	58,400	27,200	57,000	123,500	499,300
1961	47,950	63,900	43,550	99,200	66,100	30,300	64,200	129,000	544,200
1962	53,000	66,000	68,000	64,000	156,000	58,000	73,000	163,000	703,000
1963	49,000	60,000	61,000	58,000	140,000	52,000	73,000	146,000	639,000

6. Export and Import (Unit; short ton)

Table 16

Item	1963	1964
Import of Paper and Paper board	140,000	87,000
Export of Paper and Paper board	500	500
Import of Pulp	58,921	60,000
Export of Pulp	4,626	15,300

Main import country of Paper and Paper board;
Finland, Sweden, Norway
Main export country of Paper and Paper board;
Argentina, South Africa, Paraguay
Main import country of Pulp;
Finland, Norway, Sweden, Chile
Main export country of Pulp;
Argentina, South Africa, Uruguay

7. Import of pulp classified by kind and country (unit; short ton)

Table 17

Year and Country	Dissolution	SP.		KP.		Total
		Bleached	Unbleached	Bleached	Unbleached	
1962	24,239	5,625	5,704	13,660	23,968	73,196
U.S.A.	6,196	0	0	480	0	6,676
Canada	2,635	0	439	815	1,348	5,237
Chile	0	0	0	3,930	3,267	7,197
Finland	3,463	2,972	4,461	3,976	13,773	28,645
Norway	5,773	992	0	0	0	6,765
Sweden	6,172	1,661	804	4,459	5,580	18,676
1963	22,036	4,909	1,801	10,990	12,389	52,125
U.S.A.	5,962	0	0	1,460	0	7,422
Finland	1,410	2,709	1,746	2,522	7,260	15,647
Norway	3,005	500	0	0	0	3,505
Sweden	7,930	1,700	55	4,944	2,865	17,494
Canada	3,729	0	0	58	497	4,284
Chile	0	0	0	2,006	1,767	3,773

Statistics on paper pulp in Argentina

1. Number of paper mill 69
2. Number of pulp mill 3
3. Number of straw and other vegetables fiber mills 4
4. Outputs (Unit: Short ton)

Table 18

Article	1963	1964
Paper and paper board	375,516	437,800
Chemical pulp	82,133	91,080
Mechanical pulp	27,085	26,400
Straw, Bagasse and others	22,385	22,000
Pulp total	131,603	139,480

5. *Pulp outputs by kinds (Unit; short ton)*

Table 19

Year	Dissolution	SP		KP Bleached	Chemical pulp total	Semi-chemical	Exploded	Mechanical pulp	Total
		Bleached	Un-bleached						
1955		0	0	6,300	6,300			19,233	25,533
1956		450	5,500	8,050	14,000			17,773	31,773
1957		7,900	5,700	7,900	21,500			15,514	37,014
1958		17,200		9,850	27,050			20,184	47,234
1959		9,900	10,400	10,400	30,700			18,408	49,108
1960		16,300	1,700	11,000	29,000			20,278	49,278
1961	110	12,530	11,130	11,020	34,790	3,100		19,030	56,920
1962	100	18,400	5,300	9,900	33,700	16,000		20,741	70,441
1963	0	18,400	5,600	10,300	34,300	17,900	31,300	27,142	110,642

6. Import (Unit: Short ton)

Year	1963	1964
Import of paper and paper board	167,553	202,075
Import of pulp	105,624	177,348

Main import country of paper and paper board; *Canada, Finland, Sweden, Chile*
Main import country of pulp; Finland, Sweden, Chile, Brazil

7. Pulp import amounts by kinds and countries (Unit; short ton)

Table 20

Country	Dissolution	SP		KP		Chemical pulp total	Others	Total
		Bleached	Unbleached	Bleached	Unbleached			
U.S.A.	4,582	1,565	900	8,320	1,007	16,374	0	16,374
Chile	0	0	0	3,724	6,711	10,435	0	10,435
Canada	252	4,599	12,549	4,990	2,658	25,048	1,647	26,695
Finland	0	1,973	2,758	328	9,943	15,002	550	15,552
Germany	0	57	0	0	0	57	0	57
Italy	871	0	0	0	0	871	0	871
Norway	0	659	217	0	0	876	0	876
Sweden	4,154	8,865	2,368	6,342	14,156	35,885	6,829	42,714
Total	9,859	17,718	18,792	23,704	34,475	104,548	9,026	113,574

Table 21 List of Special Papers in Lafta nations

Article	Argentina	Columbia	Chile	Ecuador	Peru	Uruguay
Bible paper	E	I-NP	NI-NP	I-NP	I-NP	NI-NP
Cheque paper, sensitive paper and securities paper	E	I-NP	NI-NP	I-NP	I-NP	I-NP
Book paper of 35 - 200 gr. per 1 m^2 with or without wave forms	E	E	NI-P	I-NP	E	NI-P
Printing paper	E	NI-P	NI-P	I-NP	NI-P	NI-P
Drawing paper containing 50% paper waste	E	I-NP		I-NP	I-NP	I-NP
Tracing paper	E	I-NP	I-NP	I-NP	I-NP	I-P
Magnetized computor paper	E	I-NP	I-NP	I-NP	I-NP	I-NP
15 gr./m^2 - 35 gr./m^2 air mail paper with wave form	E	I-P	NI-P	I-NP	I-P	I-P
50 gr./m^2 - 180 gr./m^2 thin, natural-color blotting kraft paper	E	I-NP	NI-P	I-NP	I-NP	NI-P
Air filter paper for engine industry	E	I-NP	NI-P	I-NP	I-NP	I-NP
Thin board paper with its surface containing great amount of minerals	E	I-NP	I-P	I-NP	I-NP	I-NP
Facing paper for rolling industry to remove uneveness	E	I-NP	NP	I-NP	I-NP	I-NP
Perforating card board for computor, etc.	AC	I-NP	AC	I-NP	I-NP	AC
100 kraft paper for sand paper, abrasive paper and emery paper	E	NI-NP	NI-P	NI-NP	NI-NP	I-P
Ground paper for water-proof paper and sand paper	E	NI-NP	I-NP	NI-NP	NI-NP	I-NP
Kraft paper and paper made of fibers of cotton rag or Manila hemp, for abrasive paper	E	I-NP	I-NP	I-NP	I-NP	I-NP
Paper to resist water, acid, gasoline, etc. (for packing)	E	I-NP	I-NP	I-NP	I-NP	I-NP
Gray fiber paper for motor coil and other electrical materials (coil insulating paper)	E	I-NP	I-NP	I-NP	I-NP	I-NP
Pressphan, a cardboard with both calendered surfaces strongly pressed for electrical insulation, book-binding and card separator	E	I-NP	I-NP	I-NP	I-NP	I-NP
Strong fiber cardboard with its specific gravity around 1, for footwear industry	E	I-NP	I-NP	I-NP	I-P	I-NP
Strong fiber cardboard with its specific gravity around 1, for bags and can body and seats	E	I-NP	I-P	I-NP	I-NP	I-P
Paper for battery insulating part	E	I-NP	NI-NP	I-NP	I-NP	I-NP
Ground paper for blue print	E	I-NP	I-NP	I-NP	I-NP	I-P
Paper for insertion between X ray film and radioactivity neutralizing material	E	I-NP	NI-NP	I-NP	I-NP	I-NP
Crystal paper (sand paper)	E	I-NP	NI-NP	I-NP	I-NP	I-NP
Vegetable parchment, immitation parchment	EE-P	I-NP	NI-NP	I-NP	I-NP	I-NP
Pattern printed paper in rolled cylindrical form or in flat board form	NI-P	NI-P	NI-P	I-NP	NI-P	E
Art paper or coated paper	E	I-NP	I-NP	I-NP	I-NP	E
Carbon papers	NI-P	NP-P	NI-P	I-NP	NI-P	E
Plastic laminated paper and board	NI-P		I-P	I-NP	I-P	E
Oiled or waxed paper and board	NI-P	NI-P	NI-P	I-NP	NI-P	E
Resin or silicon coated paper	NI-P		I-P	I-NP	I-P	E
Match paper	I-P	I-P	NI-NP	I-NP	NI-P	E
Perforating card board for computor, etc.	AC	I-NP	AC	I-NP	I-NP	AC
Toilet paper	NI-P	I-P	NI-P	I-NP	I-P	E
Asphalt roofing paper	E	I-NP	NI-NP	I-NP	I-NP	NI-NP
Fiber-reinforced, rubber-coated paper tape	E	I-NP	I-NP	I-NP	I-NP	I-NP
Polyethylene film covered kraft paper	NI-P	I-NP	I-NP	I-NP	E	I-NP

(Note) Letters used here designate

E = Country capable of exporting to the region
I = Country to import
NI = Country not to import
P = Country to produce
NP = Country not to produce
AC = Product included in supplementary agreement

Table 22 Yearly paper consumptions per capita in South American Countries

(pond)

Country	Population (unit; 1,000 persons)	1964	1963	1956
Argentine	22,200	57	48	43
Venezuela	8,650	57	49.3	9.6
Uruguay	2,500	48	42.6	47.7
Chile	8,416	33.9	31.7	24
Columbia	15,434	28	23	12
Brazil	80,000	22.2	26	19
Peru	11,800	18	17.7	7
Paraguay	2,000	5.1	4.8	3.6

From; Pulp & Paper World Review Magazine

Statistics on chemicals for paper pulp in Brazil

(1) Caustic Soda (1964)

Table 23

Domestic Productions	
Company	Quantity (K ton)
Elcloro	33,000
Nitro Quinrca	24,000
Fluminense	22,000
Carboclore	12,000
Anhembi	7,000
Matarajjo	15,000
Lgrassu	14,000
Pan Americana	25,000
Fongra	1,000
Total	130,500

Table 24

Import		
Importing country	Quantity (K ton)	Sum of Money ($)
West Germany	13,654	1,421,000
East Germany	1,314	167,000
Belgium	290	30,000
Bulgaria	82	10,000
Communist China	1,253	99,000
U.S.A.	50,321	5,181,000
France	2,909	325,000
Hungary	2,918	371,000
Italy	650	67,000
Yugoslavia	7,914	922,000
Netherland	5,208	574,000
Poland	3,958	489,000
United Kingdom	18,871	2,138,000
Rumania	5,147	530,000
Sweden	5	1,000
Czecho-Slovakia	2,103	234,000
Total	116,602	12,566,000

(2) Soda Ash

Table 25

Importing Country	Quantity (Kg)	Sum of Money ($)
West Germany	315	169
U.S.A.	18,733	8,397
France	3,000	595
United Kingdom	425,047	183,366
Rumania	1,751,250	129,000
Total	6,023,345	321,527

(3) Sodium Sulfate

Table 26

Importing Country	Quantity (ton)	Sum of Money ($)
West Germany	62	6,600
East Germany	4,040	208,000
Chile	1,191	66,000
U.S.A.	88	700
Total	5,295	281,000

(4) Sodium Sulfite

Table 27

Importing Country	Quantity (ton)	Sum of Money ($)
West Germany	134	17,000
U.S.A.	11	3,000
United Kingdom	-	-
Czecho-Slovakia	10	1,000
Total	154	21,700

(5) Bleaching powder

Table 28

Importing Country	Quantity (ton)	Sum of Money ($)
West Germany	200	25,000
Denmark	150	19,000
U.S.A.	2	2,000
Total	352	46,000

Table 29 Statistics on chemicals for paper and pulp in Argentina

Article	Domestic production (ton)	Import (ton)	Name of Import Country
Sulfur	195,826	45,021	U.S.A.
Caustic soda		15,951	West Germany, Belgium, U.S.A., France, Italy, United Kingdom
Sodium sulfide	11,199	414	West Germany, Belgium, U.S.A., Italy, Japan
Soda ash		104,068	West Germany, U.S.A., France, Italy, Netherland, United Kingdom

4. Paper and pulp industries in Paraguay

(1) Present trend of paper and pulp industries

Paraguay is importing all the paper and paper processed goods from overseas. Paraguay had imported a second-hand paper machine from Sweden a few years before and set it up after adjusting each part, but couldn't operate it well owing to the lack of technicians and to that the machine was a second-hand one. Presently, it is ceased to operate because of the internal conflict among the managers, and the machine is not kept in good conditions.

This plant is manufacturing bamboo pulp, but it seemingly has problems in collecting bamboo.

There actually is no paper pulp industries in this country.

We visited pulp plant of La Cellulosa Argentina in Puerto-Piray of Misiones Province, to see the possibility of establishing paper mill along the opposite bank of the Parana River, by inspecting the reality of paper mill there.

This plant is producing over 100 tons of sulfide pulp a day out of Parana pine and eucalyptus.

Production ratio of bleached and unbleached pulp is different according to the convenience of the every paper mill.

Ratio of the raw material is 80% of Parana pine and 20% of eucalyptus.

There are four digesters of 150 cubic meters (one digester can turn out 16 tons of pulp at one time), of which two are old-type and the other two are new-type which is made of stainless steel. One cycle takes respectively 15 hours and 12 hours.

Bleaching equipment is four step system, and capable of bleaching to 90%.

There are 28 sets of pulp machines with dry-width of 3.20 m, which produces sheet-type material containing 18-20% of water. All the products are shipped to the other plants of their own. It has a installment for generating electric power, which fuel is fire-wood.

After installing two new-type digesters and bleaching equipments, former equipment could not supply factory with water sufficiently.

It is now using the water of the Parana river, setting up accommodation for cleaning water. This plant hopes to process only long-fiber-pulp (this means needle-leaved tree pulp in Japan), but because Parana pine cannot afford sufficient raw wood, they cannot but use eucalyptus to make up for the shortage of 20% of raw wood.

They intend to switch over to pulp-of-long-fiber all-out, if only they can get sufficient raw trees, and so they are very positive to plant Parana pine and American pine.

The price of the raw wood when it is handed to the factory, in case of barked timber within the reach of one kilo meters from the plant, 1,600 pesos (equivalent to Japanese money of 2,720 yen at that time) and additional freight of 6 pesos per one kilo meters (equivalent to Japanese money of 10.2 yen).

Until then, the plant was gathering raw timbers from within the reach of 100 km, but this was not enough to meet the demand, and it expanded the gathering distance to within the reach of 200 kilo meters, and purchased its own plantation recently near the boarder of Brazil, where they plan to raise Parana pine and American pine.

They are keeping eye on Paraguay, which is placed at the opposite side of the river, as it is quite near and so very convenient to carry their products.

This company and others (which names are uncertain) are said to be planning to set up a kraft pulp mill somewhere in Misiones Province. For a time being, they seem to continue processing short-fiber-pulp using broad-leaved trees in the natural forests, and switch over to long-fiber-pulp out of Parana pine and American pine in the future.

(2) Trend of supply-demand, and paper and pulp market

As we have mentioned before, all the papers used in this country is depending on import, as there are almost no domestic production of paper worth

to take note. Printed papers and processed papers are imported mainly from adjacent Brazil and Argentina, and papers for general use are imported from Sweden and Chile.

The printing and processing equipment and the technique are falling behind, so the high quality products are imported from Argentina.

As the following statistic shows, the volume of imports in the fiscal 1964, was 4.091 tons, but the actual volume is thought to double that amounts, as there are said to be some assistance goods to special organizations, and some goods via certain routes other than the formal import.

As for the price, domestic price is by far the higher than that of the international price according to the statistics, that is, papers for business use, for general use, and for printing and writing in school education are, except for a few cases, badly qualified, and the quantity of papers runs short.

The standard of paper consumption of that country is among the lowest in South America, but it is only on the statistics and actually it seems to be on the increase year by year.

All these trends considered, we can summerize that although there is a discrepancy in price between domestic and international, the demand for paper is increasing year by year, and that the future of the domestic paper pulp market can be expected certainly bright, as great increase of demand is possible, if only the price could be cut down. It goes without saying, however, that Paraguay should seek market outside of the country as the absolute number of the population is small.

Table 30 Import of paper products by kinds in Paraguay (Unit quantity = ton, sum of money = US$1,000)

Article	1960		1963		1964		Comparison between 1960 and 1964	Remark
	Quantity	Sum of money	Quantity	Sum of money	Quantity	Sum of money		
Wrapping paper	667	140	755	162	939	200	40%(+)	
Newsprint paper	1,251	190	1,104	157	1,420	206	13%(+)	Some part of newsprint paper in role mat cut into sheet for use in writing paper
Cigarette paper	35	28	44	36	51	28	45%(+)	
Papers for office use	276	71	427	130	566	154	105%(+)	
Paper board	160	36	181	38	592	140	370%(+)	
Paper board product	178	48	472	133	34	18	500%(-)	
Paper products	174	129	224	234	191	162	10%(+)	
Printing paper	51	21	85	62	119	117	130%(+)	
Others	173	91	112	72	179	88	4%(+)	
Total	2,965	760	3,404	1,024	4,091	1,113	38%(+)	

Figures of Quantity and Sum of money are based on data of the Bureau of Economic Statistics of Central Bank of Paraguay.

Table 31 List of Import Prices of Various kinds of Papers in Paraguay

Article	Standard Size	CIF Buenos Aires price per 1 ton (A)	Standard Freight Buenos Aires to Asuncion per 1 ton (B)	Asuncion Price (C)=(A)+(B)	Amount of Levy (D)=A×30%	Tax-Included Asuncion Price (C) + (D)	Clearance Expenses E=A×80%	Remark
Newsprint (roll)	52 gr/m^2 width 81cm or 90cm	163.54$	15$	178.54$	49.06$	227.6$	130$	There may be some kinds on which lower import duty is imposed
Newsprint (sheet)	52 gr/m^2					247.6		$20 higher per ton as compared with roll
White sulphite paper (sheet)	40 g/m^2 74cm×110cm	285.4	15	302.4	85.6	388	228.3	
Wood free printing & writing paper (roll)	60 gr/m^2			323.	96	419	258	
" (sheet)	60 gr/m^2			343	103	446	274	
White board (Superior)	230 gr/m^2	293.4	15	308.4	88	396.4	234	
White board (Ordinary, roll)	160 gr/m^2	222.2	15	237.2	66	303.2	177	Cigarette case and writing paper
Straw Board	200 gr/m^2	125	15	140	37.5	177.5	$8 per 1 ton for one clearance irrespective of quantity	
Kraft wrapping paper (roll)	33 gr/m^2			250	75	325	200	

The above list shows general standard prices. Some kinds of papers require $30 1 ton in their freight from Buenos Aires to Asuncion, and there may be some on which import duty is imposed.

5. Marketability of raw wood for sawing

Useful wood in natural forest is exported raw for the purpose of obtaining foreign currency in Paraguay, and only low quality lumbers are left for domestic use. There are only curved timbers for doors and poor timbers for boxes, because of insufficient production.

We could hardly see wooden houses in Paraguay, although many were seen in Argentina and Brazil, the opposite side of the river, where needle-leaved trees are also growing. It is a little rash to conclude that this comes from the different conventions.

If cheap needle-leaved trees are on the market in Paraguay, the number of the wooden house will certainly increase in Paraguay.

As for materials for boxes, the wooden box used for carrying vegetables to market, for example, is made of broad-leaved trees. The box is, as a result, heavy and used time and again to save the insufficient materials. If there is a plenty of needle-leaved trees, that will be exclusively used for making boxes.

As for materials for the telegraph poll, when the 360 thousand kilo watt power plant now under construction will be completed, there will be a good demand expected from that plant.

It is clear from the examples of the adjacent countries that further demand for the needle-leaved trees will be found internally, and from the trend of the market of forest products in South America, it is certain that sufficient market will be found, although minor trade problem may be left unsolved.

(4) Trial plans for afforestation and forest enterprise in Yguazu district

1. Basic stand for the plans

(1) Basis of conclusion

Based on the unsatisfactory materials at hand, the forest areas of Paraguay is approximately 24 million hectares, among which the forest areas capable

of exploiting in the eastern districts is about 4 million hectares. Among them, the useful materials like Lapacho and Cedro are counted at about 20 million cubic meters, (5%) and the yearly volume of cutting is 0.7 million cubic meters. Quantity of material wood is about 0.5 million cubic meters.

As for the condition in Paraguay of forest production, yearly production volume is approximately 3 million cubic meters, among which internal consumption is 2.7 million cubic meters (of which 2.14 is for fuelwood), and the exporting volume is 0.3 million cubic meters.

Speaking of the present condition of forestry in Paraguay, the quality of forests is gradually worsening, because of the plunder-like cutting of useful wood, which is decreasing year by year, and causing soaring of the price.

This afforestation plan was drawn up therefore, first of all, aiming at the securing of raw woods for the domestic use in Paraguay, securing of the raw woods for various purposes, all of which are now depending on imports, and procuring of 12,500 hectares of forest area.

Production cost will be cut down greatly, if this procured area can be managed reasonably. According to this first plan, 1,000 hectares of the purchased land will be afforested a year.

As for the kinds of the trees to be planted, we reached the conclusion that, after a careful study in the basic natural condition of Yguazu district and in the findings in Misiones Province and in the way of utilizing the cut-down trees, Parana pine should be raised here first of all, and that Pinus elliottii is also good in the low-land along many little streams.

We selected Rotte No. F.G.H.I. as the plantation site, as it is fit for planting above-mentioned trees, and the management can go perhaps the whole hog as it is placed the nearest to the prospective city area, and moreover, it is convenient to transport the woods to pulp mills. Paraguay is depending its whole consumption of 8,000 ton pulp on the import. We are planning to produce 20 tons of pulp a day, which amounts to 6,000 tons -- 80% of the domestic

consumption--, using the timbers thinned down six years after the plantation.

We will study the further expansion plan, as there still is surplus in raw trees.

As for timber for sawing, we will set up a saw mill of 30 horsepower and at the beginning will use natural woods as construction timber, and after 7 years, will begin the production of wooden boxes to transport agricultural products, utilizing the timbers thinned down from the plantation. We will make up the further plan, taking the trend of supply and demand into consideration.

We will secure the market of the surplus wood, which destinations are domestic sawing mills and Argentina.

(2) What working organization should be

We are planning to run a business, by developing wild forest into the artificial forest of high economic power, and by using the materials coming out from there, will stabilize the Japanese settlers' economic status and will contribute to the development of the industry of Paraguay.

In this meaning, because of the necessity of inducing private capital, it cannot help taking the corporation system, and it needs to be the organization easy to accept the government assistance as it is the business which character is very much public from its establishment purport.

As for the structure of the company, we plan to set up the head office in Japan, and branch office in Asuncion in Paraguay and business office in Yguazu.

As for the staff of the company, we plan as follows;

As special technique in forestry is required, we hope to dispatch temporalily technitians from the Government and prefectures of Japan.

President	1	at the Tokyo office
Managing director	1	ditto
director	6	1 for full-time work at the branch office 5 for part-time work at the branch office
Auditor	2	part-timer

Table 32 Gist of the organization

Name of office	Place	Number of full-timer ( ) is managing staff	Gist of work
head office	Japan	(2) 5	Raising of money Planning, Management (accounting)
office	Asuncion	(1) 4	Supervising of business execution Raising of material and labor Marketing of production General affairs at the spot, Accounting
Business office	Yguazu	10	Execution of the business Administration of land Labor control, Management, General accounting
Total		(3) 19	

(annotation):

1. The number of the necessary staffs is based on the quantity of the business.

2. The number of the staffs is for the establishing period.

3. Upon the establishing of the pulp mill, 38 personnels are to be added to

the initial number (Among 38 staffs, 19 are hired on the spot).

(3) Basic way of raising money

The authorized capital of the company is 1.11 million dollars, and it will start with the capital of 0.28 million dollars. The raising of the money will be conducted in cooperation with the concerning prefectural agencies and trading companies.

We plan to loan from Overseas Economic Cooperation Fund at the annual interest of 4.5% each year as other account. As for the afforestation, we plan to redeem from 10 years after the start, and in the end refund the total loan of 4.07 million dollars in 17 years.

Speaking of the paper, pulp mills, we will refund the total loan of 1.16 million dollars in 4 years from the initiation of the business.

(4) Land utilizing plan

We will purchase 12,500 hectare forest in F.G.H.I. sectors of Yguazu Settlement, and divide it into 11 forest compartments and 121 subcompartments, utilizing forest road as the boarder line between the subcompartments.

That is, the site of the forest compartment is 1,000 hectares.

Table 33 Plan how to utilize the land

Division	Site	Remarks
Managing area	10,000 ha.	Afforestation area
Site of building and surroundings	3 ha.	Business office, pulp mill, residence of the staff, site of the storage and surroundings
Nursery	3 ha.	Managing office including storage
Site of forest road	141 ha.	Major forest road, site of branch forest road
Shelter belt	1,400 ha.	
Left-over area from forest treatment	953 ha.	Including forest for harvesting seed
Total	12,500 ha.	

2. Afforestation plan

(1) Summary of the afforestation equipments

A) Fixed facilities

a) Forest road installment

We plan to arrange forest road with 6 meters width at regular interval of 1,000 meters, to use as the major forest road, that is, the density of the forest road will be 10 m to one hectare. Total length will be 125 km, construction expenses will be 34,750 dollars, and the site of the forest road will be 7.5 hectares.

The branch forest road of 4 m width will be arranged at the regular interval of 500 meters, that is, the density will be 13 meters to one hectare. Total length is 165 km, and construction cost will be included in the afforestation cost. Site of the road is 66 hectares.

b) Nursery equipment

As for afforestation, Parana pine will be planted by direct sawing, and as for Pinus elliottii, one year seedling is to be

planted. Accordingly, 300,000 Parana pine and 750,000 Pinus elliottii will be necessary for after planting. Nursery of 3 hectares will be set up.

We plan to seed Parana pine in one hectare every year and reforest elliottii by seeding in 0.5 hectares, and use nursery every other year. Seed quantity of Parana pine is 4,000 kg, and of Pinus elliottii is 60 kg. Germination ratio is about 50%. Presuming that the number of seeds per 1 kg is 150 in case of Parana pine, and is 250,000 in case of Pinus elliottii the total of the planned seedling will be as follows.

Parana pine $150 \times 0.5 \times 4{,}000$ kg = 300,000

Pinus elliottii $25{,}000 \times 0.5 \times 60$ kg = 750,000

As for the way of seeding, Parana pine will be sown and raised in pots, while the elliottii will be sown in drills and moved to pots and raised 3-4 months after the germination.

The raising expense is 1.16 cents for one Parana pine and 0.35 cents for one Pinus elliottii, as is clear from the table 34, 35, and these cost will be included in the seedling expenses.

c) Fire-break and shelter belt

We will set up fire-break and shelter belt along the ridge. On one side of the ridge, natural forest belt of 50 m width will be left unplanted, and no tree area of 50 m width will be arranged which will be used as the fire-break and shelter belt. This is so aimed as to prevent damage by blight and noxious insects against artificial uniform forest of needle-leaved trees and to break fire. The total length is 20 km and site is 1,400 hectares.

d) Seed harvesting forest

Setting up of the forest for harvesting is necessary to prepare for the harvesting of seed, but for time being, that plan will

be included in the left-over area from forest.

B) Machinery equipment

We plan to install machines necessary to execute this plan as we have made clear in the table 36.

C) Seedling production cost

a) Parana pine raising cost

150 seeds per 1 Kg. Germination and seedling raising rate 50%. For 1 ha seeding, it is planned to raise 300,000 seedlings (=4,000 Kg × 50 seeds × 0.5)

Table 34

Process	Expense	Basic Computation
Cultivation	$ 201	Rotarvator $3.06 × 3.5 hours = $10.71 Driver $2.83 × 0.5 persons = $1.42 Laborers $1.89 × 100 persons = $189
Seed	566	$0.1416 × 4,000 Kg = $566.4
Seeding	756	$1.89 × 400 persons = $756.00 One person's seeding capacity: 1,500 seeds
Weeding	999	Laborers, 4 times a year $1.89 × 500 persons = $945.00 Simazin $9.03 × 6 Kg = $ 54.18 (1.5 Kg × 4 times = 6 Kg per 1 ha)
Sterlizing	36	Laborers $1.89 × 4 persons = $7.56 D.D.T. $0.194 × 30 Kg = $5.82 Power sprayer $22.20
Sun-shade	345	Laborers $1.89 × 50 persons = $94.50 Support $83.33 Sun-shade $166.67
Timber-measuring pond	567	Laborers $1.89 × 300 persons = $567.00 One person's capacity 1,000 timbers
Splinkling	31	Sprinkler $7.78 × 10 = $77.80 Esron pipe $0.75 × 100 = $75.0 $152.80 $152.80 ÷ 5 years = 30.56 ≅
Pot	8	Asphalt paper $2.78 Laborers $1.89 × 3 persons = $5.67
Total	3,509	

$0.0166 per 1 seedling

b) Eliot pine raising cost

25,000 seeds per 1 Kg, germination and seedling raising rate 50%.

For 1 ha seeding, it is planned to raise 750,000 seedlings

(= 60 Kg × 25,000 seeds × 0.5)

Table 35

Process	Expense	Basic Computation
Cultivation	$ 101	Rotorvator $3.06 × 1.75 hours = $5.36 Driver $2.83 × 0.25 persons = $0.71 Laborers $1.89 × 50 persons = $94.50
Seed	167	$27.78 × 60 Kg = $166.68
Seeding	95	$1.89 × 50 persons = $94.50
Transplanting	756	Laborers $1.89 × 400 persons = $756.00 one person's capacity; 2,000 plants
Pot	10	Asphalt paper $2.78 Laborers $1.89 × 4 persons = $7.56
Weeding	500	Laborers, 4 times a year, $1.89 × 250 person = $472.5 Simazin $9.03 × 3 Kg = $27.09 (1.5 Kg × 4 times ÷ 1/2 = 3 Kg per 1 ha)
Sterilization	21	DDT $0.194 × 15 Kg = $2.91 Power sprayper $11.11 Laborers $1.86 × 4 persons = $7.44
Sun-Shade	176	Laborers $1.86 × 25 persons = $47.25 Support $45.83 Sun-shade $83.33
Timber-measuring Pond	756	Laborers $1.86 × 400 persons = $756.00 one person's capacity; 2,000 timbers
Sprinkling	31	Sprinkler $7.78 × 10 = $77.80 Esron pipe $0.75 × 100 m = $75 $152.8 $152.8 ÷ 5 years = 30.56 $
Total	2,613	

$0.0035 per 1 seedling

Table 36 List of mechanical equipments

Mechanical Equipment	Number	Remark
Jeep, etc.	5	2 in Asuncion and 3 in the field
Trucks (5 tons)	5	For transportation of materials and laberers
Bulldozer (10 tons) with various attachments	5	One tractor is estimated to require 1.5 days to weed, grade and cultivate 1 ha of land and 2 days to weed. If it works 300 days in a year, 1,000 ha ÷ (300 days ÷ 4.5 days) = 15 tractors. It will require 1.5 days to weed in the second year, and therefore 5 tractors will be needed. With one day required in the third year, 3 tractors will be needed.
Tractor (4.5 tons) with various attachments	15	A total of 23 tractors will be needed 3 years after the start of the enterprise. Judging from soil condition it can be said that a 10-ton bulldozer is more efficient than a tractor, and therefore, 8 tractors of the total are replaced by 5 bulldozer in the plan.
Chain Saw	20	100 laborers of regular employ are divided into 20 groups, each of 5 members to operate a chain saw.
Weeding Machine	20	
Power Sprayer	10	For extermination of noxious insects
Five Extinguishing Pump	5	
Lumbering Equipment	1 set	Band saw mill with truck installed
Machine Shop Equipment	1 set	

(2) Management of forest area

A) Management plan

The object of this plan is as we already have made clear, successive administration of forest resources and maintaining of the preserving capacity of the soil. These factors were considered when drawing up the plan.

a) Afforestation plan

We have drawn up a plan to reforest 1-2 sub-compartments to one forest compartment a year, totaling 11-12 sub-compartments to 6 forest compartments, considering the cutting order.

b) Forest road plan

We have arranged a major forest road to pass each forest compartment, and a branch forest road to pass each sub-compartment.

c) Lumbering plan

Thinning down will be conducted from 6 years after the plantation, which will be chiefly tending thinning. From the condition of forest land, intense thinning seems to be possible.

Table 37 The rate of thinning from the viewpoint of standing tree volume

Year of thinning	6	9	12	16
Number of thinning	1,300	340	170	220
Rate of thinning	52%	30%	23%	35%

Final cutting will be conducted 20 years after the plantation, and cutting series will be set up to prevent clear cutting of big area. As for transportation of wood, we plan to set up a field in every sub-compartment, and send them to pulp factory and sawing mill by land.

Table 38 Annual Plan for Separate Afforestation (final cutting) by Sub-Compartment

Year		Number of Sub-Compartment												
Year stage of afforestation	Final cutting	Compartment	Sub-compartment	Compartment	Sub-compartment	Compartment	Sub-compartment	Compartment	Sub-compartment	Compartment	Sub-compartment	Compartment	Sub-compartment	Total number of subcompartment
1	21	1	1,2,3	2	6,7	3	4,5	4	4,5	5	1,6	6	1	12
2	22	1	6,7	2	4,5	3	9,10	4	7,8	5	2,7	6	2	11
3	23	1	4,5	2	3,8	3	7,8	4	1,2,3	5	8,9	6	3	12
4	24	1	8,9	2	9,10	3	2,3	4	12,13,14	5	10	6	4,5	12
5	25	1	10,11	2	1,2	3	1,6	4	9,10,11	5	3,4,5			12
6	26	7	3,6	8	5,10	9	5,10	10	1,6	11	1,7,8	6	10	12
7	27	7	2,5	8	4,9	9	4,9	10	2,7	11	6,11,12	6	9	12
8	28	7	1,4,7	8	2,7,8	9	3,8	10	8,9	11	9,10			12
9	29	7	10,11	8	1,6	9	2,7	10	3,4	11	4,5	6	6	11
10	30	7	8,9	8	3	9	1,6	10	5,10	11	2,3	6	7,8	11

No.6 sub-compartment of the No.4 compartment, No.12 subcompartment of the No.7 compartment and No.11,12 subcompartment of the No.10 compartment are the left-over area from forest treatment.

B) Method of afforestation

80% of the plant species consists of Parana pines and 20% Pinus elliottii. The afforestation expenses are shown in the attached statement. With respect to the afforestation, the Parana pine is planted by direct seeding and the Pinus elliottii by the use of one-year seedlings.

The number of trees grown during a three-year period is presented in Table 39.

Table 39 The number of grown tree per 1 ha.

Year	Species of wood	Seed quantity	Number of germination Number of grown tree Number of planted tree	Number of dead standing tree	Number of after planting	Number of improvement cutting	Number of remaining tree	Remark
First year	Parana	60 kg (9,000 seeds)	4,500	30% 1,350			3,150	
	Elliot.		3,000	25% 750			2,250	
Second year	Parana		3,150		300		3,450	
	Elliot.		2,250		750		3,000	
Third year	Parana		3,450			700	2,750	
	Elliot.		3,000			250	2,750	

The trimming will be conducted four times in the first year using rotary cutter, three times in the second year, twice in the third year (totalling 9 times in three years) and in the third year improvement cutting will also be conducted at the same time, when the number of standing trees will be reduced to 2,750 a hectare. For the first three years we will pay special attention to the extermination of

ants. The extermination of ants will be continued consecutively after the third year.

C) An estimation of amount of harvest and price of standing tree

Volume increment and amount of harvest will be as follows. Thinning will be conducted from after 6th year, and harvest will be as the following table. Final cutting will be executed on the 20th year.

year of final cutting	6	9	12	16	20	Total
volume of harvest	71 m^3	89 m^3	87 m^3	172 m^3	307 m^3	726 m^3

As a rule, lumbering will be done chiefly by sale of standing trees. Thinned down trees will be used mainly as the material for pulpwood and the price of standing timber per cubic meter is 2,160 yen (6 dollars), trees of final cutting will be used mainly for lumber, and price of standing tree, in case of Parana pine is 5,400 yen (15 dollars) per cubic meter and in case of Pinus ellicttii, is 3,600 yen (10 dollars) per cubic meter.

The price of standing tree was fixed, based on the materials of FAO and the transaction price in Misiones Province.

Annual quantities for consumption of raw woods of the factory under the direct control of the Government of Paraguay, is in case of quantity of raw wood for easy bleaching kraft pulp, 4.4 cubic meters × 290 ton × 12 months = 15.45 cubic meters, in case of the quantity of easy unbleached kraft pulp 4.2 cubic meters × 260 ton × 12 months = 13,000 cubic meters.

Total of needed raw trees is 28.46 cubic meters.

Expecting 30% increase of storage, and presuming that the quantity of demand is 37,000 cubic meters and that the exchange rate of standing tree is 0.7, the volume of standing trees is approximately 37,000 cubic meters. The volume of standing tree for thinning

amounts to 71,000 cubic meters from the 7th year and hit the all time high of 348,000 cubic meters on the 17th year. After all, the standing trees of from 17,000 to 294,000 cubic meters will be sold for the general use.

Diagram of working plan for projected afforestation area at Yguazu district

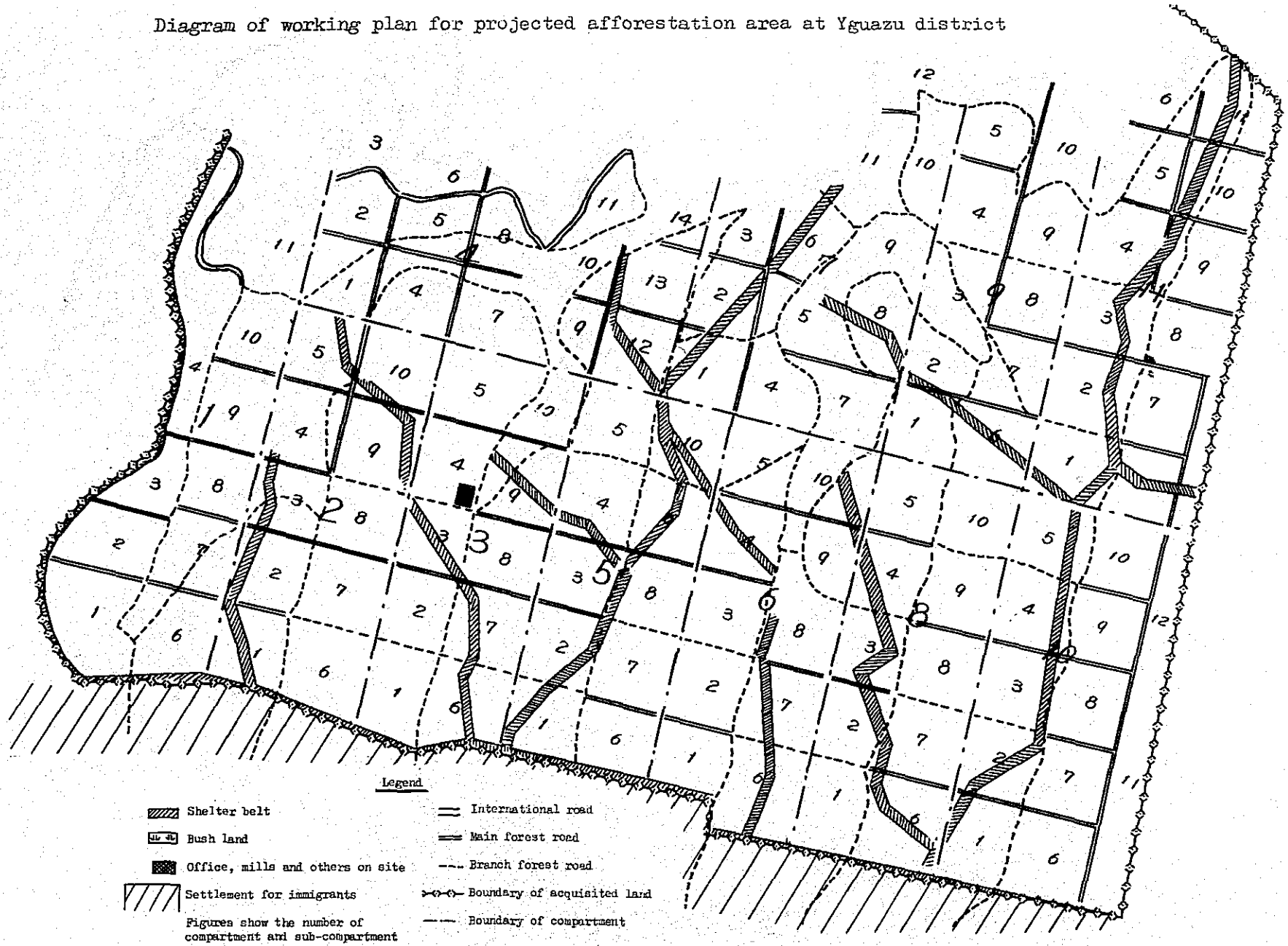
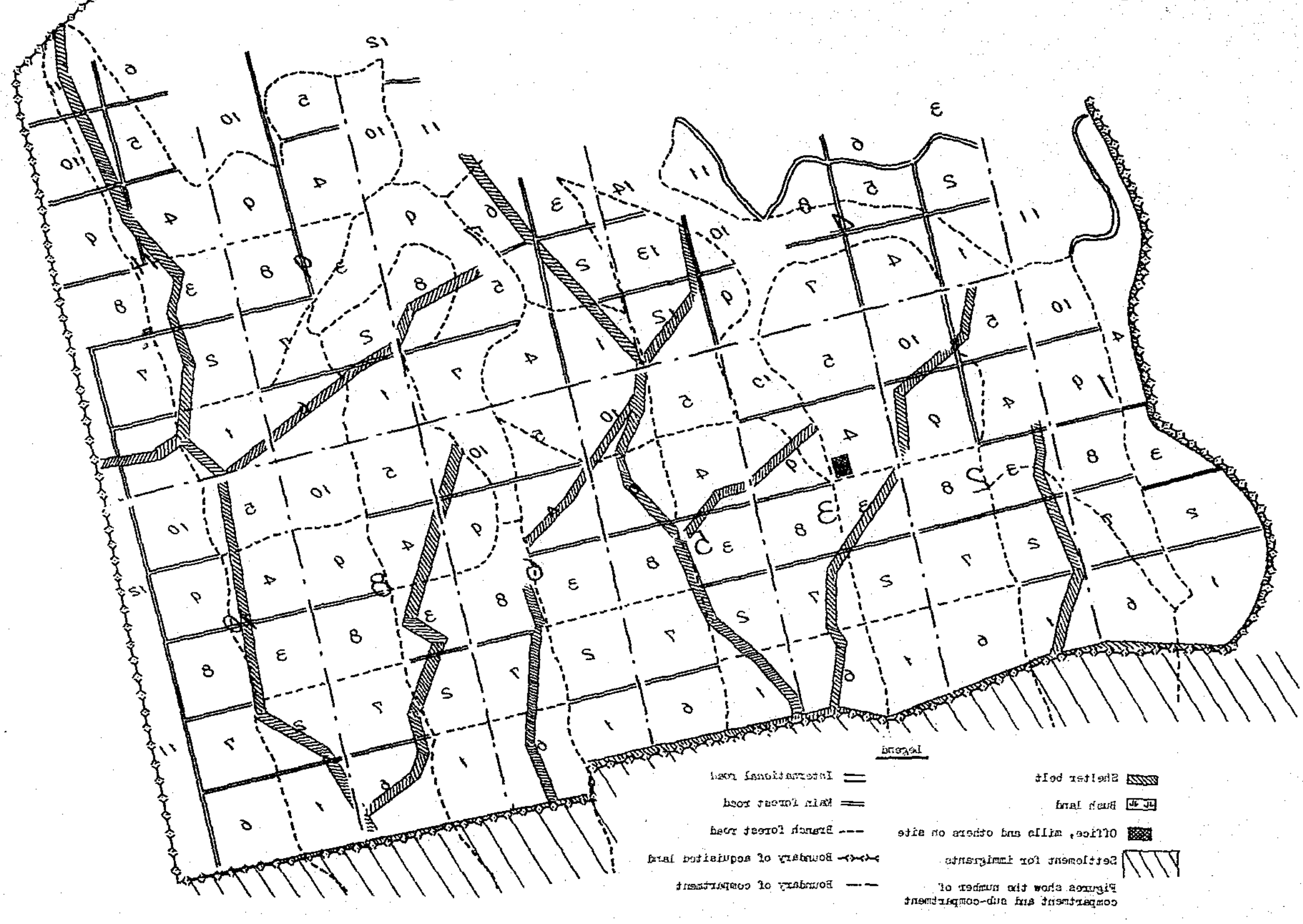
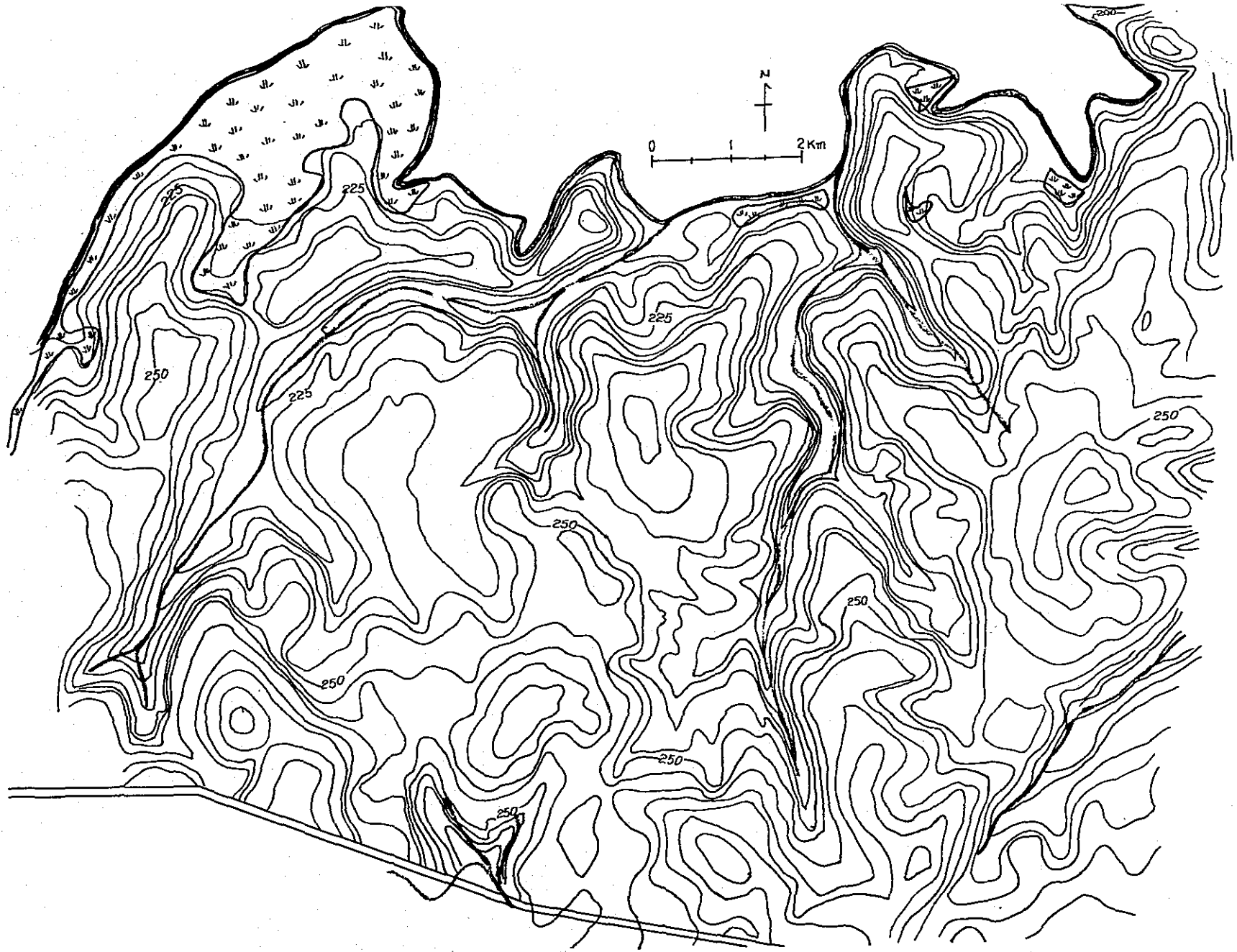


Diagram of working plan for projected afforestation area at Yguazu district




N
0
1
2Km
225
250

a)-1 Statement of Cost for Afforestation (Pakistan Pine) per 1 ha

Table 40

Classification of works			1st Year			2nd Year			3rd Year			Remarks
			Number or quantity	Unit cost	Sum of money	Number or quantity	Unit cost	Sum of money	Number or quantity	Unit cost	Sum of money	
Weeding and Grading	Weeding and Grading	Chain saw for treating of felled timber	20 hours	0.56$	11.20$		$	$		$	$	
		Laborer for treating of felled timber	4 persons	1.89	7.56							
		Rakedozer for treating of felled timber	14 hours	2.78	38.92							
		Driver for rakedozer	2 persons	2.83	5.66							
		Total			63.34							
	Cultivation	Rotorvator	3.5 hours	3.06	10.71							
		Driver for rotorvator	0.5 person	2.83	75.47							
		Total										
Seeding after planting Improvement cutting			(Seeding)			(After planting)			(Improvement cutting)			
		Purchase of seed (9,000 seed / 60kg)	60 kg	0.1416	8.50	seeding 300 plants	0.0016	3.48				
		Laborer	3 persons	1.89	5.67	9 persons	1.89	17.01	15 persons	1.89	28.35	
		Laborer for selection of seeds	1 person	1.89	1.89							
		Total			16.06			20.49			28.35	
Weeding		Rotory cutter	14 hours hours times (3.5 ×4)	3.06	42.84	10.5 hours hours times (3.5 ×3)	3.06	32.13	7 hours hours times (3.5 ×2)	3.06	21.42	
		Driver for rotary cutter	2 persons persons times (0.5 ×4)	2.83	5.66	1.5 persons person times (0.5 ×3)	2.83	4.25	1 person person times (0.5 ×2)	2.83	2.83	
		Assistant laborer for weeding	12 persons persons times (3 ×4)	1.87	22.68	9 persons persons times (3 ×3)	1.89	17.01	6 persons persons times (3 ×2)	1.89	11.34	
		Total			71.18			53.39			35.59	
Extermination of ant		Laborer	6 persons	1.89	11.34	6 persons	1.89	11.34	6 persons	1.89	11.34	
		Medicine			7.08			7.08			7.08	
		Total			18.42			18.42			18.42	
Sundry expenses			about 15%		32.76	about 10%		7.70	about 10%		6.53	
Grand total					214			100			89	

(a)-2 Statement of Cost for Afforestation (Pinus Elliottii: per 1 ha)

Table 41

Classification of works			1st Year			2nd Year			3rd Year			Remarks
			Number or quantity	Unit cost	Sum of money	Number or quantity	Unit cost	Sum of money	Number or quantity	Unit cost	Sum of money	
Weeding and Grading	Weeding and Grading	Chain saw for treating of felled timber	20 hours	0.56$	11.20$		$	$		$	$	Planting (average per 1 ha) $\frac{\$214\times800+\$236\times200}{1,000}$ =$218
		Laborer for treating of felled timber	4 persons	1.89	7.56							
		Rakedozer for treating of felled timber	14 hours	2.78	38.92							
		Driver for rakedozer	2 persons	2.83	5.66							First time tending (average per 1 ha) $\frac{\$100\times800+\$94\times200}{1,000}$ =$99
		Total			63.34							
	Cultivation	Rotorvator	3.5 hours	3.06	10.71							
		Driver for rotorvator	0.5 person	2.83	1.42							
		Total			12.13							
	Total				75.47							Second time tending (average per 1 ha) $\frac{\$89\times800+\$69\times200}{1,000}$ = $85
Seeding after planting Improvement cutting			(Seeding)			(After planting)			(Improvement cutting)			
	Seeding		3,000 plants	0.0035	10.50	750 plants	0.0035	2.63				
	Laborer		15 persons	1.89	28.35	5 persons	1.89	9.45	5 persons	1.89	9.45	
	Total				38.85			12.08			9.45	
Weeding	Rotary cutter		14 hours hours times (3.5 ×4)	3.06	42.84	10.5 hours hours times (3.5 ×3)	3.06	32.13	7 hours hours times (3.5 ×2)	3.06	21.42	
	Driver for rotary cutter		2 persons person times (0.5 ×4)	2.83	5.66	1.5 persons person times (0.5 ×3)	2.83	4.25	1 person person times (0.5 ×2)	2.83	2.83	
	Assistant for weeding		12 persons persons times (3 ×4)	1.89	22.68	9 persons persons times (3 ×3)	1.89	7.01	6 persons persons times (3 ×2)	1.89	11.34	
	Total				71.18			53.39			35.59	
Extermination of ant	Laborer		6 persons	1.89	11.34	6 persons	1.89	11.34	6 persons	1.89	11.34	
	Medicine				7.08			7.08			7.08	
	Total				18.42			18.42			18.42	
Sundry expenses			about 15%		32.19	about 10%		10.55	about 10%		5.98	
Grand total					236			94			69	

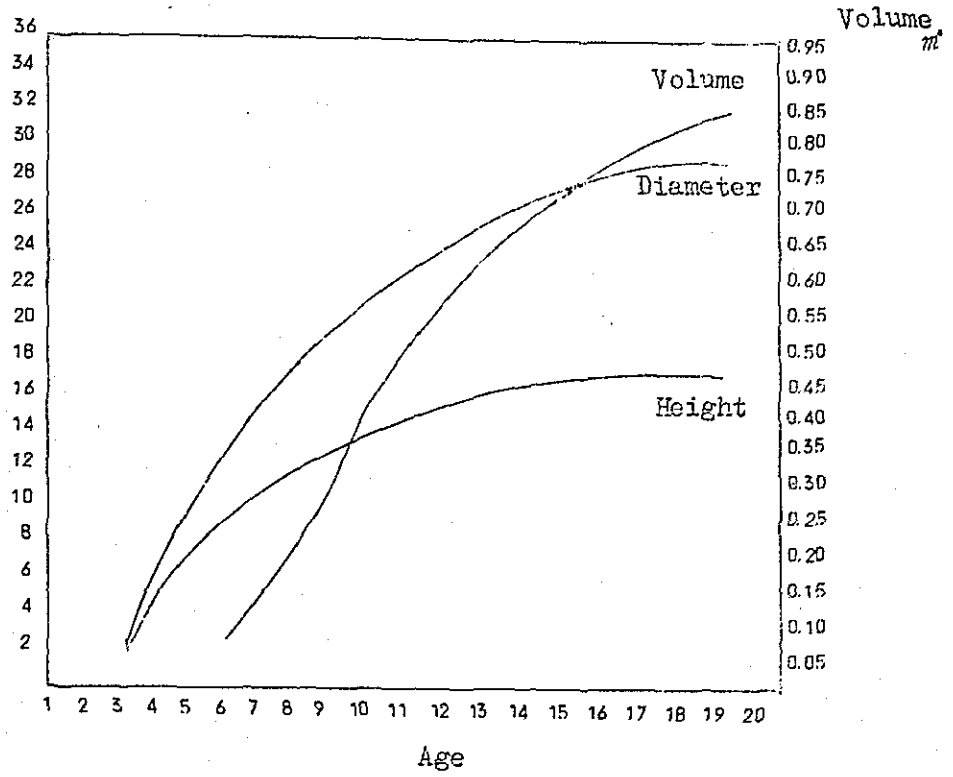
b) Yield Table per 1 ha.

Table 42

Age	Mean diameter	Mean height	Volume of single tree	Number	Reserve	Volume of thinning	Volume of final cutting	Income	Remarks
1	cm	m	m^3		m^3	m^3	m^3	$	
2									
3	2.0	2.0		2,750					
4	6.1	4.6	0.0088	2,620	23				
5	9.9	7.2	0.0330	2,500	83				
6	13.3	9.6	0.0742	1,200	89	71		426.0	
7	16.6	11.6	0.1361	1,170	159				
8	19.7	13.2	0.2159	1,140	246				
9	22.3	14.6	0.3079	800	246	89		534.0	
10	24.7	15.8	0.4008	780	313				
11	26.8	16.8	0.4974	760	376				
12	28.5	17.4	0.5791	600	347	87		522.0	
13	29.9	18.0	0.6561	590	387				
14	31.0	18.3	0.7170	580	416				
15	31.8	18.7	0.7747	570	438				
16	32.5	19.1	0.8187	350	287	172		1,032.0	
17	33.0	19.4	0.8574	345	296				
18	33.4	19.6	0.8837	340	300				
19	33.7	19.8	0.9089	335	304			Mean 4,298.0 parana pines 4,605.0	
20	34.0	20.0	0.9293	330	307		307	pinus elliottii 3,700.0	
Total						419	307	Parana pines 7,119.0 pinus elliotti 5,584.0	

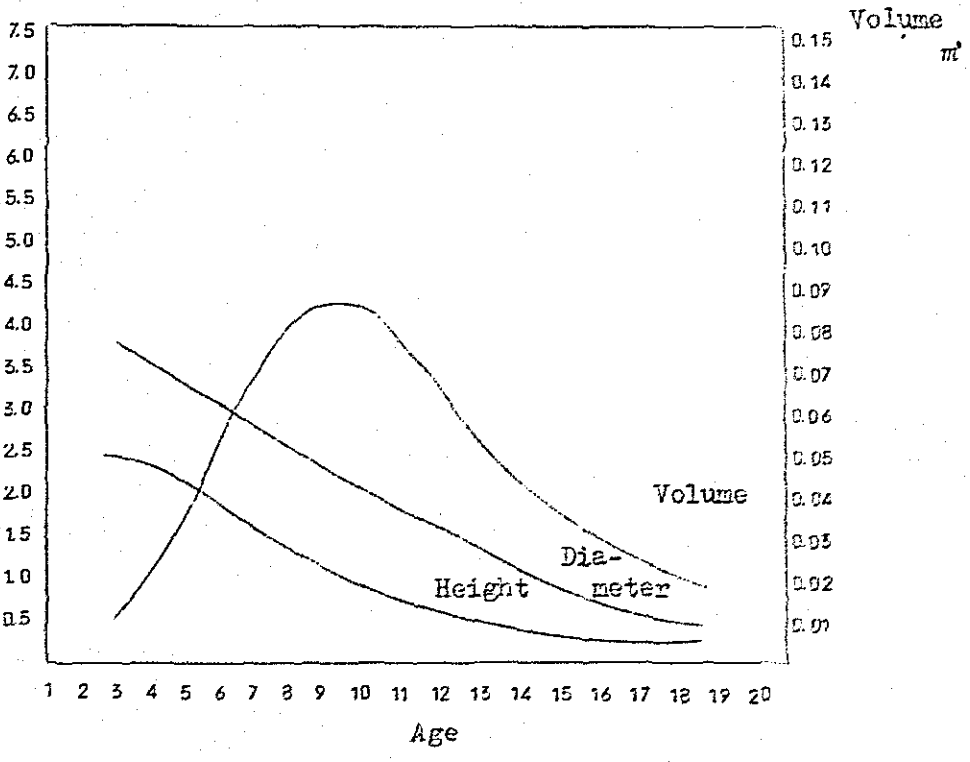
c) Diameter, height and volume of single tree

Fig. 2



d) Current annual increment of diameter, height and volume of single tree

Fig. 3



e) Statement of calculation of yield volume

Table 43

Yearly order	Cut amount			Income from cutting			Remark
	Thinning	Final cutting	Total	Thinning	Final cutting	Total	
	m^3	m^3	m^3	1,000$	1,000$	1,000$	
1							Timbers from thinning are used for pulpwood. Standing timber's price is \$6 per 1 m^3. Timbers from final cutting are used for lumbering. Price of standing timbers per 1 m^3 selling price \$14.
2							
3							
4							
5							
6							
7	71,000		71,000	426		426	
8	71,000		71,000	426		426	
9	71,000		71,000	426		426	
10	160,000		160,000	960		960	
11	160,000		160,000	960		960	
12	160,000		160,000	960		960	
13	247,000		247,000	1,482		1,482	
14	247,000		247,000	1,482		1,482	
15	247,000		247,000	1,482		1,482	
16	247,000		247,000	1,482		1,482	
17	348,000		348,000	2,080		2,080	
18	348,000		348,000	2,080		2,080	
19	348,000		348,000	2,080		2,080	
20	259,000		259,000	1,554		1,554	
21	259,000	307,000	566,000	1,554	4,298	5,852	
22	259,000	307,000	566,000	1,554	4,298	5,852	
23	172,000	307,000	479,000	1,032	4,298	5,330	
24	172,000	307,000	479,000	1,032	4,298	5,330	
25	172,000	307,000	479,000	1,032	4,298	5,330	
26	172,000	307,000	479,000	1,032	4,298	5,330	
27		307,000	307,000		4,298	4,298	
28		307,000	307,000		4,298	4,298	
29		307,000	307,000		4,298	4,298	
30		307,000	307,000		4,298	4,298	
Total	4,190,000	3,070,000	7,260,000	25,140	42,980	68,120	

Note: Yearly order is arranged from the starting year of the enterprise. Therefore planting started at the second year.

(3) Number of laborers required

The necessary number of laborers is as shown in the table 44. The total of first three years is required from the fhird to 10th year.

Table 44

Year	Number of laborers per ha.	Number of laborers per 1,000 ha.	Actual number of laborers, presuming 250 days a year
	person	person	person
1st year	38.5	38,500	154
2nd year	25.5	25,500	102
3rd year	28.0	28,000	112
Total	92.0	92,000	368

At the busiest year, a total of 368 is in need. Weeding and grading are expected to be finished before seeding and planting period, which is hoped to be conducted from the beginning of April to the end of May. In this period four persons to each hectare to seed Parana pine are needed, that is 4 × 800 ha. ÷ 60 days = 50 and five persons to each hectare to seed Pinus elliottii are needed, that is 15 × 200 ha. ÷ 60 days = 50. Altogether 104 additional workers are in need.

(4) Administrative preparation of afforestation business and plan of raising money and accounting of profits and expenses

Besides the 280,000 dollar capital, the enterprise will loan 400,000 dollars from Overseas Economic Cooperation Fund at the annual interest rate of 4.5% for running the business. Next, we would like to mention about the various preparations to be made for putting the business into operation, the calculation paper of land, building, general management, the fund-raising plan and accounting paper of profit and expenses.

Organization Preparation Plan

1. Schedule of the plan

April - May, 1967 Field Preparatory Survey

June , 1967 Review of the data

July , 1967 Meeting of the persons concerned to decide a policy

August , 1967 Raising of fund

September, 1967 Inauguration

October , 1967 Setting up of field office

(1) To draft afforestation plan

(2) To start construction work

(3) To start fixed facilities construction work

(4) To purchase all required mechanical equipment

March , 1968 Nursery enterprise and weeding and grading enterprise to be started

March, 1968 - March, 1969 Weeding and grading to be continued

March , 1969 Cultivation to be started

2. Expenses required for preparation

1) Field Preparating Survey 3 members for 2 months

Travelling expenses	$1,670 × 3 persons =	$5,010
Hotel expenses	$830 × 3 persons =	$2,490
Survey expenses	$560 × 3 persons =	$1,680
Foods		$2,780
Survey in standard places		
	$139 per one month × 10 places =	$1,390
Interpreter	$280 a month × 2 months =	$560
Total		$13,910

2) Expenses required for inauguration of field office and drafting of afforestation plan

A measuring team consisting of 12 members (including 2 in charge of

machines) is to be dispatched for 3 months.

Travelling expenses	$1,670 × 12 persons	= $20,040
Hotel expenses	$1,250 × 12 persons	= $15,000
Measuring apparatus	$280 × 5 sets	= $1,400
Survey expenses	Laborers $1.94 × 100 persons × 90 days	= $17,460
Interpreters	$280 a month × 2 persons × 3 months	= $1,680
Total		$55,580

3) General management expenses

(1) Officer's expenses

Table 45

Office	Number of officers	Expenses of the year	Basic computation
Tokyo	5	$13,280	$550 × 8 months × 2 persons = $8,800
			$280 × 8 months × 1 person = $2,240
			$140 × 8 months × 2 persons = $2,240
Asuncion	4	$26,640	$1,390 × 8 months × 1 person = $11,120
			$1,110 × 8 months × 1 person = $8,880
			$550 × 8 months × 1 person = $4,400
			$280 × 8 months × 1 person = $2,240
Locality	10	$21,120	$830 × 8 months × 1 person = $6,640
			$550 × 8 months × 1 person = $4,400
			$280 × 8 months × 1 person = $2,240
			$140 × 8 months × 7 persons = $7,840
Total	19	$61,040	

2) Required Expenses

Table 46

Expense	Amount	Basic Computation
Travelling expenses	68,820 $	Allowance for proceeding to new posts $2,200 × 7 persons × 4 persons = $62,160 Travelling expenses $2,200 × 3 persons = $6,660
Wages	2,950	Non-regular employees, $60 × 8 months × 5 persons = $2,400 Others $550
Office utensils	4,140	Measuring apparatus $280 × 10 sets = $2,800 Camera, etc. $1,340
Supplies	2,780	
Communications charges	4,170	
Foods	5,560	
Fuels for Office use	1,680	Fuels for 5 passenger cars and 5 trucks $28 a month × 6 months × 10 vehicles = $1,680
Tools for Office use	4,170	Hoe, hatchet, scoop, etc.
Rents	9,790	Office $140 a month × 6 months × 7 = $5,880 Lodge $140 a month × 5 months × 4 = $2,800 Motor car hiring $1,110
Total	104,060	

Total	$165,100
Total of Organization Preparation Fund	$234,590
Suppling Nursing Expense	$2,613
Grand Total	$237,203

First Afforestation Plan

Invested Capital

1. Land Area 12,500 ha.

   Sum of Money 12,500 ha. ÷ 30 ha. × $1,388 = $578,796

2. Building

Field Office	100 m^2 × $84 =	$8,400
Officer's Houses	40 m^2 × $42 × 10 houses =	$16,800
Laborer's Houses	1,000 m^2 × $25 =	$25,000
Garage 3 jeeps	33 m^2 × $25 =	$825
7 trucks	66 m^2 × $25 =	$1,650
Saw Mill	165 m^2 × $25 =	$4,125
Warehouse	727 m^2 × $25 =	$18,175
Lookout Shed	33 m^2 × $42 × 12 houses =	$16,632
Club House	100 m^2 × $84 =	$8,400
	Total	$100,007

3. Equipment

   1) Fixed Equipment

      Main Forest Road

      Width 6 m, 10 m per 1 ha. (at intervals of 1,000 m)

      Extension 10 m × 12,500 ha. = 125,000 m

      Construction cost 125 km × $278 = $34,750

      Nursery

      Area 3 ha. $6,060

      Equipment; Control shed 33 m^2 × $42 = $1,386

      Warehouse 66 m^2 × $25 = $1,650

      Nursing cost 3 ha. × $83 = $249

      Electric power and water expenses $2,775

      Total $40,810

2) Office Equipment

Desks, chairs, filing cabinets, telephone, wire telephone, water and electric power supply equipment, etc.		$8,330

3) Welfare Equipment

Radio sets, projector, etc.		$2,780

4) Mechanical Equipment

Jeeps, etc.	$2,780 × 5 =	$13,900
Trucks (5 ton)	$4,170 × 5 =	$20,850
Bulldozers (10 ton) with various attachments	$16,670 × 5 =	$83,350
Tractors (4.5 ton) with various attachments	$11,100 × 15 =	$166,650
Chain saws	$420 × 20 =	$8,400
Power Sprayer	$330 × 20 =	$6,600
Fire extinguishing pumps	$420 × 10 =	$4,200
Machine shop	$1,110 × 5 =	$5,550
A set of equipment		$2,800
Saw mill equipment		$8,300
Engine of 30 HP with band saw with truck and circular saw for scantling		
Total		$320,600
Grand Total		$372,520

Total of Invested Fixed Assets

Table 47

Item		Sum of Money	Payment Plan							Remark
			1st year	6th	7th	8th	9th	10th	Total	
Land		$578,796		$115,760	$115,759	$115,759	$115,759	$115,759	$578,796	
Construction		100,007	$100,007						100,007	
Equipment		372,520	372,520						372,520	
Breakdown	Fixed Equipment	40,810	40,810						40,810	
	Office Equipment	11,110	11,110						11,110	Including welfare equipment at $2,780
	Mechanical Equipment	320,600	320,600						320,600	
Total		$1,051,323	$472,527	$115,760	$115,759	$115,759	$115,759	$115,759	$1,051,323	

Note; Land price is to be left unredeemed for 5 years and repaid equally in the next five years.

Management Expenses

1. Officer's Expenses

Table 48

Office	Number of officers	Expense for the year	Basic Computation
Japan	persons 5	24,900 $	550$ × 15 months × 2 persons = 16,500$ 140$ × 15 months × 2 persons = 4,200$ 280$ × 15 months × 1 person = 4,200$
Asuncion	4	49,950	1,390$ × 15 months × 1 person = 20,850$ 280$ × 15 months × 1 person = 4,200$ 1,110$ × 15 months × 1 person = 16,650$ 550$ × 15 months × 1 person = 8,250$
Locality	10	39,600	830$ × 15 months × 1 person = 12,450$ 280$ × 15 months × 1 person = 4,200$ 550$ × 15 months × 1 person = 8,250$ 140$ × 15 months × 7 persons = 14,700$
Total	19	114,450	

2. Required Expenses

Table 49

Expense	Expense for the year	Basic Computation
Travelling Expenses	$11,000	5 return trip between Tokyo and Asuncion ($2,200 per return trip) $2,200 × 5 = $11,000
Wages	5,600	Non-regular employees in office $66 × 12 months × 5 persons = $3,600 other add - jobbers $2,000
Office utensils	5,590	Measuring apparatus $280 × 10 = $2,800 ($280 for the first year, Camera $55 × 10 = $550 Copy $280 × 3 = $840 Typewriter ribbon $1,400
Supplies	2,800	Papers, photograph expense, writing utensils, draftman's outfit etc.
Communication charges	5,040	$420 a month × 12 months = $5,040
Foods	5,500	
Fuels for Office use	4,560	Fuels for 5 passenger cars and 5 trucks $30 a month × 12 months × 10 = $3,600 Fuels for saw mill $80 a month × 12 months = $960
Tools for office use	5,000	Hoe, scoop, ax, etc.
Repairs	4,000	
Rents	8,400	Rents for office and residence in Asuncion $140 a month × 12 months × 3=$5,040 Rent for Tokyo Office $280 a month × 12 months = $3,360
Total	57,490	

Grand Total 171,940

Note: After the 6th year the following expenses will be added.

(1) expenses for survey of thinning and survey of volume	(Unit $1,000)	13.8
(2) expenses for extermination of noxious insects	(Unit $1,000)	13.8
Total		27.7

Table 50 Fixed assets whose depreciation expenses are to be included in price of standing timber (scrap rate 1/10)

Article		5 bulldozers	5 tractors	20 chainsaw	20 weeding machines	10 power sprayer	Building attached to nursery	Wasting business instruments
Acquisition cost		83 1,000$	167 1,000$	8 1,000$	7 1,000$	4 1,000$	6 1,000$	5 1,000$
Service life		5 years	4 years	2 years	2 years	5 years	12 years	
1		14.94	37.575	3.6	3.15	0.75	0.45	5
2		14.94	37.575	3.6	3.15	0.75	0.45	5
3		14.94	37.575	3.6	3.15	0.75	0.45	5
4		14.94	37.575	3.6	3.15	0.75	0.45	5
5		14.94	37.575	3.6	3.15	0.75	0.45	5
6		14.94	37.575	3.6	3.15	0.75	0.45	5
7		14.94	37.575	3.6	3.15	0.75	0.45	5
8		14.94	37.575	3.6	3.15	0.75	0.45	5
9		14.94	37.575	3.6	3.15	0.75	0.45	5
10		14.94	37.575	3.6	3.15	0.75	0.45	5
11		14.94	37.575	3.6	3.15	0.75	0.45	5
12		14.94	37.575	3.6	3.15	0.75	0.45	5
13		14.94	37.575	3.6	3.15	0.75	0.45	5
14		14.94	37.575	3.6	3.15	0.75	0.45	5
15		14.94	37.575	3.6	3.15	0.75	0.45	5
16		14.94	37.575	3.6	3.15	0.75	0.45	5
17		14.94	37.575	3.6	3.15	0.75	0.45	5
18		14.94	37.575	3.6	3.15	0.75	0.45	5
19		14.94	37.575	3.6	3.15	0.75	0.45	5
20		14.94	37.575	3.6	3.15	0.75	0.45	5
Depreciation expenses total	5 years	74.7	187.875	18.00	15.75	3.75	2.25	25
	20 years	298.8	751.5	72.00	63.00	15.00	9.00	
Asset	5 years	83	129.425	4.40	3.85	0.40	3.75	100
	20 years	83	16.7	0.8	0.7	0.40	2.40	

managing shed	1,386
warehouse	1,650
electricity, service water	2,775
total	5,811

Table 51 Fixed assets whose depreciation expenses are to be included in loss (general management expense)
(Scrap rate 1/10)

Articles		5 jeeps etc.	5 trucks	5 extinguishing pumps	A set of machine shop equipment	A set of saw mill equipment	Saw Mill	Field Office	ditto attached facilities	Laborer's house	Garage warehouse outlook shed	Fixture	Officer's house	Dining room	ditto attached facilities
Acquisition cost		1,000$ 14	1,000$ 21	1,000$ 6	1,000$ 3	1,000$ 8	1,000$ 4	1,000$ 8	1,000$ 8	1,000$ 25	1,000$ 37	1,000$ 6	1,000$ 17	1,000$ 8	1,000$ 3
Service life		years 5	years 5	years 12	years 12	years 20	years 30	years 75	years 10	years 30	years 30	years 3	years 30	years 75	years 5
1		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
2		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
3		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
4		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
5		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
6		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
7		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
8		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
9		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
10		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
11		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
12		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
13		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
14		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
15		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
16		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
17		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
18		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
19		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
20		2.52	3.78	0.45	0.225	0.36	0.12	0.096	0.72	0.75	1.11	1.8	0.51	0.096	0.54
Depreciation expense total	5 years	12.60	18.90	2.25	1.125	1.80	0.60	0.48	3.60	3.75	5.55	9.0	2.55	0.48	2.70
	20 years	50.4	75.60	9.0	4.50	7.20	2.40	1.92	14.40	15.0	22.20	36.0	10.20	1.92	10.80
Asset	5 years	14.0	2.10	3.75	1.875	6.20	3.40	7.52	4.40	21.25	31.45	2.4	14.45	7.52	0.30
	20 years	14.0	2.10	2.40	1.20	0.8	1.6	6.08	0.80	10.0	14.80	2.4	6.80	6.08	0.30

Table 52 Afforestation Enterprise Fund Plan

Year	Expenditure							Financial Programming				Surplus	Remarks
	Land	Con-struc-tion	Equip-ment	Enterprise expense	Management expense	Repayment of loans	Total	Capital	Loan	Transferred from profit	Total		
	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	
1		100	372		237		709	(277)	432		709		
2				218	172		390		390		390		
3				317	172		489		489		489		
4				402	172		574		574		574		
5				402	172		574		574		574		
6	116		35	402	172		725		725		725		
7	116			402	200		718		292	426	718		
8	116			402	200		718		292	426	718		
9	116			402	200		718		292	426	718		
10	116			402	200	242	960			960	960		
11			35	402	200	323	960			960	960		
12				184	200	576	960			960	960		
13				85	200	1,197	1,482			1,482	1,482		
14					200	1,282	1,482			1,482	1,482		
15					200	1,282	1,482			1,482	1,482		
16			35		200	1,247	1,482			1,482	1,482		
17					200	257	457			457	457	1,631	
18					200		200			200	200	1,888	
19					200		200			200	200	1,888	
20					200		200			200	200	1,354	
21			35		200		235			235	235	5,617	
22					200		200			200	200	5,652	
23					200		200			200	200	5,130	
24					200		200			200	200	5,130	
25					200		200			200	200	5,130	
26			35		200		235			235	235	5,095	
27					200		200			200	200	4,098	
28					200		200			200	200	4,098	
29					200		200			200	200	4,098	
30					200		200			200	200	4,098	
Total	580	100	547	4,020	5,897	6,406	17,550	277	4,060	13,213	17,550	54,907	

Table 53 Statement of incomes and expenses for first term afforestation enterprise plan

Year	Expenditure					Income (b)	Officer's retirement allowance reserve (c)	Profit and Loss (b)-(a+c)		Remark
	Enterprise expense	Management expense	Depreciation expense	Interest on loans	Total (a)			Loss	Profit	
	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	
1		237	13	19	269		6	275		
2	218	172	13	38	441		8	449		
3	317	172	13	62	564		8	572		
4	402	172	13	90	677		8	685		
5	402	172	13	120	707		8	715		
6	402	172	13	158	745		8	753		
7	402	200	13	178	793	426	8	375		
8	402	200	13	199	814	426	8	396		
9	402	200	13	222	837	426	8	419		
10	402	200	13	232	847	960	8		105	
11	402	200	13	231	846	960	8		106	
12	184	200	13	227	624	960	8		328	
13	85	200	13	211	509	1,482	8		965	
14		200	13	167	380	1,482	8		1,094	
15		200	13	117	330	1,482	8		1,144	
16		200	13	64	277	1,482	8		1,197	
17		200	13	11	224	2,088	8		1,856	
18		200	13		213	2,088	8		1,867	
19		200	13		213	2,088	8		1,867	
20		200	13		213	1,554	8		1,333	
21		200	13		213	1,554	8		5,631	
22		200	13		213	5,852	8		5,631	
23		200	13		213	5,852	8		5,109	
24		200	13		213	5,330	8		5,109	
25		200	13		213	5,330	8		5,109	
26		200	13		213	5,330	8		5,109	
27		200	13		213	4,298	8		4,077	
28		200	13		213	4,298	8		4,077	
29		200	13		213	4,298	8		4,077	
30		200	13		213	4,298	8		4,077	
Total	4,020	5,897	390	2,346	12,653	68,120	238	4,639	59,868	

3. Plans for constructing paper and pulp mill

(1) Basic way of forming plans for constructing paper and pulp mill

There are many basic conditions for constructing paper and pulp mills, such as, a) whether the sorts of raw wood and other raw materials are suitable, and whether the quantity of storage is rich and convenient to collect. b) Whether the chemicals for raw materials, building and repairing resources are easily obtained. c) Whether the good and large water resources can be easily obtained. d) Whether there is no waste water problem. e) Whether the electric power and fuel are easily obtained. f) Whether there is bountiful markets for the production and the transportation to the consuming place is easy. g) Whether the technicians and workers can be easily found.

What then is the condition specific in this country? According to the findings of the investigation, we deem that Encarnaçion in Yguazu district is the most suitable for the construction site.

A) Raw materials; The raw materials processed by this country are natural tree, needle-leaved tree by plantation, Bagasse and waste papers.

a) The natural wood of this country is most of all broad-leaved tree and no needle-leaved tree. Generally speaking, broad-leaved tree is changed into pulp by chemical processing. The condition in this country in processing broad-leaved tree to pulp, and in processing this pulp into paper is slightly different from the Japanese way of producing pulp and paper out of broad-leaved tree. Kinds of broad-leaved trees in this country are so many that it needs a great sum of money and labor to collect particular kind of wood for pulp production in quantity.

Some of them cannot be turned into pulp, some has difficulty during the process and some leaves problem of quality when it is processed into pulp. The technical problem in producing a paper

using only broad-leaved pulp is one of the bad factors this country possesses. Using of needle-leaved tree is very much convenient in many points in paper making. Naturally the production of pulp out of needle-leaved tree is dependent on afforestation of it. In latter case, the production cost cannot help being higher than in the former case--when the natural forest is utilized. This plan aims at the profitability of using woods of needle-leaved trees by afforestation as premise, and selected the needle-leaved tree to be used as major raw material. Along with the stabilization of the market and expansion of it, the processing of broad-leaved tree into pulp will be taken into consideration.

b) Bagasse, which is the by-product of sugar industry, can possibly be turned into pulp, but this has a problem of the location of mill site. So we would like to think of this idea later.

c) It is possible to set up paper-mill using waste paper as the raw material, but it has a problem of collecting and the quality of paper to be produced so we would like to leave this idea to later thinking. When the problem of collecting and quality are solved, naturally the using of waste-paper as raw material will be taken up.

B) Chemicals and building materials

The chemicals produced for pulp and paper manufacturing in this country is only lime. All the other items are dependent on import. Construction materials and building, repairing materials when business is in operation are the same.

C) Water supply for the plant

This country is rich in water supply because of many rivers. There is no problem in securing water. But some of the rivers run turbid and need purifier. But it leaves no problem technically.

D) Problem of waste-water

Because of the bountiful water, the contamination of rivers by waste-water discharged from the mills has no outward problem, and almost no bad effects on the land along the lower reaches of the rivers. Adverse effects on fish and agriculture doesn't have to be taken into consideration.

E) Electric power and fuel

In some parts of this country, fuel wood is still used in generating electric power by fire. Establishment of electric power plant by fire is not out of consideration, but there seems to be no need for it. Electric power plant by water is under construction at the river Akarai, 300 km east of Asunçion in Yguazu district, which is slated to finish its first stage construction (45,000 kW) in three years hence. The problem of electric power is expectedly uniformally solved upon the completion of this power plant. We can deal with the electric power problem by buying it from this power plant. The fuel needed in operating factory boiler is easily attained by utilizing fire-wood from the natural forest, which is extremely cheap compared with other fuels. There is no fuel problem at all.

F) Market of the products and problem of carriage

As we have studied before, there is only little domestic demand. Expansion of import should be worked out somehow, by having closer contact with countries of LAFTA.

As for the carriage, for the time being, there is no other way but to use truck in the domestic transit, and truck or ship in the transit outside of the country.

G) Problem of the technicians

Actually, there is no paper, pulp technicians in this country. Accordingly, for the first two years after the setting up of plant, invitation of overseas technicians for the purpose of teaching the technique and efforts to heighten the technical standard are inevitable. With the heightening of the technique, the labor will follow the suit and perhaps leaves no problem.

Based on these considerations, we would like to propose the following tentative plan for constructing pulp and paper manufacturing plant.

For the purpose of promoting paper, pulp industry in this country, we expect to set up a industrial laboratory including forestry experiment, for the general study and investigation of paper pulp. If possible, installment of experimental paper machine and dispatch of Japanese technicians to train the technicians there are instrumental. Special consideration is expected on the part of this country in transportation, electric power, tax, market and all other fields.

(2) Tentative plan of construction

A) Object and gist of construction

This plan, along with the execution of afforestation, forms a link in the chain of forest industry plan, and aims at the construction of paper, pulp mill there.

The site of the plant must fill various basic qualifications, but at the same time, we should take the relations with the national plan of Paraguay into consideration. We selected Yguazu as the best suitable site.

The scale of the plant is as follows.

a) market -- sales route

According with the development of LAFTA countries, the export to this region is expected in the future. But for the time being, the production aimed at the domestic market looks sound and safe, as there are many international difficulties.

With the economic development of the country, the domestic demand will increase year by year. Taking the sorts of paper into consideration, we think it proper to fix the production volume of paper on the first stage plan, to from 500 to 550 tons a month approximately.

In this case, the equipment to be set up must be the one easy to attach additional part, in case when the export becomes possible in the future.

b) In the first stage plan, pine trees which will be thinned down from the forest for the first 6-7 years after afforestation is to be used as the major raw materials, considering the quantity of the raw materials, and in the second stage plan, the pines thinned down thence is to be used.

c) In establishing a large plant, a lot of excellent technicians are necessary in its construction and in supervising the operation. It also may be difficult to secure labor. So in the beginning, although it may be a little expensive in ratio, we will execute the first plan in a middle-sized plant, and when the education and training of the employees have finished to some degree, we can step on to the next stage -- the execution of the second plan.

B) Mill equipment

Table 54

a) Construction

Item		Area	Q'ty	Unit Price	Sum of money	Specifications
Plant Construction	Chipping Room	160 10m²	1 house	42 $	6,720 $	18m × 9m A steel-frame flat house
	Digesting Room	480	1	42	20,160	11m × 11m 4 story reinforced concrete and steel-frame building
	Screening Room	400	1	42	16,800	11m × 18m 2 story "
	Bleaching Room	130	1	42	5,460	7m × 9m " "
	Paper Machine Room	350	1	42	14,700	13m × 27m A steel-frame flat house
	Processing Room	230	1	42	9,660	13m × 18m "
	Boiler Room	60	1	42	2,520	7m × 9m "
	Electric Power Room	60	1	42	2,520	9m × 7m "
	Repairing Room	200	1	42	8,400	9m × 22m "
	Warehouse for products and material	230	1	42	9,660	13m × 18m "
	Total	2,300	10		96,600	
Company house for employee	For plant superintendent and division chief	50	4	50	10,000	
	For subdivision chief	40	15	42	25,200	
	For officers	26	19	25	12,350	
	For employees	16	41	25	16,400	
	Total	132	79		63,950	
Grand Total			89		160,550	

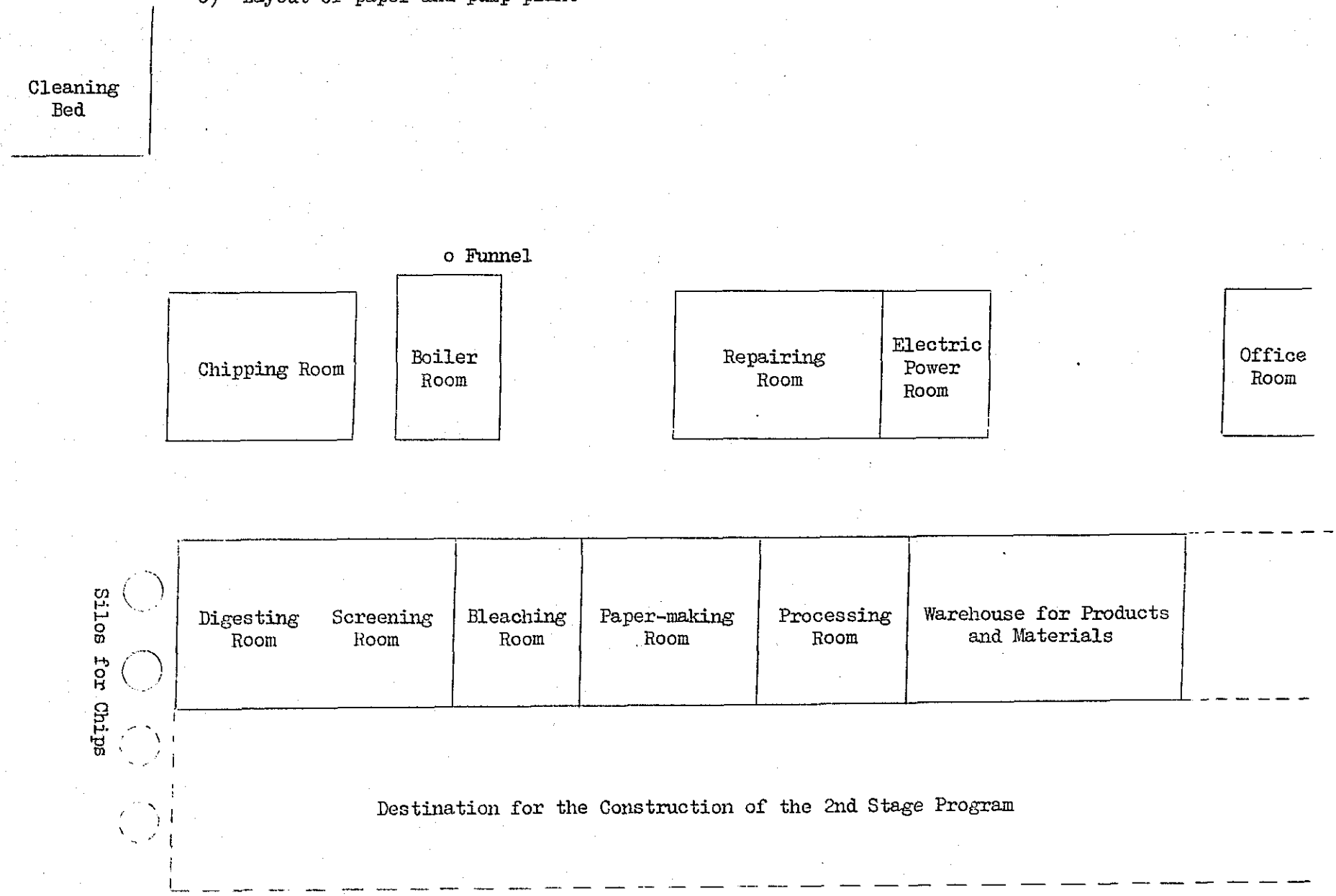
Note: The disposition of the plant construction is shown in the annexed paper.

b) Machines and Constructions

Table 55

Room	Name of Machines	Specifications	Q'ty	Sum of Money	Total
Chipping Room	Chipper	Disk diameter 1.5 m 5 - 6 knives	1 Set	$1,000 19.4	$1,000
	Chipper Motor	200 HP.	1 "	3.9	
	Chip Screen	including motor and accessories	1 "	6.1	
	Chip silo	Chip volume 72.1 m^3	1 "	16.7	
	Other machines	conveyor, elevator, motors, etc.	1 "	13.9	60.0
Digesting Room	Digester	volume 60 m^3, including accessories	1 "	55.6	
	Blow Tank	volume 120 m^3	1 "	27.8	
	Other machines	Piping, motors	1 "	13.8	97.2
Screening Room	Filter	made of stainless steel, including accessories and motor	3 "	50.0	
	Refiner	including motor	1 "	5.6	
	Screen	including motor	2 "	13.9	
	Other machines	Piping, concrete work, water circulating device, etc.	1 "	22.2	91.2
Bleaching Room & Paper Material Adjusting Room	Poacher	five 2,000-pound bleaching poaches (above 70° in whiteness)	5 "	27.7	
	Attached Beater	three 1,000-pound beaters	3 "	16.7	44.4
Paper Machine Room	Yankee type Fourdrinier machine	78 inches in width, including motor and various meters	2 "	444.4	444.4
Boiler Room	Boiler	Horizontal multi-pipe boiler, including Lancashire (fuel-firewood) chimney	1 "	55.6	55.6
Electric Power Room	Power receiving equipment	Outdoor transformer, power receiving and distribution equipment, wiring, etc.	1 "	41.7	41.7
Repair Room	Machine Tools	lathe, etc.	1 "	41.7	41.7
Water treatment Equipment	Rapid Filtering Device	6 inches in diameter, 3,000 m^3/day x 6, total treatment 1,800 t/day	6 "	83.3	83.3
Total					960.0

c) Layout of paper and pulp plant



(3) Production plan

The production of pulp; The kind of the pulp to be produced will be bleached or unbleached, and made by easy kraft processing, which is somewhere midway between kraft processing and soda processing. We will also install equipment to recover chemical water.

In the plan, we will be equipped a pulp digesting boiler of about 60 cubic meters. In case of bleached pulp, one digester requires 6-8 hours. A 60 cubic meters digesting boiler can produce 6 tons pulp at one time, so 18 tons will be turned out by three cycles. Presuming that it is in operation 16 days a month, 290 tons of bleached pulp will be produced a month.

In case of unbleached pulp, one cycle takes 6 hours, and four cycles are possible a day, which means that 24 tons of unbleached pulp will be turned out a day. Accordingly, supposing that it is operated 11 days a month, 260 tons of unbleached pulp will be the output of a month.

Plan of paper production; We are planning to manufacture M.G. white sulphite paper from easy kraft pulp, and M.G. kraft wrapping paper from easy unbleached kraft pulp. For the sake of conforming manufacturing process well to the pulp production, we will set up two sets of paper making machines able to turn out printing paper, papers for office use, paper for books, wrapping paper, cosmetic paper, and other tissue paper. One paper machine can turn out 10 tons a day. According to the plan, 16.2 tons of M.G. sulphite papers will be manufactured out of 18 tons of bleached pulp a day, that is, 260 tons a month, supposing the machines are in operation 16 days a month. 21.6 tons of M.G. kraft wrapping paper will be produce out of 24 tons of unbleached pulp a day, which will amount to 234 tons a month, supposing the machines are in operation 11 days. We will count on the import of chemicals including caustic soda, as there is no production of them in this country.

(4) Trial Balance

A) Production cost

a) Easy bleached pulp production cost (per ton)

plant production capacity at 290 tons a month (18 tons a day for 16 working days)

Table 56

Article	Quantity	Unit Price	Sum of money	Remark
Raw Wood	4.44 m^3	$ 10.30	$ 45.73	Price of standing timber × Net yield of material wood × hauling $6/$m^3$ ÷ 0.7 × 1.2
Caustic Soda	430 Kg	0.1	43.00	
Sodium Sulphide	70 Kg	0.138	9.73	
Bleach Liquor	3,100 litre	0.00694	21.51	Quantity required for bleaching 1 ton of pulp
Electric Power	328.8 KWH	0.027	9.14	Daily power consumption 5,918/KWH ÷ 18 t = 322.8/KWH
Fuels			2.78	Firewood used
Supplies			0.96	$277.7 (a month) ÷ 290 t (monthly production capacity)
Repairs			2.39	$694.4 (a month)
Labor Cost			8.93	Monthly labor cost (Refer to the separate list of personnel expenses) $2,590.27 ÷ 290 t
Welfare Expenses			2.29	Monthly labor cost × laborer's accident insurance premium $2,590.27 × 0.2 ÷ 290 t
General Management Expenses			2.88	Non-regular employees and office expenses monthly $833.3 ÷ 290 t
Fire Insurance			0.34	$0.018 per $2.7 of insurance premium monthly $99.527 ÷ 290 t
Total			149.68	

b) M.G. white sulfite paper production cost (per 1 ton)

Plant production capacity at 260 tons a day (163 tons a day for 16 working days) of M.G. white sulfite paper, depending on easy kraft pulp output.

Table 57

Article		Quantity	Unit Price	Sum of Money	Remark
Bleached Pulp		1.111 t	$ 149.68	$ 166.29	Yield per 1 ton of pulp 0.9
Chemicals	Sizing Agent			4.17	Synthetic sizing agent used
	Aluminium Sulphate			1.94	
	Dyes. etc.			2.78	
	Others			1.39	De-foaming agent etc.
Aux. Materials	Felt			4.44	
	Wire Cloth			1.41	
	Packing Material			2.78	Wrapping expenses (our company's products) etc.
	Others			1.39	As to planks, our company's products are used
Electric Power		657/KWH	0.027	18.25	Daily power consumption, ÷ Daily production capacity (10,632 KWH ÷ 162 t)
Fuels				4.17	Firewood used
Repairs				1.60	A month $4,166.67 ÷ 260 t
Labor Cost				8.31	Monthly labor cost $2,159.72 ÷ 260 t
Welfare Expenses				1.66	Monthly labor cost × Laborer's accident insurance premium $2,159.72 × 0.2 ÷ 260 t
General Management Expense				16.03	Carriage and office expenses monthly $4,166.6 ÷ 260 t
Fire Insurance				0.48	$0.013 per $278 of insurance premium monthly $125 ÷ 260 t
Total				237.09	

c) Easy unbleached kraft pulp production cost (per 1 ton)

Plant production capacity at 260 tons a month (24 tons a day for 11 working days)

Table 58

Article	Quantity	Unit Price	Sum of Money	Remark
Raw Wood	4.17 m^3	$ 10.30	$ 42.95	Price of standing timber × net yield of material wood × hauling $6/$m^3$ ÷ 0.7 × 1.2
Caustic Soda	400 Kg	0.1	40.0	Raw wood weight
Sodium Sulphide	68 Kg	0.138	9.34	
Electric Power	246.6 KWH	0.028	6.90	Daily power consumption 5,918 KWH ÷ 24 t = 246.6 KWH
Fuels			2.78	Firewood used
Supplies			1.07	$277.78 (a month) ÷ 260 t (monthly output)
Repairs			2.14	$2,590.28 (monthly labor cost) ÷ 260 t
Labor Cost			9.96	$2,590.28 (monthly labor cost) × 0.2 (laborer's accident insurance premium) ÷ 260 t
Welfare Expenses			2.56	$833.30 (monthly non regular employees and office expenses) ÷ 260 t
General Management Expenses			3.21	$0.0138 per $2.78 of insurance premium $99.53 (a month) ÷ 260 t
Fire Insurance			0.38	
Total			121.29	

d) Unbleached kraft wrapping paper production cost (per 1 ton)

Plant production capacity at 234 tons a month (216 tons a day for 11 working day) of unbleached kraft wrapping paper (M.G. kraft, ribbed kraft, etc.), depended on easy unbleached kraft pulp output.

Table 59

Article		Quantity	Unit Price	Sum of Money	Remark
Unbleached Pulp		1.111 t	$ 121.26	$ 134.75	Yield per 1 ton of pulp: 0.9
Chemicals	Sizing Agent			4.17	Synthetic sizing agent used
	Aluminium Sulphate			1.94	
	Others			0.83	De-foaming agent, etc.
Aux. Material	Felt			4.44	
	Wire Cloth			1.39	
	Packing Material			2.78	Wrapping expenses (our company's products), etc. As to planks, our company's products are used.
	Others			1.39	
Electric Power		492 KWH	0.028	13.78	Daily power consumption ÷ Daily production capacity 10,632 KWH ÷ 216 t
Fuels				4.17	Firewood used
Repairs				1.78	A month $4,166.67 ÷ 234 t
Labor Cost				9.23	Monthly labor cost $2,160.40 ÷ 234 t
Welfare Expenses				1.85	$2,160.40 (monthly labor cost) × 0.2 (laborer's accident insurance) ÷ 234 t
General Management Expenses				17.81	Carriage and office expenses monthly $4,166.67 ÷ 234 t
Fire Insurance				0.53	$0.013 per $278 of insurance premium monthly $125 ÷ 234 t
Total				200.84	

B) Calculation of annual rough profit

Enterprise expense (Production cost)

White sulphite paper cost $237 × 260 ton × 12 months=$739,440

Unbleached kraft wrapping paper cost

$201 × 234 ton × 12 months=$564,408

Officer's bonuses $12,320 × about 3.2 months= $39,000

Total $1,342,848

Sales amount

White sulphite paper $347 × 260 ton × 12 months= $1,082,640

Unbleached kraft wrapping paper

$285 × 234 ton × 12 months=$800,280

Total $1,882,920

Rough profit after deduction $540,072

C) General management expense

a) Officer's expense (For the first year only)

Annual expenses $26,400

Plant superintendent monthly amount

$1,100 × 12 months × 1 person = $13,200

Division chief monthly amount

$550 × 12 months × 2 persons = $13,200

b) Required expense

Travelling expense Allowance for proceeding to new posts

for the first year $6,600 $2,200 × 3 persons = $6,600

Travelling expense Allowance for proceeding to new posts

for the second year $35,200 $2,200 × 16 persons = $35,200

Travelling expense Allowance for proceeding to new posts

for the third year $2,200 × 5 persons = $11,000

and after $11,000

C) Working fund $105,300

To have loan in the first year to buy chemicals, etc.

D) Composition list of plant personnel

Table 60

Item	by shift	Numbers of persons to consist of a shift	Total	Plant superintendent ($100/month)	Division chief ($550/month)	Subdivision chief ($280/month)	Subdivision ($110/month)	Laborer ($80/month)	Total
Office	1	6	6	1	3		1	1 (woman)	2,940$
Person in charge of wood treatment	1	10	10			1	1	8	1,030
Person in charge of digesting	3	3	9			3	3	3	1,410
Person in charge of adjustment of screen bleach and paper material	3	3	9			3	3	3	1,410
Person in charge of paper machine	3	6	18			3	3	12	2,130
Person in charge of processing	1	10	10				1	9(5 women)	830
Person in charge of boiler	3	1	3			1	2		500
Person in charge of electric power	3	1	3			1	2		500
Person in charge of repairing	1	8	8			2	2	4	1,100
Person in charge of checking	1	3	3			1	1	1 (woman)	470
Total			79	1	3	15	19	41	12,320

Plant superintendent, division chief and sub-division chief are to be dispatched from Japan.

E) Fixed facilities depreciation expense

Table 61

Description of equipment	Acquisition value	Service life	Scrap value 1/10	Annual depreciation expense	Remark
Plant construction	96,600$	30years	9,660$	2,898$	
Company house for workers	63,950	20	6,395	2,878	
Mechanical equipment	960,000		96,000	66,034	
Pulp making equipment	404,450	12	40,445	30,327	
Paper making equipment	555,550	14	55,555	35,707	
			112,055	71,810	

F) Fund programming of pulp and paper mill

Table 62

Year	Expenditure							Financial Programming				Surplus
	Land	Construction	Plant equipment	Enterprise equipment	Management equipment	Repayment of loans	Total	Capital	Loan	Transferred from profits	Total	
	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$
1								(277)				
2												
3												
4												
5												
6		161	960		33		1,154		1,154		1,154	
7				1,448	35	400	1,883			1,883	1,883	
8				1,343	11	529	1,883			1,883	1,883	
9				1,343	11	327	1,681			1,681	1,681	202
10				1,343	11		1,354			1,354	1,354	529
11				1,343	11		1,354			1,354	1,354	529
12				1,343	11		1,354			1,354	1,354	529
13				1,343	11		1,354			1,354	1,354	529
14				1,343	11		1,354			1,354	1,354	529
15				1,343	11		1,354			1,354	1,354	529
16				1,343	11		1,354			1,354	1,354	529
17				1,343	11		1,354			1,354	1,354	529
18				1,343	11		1,354			1,354	1,354	529
19				1,343	11		1,354			1,354	1,354	529
20				1,343	11		1,354			1,354	1,354	529
21				1,343	11		1,354			1,354	1,354	529
22				1,343	11		1,354			1,354	1,354	529
23				1,343	11		1,354			1,354	1,354	529
24				1,343	11		1,354			1,354	1,354	529
25				1,343	11		1,354			1,354	1,354	529
26				1,343	11		1,354			1,354	1,354	529
27				1,343	11		1,354			1,354	1,354	529
28				1,343	11		1,354			1,354	1,354	529
29				1,343	11		1,354			1,354	1,354	529
30				1,343	11		1,354			1,354	1,354	529
Total		161	960	32,337	321	1,256	35,035		1,154	33,881	35,035	11,311

G) First statement of income and expense on production of paper pulp and paper Table 63

Year	Expenditure					Income	Officer's retirement allowance reserve	Profit and Loss	
	Enterprise expense	Management expense	Depreciation expense	Interest on loans	Total			Loss	Profit
1	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$
2									
3									
4									
5									
6		33			33		3	36	299
7	1,448	35	72	17	1,572	1,883	12		400
8	1,343	11	72	45	1,471	1,883	12		405
9	1,343	11	72	40	1,466	1,883	12		445
10	1,343	11	72		1,426	1,883	12		445
11	1,343	11	72		1,426	1,883	12		445
12	1,343	11	72		1,426	1,883	12		445
13	1,343	11	72		1,426	1,883	12		445
14	1,343	11	72		1,426	1,883	12		445
15	1,343	11	72		1,426	1,883	12		445
16	1,343	11	72		1,426	1,883	12		445
17	1,343	11	72		1,426	1,883	12		445
18	1,343	11	72		1,426	1,883	12		445
19	1,343	11	72		1,426	1,883	12		445
20	1,343	11	72		1,426	1,883	12		445
21	1,343	11	72		1,426	1,883	12		445
22	1,343	11	72		1,426	1,883	12		445
23	1,343	11	72		1,426	1,883	12		445
24	1,343	11	72		1,426	1,883	12		445
25	1,343	11	72		1,426	1,883	12		445
26	1,343	11	72		1,426	1,883	12		445
27	1,343	11	72		1,426	1,883	12		445
28	1,343	11	72		1,426	1,883	12		445
29	1,343	11	72		1,426	1,883	12		445
30	1,343	11	72		1,426	1,883	12		445
Total	32,337	231	1,728	102	34,488	45,192	291	36	10,449

4. General Financial Program and Statement of Total Income and Expenditure involved in the First Stage Plan

The financial program covering all the fields of afforestation and paper and pulp production and the statement of income and expenditure involved in these activities and presented in Table 64 and 65. In this financial program, profit from the paper and pulp department which will go into operation in the seventh year will be appropriate to the repayment of loans to the afforestation department. Consequently this overall financial program is somewhat different from the financial plan and proposed income and expenditure of each department.

General statement of income and expense for first term plan

Table 64

Year	Expenditure					Income	Officer's retirement allowance reserve	Profit and loss		Remark
	Enterprise expense	Management expense	Depreciation expense	Interest on loans	Total			loss	profit	
	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	
1		237	13	19	269		6	275		
2	218	172	13	38	441		8	449		
3	317	172	13	62	564		8	572		
4	402	172	13	90	677		8	685		
5	402	172	13	120	707		8	715		
6	402	205	13	210	830		11	841		
7	1,850	235	85	219	2,389	2,309	20	100		
8	1,745	211	85	224	2,265	2,309	20		24	
9	1,745	211	85	224	2,265	2,309	20		24	
10	1,745	211	85	223	2,264	2,843	20		559	
11	1,745	211	85	199	2,240	2,843	20		583	
12	1,527	211	85	169	1,992	2,843	20		831	
13	1,428	211	85	127	1,856	3,365	20		1,494	
14	1,343	211	85	55	1,694	3,365	20		1,651	
15	1,343	211	85		1,639	3,365	20		1,706	
16	1,343	211	85		1,639	3,365	20		1,706	
17	1,343	211	85		1,639	3,971	20		2,312	
18	1,343	211	85		1,639	3,971	20		2,312	
19	1,343	211	85		1,639	3,971	20		2,312	
20	1,343	211	85		1,639	3,437	20		1,778	
21	1,343	211	85		1,639	7,735	20		6,076	
22	1,343	211	85		1,639	7,735	20		6,076	
23	1,343	211	85		1,639	7,213	20		5,554	
24	1,343	211	85		1,639	7,213	20		5,554	
25	1,343	211	85		1,639	7,213	20		5,554	
26	1,343	211	85		1,639	7,213	20		5,554	
27	1,343	211	85		1,639	6,181	20		4,522	
28	1,343	211	85		1,639	6,181	20		4,522	
29	1,343	211	85		1,639	6,181	20		4,522	
30	1,343	211	85		1,639	6,181	20		4,522	
Total	36,357	6,218	2,118	1,979	46,672	113,312	529	3,637	69,748	Profit after deduction 1,000$ 66,111

General financial programming

Table 65

Year	Expenditure							Financial programming				Surplus	Remark
	Land	Construction	Equipment	Enterprise expense	Management expense	Repayment of loans	Total	Capital	Loan	Transferred from profits	Total		
	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	1,000$	
1		100	372		237		709	277	432		709		
2				218	172		390		390		390		
3				317	172		489		489		489		
4				402	172		574		574		574		
5				402	172		574		574		574		
6	116	161	995	402	205		1,879		1,879		1,879		
7	116			1,850	235	108	2,309			2,309	2,309		
8	116			1,745	211	237	2,309			2,309	2,309		
9	116			1,745	211	237	2,309			2,309	2,309		
10	116			1,745	211	771	2,843			2,843	2,843		
11			35	1,745	211	852	2,843			2,843	2,843		
12				1,527	211	1,105	2,843			2,843	2,843		
13				1,428	211	1,726	3,365			3,365	3,365		
14				1,343	211	1,281	2,835			2,835	2,835	530	
15				1,343	211		1,554			1,554	1,554	1,811	
16			35	1,343	211		1,589			1,589	1,589	1,776	
17				1,343	211		1,554			1,554	1,554	2,417	
18				1,343	211		1,554			1,554	1,554	2,417	
19				1,343	211		1,554			1,554	1,554	2,417	
20				1,343	211		1,554			1,554	1,554	1,883	
21			35	1,343	211		1,589			1,589	1,589	6,146	
22				1,343	211		1,554			1,554	1,554	6,181	
23				1,343	211		1,554			1,554	1,554	5,659	
24				1,343	211		1,554			1,554	1,554	5,659	
25				1,343	211		1,554			1,554	1,554	5,659	
26			35	1,343	211		1,589			1,589	1,589	5,624	
27				1,343	211		1,554			1,554	1,554	4,627	
28				1,343	211		1,554			1,554	1,554	4,627	
29				1,343	211		1,554			1,554	1,554	4,627	
30				1,343	211		1,554			1,554	1,554	4,627	
Total	580	261	1,507	36,357	6,218	6,317	51,240	277	4,338	46,625	51,240	66,687	

(5) Problems in promoting activities

As we have discussed, both the natural conditions and the marketability of forest products are deemed to offer very hopeful possibilities for the initiation of afforestation and the creation of a forest product industry around paper and pulp in the Yguazu area.

Moreover, the Paraguayan government is greatly interested in this project. If, therefore, it is put into practice, they have made the statement that they are prepared to offer as many facilities as possible.

Nevertheless, it would pose problems immediately to recommend the introduction of afforestation to immigrants as one of the main undertakings to be projected. The reason is that the development of reliable markets should precede the recommendation of such afforestation to the immigrants and that the project should be supported by the assured sales of forest products.

For this purpose, it is of absolute importance that while planting wood in a given area on a commercial basis, a lumber mill and a paper and pulp plant should be concurrently set up within the same industry as a center of consuming the pulp wood thus obtained.

If market development is carried out on the above-mentioned premises, the immigrants surrounding the project center will naturally incorporate afforestation in their agricultural operation.

The first requisite is to clear the way for the earliest possible invitation of enterprises possessed of the aforesaid idea. From this standpoint, namely, with the view of promoting goodwill between Paraguay and Japan through the stabilization of the immigrants' agricultural undertakings and the economic growth of Paraguay, it is emphasized that the project in question should not be entirely entrusted to the public, but that governmental support is most important.

Of course, the emergence of various undertakings on the proposed site is not so easy a task as it appears to be. In practice, there are a great many

questions remaining to be resolved, such as the bearings which the project may have on the various existing institutions of Paraguay, procurement of required funds, secure enrollment of competent engineers, market development, etc.

It is earnestly hoped that all these problems will be amicably settled through the mutual understanding and co-operation of the Paraguayan and Japanese governments, and related nations and circles.

Of the questions to be considered in connection with the promotion of the project under review, hereinafter are discussed only the basic ones.

1. Understanding of the object of the present project

It should be understood by all related circles that the proposed project is not a mere money-making pursuit, but that if put into practice, the project will enable goodwill between Paraguay and Japan to be further promoted by making contributions to the economic stabilization of the Japanese immigrants and also to the economic development of Paraguay.

2. Creation of a parent body in preparation for the project

It is suggested that a parent body to prepare for the materialization of the present project be organized jointly by the related government departments and other circles by the aid of the Overseas Technical Cooperation Agency and other organizations in order to arrange for the invitation of Japanese enterprises.

3. Study of the nature and organization of incoming businesses

The undertakings under this project should be of very high public nature as inferred from their mission. Consequently an incorporated system is temporarily contemplated for these enterprises so as to facilitate the acquisition of government and private loans. However, the nature and organizational setup of participants in the project should be further studied according to the actual circumstances involved and also in such a manner that the proper types of business may be smoothly operated in the

projected areas.

4. Adoption of a complex system

The project under review should be developed by incorporating the industries of afforestation and forest product manufacture into one. Otherwise, it would be difficult to attain the desired object. Consequently it is important to adopt a complex system in which these industries are not separated from each other, but completely coordinated.

5. Execution of detailed preliminary surveys

The present report has been compiled on the basis of data obtained by the on-site surveys conducted during a very short period, so that it seems to contain some insufficient or perhaps mistaken statements concerning the analysis of concrete problems. Consequently before the project is carried out, a detailed working plan should be drawn up by making further concrete preliminary surveys.

6. Considerations concerning the acquisition of land for the project

The land for the execution of the project is desired to be such as will facilitate afforestation both technically and economically. The present report suggests that the F, G, H and I areas of the Yguazu immigrant settlement be selected as land for the project. For the actual supply of land, the special considerations of the Japan Emigration Service are desired. With respect to payments for purchases of land, measures should be taken to ensure the convenient operation of the existing institutions insofar as permissible and also to provide a most advantageous method particularly for deferred payments and redemption by yearly amortization.

7. Procurement of funds

With respect to fund requirements for the project, the present body for invitation of incoming enterprises should first furnish its own funds. However, since the project mainly consists of afforestation, considerable long-term fixed funds are required. Moreover, in view of the object of the

project, it is important that loans, if required, be procured at low interest. For this purpose it is desired that the Overseas Economic Cooperation Fund be utilized, and that special considerations be given by the Fund to the loaning of funds for the present project.

Also from the nature of the afforestation industry, it is hoped that the rate of interest on loans will be as low as about 4.5 per cent per annum.

8. Procurement of engineers

Before the afforestation and pulp industries are initiated, it is necessary to procure engineers of high capability. Furthermore, in view of the remoteness of the areas where the project is to be carried out, very positive measures should be taken for the satisfactory treatment of the engineers who will be sent to those areas. It is also important to study the possibility of instituting a system whereby governmental or prefectural officials can be assigned to overseas work for a period of about three years with their organizational status guaranteed.

Argentina has engineers of advanced aforestation technology, so that, if required, they may be hired on the site. Of course, consideration should also be given to the progressive reduction of Japanese engineers whose technical services will be rendered in the projected areas by transmitting the technical knowledge and skill possessed by these engineers to the Japanese immigrants or native people on the site.

9. Procurement and training of mechanical operators

Of the proposed undertakings involved in the project, the work of afforestation is almost entirely mechanized. Consequently particular consideration should be given to the procurement of mechanical operators. For this purpose, it will be advisable to send technical immigrants from Japan as mechanical operators. In this case, a training period of about three months will be required. It is also necessary to contemplate training the native people and hiring them as mechanical operators.

10. Procurement of labor

Afforestation under the project alone will require at least one hundred laborers at all times. The secure procurement of these workers relies a great deal on the cooperation of the Paraguayan government. At the same time consideration should be given to the promotion of employment of those Japanese immigrants who can offer manual labor.

For the afforestation work, a contract system may be contemplated.

In such case, it will be necessary to study the creation of an institution to lend required machinery, equipment and other facilities to contractors.

11. Improvement of living environments

From the nature of the project, the living environments of the proposed areas must be expected to be under unsatisfactory conditions. Consequently too careful considerations could hardly be given to the living accommodations, hygienic equipment including water supply and medical care, entertainment facilities, etc. For the people assigned to services not only in the Yguazu area as the projected work site, but also at Asuncion, such facilities should be provided so that they may pursue their duties in peace.

12. Clear understanding of the Paraguayan government's setup to accept the project and request for their cooperation

Before the project can be initiated, it is necessary to clearly understand the Paraguayan government's setup to accept the project and obtain their firm promise to furnish required cooperation and assistance. The government has already announced that they are fully prepared for cooperation, and desire to settle concrete matters through diplomatic negotiation with the Japanese government.

The main points to be considered first in this case may be itemized as follows:

1) Effective operation of a system for importation of foreign capital

2) Exemption of land tax until lumbering starts on a full scale

3) Permission of free importation of machinery and equipment, chemicals and other necessary materials

4) Exemption of income tax until lumbering starts on a full scale

5) Unconditional permission of foreign exchange remittance of invested principal, interest and profit

6) Exclusions from the application of labor and other laws

7) Request concerning assured supply of required electric power and substation location

8) Adoption of industrial power rate

9) Positive development of demand for forest products

13. Procurement of Parana pine seeds

At the present time the Brazilian government forbids the export of Parana pine seeds. Therefore, unless the export of these seeds to Paraguay is permitted, the proper execution of the present project would be impossible. Thus it is absolutely necessary for the Japanese government, along with the Paraguayan government, to negotiate with the Brazilian government for the lifting of a ban on the export of these pine seeds. In this case, it is also important to obtain the understanding of LAFTA, and FAO. Where required, it must also be contemplated to send competent persons to Brazil to negotiate for the procurement of said seeds.

14. Development of market for firest products

If a market for forest products is to be sought for in Paraguay alone, positive efforts should be made for the diffusion and instruction of the use of needle-leaved trees with full recognition of the fact that no supply of these trees has heretofore been available in the country. Also considering that Paraguay alone will offer only a limited market for the forest products over years to come, the possibility of their exports to Argentina and Brazil should deserve close attention. To ensure further market

development, however, efforts should be made to obtain the understanding and cooperation of the related countries and LAFTA.

15. Cooperation of related institutions on site

Unless the positive cooperation of the circles related to the Japanese Embassy and Japan Emigration Service on the site is obtained in carrying out the project, the attainment of its object would be difficult. Therefore particular efforts should be directed to the acquisition of the full understanding of all the institutions and related circles on the site.