

**THE FEASIBILITY STUDY REPORT**  
**ON**  
**THE ESTABLISHMENT OF A PAPER PULP PLANT**  
**IN**  
**THE ORIENTAL REPUBLIC OF URUGUAY**  
**(SUMMARY)**

**SEPTEMBER, 1985**

**JAPAN INTERNATIONAL COOPERATION AGENCY**  
**TOKYO, JAPAN**



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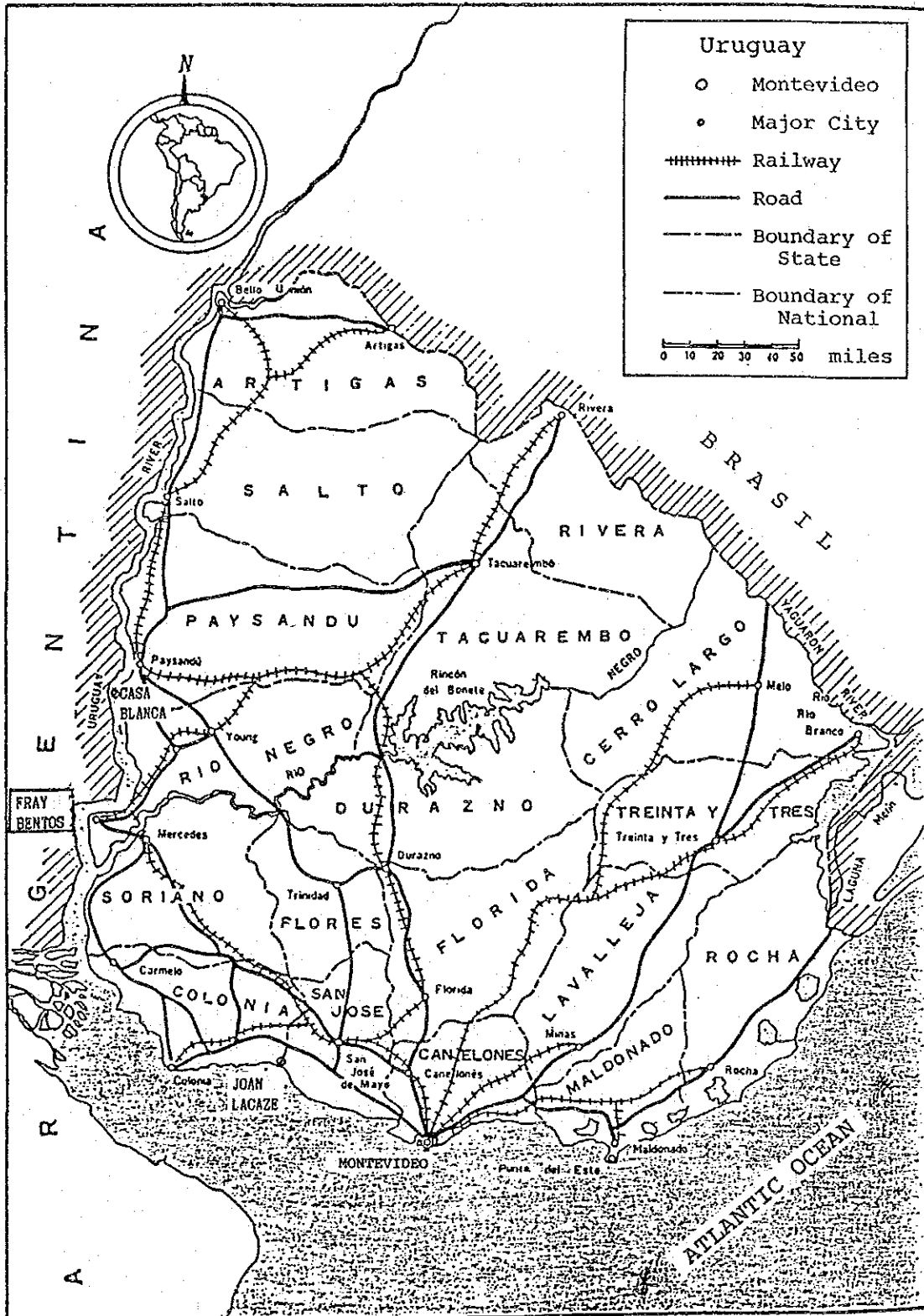
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**TOKYO, JAPAN**

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The Feasibility Study on the Establishment  
of a Paper Pulp Plant  
in the Oriental Republic of Uruguay





## ABBREVIATIONS

### Technical Terms

Hw, L.W	Hardwood
Sw, N.W	Softwood
BKP	Bleached kraft(sulfate) pulp
UKP	Unbleached kraft(sulfate) pulp
LBKP	Hardwood bleached kraft pulp
NBKP	Softwood bleached kraft pulp

### Financial and Economic Terms

DCF	Discounted cash flow
IRR	Internal rate of return
ERR	Economic internal rate of return
FRR	Financial internal rate of return
ROI	Return on investment
NPV	Net present value
DSR	Debt Service Ratio
GDP	Gross domestic product
GNP	Gross national product
C & F	Cost and freight
CIF	Cost, insurance and freight
FOB	Free on board

### Organization and Company

SEPLACODI	The planning Coordination and Information Secretariate
MIE	Ministerio de Industria Y Energia
LATU	The Technological Laboratory of Uruguay
MAP	Ministerio de Agriculture Y Pesca
JICA	Japan International Cooperation Agency





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## SUMMARY

### Chapter 1 Background of the Project

Whereas the Government of Uruguay is expecting to create the demand for wood by promotion of paper and pulp industry to improve the utilization of the national land for the higher efficiency. And, the Government is encouraging afforestation on unsuitable place for agriculture and stock farming with the expectation to accelerate regional development together with effective utilization of the national land.

In response to a request from the Government of Uruguay in February 1981, the Government of Japan presented a master plan for development of that country's paper and pulp industry, which was prepared in accordance with the result of the site survey report of the expert study team sent to there in August 1980.

The master plan includes recommendation consisting of the following three phases.

- Phase I Improvement of existing mills, with the goal of increasing production by about 26,000 T/Y over a period of 5-6 years.
- Phase II As a medium-term plan, construction of a newsprint mill, having 72 T/D capacity with intention to supply the domestic market.
- Phase III As a long-term plan, construction of a BKP mill, having 750 T/D capacity for export purpose provided that a suitable afforestation measures will be taken.

The Project of pulp manufacturing for export purpose recommended at Phase III above is the background of encouraging of afforestation on the Governmental level and it was considered as the item which has worth to study judging from the point of view to utilize the above afforestation and decided to request to conduct feasibility study to Japan International Cooperation Agency.

On the basis of the foregoing, the Government of Uruguay requested to the cooperation of the Government of Japan for conducting a feasibility study for construction of the export-oriented 750 T/D BKP mill, of Phase III. In

compliance with this request, the Japan International Cooperation Agency (JICA) dispatched a preliminary study team to Uruguay in August 1984. September 6, 1984 an agreement of undertaking the feasibility study was signed by a representatives of JICA and SEPLACODI, the competent agency of the Government of Uruguay. This feasibility study was carried out on the basis of the agreement.

## Chapter 2 Adequacy of Selection of BKP 750 T/D

By checking of world-wide situation of production, demand and export & import of various kinds of paper and pulp classified by regional groups as well as by each year, the followings were observed.

- (1) Pulp production base points are shifting to the places where pulp wood can be obtained at cheaper rate, and the supply of pulp is assumed to become insufficient in 1995.
- (2) Among of world markets, EC area is the most prospective markets for both of paper and pulp, and the import amount there seems large enough.
- (3) The trade quantity is concerned, News Print and BKP are both prospective items.

At the same time, plant construction cost at the new site is expensive and also the smaller scale plant is more expensive for unit production cost. (There are such plant having capacity of 1,000 T/D and 750 T/D size for export oriented BKP plant in recent years.)

Since there is almost no difference in ocean freight cost between paper and pulp, and paper is mostly produced at the near place to the consumption area, pulp is better than paper for export in case of Uruguay, and considering from the scale of quantity of trade, BKP is the most prospective among the various pulp.

Accordingly, the selection of 750 T/D BKP plant for export purpose proposed in the master plan is justified and can be said as good selection.

### Chapter 3 Location

In accordance with the negotiation with Uruguay Counterpart, site study has been made on the following four proposed sites of Juan Lacaze, Fray Bentos, Casa Blanca and Nueva Palmira.

The result of the site study is shown in the Table S-1 and Fray Bentos was judged as the best.

### Chapter 4 Pulp Testing Result, Required Quantity of Pulp Wood and Necessary Land Space

After negotiation with Uruguay Counterpart, following 6 species of tree were selected and gathered samples of them for testing.

#### Gathered Species and Location

<u>Species of tree</u>	<u>Location and/or Owner</u>
grandis (Eucalyptus)	CAJA BANCARIA
globulus (Eucalyptus)	FNP
Maidenii (Eucalyptus)	FNP
taeda (Pinus)	CAJA BANCARIA
Elliottii (Pinus)	CAJA BANCARIA
Populus	CAJA BANCARIA

The testing was made at the laboratory of Hokuetsu Paper Mills, Ltd. and were certified that all of them are suitable for the market pulp manufacturing.

By the result of the test, specific gravity of each species, yield, consumption of chemicals were obtained and those figures are utilized as the base of afforestation plan, price estimation of trees, plant design and calculation of unit consumption, etc.

The required quantity of pulp wood, area of afforestation and required land space are calculated as the following table, in case, the BKP is produced by the plant of this project with the above species of wood.

In this case, 80% of required land space is used for actual afforestation and 20% is for the fire arresting line (including forestry road), riverbed and damp ground, etc. which is not suitable for the afforestation.

Species	Annual pulpwood requirement (m <sup>3</sup> /y)	Necessary plantation area (ha)	Required land area (ha)	Annual planting area (ha/y)
E. globulus	907,800	38,420	48,025	4,540*1
E. grandis	1,206,150	51,030	63,788	6,030*1
Populus	1,397,400	59,150	73,938	6,990*1
P. taeda	1,558,050	103,950	129,938	9,450*2
P. elliottii	1,723,800	114,950	143,688	10,450*2

Note: \*1 Showing annual planting area during 6 years.

\*2 Showing annual planting area during 11 years.

As shown the above, even if, in the case of pinus which requires the broadest area, enough land space is available at recommendation area for afforestation in three prefectures such as Rio-Negro, Soriano and Colonia within 150 km distance from FRAY BENTOS, which is less than 40% of such area of 397,807 ha.



## Chapter 5 Factory Price\* of Pulp Wood

The factory price of pulp wood by each species are as under.

(in US\$/m<sup>3</sup>)

Items	<u>E.globulus</u>	<u>E.grandis</u>	<u>Populus</u>	<u>P.taeda</u>	<u>P.elliottii</u>
Stumpage cost	4.78 (3.03)	4.78 (3.03)	4.78 (3.03)	10.82 (6.83)	10.82 (6.83)
Logging cost	6.42	6.42	6.42	5.86	5.86
Forest road cost	0.19	0.19	0.19	0.27	0.27
Hauling cost	4.00	4.00	3.20	3.20	3.20
Total cost at mill woodyard	15.39 (13.64)	15.39 (13.64)	14.59 (12.84)	20.15 (16.16)	20.15 (16.16)
BD ton/m <sup>3</sup>	0.555	0.410	0.361	0.375	0.355
US\$/BDt at factory	27.73 (24.58)	37.54 (32.27)	40.42 (35.57)	53.73 (43.09)	56.76 (45.52)

Note: Discount rate is 12%, but in ( ) indicate in the case of 8%.

If globulus, grandis and populus are used in mixture, the average factory price of L-pulp wood are as under.

<u>Species</u>	<u>Annual requirement</u> (m <sup>3</sup> /y)	<u>Cost at mill woodyard</u> (US\$/m <sup>3</sup> )	<u>Remarks</u>
E. globulus	292,700	15.39	Average volume Weight: 0.481 BDt/m <sup>3</sup> Cost per BD ton: 31.64 US\$/BDt
E. Grandis	125,500	15.39	
Populus	104,600	14.59	
Total	522,800	15.23	

Note: \* delivered price at factory

At the same base, factory price of N-pulp wood are as under:

Species	Annual requirement (m <sup>3</sup> /y)	Cost at mill woodyard (US\$/m <sup>3</sup> )	Remarks
P. taeda	409,300	20.15	Average volume Weight: 0.365 BDt/m <sup>3</sup> Cost per BD ton: 55.21 US\$/BDt
P. elliottii	409,300	20.15	
Total	818,600	20.15	

As indicated in the above tables the cheapest species of wood on the basis of factory per BD ton is globulus. Globulus shall be planted for use as fuel wood.

#### Chapter 6 Price of BKP

Considering the price of BKP in the past, CIF prices in Europe in 1984 are estimated as NBKP US\$490/T, LBKP US\$460/T. Estimated ocean freight from Montevideo to Rotterdam US\$72/T was deducted and assumed FOB price in Uruguay in 1984 as NBKP US\$418 (439)/T and LBKP US\$388 (407)/T.

Inside of ( ) are showing price in 1985.

#### Chapter 7 Case Study

For the construction method, the Barge method shows a merit for shortening of construction period but construction cost is expensive. By this reason the conventional type of the plant for site erection and construction method are considered as the best.

For the study case, the recommendation plan in Development Study Report of Paper and Pulp Industry, proposed in 1980, of BKP 750 T/D (N:L = 50:50) are used as the base case and studied on the following 4 kinds of cases.

Base Case:

N : L ratio of pulp wood = 50:50 (LW = mixture of 4 kinds)

Case 1:

N : L ratio of pulp wood = 50:50 (LW = globulus only)

Case 2:

N : L ratio of pulp wood = 0:100 (LW = mixture of 4 kinds)

Case 3:

N : L ratio of pulp wood = 0:100 (LW = globulus only)

Note: LW = L-pulp wood

The annual production capacity are as under.

	Production Capacity (ADt/D)	Annual Working Days (days)	Annual Production (ADt/Y)	Pulpwood Volume (M3/D)	Consumption Weight (BDt/D)
<b>Base Case</b>					
N in average	705	181	127,500	4,581	1,672
L in average	805	159	127,500	3,341	1,607
Total	750	340	255,000		
<b>Case 1</b>					
N in average	705	181	127,500	4,581	1,672
L was globulus	805	159	127,500	2,895	1,607
Total	750	340	255,000		
<b>Case 2</b>					
L in average	805	340	273,700	3,341	1,607
<b>Case 3</b>					
L was globulus	805	340	273,700	2,895	1,607

Due to the difference of growth rate in case of L-wood only, the deforestation can be started 8 years after plantation and in case of N-wood, it will be started 11 years after the plantation. If N-wood is included, production of BKP is estimated to start in 1998, while in case of L-wood only, it can be started in 1995.

## Chapter 8 The Total Capital Requirement

As shown below there are almost no difference in total capital requirement between 4 cases at Base Project Cost. There are, however, big differences in price contingency, interests during construction between case of L:N = 50:50 and case of L = 100%. Such difference is caused in 3 years difference for starting of the operation.

### Escalated Capital Cost Estimate

(Unit: Million US\$)

Case Product	Base Case N:L = 50:50	Case 1 N:L = 50:50	Case 2 L = 100	Case 3 L = 100
1. Base project cost	F 220.2	F 220.2	F 220.2	F 220.2
	L 68.12	L 68.02	L 67.22	L 66.92
	T 288.32	T 288.22	T 287.42	T 287.12
2. Physical contingency	F 22.1	F 22.1	F 22.1	F 22.1
	L 6.8	L 6.8	L 6.8	L 6.7
	T 28.9	T 28.9	T 28.9	T 28.8
3. Price contingency	F 144.3	F 144.3	F 91.9	F 91.9
	L 48.1	L 48.0	L 30.9	L 30.8
	T 192.4	T 192.3	T 122.8	T 122.7
4. Initial working capital	F 0	F 0	F 0	F 0
	L 38.9	L 38.9	L 33.5	L 33.5
	T 38.9	T 38.9	T 33.5	T 33.5
5. Interest during construction	F 161.4	F 161.2	F 138.9	F 138.9
	L 0	L 0	L 0	L 0
	T 161.4	T 161.2	T 138.9	T 138.9
Total	F 548.0	F 547.80	F 473.1	F 473.1
	L 161.92	L 161.72	L 138.42	L 137.92
	T 709.92	T 709.52	T 611.52	T 611.02

Notes: F = Foreign, L = Local, T = Total

## Chapter 9 Result of Financial Analysis

Results of calculations of FRR and NPV of each case are as indicated in the next table. As you find in the following, in spite of the fact that LBKP is cheaper than NBKP at price of product, L 100% is the more profitable than

mixture of N50%. Especially, in case of globulus 100% is the most profitable. It caused by the cheaper price of L-wood and also influence of higher production quantity per year with the same plant.

#### FRR AND NPV FOR INCREMENTAL

Item	(Unit: %)			
	Base Case	Case 1	Case 2	Case 3
(1) FRR in Constant Price	in 1994	in 1994	in 1991	in 1991
After Tax (%)	7.64	7.83	9.60	9.95
Before Tax (%)	9.10	9.33	11.48	11.92
(2) FRR in Current Price				
After Tax (%)	12.57	12.77	14.66	15.04
Before Tax (%)	14.15	14.40	16.68	17.15
(3) NPV in Constant Prices				
10% Discount Rate				
After Tax (US\$Million)	-79.02	-72.98	-12.15	-1.41
Before Tax (US\$Million)	-32.33	-24.21	48.61	63.76

In the Base Case and Alternative Case 1 which are mixture of L and N, FRR is less than 8% at the constant price after tax and it seems difficult enterprise considering from profitability but in case of L-wood 100% it seems in the range of feasible enterprise in general, of course it depends on the cost of financing. If observed from the view point of cash flow, in case of globulus 100%, after starting of repayment (3 years of grace period, 7 years installment) of long term loan, during several years, financial ratio (Debt service ratio 1.11) cash flow (Quick ratio) are low, but there are no special problem during whole life period.

The result of sensitivity analysis is shown in Figure S-1. From this Figure S-1 the following matters could be understood. The most influential factor on FRR is selling price and the next are capital cost and operation rate. Fluctuation of pulp wood cost is not so much effected because cost of wood is lower compared with other production costs. If the production rate could exceed same as happened in Brazil, (actual production rate was obtained 900 T/D instead design capacity of 750 T/D) its influence is very big. On the contrary if production rate is reduced, FRR is also reduced for considerable extent. In order to prevent it, an ample measure and expenses are estimated in this study.

Actual selling price of products will be fluctuated for considerable extent than the assumed price this time. From the break even point of selling price for cash flow, in 1999 and 2000 (the starting year of repayment of long term loan) the ratio shows 92% and 94% respectively. But in other years it shows less than 80%, therefore it seems durable against fluctuation to lower side. It is possible to increase stability for the project, if it is possible to provide more soft fund (long term and lower interest loan).

## Chapter 10 Result of Economic Analysis

Against to financial analysis, the economical analysis was made on the basis of exclusion of tax such as corporation tax etc. Price of pulp wood was estimated at the fuel wood level of US\$15/BDt and wages for unskilled labor, for construction and operation, was estimated as 50% of the figure of financial analysis. On the other side construction costs of road, hospital and company residence are included. As the result, ERR shows 12.99% at constant price in 1991 in case of 100% globulus.

This ERR 13% is not so high but still enough feasible. In case of discount rate of 10%, economical net present value is so high as US\$110,300,000 at the constant price in 1991.

If export quantity is estimated as 255,000 T/Y and the unit price is the same in 1983 (US\$369/t) then its amount shows US\$94,000,000, which is approx. 9% of gross export amount in 1983 in Uruguay. It means that the contribution to expand the export from the country is apparently remarkable. The net earning of foreign currency (income - flowout) will reach to US\$1,299,000,000.- in accumulation of during 10 years after starting of the commercial operation. It is quite sure that the project will contribute to increase Uruguayan foreign currency balance.

Another effect of this project is promotion of employment, which shows requirement of working persons as such 1,021 at the time of the plant operation, and approx. 2,000 for afforestation.

In addition, another 1,450,000 man-day employment will be added during the construction period of 3.5 years.

Another related industry, and various kinds of service business will be also developed in parallel with this project.

Other than these effects, there are another remarkable effects such as to make good use of land, which was left under low utilization and prevent the land from desolation such as washed away of soil etc.

## Chapter 11 Recommendation

It is clear that this project is feasible financially and economically in case of the mill will produce BKP by 100% L-wood.

The following consideration, however, shall be paid for successful operation.

- (1) A pulp plant shall be constructed at the place where ample quantity of pulp wood are available.

In order to ensure stable supply of pulp wood in the future, appropriate part of afforestation (50% in case of Eucalyptus and more than 35% in case of Pinus) shall be desirable to make plantation by the pulp plant owner themselves.

Futhermore, it is absolutely necessary to have the best cooperation of landlords near to the plant for the smooth execution of afforestation and supply of pulp wood to the pulp plant.

Governmental support in taxation, finance and others are also, of course, necessary for promotion of the afforestation.

- (2) A capital investment approx. US\$300,000,000 is required as the base project cost. In addition to the sum, another investment is necessary for land 50,000 ha (globulus only) - 100,000 ha (L-50% and N-50%) and expenses of afforestation, maintenance, cutting down and also transportation equipment etc.

As reported in the Chapter of Financial Analysis, even in the case of the most profitable "globulus", the internal profit rate is 11.92% before tax and

9.95% after tax. These figures are not higher rate but suggesting the necessity of soft loan. Since the fluctuation of pulp market price is broader, soft loan is severely desirable, especially for during several years after starting of repayment of long term loan for the prevention of the shortage of fund.

As reported in the Economic Analysis, on the other side, it is quite clear that this project will effect in export promotion, consequential effect of obtaining of foreign exchange, promotion of employment, utilization and improvement of land, these are very favorable factors for the promotion of National Economy of Uruguay.

Considering from these points, even if the share of investment by the Government is limited less 20%, powerful leadership by the Government is absolutely required for the promotion of this project.

As stated in case of Brazil, the cooperation with other country's Government and or Enterprise or International Organization from the technical, marketing and financial aspect, are desirable to realize this project.

There are several forms of cooperation with outside organization, but if Joint Venture Form is taken as the method to promote this project, Uruguay Government will be required to prepare the conditions to invite the foreign capital, for example, to establish the forest promotion policy to supply the required quantity of pulp wood with reasonable price and to make guarantee for the equity which will not be nationalized and for the remittance of the principal, interest and profit, etc. to give the security of Investor because this project is profitable but has more favourable impact on the Uruguay Economy.

- (3) In the economic evaluation, construction cost for the investment including hospital, road and company residence etc. was added, however, the investment for the harbor (charging and discharging of the products and material) was excluded because it is used only 2 times per month. Please, therefore, investigate it as a matter of regional development infrastructure including the benefits of this project also.

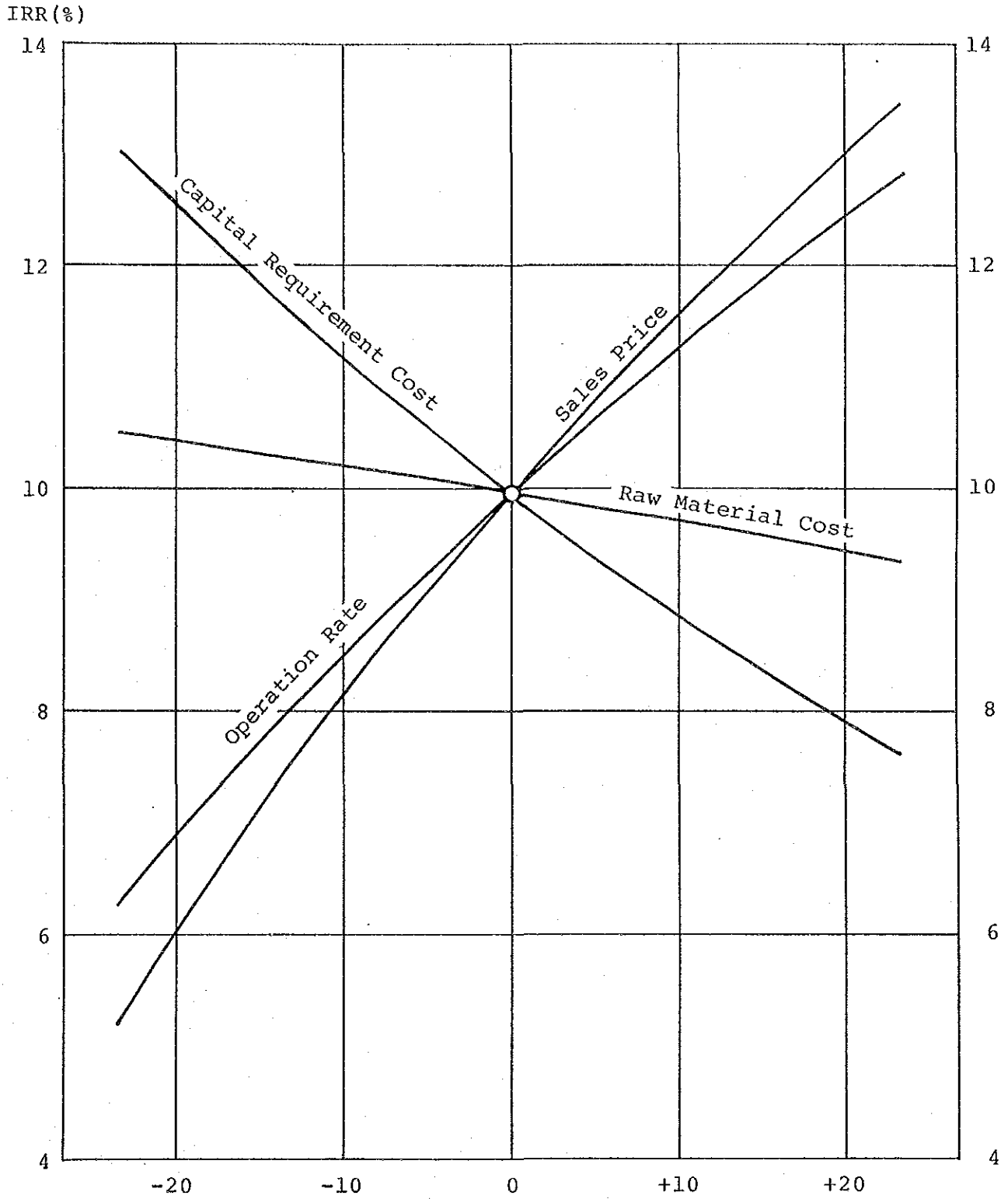


- (4) For the selection of kind of species of trees, there are not so much difference for economical evaluation if it is L-wood, whether 100% of globulus or mixture with other kind of L-wood. Therefore, it shall be studied from a viewpoint of stable supply of material in the appointed area in the future.
  
- (5) Since this study was performed on the basis of the Uruguayan as well as world's situations of the economic and physical aspects, as the time of specified month of year in this report, we therefore would like to recommend to conduct another feasibility study for the construction of the mill itself at the appropriate time, beforehand to start it, because the actual construction of the pulp mill will be commenced approx. 3 years after the afforestation in case of LBKP.

Table S-1 COMPARISON TABLE FOR SITE SELECTION

SITE		JUAN LAHAZE	FRAY BENTOS	CASA BLANCA	NOEVA PALMERA
ITEMS					
1.	Plant Site				
•	Site plan	None	Yes	Yes	None
•	Site condition		River site and terraced land. Surface is undulating and covered with grass. Ground level is approximate 10m higher than water level.	Terraced land. Site is separated into two (2) areas and located along river side. Ground level is approximate 15m higher than water level.	
•	Site space	-	Approximate 140ha	Approximate 150ha	-
•	Bearing capacity	-	Approximate 60 t/m <sup>2</sup>	Same to Fray Bentos.	-
2.	River Condition				
•	Water depth	Shallow (2m - 3m)	5m - 8m	CASABLANCA 10m, PAY SANDU 7m-10m	7m - 10m
•	Flood	None	None	Yes Shallow points are found.	None
3.	Infrastructure				
•	Wharf or Jetty	Located	Located	CASABLANCA : Located, but not available PAY SANDU : Located	Located
•	Railway	Located	Located	PAY SANDU : Located	None
•	Road	Good	Good	CASABLANCA : Not so good	Good
4.	Electric Power and Water Intake				
•	Electric power supply	Available	Available	Available	Available
•	Water supply	Possible	Possible	Possible	Possible
5.	Labor Supply				
•	For construction	Possible	Possible	Possible	Possible
•	For Operation	ditto	ditto	ditto	ditto
6.	Transportation for Raw Woods	So far from afforestation area.	Not so far from afforestation area.	Not so far from afforestation area.	So far from afforestation area.
7.	Policy of the site development for industrial complex				
		None	Reliable	Not so reliable	None
	Site Selection	Not applicable	Applicable	Not applicable	Not applicable

Figure S-1 SENSITIVITY ANALYSIS ON THE MAJOR FINANCIAL FACTORS  
(AFTER TAX FOR CASE 3)







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