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EVALUATION OF PROPOSALS FOR FRUITBOX MANUFACTURE IN URUGUAY ^{1/} (1975)

(TS/URU/74/020)

by

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UNIDO Expert

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1. SUMMARY

1.1 The import value of wire-bound wooden boxes meant to the country for 1974 a disbursement of foreign currency of US\$ 730.000. The development of citrus plantations within the Citrus Development Project and Small Farm Development Project (*) would increase the necessary import of boxes year 1978 to a value of US\$ 2.000.000 (page 8).

The existing card-board box industry is only partially import-substituting as the raw-material (semi-chemical pulp) is imported.

The existing wooden-box industry has neither the capacity nor the quality for wire-bound boxes for exports.

1.2 As to the raw-material (wood) availability, there has been a remarkable increase in the utilization of locally grown wood. Year 1973 domestically grown industrial roundwood was covering 56% of demand, compared with 38% year 1968. Species as pines, poplar and salix are in great demand from the existing industry and the fruit-box manufacture should mainly utilize eucalyptus species (page 11).

The filling of dam of Salto Grande Hydroelectric Project (1979-80) will submerge 500 hectares eucalyptus plantation forests representing a volume of 100.000 m³ roundwood suitable for industrial use.

1.3 The evaluation of proposals for erection of factory for wire-bound box manufacture considered the localization of industry, technical aspects (page 20), and the economic viability (page 32).

The economic-technical conclusions (page 34) gave at hand, that the proposal from Campichuelo S.A. is most advantageous for the national economy for following main reasons (page 37 and 41):

(*) Proyecto de Desarrollo Granjero

a) It will utilize eucalyptus rostrata including the roundwood amounts from Salto Grande dam area;

b) it will give a high quality product in integration with plywood mill, which already has been declared by Government as "industry of national interest".

c) it can commence the operation by end of 1976, the year when the value of imported boxes has already reached the level of US\$ 1.300.000.

d) the financial arrangements seem to be in hand including necessary external credits for machinery.

1.4 The continuous increase of fruit-box demand to 3,6 million boxes by year 1980 and 4.8 million boxes year 1986 (Table 4) makes it necessary to consider and additional factory to start the operations 1980-81.

The proposal of Darricarrere-Solari (page 35) is advantageous as to the localization, organization and financial arrangements. Darricarrere-Solari should be considered for the erection of the second factory after including the proposed technical improvements in manufacturing process and also considering more extensive use of eucalyptus as raw-material.

1.5 The quality control (page 39) should be carried out by independent impartial body. The Analysis and Quality Control Laboratory (Laboratorio de Análisis y Ensayos - LAE) could fill this function, but they lack at present both suitable testing equipment and personnel trained for that purpose.

1.6 Following main recommendations are given (page 41):

- to start the manufacture of wire-bound boxes as soon as possible.
- to give Campichuelo S.A. the task to start the box manufacture and declare the box-factory as "industry of national interest"

- to request an UNIDO expert for participation in plywood testing and final machinery choice in France.
- to request an UNDP/UNIDO fellowship for a technician from LAE to receive the necessary training in box-testing.
- to request through UNDP/UNIDO funds for additional equipment for LAE.
- to carry out a feasibility study for the second fruit-box factory about end of 1976 through the National Industrial Technology and Productivity Centre in collaboration with the Agriculture Policy and Planning Office and possible participation of an UNIDO expert.

2. INTRODUCTION

2.1 General Background for Uruguay

Total Land Area: 176.215 Km.²

Total Forest Area: Approx. 6.200 Km.² of which 133.400 Ha. plantation forests (1970).

Population: 3:064.000

Currency:	Financial value: (March 1975)	Commercial value (used in economic evaluation):
	1 US\$ = 2.290 Pesos	1 US\$ = 1.970 Pesos

GDP:	In 1961 years peso value:
1973 - 2.500.000 million Ps.	1973 - 18.921 million Ps.
1974 - 4.400.000 million Ps.	1974 - 19.283 million Ps.

GNP: 1973 - 2.480.000 million Ps.

Exports:	Imports:
1973 - 321.5 million US\$	1973 - 284.8 million US\$
1974 - 363.2 million US\$	1974 - 480.9 million US\$

GDP per cápita:	In 1961 years peso value:
1973 - 822.074 Pesos	1973 - 6.324 Pesos
1974 - 1.456.422 Pesos	1974 - 6.374 Pesos

Rate of increase of the GDP in percent (constant value):

<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>
4.7%	-1.0%	-3.4%	1.7%	1.5%

Part of manufacturing industry in GDP at factor costs:

1973 - 25.12%	1974 - 25.75%
---------------	---------------

The contribution of forest industries to the GDP is approximately 1.0 percent.

The estimated annual growth of GDP for the present 5 years plan (1973-1977) is 4 percent thereafter the estimated annual growth is 5 percent.

The National Development Plan includes the promotion of exports of agricultural products which is viewed as an important stimulus to the economy. The planned increase in the quantity of fruits and vegetables is noteworthy.

The expansion of the industrial sector will consist essentially in import substitution industries and development of industries which will increase the exports of processed goods. The Government stimulates industrial growth through an Industrial Development Law which grants fiscal incentives to industries that are declared to be in the national interest and provides a favourable tariff structure for capital goods and required raw-material imports. The enterprises of "national interest" have the following exemptions in general:

<u>Year of operation</u>	<u>Exemptions</u>
0 - 1	Total exemption of fiscal duties on machines, raw materials and on profits.
2 - 4	Total exemption on the part of imported raw materials used for export goods. Exemption profit taxes.
5 - 6	50 percent exemption on imported raw materials and on profit taxes.

2.2 Project Background

Within the National Development Plan the implementation of the Citrus Improvement and Expansion Plan and the Small Farm Development Project have been included.

These projects, which are financed through the Inter-American Development Bank (IADB), are expected to increase significantly the quantities of fruit for exports. At present, the wooden packing boxes for the increased exports of fruit have been imported, mainly from Brazil. It is essential to produce an adequate amount of wooden fruit-boxes within the country. This will contribute to the realization of plans to increase fruit exports and, furthermore, considerable amounts of foreign currency will be saved excluding the necessity to import wooden fruit-boxes. The present wood-box manufacture covers only the needs for the internal fruit-market and consists of small units not in position to meet the growing demand for citrus exports.

Tenders were therefore called for from those, interested in establishing factories for wire-bound boxes for fruit. In the background given, the size of boxes was estimated for 18 Kg. and 22 Kg. of citrus and other fruits. It was further estimated that the factory would have to fill a demand increasing from 800,000 boxes in 1974 to 5,325,000 in 1984. Factors such as location, the availability of wood, its suitability and quality, the legal and administrative organization, estimation of the investment necessary over a ten-year period, a description of the production process, cost factors, manpower requirements, construction time required and the financial possibilities of the company, should be included in the tenders. Fourteen tenders were received offering a wide variation of solutions.

2.3 Outline of official arrangements

The Government's request through the Agriculture Policy and Planning Office (OPYPA) of the Ministry of Agriculture and Fisheries for assistance in wooden box packaging for fruit exports was received on the 11 June 1974, and the request was approved by United Nations Industrial Development Organization (UNIDO) on the 4 October 1974 (Job description see Appendix 1).

Due to widened scope of activity, including the evaluation of possible integration of wooden box manufacture with a plywood industry to be erected, the Government requested for an extension of the project on the 4 March 1975, which was approved by UNIDO on the 17 March 1975.

The work was carried out at the office of OPYPA at the Ministry of Agriculture and Fisheries and was performed in close collaboration with the team formed by representatives of OPYPA, the National Industrial Technology and Productivity Centre and the Planning and Budget Office of the Ministry of Finance.

2.4 Objectives of the Project

The objective of the Project was to help the Government to determine which of the tenders received is economically and technically viable and to determine the best solution to the problems in the interest of the country, taking into account economic aspects as well as the quality of the wire-bound box manufactured. Selection of alternative technologies for manufacture should be established. Following aspects should especially be taken into consideration:

- a) Analysis of the bids presented indicating the technical viability of the process suggested in relation to the need for wire-bound boxes of acceptable quality;
- b) proposition for the best technical solution for a wire-bound box factory with regard to the wood to be used, production methods, treatment required, equipment involved, etc.;
- c) evaluate the alternatives and select the most convenient one taking into account the present availability of forest and human resources in Uruguay;
- d) formulate the final project for the installation of the factory incorporating the best tenders.

The significance to the country's economy would be, that based on the present imports of wire-bound boxes about US\$ 800,000 will be saved. By 1984 this amount would rise to the level of US\$ 4,000,000 (in present value). Possible utilization of wood species not at present utilized for industrial purposes to a greater extent, would give a stimulus for the development of industrial use of plantation forest's species at present mainly used for fuel.

This aspect was already raised by the French mission who, within the scope of the technical bilateral cooperation between France and Uruguay, visited the country in 1967 and 1969. The mission evaluated both the existing forest resources and forest industries and recommendations were given for future development. Among these recommendations the need of utilization of eucalypt species was underlined. Also the viability to start the manufacture of fruit boxes both for the internal market and the wire-bound boxes for exports was mentioned (Summary and Conclusions of the French Mission's report - see Appen. Six 8).

The Government contribution for the Project has been approximately US\$ 4,000 and the UNDP/UNIDO Contribution approximately US\$ 6,500.

The Project commenced on the 22nd February 1975, and was completed on the 8th April 1975.

3. FINDINGS

3.1 The Fruit Box Demand at Present and Forecasts for Future Development

The Citrus Development and the Small Farm Development Projects will increase the fresh fruit exports through the improvements of the present plantations and the introduction of new varieties. The estimated quick rise of mainly the citrus production will make it possible to increase significantly the exports. However, already the last year's developing export meant high rate increase of imports of wire-bound boxes mainly from Brazil.

Table 1 shows the export development 1970-1974 (boxes containing 17 to 18 kgs. citrus fruit).

Table 1

EXPORTS OF CITRUS FRUIT FROM URUGUAY 1970-1974

<u>Year</u>	<u>Number of wire-bound boxes</u>
1970	175.200
1971	278.400
1972	232.300
1973	569.500
1974	728,300
	(833.900) 1/

Source: Central Bank of Uruguay
Ministry of Agriculture and Fisheries

1/ Note that the total amount 1974 was 833.900 of which amount 61.000 wire-bound boxes were manufactured locally and 105.500 were card-board boxes imported.

The prices for imported wire-bound boxes have been continuously increasing. The present price for imported wire-bound boxes (March 1975) is US\$ 1.00. For card-board boxes the import price is US\$ 0.80. The import value of boxes for 1974 year's exports meant to the country a disbursement of foreign currency of US\$ 730,000.

Based on development plans for citrus plantations the needs of wire-bound boxes and smaller boxes for fruits were estimated in January 1974 by the Agriculture Policy

and Planning Office (OPYPA) at the Ministry of Agriculture and Fisheries, for the period of 1974 to 1984 and thereafter. (See Table 2). The implementation of the Citrus Development Project is proceeding as planned whereas the Small Farm Development Project is slightly behind the schedule. In any case, by 1978 the needed imports of wire-bound boxes for export of fruit would represent a value of US\$ 2,000,000 which will be affecting the balance of payments of Uruguay. The imported box has a value of approximately 25 percent of the total price of exported boxes including fruit. Local manufacture of boxes at possibly lower prices would benefit the fruit producers and contribute to a more profitable development of the Citrus Development Project.

The trend of development in substitution of wire-bound boxes with card-board boxes is difficult to establish for Uruguay as card-board boxes were used for the first time in 1974. It should be noted the existence of card-board box industries in Uruguay. One of them, Compañía Industrial Comercial del Sur S.A. (CICSSA), is manufacturing boxes according to international standards and seems to be dependent of exports as the internal market has always been too small for the capacity. The industry is able to deliver 100.000 boxes per month (and more) at competitive prices compared with import boxes. The production of card-board in CICSSA is, however, wholly based on imported semi-chemical pulps and thus only partially import substituting for boxes.

The present use (1972) of card-board boxes for fruits and vegetables in different countries is shown in Table 3. There seems to be a relation between the use of card-board boxes and the GDP per cápita rate although it is not valid for all the countries. Use of card-board boxes is also connected with the implementation of palletised transports. Furthermore, the card-board boxes must conform with international standards of suitability for sea transports to resist moisture and have strength for piling.

It is concluded that for a considerable period of years to come, the prevailing packaging method for fruit exports in Uruguay will be the wire-bound boxes. However, as the 1974 year's share of card-board boxes is approximately 13 percent, it may be right to assume a stable share of 10 percent in the coming development of fruit-box demand. This would place Uruguay on the same level with fruit exporting countries as, e.g. France, Greece and Italy.

Table 2

The estimated demand of wire-bound boxes
for fresh-fruit exports
(In thousand units)

Year	Wire-bound box ^{1/}			Total	Small boxes ² Southern Zone
	Citrus-fruit		Other fruits		
	Northern Zone ^{3/}	Southern Zone	Southern Zone		
1974	600	200	-	800	51
1975	1.060	240	130	1.430	284
1976	1.560	280	135	1.975	495
1977	2.280	320	140	2.740	744
1978	2.540	360	170	3.070	881
1979	2.700	400	200	3.300	992
1980	2.760	440	200	3.400	1.043
1981	2.920	480	240	3.640	1.200
1982	2.980	520	260	3.760	1.263
1983	3.030	560	260	3.850	1.300
1984	3.165	600	260	4.025	1.300
1985	3.165	600	260	4.025	1.300
etc.					

Source: Agricultural Policy and Planning Office (OPYPA)
Ministry of Agriculture and Fisheries

^{1/} Wire-bound boxes with volume for 17 - 20 Kg. fruit

^{2/} Small boxes with volume for 2 - 8 Kg. fruit

^{3/} Salto and Paysandu Departments

(amh)

Table 3

Use of wood and cardboard for fruit and vegetables
in different countries
(Year 1972)

Country	Wood (Percentage)	Cardboard (Percentage)
Algeria	100	0
Australia	60	40
Belgium	80	20
Bulgaria	95	5
France	90	10
Greece	90	10
Israel	80	20
Italy	90	10
Latin America	95	5
Marocco	95	5
Netherlands	50	50
New Zealand	60	40
South Africa	60	40
Switzerland	100	0
Tunisia	95	5
Turkey	95	5
United Kingdom	60	40
United States	50	50
Yugoslavia	98	2

SOURCE: UN Publication N° E.72.II.B.12

(amh)

The estimate for wire-bound box demand 1975 to 1986 and thereafter, with the above assumptions taken into account, is given in Table 4.

The demand of wire-bound boxes for citrus fruit in the Northern Zone, year 1977, is estimated to be 1.4 million boxes and in the Southern Zone, year 1981, 1.4 million boxes consisting of 0.6 million wire-bound boxes and 0.8 million stapled small boxes for fruit. The factory to be erected in the near future for the capacity of 1,500,000 boxes should start implementing two shifts work by 1978, to fill the demand for both zones. By 1981-1982 an additional factory mainly for the supply of the Southern Zone could be considered, especially if the demand for wire-bound boxes would increase faster than estimated.

3.2 Forest Resources, Raw Material Availability and Prices

3.2.1 Forest Resources and Out-Put

The plantation forests in Uruguay cover the total area of 133,400 Ha. (The General Agriculture Census 1970), representing 21 percent of the total forest area.

The distribution of main wood species as to the area is as follows:

100.000 Ha. of eucalyptus species
17.000 Ha. of pine species
9.000 Ha. of salix species
7.000 Ha. of other species

The main species within these groups are the following:

<u>Latin Name</u>	<u>Local Name</u>
Populus euramericana	Alamo híbrido
Populus deltoides	Alamo carolino
Salix alba var. calva	Saucealamo
Pinus radiata	Pino insigne
Pinus taeda	Pino taeda
Pinus elliottii	Pino elioti
Eucalyptus grandis	Eucalipto grandis
Eucalyptus globulus	Eucalipto blanco
Eucalyptus saligna	Eucalipto saligna
Eucalyptus tereticornis	Eucalipto colorado
Eucalyptus rostrata	Eucalipto colorado o rostrata
Pinus pinaster	Pinus marítima

Table 4
Estimate of net-demand of wire-bound and stapled wooden boxes year 1975 - 1986
(In 1,000 Units)

Year	Northern Zone ^{1/}		Southern Zone ^{2/}				Total	
	Large boxes for citrus		Large boxes for citrus and other fruits		Small boxes for fruit		Wooden boxes (Both zones)	
	Wire-bound wooden	Card-board	Wire-bound wooden	Card-board	Stapled wooden	Card-board	Wire-bound	Stapled
Actual demand 1974	728	106	-	-	-	-	728	-
Estimate for:								
1975	720	80	180	20	-	-	900	-
1976	954	106	333	37	-	-	1,287	-
1977	1,404	156	369	41	45	6	1,773	45
1978	2,052	228	414	46	252	28	2,466	252
1979	2,286	254	477	53	450	50	2,763	450
1980	2,430	270	540	60	666	74	2,970	666
1981	2,484	276	576	64	792	88	3,070	792
1982	2,628	292	648	72	891	99	3,272	891
1983	2,682	298	702	78	936	104	3,384	936
1984	2,727	303	738	82	1,080	120	3,465	1,080
1985	2,844	316	774	86	1,134	126	3,618	1,134
1986 etc.	2,844	316	774	86	1,170	130	3,618	1,170

Source: Based on information from Ministry of Agriculture and Fisheries (1975)

1/ Mainly the western part of the Departments of Salto and Paysandú.

2/ Mainly the Departments of San José and Canelones.

75 percent of the plantation forests in the country are eucalyptus species, whereas pines and salix represent 13 percent and 6.5 percent, respectively, of the total (see Table 5). The plantation forests of mainly pines in the Southern part of the country are often planted on the dunes for soil conservation and as wind-breaks. The eucalyptus species are mainly situated in the Northern area. The distribution of plantation forests in different districts of Uruguay and also the citrus expansion area is shown on the map Appendix 2. The Government has also initiated and started a Development Plan for plantation forests including the Paysandú district (see map Appendix 3). For the establishment in the Southern area, with mainly coniferous forests, a loan from the Inter-American Development Bank has been requested. For the Northern area the tax exemption law for forest plantations is applied. The Northern area will contain mixed coniferous and eucalyptus forests. The Paysandú district will give in the future a considerable output of raw material for industrial purposes.

The possible out-put of the present plantation forests in Uruguay is approximately 1.6 million m^3 solid volume annually. Thereby, log diameters from 10 cms. and up are considered. Taking into account forest areas exceeding 20 Ha. the utility round-wood in Uruguay is estimated at approximately 860.000 m^3 annually. (See Table 6). Although this estimate was made by the French Mission for Technical Cooperation 1969, it is still valid as the total forest area has not changed significantly since then.

3.2.2 Raw Material Utilization and Availability

The utilization of local wood species between 1950 and 1965 was also established by the French Mission for Technical Cooperation (see Table 7). Already for the period 1963-1965 it was found, comparing wood availability and utilization, that eucalyptus species were in abundance while pine species and especially salix were in deficit.

A large part of the consumption has been traditionally covered by considerable imports. The production, imports and consumption of the main forest products expressed in m^3 round-wood solid volume for the year 1968, is given in Table 8. The development of imports of forest products to Uruguay, expressed in round-wood equivalent, during the period 1964-1973 is given in Table 10. The installed industrial capacity (see Table 9) was only partially utilized.

Table 5

Distribution of plantation forests in Uruguay
on species and areas

Wood specie	Area in ha.			Percentage		
	1961	1966	1970	1961	1966	1970
Eucalypts spcs. 1/	101.274	112.426	99.620	73.9	75.8	74.7
Pinus spcs.	14.051	16.105	17.181	10.2	10.9	12.9
Poplar spcs.	6.758	5.422	5.260	4.9	3.7	3.9
Willow (salix)	2/	4.476	3.520	2/	3.0	2.6
"Paraiso" 3/	3.154	1.956	1.787	2.3	1.3	1.3
Other wood spcs.	11.879	8.002	6.017	8.7	5.3	4.6
Total	137.116	148.387	133.385	100.0	100.0	100.0

Source: General Agricultural enumerations year 1961, 1966, 1970.

1/ The general distribution of eucalypt species is:

- approx. 50% Eucalyptus globulus in the southern and central parts of the country.
 - 10% Eucalyptus rostrata and teriticornis in the northern and western areas.
 - 10% Different euc. species with eucalyptus saligna predominating in the northwest area.
- See also the Map on plantation distribution.
Appendix 2.

2/ Included in not specified.

3/ Melia azederach.

(amh)

Table 6

Possible output of plantation forests in Uruguay

Wood species	Average increment for ϕ 10cm and up m^3 /ha/year (incl.bark)	Area (ha)	Average age years	Standing total volume m^3 s (incl.bark)	Rotation cycle years	Annual output possibilities m^3
Eucalypt spcs.	15	50.000	20	15000.000	15	1000.000
	<u>15</u>	<u>50.000</u>	<u>10</u>	<u>7500.000</u>	<u>15</u>	<u>500.000</u>
Sub-total		100.000		22500.000		1500.000
Pine spcs.	12	20.000	10	2400.000	20	120.000
Salix spcs.	10	7.000	5	350.000	10	35.000
Other spcs.	2	16.000	15	480.000	30	16.000
Total		<u>143.000</u>		<u>25730.000</u>		<u>1671.000</u>

Source: Report of R. Dubois 1969 - "Industrias y Comercio de la Madera en Uruguay".

Note: For industrial use the log supply will come from forests having an area exceeding 20 ha. These "larger" forest comprise following area from the total:

- 50% plantation forests of Eucalypt spcs.
- 60% plantation forests of Pine spcs.
- 70% plantation forests of Salix and other species.

With this background following total amounts of utility roundwood may be available in Uruguay per annum:

750.000 m^3 Eucalypt spcs.
 72.000 m^3 Pine spcs.
 25.000 m^3 Salix spcs.
 11.000 m^3 Other wood species

or approx. 860.000 m^3 roundwood solid volume annually.

(amh)

Since 1968 only two larger enterprises have additionally started operation: one pulp-mill with a capacity of 50 ton/day of chemical pulp and one, particle-board factory, with a capacity of 12.000 m³/year. Especially the pulp-mill is contributing to a better utilization of the available eucalyptus species.

The Government's policy has been guided towards the increase of utilization of wood from plantation forests.

The present situation (1973) in production, imports and consumption is given in Table 11. Although there has not been any change in the total consumption since 1968, there has been a remarkable increase in the utilization of locally grown wood to fill the consumption. When in 1968 only 38 percent of industrial round-wood was covered from domestic sources, this had increased by 1973 to 56 percent. The coniferous wood species were representing 73.000 m³ from the total of 212.000 m³ round-wood, and e.g. the saw-mills are now covering more than 70 percent of their raw-material needs from domestic raw material sources. The same trend seems to have continued after 1973.

For sawmilling, but also for veneer and plywood manufacture, dimensions exceeding 20 cms. in diameter of mainly pine and salix species are desirable. It is obvious that this demand is reflected in the price pattern on the different wood species and diameters. Considering the real availability of industrial round-wood at present (1975), it should be taken into account that since the enumeration (1970), large amounts of better quality round-wood of pine, poplar and salix have already been utilized(*). It has to be noticed, further, that pines in the coastal area, planted for soil conservation and shelter purposes, have not been pruned and thinned hence the shape is often bad with short log lengths. It is, therefore, only a minor part of output from this area which gives logs of medium quality and diameters above 20 cms., which are suitable for peeling of veneers with acceptable quality. This is also reflected in the high prices which the veneer and plywood manufacturers pay for the usable wood species for peeling purposes.

Until the new plantation forests of pine species have started to give an out-put of timber, it is obvious that pines, salix and poplar should be utilized by the already operating industry and be used for construction and joinery purposes.

(*) Confirmed through enumeration 1974 by Min. of Agriculture around Libertad (120 kms. distance around the

Table 7

Utilization of local wood species in Uruguay

Purpose of utilization	Wood Species	Average use 1950-52		Average use 1956-58		Average use 1963-65	
		In 1000m ³	%	In 1000m ³	%	In 1000m ³	%
<u>Fuelwood and charcoal production</u>	Eucalypt spcs.	350	50	500	50	500	60
	Indigenous spcs.	350	50	500	50	300	40
Sub-total		<u>700</u>	<u>100</u>	<u>1000</u>	<u>100</u>	<u>800</u>	<u>100</u>
<u>Forest industries</u>	Pine spcs.	66	67	50	52	60	40
	Eucalypt spcs.	19	19	27	28	60	40
	Salix spcs.	13	14	18	20	30	20
Sub-total		<u>98</u>	<u>100</u>	<u>95</u>	<u>100</u>	<u>150</u>	<u>100</u>
<u>Total use of local wood species</u>	Indigenous spcs.	350	43.7	500	45	300	32
	Pine spcs.	66	8	50	4.5	60	6
	Eucalypt spcs.	369	46	527	48	560	59
	Salix spcs.	13	2.3	18	2.5	30	3
<u>Total</u>		<u>798</u>	<u>100.0</u>	<u>1.095</u>	<u>100.0</u>	<u>950</u>	<u>100</u>

1/ Note all quantities in m³ are given in solid volume roundwood.

Comparison between wood availability and utilization
(For 1963/65)

Wood Species	Availability of roundwood for "industrial" use in m ³ per annum	Utilization 1963/65 in m ³ per annum	Balance in m ³ per annum
Eucalypt spcs.	750.000	560.000	+ 190.000
Pine spcs.	72.000	60.000	+ 12.000
Salix spcs.	25.000	30.000	- 5.000

Source: Report of E. Dubois 1969 "Industrias y Comercio de la Madera en Uruguay".-

(anh)

Table 8

Production imports and consumption
of main wood-products 1968
(Expressed in round-wood equivalent)

Products	Production		Imports		Consumption ^{1/}	
	1000m ³ r.w.eq.	%	1000m ³ r.w.eq.	%	1000m ³ r.w.eq.	%
Pulp and paper	15	10	135	90	150	100
Fibre-board	7,9	99	0,1	1	8	100
Particle-board	3	100	-	0	3	100
Plywood and veneers	2,5	33	5	66	7,5	100
Sawn-wood	110	53	100	47	210	100
Round-wood	13,6	78	3,9	22	17,5	100
Total industrial wood	152,0	38	244,0	62	396,0	100
Fuel-wood	800,0	100	-	0	800,0	100
Grand total	952,0	80	244,0	20	1.196,0	100

Source: Report of R. Dubois 1969 - "Industrias y Comercio de la la Madera en Uruguay".

^{1/} Note that exports of wood or wood products do not exist from Uruguay.

(amb)

Table 9

Production capacity of forest industries
in Uruguay 1968

Wood-mechanical industries

Estimated capacity at 2.000 working hours per annum:

Saw-mills	.....100.000 m ³	sawn wood
Plywood	..... 15.000 m ³	
Particle-board ^{1/}	..... 2.500 m ³	
Fibre-board	..... 2.500 tons	
Preservation ^{2/}	..... 4.000 m ³	poles and posts

^{1/} Note that this particle-board factory has ceased the activity but a new one with the capacity of 10.000 m³ started operation 1971.

An additional plant with the capacity of 15.000 m³ annually is under planning for Paysandu area, utilizing mainly pine species (West-German BISON - method).

^{2/} Additional three impregnation plants have since 1968 come in operation using vacuum-pressure treatment of eucalyptus with copper-arsenate salts.

Wood-chemical industries

For pulp and paper-industry it is estimated capacity at 300 working days per annum:

<u>Pulp-industry</u>	.....	14.500 tons.
devided on:		
Chemical short-fibre pulp ^{1/}	.....	8.000 tons.
Semi-chemical short-fibre pulp	.....	4.000 tons.
Mechanical pulp	.....	2.500 tons.

^{1/} Note that this capacity has been increased with 15.000 tons. (50 tons/day) 1974 through installation of continuous KAMYR-process for utilization of eucalyptus in Colonia.

Paper and paper-board

.....	55.000 tons.
devided on:	
Printing papers	..... 16.500 tons.
Wrapping paper	..... 19.000 tons.
Paper-board	..... 7.750 tons.
Hygienical papers	..... 6.750 tons.
Other papers and boards	..... 5.000 tons.

Table 10

Imports of forest products to Uruguay
(Expressed in roundwood equivalent m³ solid volume)

Items/Year	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
<u>Roundwood in logs</u>	<u>30.797</u>	<u>34.559</u>	<u>27.808</u>	<u>36.731</u>	<u>20.601</u>	<u>13.000</u>	<u>41.664</u>	<u>16.759</u>	<u>2.207</u>	<u>13.583</u>
<u>Sawn-wood and wood-based panels</u>										
Coniferous species	126.189	55.230	104.919	78.961	57.877	67.029	98.580	79.081	49.912	43.953
Railway sleepers	8.214	-	175	-	-	4.708	56	-	1.750	7.980
Plywood and other boards	32	14	-	-	-	-	-	-	-	-
Veneers	5.003	3.718	4.429	4.290	4.760	3.243	5.117	5.250	5.291	4.404
<u>Sub-Total</u>	<u>139.438</u>	<u>58.962</u>	<u>109.523</u>	<u>83.251</u>	<u>62.637</u>	<u>74.980</u>	<u>103.753</u>	<u>84.331</u>	<u>56.953</u>	<u>56.337</u>
<u>Pulp and Paper</u>										
Mechanical pulp	2.535	834	1.318	1.626	250	499	1.063	1.709	1.877	1.522
Chemical pulp	81.168	50.828	66.077	41.085	78.850	47.359	43.961	54.163	40.134	39.902
Newsprint	66.833	50.140	45.063	42.364	17.791	66.268	56.714	61.894	35.148	30.877
Writing and printing paper	1.625	574	273	179	1.900	3.420	3.703	2.667	1.655	2.419
Other paper qualities	2.009	1.118	575	1.138	813	1.879	2.157	4.797	1.385	21.346
Card-board	381	716	205	242	120	207	157	169	93	110
<u>Sub-Total</u>	<u>154.551</u>	<u>104.210</u>	<u>113.511</u>	<u>86.634</u>	<u>99.724</u>	<u>119.632</u>	<u>133.557</u>	<u>125.399</u>	<u>80.292</u>	<u>96.186</u>
<u>Grand Total</u>	<u>324.786</u>	<u>197.731</u>	<u>250.842</u>	<u>206.616</u>	<u>182.962</u>	<u>207.612</u>	<u>278.974</u>	<u>226.489</u>	<u>139.452</u>	<u>166.106</u>

Source: Central Bank of Uruguay

Table 11

Production, imports and consumption of
main wood products - 1973

(Expressed in round-wood equivalent)
 Solid volume

Products	Production		Imports		Consumption 1/	
	1000m ³	r.w.eq. %	1000m ³	r.w.eq. %	1000m ³	r.w.eq. %
Pulp and paper	27	22	96	78	123	100
Fibre-board	4	100	-	0	4	100
Particle-board	11	100	-	0	11	100
Plywood and veneers	7	58	5	42	12	100
Sawn-wood	138	71	57	29	195	100
Sleepers	-	-	3	100	8	100
Round-wood	25	100	-	-	25	100
Total industrial wood	212	2/	166	44	378	100
Fuel-wood	820	100	-	-	820	100
GRAND TOTAL	1.032	86	166	14	1.198	100

Source: Central Bank of Uruguay

Ministry of Agriculture and Fisheries

- 1/ Exports from Uruguay of wood products are negligible.
 2/ Note that coniferous wood species amounted to 72.500 m³.

From the point of view of the raw material for fruit-box manufacture, it is therefore recommended to concentrate the efforts on the utilization of the eucalyptus.

It should be also noted that when the Salto Grande Hydroelectric Project has been finalized and the filling of the dam is completed by 1979-1980, an area of approximately 500 Ha. of eucalyptus plantation forests will be submerged by water. This area consists mainly of 13 year old eucalyptus and represents a total volume of approximately 100.000 m³ round-wood solid volume ("low estimate" of Forestry Department). Obviously, it is of national interest to utilize these round-wood amounts with preference for industrial purposes, if possible.

3.2.3 Raw Material Prices, Logging and Transport Costs

The logs are normally purchased on root and following medium prices, for mixed diameters, are paid for different wood species:

<u>Wood Specie</u>	<u>Price on root</u>	
	per m ³ solid	
	<u>Pesos</u>	<u>US\$</u>
Eucalyptus colorado	6,000	3:00
Eucalyptus glob., saligna	18,000	9:00
Pines and Poplar	27,000	13:50
Salix (willow)	24,000	12:00

These prices may show a considerable variation in different parts of the country, depending on the availability, demand and diameters.

The logging and transport costs are difficult to establish as a medium value, due to the fact that only a few of larger forest industries have their own logging activity. The majority of the enterprises use contractors, both for logging and transports. This is also influencing the quality of logs delivered, because c.g. the cross-cutting of logs is mostly carried out for "filling the trucks" and not as to the most suitable length depending on the quality of the logs. This also depends on general lack of trained forest labour.

The figures given below show the logging and transport costs for some of the larger industries with own logging activity:

<u>Operation</u>	<u>Costs</u>	
	<u>per m³ solid</u>	
	<u>Pesos</u>	<u>US\$</u>
Felling, limbing, cross-cutting, loading	7,000	3:50
Transport costs: 50 Kms.	7,000	3:50
100 Kms.	15,000	7:50

For the economic evaluation, the log prices were required free factory and were established at a level considering also the information above.

3.3 Technical Evaluation of the Proposals for Wire-Bound Box Manufacture

3.3.1 Manufacturing Process of Wire-Bound Boxes

In the following paragraph the manufacturing process for wire-bound boxes is described. Alternations may be possible, but the described process is applied for good quality boxes.

Logs are generally brought to the log-yard by special trucks equipped with devices for loading and unloading the logs. Depending on the amount of timber to be processed, logs are handled either by manual rolling by labour, transporting by bogeys on rails, transporting by lift-trucks or transporting by chain conveyors.

The barking is necessary before peeling the veneers to avoid excessive wear of tools and breakages that may be caused by stones embedded in the bark, especially in wood species such as pines. The method of barking will depend on the quantity of logs to be peeled and also on the log lengths and diameters.

For up to 10 m³ per day, barking can be done with an axe or with special hand tools (bark strippers).

For 10 - 25 m³ per day, portable barking machines with travelling, percussive or other blades could be used.

For 15 - 50 m³ per day, discontinuous debarking machines with manual adjustment of the log are used.

For over 50 m³ per day, a continuously operating automatic debarking machine with a cutting head or rotating ring (with debarking tools) should be used.

Barking is normally done before the cross-cutting of logs is carried out.

Many species of wood can be peeled without special pre-treatment if logs are fresh or are kept in water. Other species, especially hardwoods, must first be steamed or immersed in hot water.

Peeling and clipping are frequently combined. The peeling lathe is often supplied with setting knives that cut cross-wise in the wood to a depth slightly greater than the thickness of peeled veneers. Two knives are set to trim the edges of the billets and between them other knives can be installed to give two or three bands of veneer.

In practice there are two categories of peeling lathes that produce veneer for wire-bound boxes:

- a) Large peeling lathes with a working width of 1.20 m. - 1.40 m. which can take wood of 0.80 m. or even sometimes 1.00 m. in diameter and can process 15 - 30 m³ per day with a yield of approximately 60 percent. The cores have a diameter of 14 cm.
- b) Small peeling lathes with a working width of 0.60 m. - 0.80 m., that can take wood up to 0.50 m. in diameter and process 7 - 15 m³ of logs per day with a yield of approximately 60 - 70 percent. The cores have a diameter of 8 cm.

Peeling lathe for production of wire-box veneers with the working width of 1.2 - 1.4 m. can peel economical logs with a minimum diameter of 30 cm. while the lathe with the working width of 0.60 - 0.80 m. has the minimum economical log diameter of 20 cm.

Slicing method can also be used for manufacture of veneers either using a vertical slicing machine, on which the knife reciprocates vertically but cuts only on the downstroke, or the rotary slicer which consists of the large diameter (3 - 5 m.) flywheel in which there are openings with knives. However, these slicing methods give

a lower yield of the final product and can be mainly used on homogeneous woods species which is not the case with, e.g. eucalyptus.

Clipping of veneers for box manufacture is carried out either with knife clippers with intermittent vertical movement or with the rotating clippers on the so called "back-roll". The "back-roll" method has the advantage that it eliminates the need to handle the sheets of veneers between the peeling and clipping operations and produces widths of accurate dimensions. However, it calls for great precision in the manufacture of rollers and different rollers are required for each thickness and each widths of veneers. It requires also very powerful machinery - about 75 percent of the power needed for the peeling process itself.

Sawing of logs or larger cores to boards for lathes and strips is made either in a bandsaw or in a circular "break-down" saw with double-blades which are adjustable for different diameters. The block received is then resawn in multi-blade resaws to boards of suitable thickness. Also small gang-saws (frame-saws) can be used for resawing cores and smaller logs.

After drying, the boards are cross-cut, mitre cut on a machine with two circular sawblades inclined at 45° and resawn into cleats. A special machine for manufacture of cleats is used for larger capacities.

The elements for manufacturing of wire-bound boxes must be dried. All attempts to make wire-bound boxes with green wood have been unsuccessful, especially because of the considerable risk of attack by fungi when wire-bound boxes made from green wood are stored flat. With several wood species even distortion can appear through warping under storage and drying of already assembled box ends and sheets.

The peeled veneers for boxes are dried normally in roller dryers.

The boards or square stock for the cleats can be either air-dried or dried artificially in continuous or compartment kilns.

If labelling of ready boxes is not used, the side veneers or box-ends are printed with the text required in a multi-colour printing-machine prior to the assembly.

Assembly of wire-bound boxes is carried out on two lines for "sheets" and box-ends.

The "sheets" which consist of sides, top and bottom panels connected together by wires, are made on two successive, synchronized machines. The first machine is multiple-head, variable-pitch stapling machine that operates with continuous advance of the wooden elements. The cleats (lists) and shooks (veneers) are placed in the jigs either by hand or automatically from magazines. The reinforcing wires are fed continuously from reels holding 500 - 1.000 Kg. of wire. The veneers (or plywood) and the wires pass together under stapling heads, which simultaneously staple the frame wires and the veneers to the cleats and intermediate wires to the veneers. A section of wire is left between each case just long enough to make the loops at the ends of the two cases. The stapling machine is capable of inserting staples at predetermined positions, regardless of the pitch of the successive movements and can operate at a speed of 500 strokes per minute. From the stapling machine the sheet passes into the second machine, which operates intermittently. Here the wires are cut by shears, mandrels shape the loops and clinch the ends of the wires into the boards.

The ends of the boxes are manufactured on identical machines.

On leaving the second machine the ends are placed by hand on the sheet and fixed down on one side only by bending over one of the end loops.

The flat cases are then placed in bundles and strapped together. When manufacturing a single-width sheet, the wire-bound box machine can produce between 4.000 and 6.000 boxes, such as citrus fruit boxes, per day, or twice as many when producing a double-width sheet.

The smallest mechanized unit for wire-bound boxes is thus the one utilizing the single sheet machine with the production of 5.000 cases per day representing an output of 1 - 1.2 million boxes per year and having a consumption of 30 m³ logs per day. This log consumption corresponds

to the raw material needed for citrus fruit boxes for approximately 20 Kg. fruit. The raw material need per box is 4.2dm^3 of logs for peeling and 1.8dm^3 of logs for sawing, assuming logs of good quality and proper diameters.

The principal lay-out including the material-flow for wire-bound box manufacture is shown in Appendix 6. The principle of wire-bound box is shown in Appendix 7.

This technical background given above is taken into consideration when assessing the technical viability of the different proposals, together with assessments of the raw material availabilities given in paragraph 3.2.

3.3.2 Dimensions for Wire-Bound Boxes for Citrus Exports

The dimensions of the wire-bound boxes given by the Citrus Board (Comisión Honoraria Nacional del Plan Citrícola), are at present the same as in Argentina and Brazil, i.e. 46 cm. x 27 cm. x 27 cm. The boxes' sizes are internationally not standardized yet and are depending on the pallets' standards, which are not final yet either. The International Union of Railways has established a pool of pallets in Western Europe based on the dimension of 800 x 1.200 mm. The pallet most commonly used internationally has, however, the dimensions of 1.000 x 1.200 mm.

The United Nations Economic Commission for Europe (ECE) Resolution N° 203 prescribes the dimensions for packing cases for fruits and vegetables, which suit to the main dimensions of pallets, and that are as follows:

60 x 40 cm.

50 x 30 cm.

40 x 30 cm.

50 x 40 cm.

In European countries fruits and vegetables are packed in boxes of many different dimensions, with the variation from 43 x 30 cm. to 60 x 46 cm. Only in France fruits and vegetables of all sizes are packed in boxes of only two basic dimensions, 57 x 34 cm. and 50 x 30 cm. The last dimension fits very well to the ECE Resolution N° 203 and utilizes the area of main pallet dimensions between 94 percent to 100 percent. As France is one of the main export markets for Uruguay it could be considered that the fruit

box size for Uruguayan exports in general could be established at the size of 50 x 30 cm.

3.3.3 General Characteristics of Wood Species for Box Manufacture

In principle all species used for manufacture of plywood can be used for manufacture of wire-bound boxes. Poplar, pine and beech are the main species used in Europe.

Generally, woods with a density of 400 to 800 Kg./cm³ (absolutely dry weight) can be used for box manufacture, the main characteristics being:

Density (abs. dry weight)	400 - 750 Kg./cm ³
Bending strength:	
Breaking strain	600 - 1.400 Kg./cm ²
Modulus of elasticity	80.000 - 140.000 Kg./cm ²
Compressive strength:	
Breaking load	350 - 600 Kg./cm ²

The wood with higher density increases the resistance to the extraction of nails but it is also more difficult to nail and staple it. There is also more tendency for distortion and splits.

If the moisture content of wood is above 20 - 22 percent, it can be attacked by fungi. Most of the countries prohibit the use of most common preservatives, used against the fungi attacks of wood, in contact with foodstuffs.

The high humidity of wood is also a corrosive agent which can affect the staples and nails, reducing the strength of the box.

Some of the species, e.g. *Pinus pinaster* (Pino maritima) may include high amounts of resin and may transmit odour to fruit and also make the workability more difficult.

The pines (other than *Pinus pinaster*), poplar and willow in Uruguay have generally the same characteristics as the same wood species grown in Europe. They would be suitable for manufacture of wire-bound boxes; poplar and willow without pre-treatment before peeling if logs are brought green to the factory. However, their availability is scarce, as elaborated under section 3.2.2.

The eucalyptus species, as many of hardwoods, need pre-treatment with steam or hot water. Within the French-Uruguayan's technical cooperation experiments, carried out in 1968 at the Centre Technique Forestier Tropical (CTFT), regimes for peeling conditions were established. These experiments were later continued through the collaboration of the French firm for wire-bound box machinery and one of the Uruguayan box manufacturers (Campichuelo S.A.).

The main characteristics established by C.T.F.T. for *Eucalyptus rostrata* and *treticornis*, are the following:

Density (abs. dry weight)	650 - 700 Kg./m ³
Bending strength:	
Breaking strain	1.400 - 1.700 Kg./cm ²
Modulus of elasticity	130.000 - 150.000 Kg./cm ²
Compressive strength:	
Breaking load	600 - 700 Kg./cm ²

It can be concluded that, as to the technical properties, *Eucalyptus rostrata* and *treticornis* are well suited for box manufacture under the pre-condition that pre-treatment of logs, necessary for good peeling properties, is adapted.

3.3.4 Technical Evaluation of Proposals

When the tender for the bids for erection of factory for wire-bound boxes was closed in July 1974, the 14 following bids were lodged with the Ministry of Agriculture and Fisheries:

1. CICSSA
2. Madereras Paysandú Ltda.
3. Campichuelo S.A.
4. Pedro A. Gutiérrez
5. Boqui S.A., Notable S.A., etc.
6. B. Bavosi e hijos
7. Embanova S.A.
8. Industria Maderera del Norte
9. Aserradero Battaglino
10. Maderera Soriano
11. Esteras Castell S.A.
12. Asociación de Industriales de la Madera y Afines del Uruguay
13. Darricarrere - Solari
14. Gustavo Pérez

Several of the firms above did not include concrete proposals for erection of factory for wire-bound boxes and therefore the Ministry of Agriculture and Fisheries selected following enterprises for the evaluation:

1. Campichuelo S.A.
2. Boqui S.A.
3. Industria Maderera del Norte
4. Esteras Castell S.A.
5. Asociación de Industriales de la Madera y Afines del Uruguay
6. Darricarrere -- Solari

In addition to the firms above, the primary technical evaluation included also the firm Melvi S.A. A summary of the main features in the proposals from three of the enterprises is given in Appendix 9. The points listed are necessary both for the technical and economic evaluation in addition to the information about the legal and administrative organization, the financial structure and set-up, etc.

Considering the factors above, three firms could not be taken in the further evaluation for following reasons:

Boqui S.A.

The proposal included a box type without wire, whereas wire-bound box was prescribed. It is questionable whether it would be accepted by the fruit-importing countries. No specification was given for the process technology, cost calculation, factory lay-out, requirements of personnel and localization. Furthermore, information was not given about the raw material supply area and vague indication on wood specie to be processed.

Esteras Castell S.A.

The localization of plant in Montevideo area is a definite disadvantage both from point of view of the raw material supply and the citrus expansion area. As to the raw material it is suggested to process willow (saucealamo) which already now is in shortage, especially for diameters exceeding 20 cm. The proposal does not give information about possibilities to receive the needed quantities of logs. The personnel is not specified and the technological process with missing lay-out is unclear, especially with reference

to drying of veneers and sawn-wood for cleats. The cost calculation is not sufficient and the information about the financial organization of the activity is incomplete.

Melvi S.A.

The localization is given to San José where the firm started in September 1974 to operate a small plant for manufacture of boxes. The production of wire-bound boxes Oct.-Dec. 1974 was 61.000 units. The raw material is claimed to be secured through the contract with Mayo S.A. plantation, and as main species for box-production are given: poplar, willow (Sauce-álamo), eucalyptus and pines with diameters exceeding 15 cm. This area is a definite deficit area for these species with the exception of eucalyptus with smaller diameters. Thus it is not sure whether the firm has the possibility to receive the needed quantities of dimensions needed for peeling and in any case for considerably higher prices than the medium ones. No specification is given as to the estimated size of production nor about the buildings and personnel. Basic machines are listed without information on manufacturing process, especially considering that the firm includes also eucalyptus within the raw materials to be utilized. Cost calculation for box manufacture is not elaborated and the financial aspects of investments are incomplete.

The following technical and economic evaluation was considering the other proposals which were more complete as to the organization, financing of activity, rawmaterial sources, technology of manufacture and not at least cost estimates. This evaluation was carried out with the following four firms:

Asociación de Industriales de la Madera y Afines del Uruguay

Darricarrere - Solari

Industria Maderera del Norte

Campichuelo S.A.

Discussions were held with the representatives of these firms on both economic and technical aspects and additional economic and technical information was received as supplement to their original proposals. In the supplementary information changes in both financial and technical aspects were permitted. The main features of the final proposals are given in Appendix 10.

Asociación de Industriales de la Madera y Afines del Uruguay

The localization of this factory is given as to South of San José with raw materials being: poplar, pine and willow (Sauce-álamo). In spite of long-term agreements with forest owners it is doubtful whether the raw material amounts needed can be received without the rise of present price level due to the shortage of these species in larger diameters. As the manufacturing process proposed needs continuous supply of green logs, own logging activity should have been included in the proposal. The area of the factory is too small and the material flow unclear. The estimated log consumption per box is too low. The manufacturing process can be carried out with the machinery proposed, however the peeling of different wood species calls for different peeling regimes and may give variations in veneer quality. The drying-technique suggested for the wire-bound sheets (box-sides) and box-ends is doubtful. The different thicknesses in veneers and lists will dry unevenly and give tensions in the materials with possible distortion as a result. In the new proposal the technology was changed as to utilizing the drier for veneers and lists and carry out the assembly of boxes with dry materials.

The proposed treatment of veneers and lists with pentachlorophenate sodium salts against fungi (blue stain) is prohibited in many of the importing countries where wood may come in contact with fruits. This is not needed if drying is used and moisture content brought under 20%.

It seems that box-shooks and box-ends are stored separately as mounting of box-ends to shooks is not given.

For transport only hand-operated lift carriages are proposed and the amounts to be stored are not estimated. The storage area is small and the large amount of boxes to be stored, due to the concentration of citrus box deliveries to 6 to 7 months, (See Appendix 4) is not considered. The economic part as to the building-machinery-and labour costs was brought on the present level compared with the original proposal.

- Main shortcomings

a) Proposed raw material-wood species which are already in big shortage.

b) Logging activity and transports are not included in the factory set-up. (The possibly participating forest plantation owner would cater for it).

c) Several points in the proposed manufacturing process:

- The peeling of different wood species for same end-use,
- The proposal to dry the already assembled box-shooks and box-ends,
- Treatment of veneers with pentachloropentate sodium salts.

Darricarrere - Solari

The final proposal considers the localization of industry at Paysandú, instead of San José, depending on both the present and future raw material availability and the expansion of the citrus planting area. It is assumed that long-term agreements with or participation of forest growers in the enterprise will guarantee the raw material supply. The logging and transport activities would be carried out by forest owners securing an even supply of green logs to the factory. It would however be advisable to have own logging and transport activities to be sure both on quality of logs and the amounts needed for production as the amount of trained forest labour is scarce in the country.

Darricarrere has also seriously considered the raw material supply question planning to establish own forest plantations of approximately 300 ha. in Paysandú area.

Following relation of wood species for box-manufacture is considered:

Year	Pines	Poplar, willow (Salix)	Eucalyptus saligna-grandis
1975 - 1980	20-25%	40-50%	25-30%
1980 - 1985	20-25%	20-25%	50-60%

It seems that Darricarrere are themselves aware of the scarcity of mainly salix species and the need to utilize to a greater extent the available eucalyptus (in the original proposal preference was given to poplar and salix).

In general the production should be based mainly on eucalyptus, especially as there is a general scarcity of pines and willows (salix) in peeling dimensions. In the economic evaluation 50% of eucalypt rawmaterial is therefore assumed.

The material flow is not quite good. The intended steam treatment of logs is planned only for periods when there is a risk for the logs to dry. However, peeling of eucalyptus needs steaming as pre-condition to receive good peeling results. As there is no dryer for veneer and wood included, "dipping" of veneers with borax sodium salt solution is suggested. Even if this salt may be accepted for fruit boxes in several importing countries, the procedure is questionable as the veneers have to be printed before assembly and the printing results on wet veneers will not be of good quality. The general machinery set-up is otherwise acceptable. The material-flow does not include the mounting of box-ends to sheets (box-sides) which indicates that storage is not made with finally assembled boxes. The storage space at the factory is not sufficient, especially considering the need of air-drying and also the slow drying rate during the autumn and winter seasons. Especially for this period the stock of ready boxes must be high due to the citrus exports' season which is concentrated to the period between June and December (See Appendix 4).

The proposal gives a proper scheme for implementation and includes also the integration of the production with manufacture of pallets. This is a good approach for leveling out the production "downs" in box manufacture and also for general economy. An indicative market investigation, including own needs, the beverage industry and the harbour's requirements, gives at hand that the proposed production of 30.000 pallets would cover these market requirements.

The information was given that there exists a Uruguayan patent on the wire-bound box owned by one of the proposed groups' members. A minor royalty (2-3%) would be charged for this patent but kept by the company itself. It is, however, doubtful whether this patent has the possibility to be kept up-right, if it is on the box in general and not on some less important detail.

Also the economic part as to the financing, investments in buildings and machinery was brought on the present level compared with the original proposal.

- Main shortcomings

- a) Proposal to work with mixed softwood and hardwood species in periods which requires different regimes in peeling, steaming, etc.,
- b) Pines and willows (salix) for peeling in diameters of 20 cms. and more are already in high demand and are transported to the plywood industries from long distances. The larger dimensions are also needed for sawmills,
- c) Lack of continuous steaming facility necessary for pre-treatment of eucalyptus logs to receive good quality veneer,
- d) Lack of dryer for veneers and timber for cleats,
- e) Treatment of veneers with borax sodium salts.

In spite of the shortages above the proposal has been well elaborated and other parts of production are well considered.

Industria Maderera del Norte

In principle this proposal is sound from the technical point of view as it integrates the box manufacture with the existing plywood industry, which also includes manufacture of other products, in case the box factory is situated in Bella Unión.

In the Northern part of the country there is a good supply of different species of eucalyptus, mainly *Eucalyptus rostrata*, but quite small amounts of poplars.

The proposal suggests as raw material the use of both *Eucalyptus globulus* and poplar, whereby these wood species have to be transported from the Middle and Southern regions to Bella Unión. Therefore, the alternative of possible erection of factory in Paysandú is more favourable. Peeling of mixed species is a disadvantage. For peeling of eucalyptus pre-treatment of logs is needed to receive good quality veneer, which is not included in the proposal. The logging and transports are carried out either by the forest owners or by a transport firm. To be secured of receiving continuous log supplies to the factory, own logging and transport activity has a definite preference.

The box-ends are suggested to be made of plywood. This is an advantage both for the appearance of the box and for its strength properties. A lay-out of factory has not been submitted but the list of machinery gives by hand that both the quality and kind of machines is sufficient for the proposed production.

The dryer for veneer and sawn-wood for the cleats' production was not given in the original proposal but included in the final proposal to receive better quality of product.

The area given for the factory and for storage is insufficient, especially considering the need of several months' storage of ready boxes.

Also the economic part was brought on the present level with changes in foreign loan arrangements, building and machinery costs, etc.

- Main shortcomings

- a) Long transport distance for raw-material,
- b) Lack of own logging and transport activity,
- c) Utilization of mixed wood species of which poplar is quite scarce in dimensions suitable for peeling,
- d) Pre-treatment for eucalyptus, which is necessary for good peeling results, is not suggested.

Campichuelo S.A.

The original proposal from Campichuelo of June 1974 included manufacture of plywood and wire-bound boxes utilizing plywood for box-ends and thick veneer for box-shooks. A basic change in this proposal occurred in February 1975 when the erection of plywood industry based on utilization of Eucalyptus colorado was declared by the Government as a "factory of national interest". The plot for this industry in the neighbourhood of Salto is already prepared and levelling has been carried out. Financing is more or less secured and the building activity is estimated to start during the present year. The final choice of machinery for plywood manufacture will be made in December 1975 or January 1976.

With the background above the manufacture of wire-bound boxes is proposed with plywood in both box-ends and box shooks and to be incorporated in the new factory utilizing the plywood line for second shift for manufacture of plywood for boxes. The new situation made it necessary to review basically the previous proposal and, for the economic calculations, deal with a box-manufacturing line as a separate unit.

Plywood being the main material for box-manufacture, in addition to cleats from solid wood, the proposal for plywood factory is scrutinized first.

- Plywood factory

The raw material availability for the factory is good due to that mainly eucalyptus colorado is going to be utilized (also for box cleats). It has to be noted in this connection that the area of forests which will be submerged during the filling of Salto Grande dam will give an amount of more than 100.000 m³ solid volume logs. These forests will give logs suitable for peeling with diameters of 20 cm. and above (forests' age at present 13 years as medium). The extraction has to be completed before 1980.

The logging activity and transports will be carried out by the firm themselves and sufficient investments for the purpose are calculated with. As logging has been carried out by Campichuelo also in previous years, they have well-trained forest labour available.

The lay-out of the plywood factory is acceptable, however, the space behind the press is too small and this part of material-flow should be re-studied. Considering the possibility of future exports of sanded plywood, space should be reserved for a drum-sanding machine.

At the intake in the log-yard a debarking machine would be necessary taking into account the large volumes of timber needed (approximately 140-150 m³/day) for plywood and box manufacture. Manual debarking is costly and is not evaluated in the proposal either. For following steam treatment of logs the bark has to be removed. Steam treatment in autoclaves under pressure has been elaborated at the Centre Technique Forestier Tropical in Paris. The firm delivering the machinery has been participating together with Campichuelo in the follow-up of the tests and the final tests on peeling properties and plywood manufacture from Eucalyptus rostrata will be carried out in December 1975 and January 1976.

The estimated yield of plywood from logs is on high side and has been decreased in the re-calculation of plywood prices. The glue price is high in relation to the international level and other glues than ureaformaldehyde should also be considered as e.g. casein glue and blood-albumine glue. Both glues give sufficient glue-line resistance against moisture required for fruit-box plywood and the raw materials for these glues is existing in the country.

In connection with glueing properties it should be noted, that the moisture content of dry veneers is given to 11-12%. This may be on the high side for urea-glues but sufficient for blood-albumine and casein glues.

- Box Manufacture

For wire-bound box production 3 mm. plywood for box-ends and box-sheets will be used. For sawn-wood eucalyptus colorado in logs and cores after peeling will be utilized. The material flow in the factory is logical and manufacturing space sufficient. The sawn-wood to be utilized for box cleats is dried in a continuous dryer prior to box manufacture. The machinery proposed is adequate and caters for a production volume of 1.5 million boxes per annum. In machinery set-up the suggested gang-saw (frame-saw) for plywood cores and small logs is too expensive for the purpose. On the other hand the estimated cost for the drier is on the low side.

The proposed storage volume for ready boxes is not sufficient considering the large amount of boxes to be stored during certain periods of the year. For the handling-storage of bundled boxes on pallets a fork-lift truck for more height should be used. Also the economic part as to the financial arrangements, investments in machinery, labour and material costs was brought to the present situation compared with the original proposal.

- Main shortcomings

- a) No debarking arrangement described, necessary for steaming of logs and for better efficiency in veneer peeling,
- b) No adequate storage space for ready boxes,
- c) Too small area behind the press in the plywood manufacturing line,
- d) No laboratory and equipment proposed for production control of plywood.

As general remark it should be noted that the quantities of wood-waste, received from plywood and box manufacture will only partially be utilized as fuel for steam production. It is therefore to consider for the future the possibility to utilize the wood-waste as raw-material for particle-board production. Prior to that internal and external marketing possibilities have to be established.

3.4 Economic Evaluation of the Proposals for Wire-Bound Box Manufacture

3.4.1 Assumptions for the Economic Comparison

Building costs in different proposals show large variation due to both big differences in factory and storage areas proposed, and also in cost estimates per m² of building area. To eliminate the influence of difference on the proposed manufacturing process all proposals are calculated with a factory area of 2.000 m² to the cost of US\$ 130 per m² (including electric installation, water and sewage, etc.). In Campichuelo's case the building cost for the part of factory used for box manufacture is included in the production costs of plywood. Depending on the concentration of fruit exports to approximately 6 months (See Appendix 4), large storage area is needed for boxes at the factory. The storage costs are added to the box price directly (approximately 2.5 months medium storage-cost for box output US\$ 0.01).

Raw Material Costs were given by three of the proposers, free factory. As to the log prices from Campichuelo S.A., the proposal included own logging activity with logging equipment in the investments and labour costs in labour requirements. In the case of Campichuelo the price on root was therefore taken.

Considering both the prices given in the proposals for wood raw-material and the estimates made in paragraph 3.2.3, following prices were taken as basis for calculations:

Wood Specie	Log price free factory US\$/m ³	
	Southern area	Northern area
Pines, poplar willow (salix)	25 ^{1/2}	25 ^{1/2}
Eucalyptus globulus, saligna, grandis	17.5	25

(Continues)

Wood Specie	Log price on root US\$/m ³
Eucalyptus rostrata	3

1/ For poplar and salix (sauce-álamo) logs, with diameters of 25 cm and above, veneer and plywood manufacturers pay 32:50 - 37:50 US\$/m³ (65 - 75.000 pesos/m³).

Two of the proposers use 3 mm plywood for boxes. The plywood price given is:

Campichuelo S.A.	0.33 US\$/m ²
Industria Maderera del Norte	0.90 US\$/m ²

The difference in plywood prices is explained by the fact that Campichuelo's price is based on the new modern factory which will process mainly Eucalyptus rostrata (low raw-material price), while Industria Maderera del Norte has based the price on the present sales' prices (with deduction) with more expensive raw-materials partially due to long transport distance.

Other materials were priced for all proposals as follows:

Wire (1.6 mm diameter)	1.10 US\$/Kg.
Printing colours	7.29 US\$/Kg.
Nylon strips for bundling	2.24 US\$/Kg.

Electric energy cost is calculated at the price of 0.04 US\$ per KWh.

Production for all proposals is taken at 1.500.000 of wire-bound boxes per annum. Additional products, as production of pallets in Darricarrere-Solari's proposal and small-boxes in Campichuelo's proposal are excluded.

Sales price for wire-bound boxes of size 46 x 27 x 27cm is estimated at US\$ 0.75. It was taken into account that the price would be slightly lower than the present price level for the imported card-board boxes.

Capital costs were established for loans and working capital on advice of the evaluation team member from the Planning and Budget Office, Ministry of Finance 1/, as follows:

1/ In the economic calculation 10% was used as an average for own invested capital and on machinery loans.

Interest on own invested capital	12%
Interest on working capital	10%
Interest on foreign loans	8%
Repayment period (stipulated by Central Bank)	5 years minimum

Depreciation was fixed for:

Machinery	10 years
Buildings	30 years

The machinery and buildings are written off and no resale value is assumed.

The working capital was calculated considering also the uneven division of deliveries of produce as follows:

Capital required

-Raw material storage:	
Logs	one month
Plywood	0.5 month
Wire	two months
Printing colour	two months
Strips for bundling, etc.	one month
-Work in progress	one month
-Storage of ready boxes	five months
-Debtors	one month

Capital supplied

Creditors - one month

Other costs as, e.g. machinery proposed, labour requirements and costs, etc. were checked and taken from the four different proposals.

3.4.2 Profitability and Financial Rate of Return

The projections for financial profitability and financial rate of return, for the four proposals, are shown in Table 12 and in Tables 13 to 16.

The financial profitability projected for the third year after the start (full production), is the following (after 25 percent tax):

Table 12

Profitability of different proposals for
wire-box manufacture

(In 1.000 US\$)

	Caspichuelo	Darri carrere-- Sclari	Asociación de Industriales de la Madera	Industria Maderera del Norte
1. Sales income	1.125	1.125	1.125	1.125
2. Fixed annual capital costs	<u>33.6</u>	<u>64.1</u>	<u>58.5</u>	<u>57.6</u>
3. Operational annual costs	792.8	708.9	728.7	943.2
- Wood (and plywood)	346.4	245.6	281.3	472.7
- Wire	231.0	231.0	231.0	231.0
- Colourpaste for printing	24.4	24.4	24.4	24.4
- Packing materials	23.5	23.5	23.5	23.5
- Wages and salaries	77.4	88.0	75.7	91.6
- Electric power	8.3	14.7	16.9	8.3
- Consumables, maintenance, etc.	5.4	9.0	2.0	3.2
- Storage costs	15.0	15.0	15.0	15.0
- Interest on working capital	18.7	17.6	17.9	22.6
- Miscellaneous (insurance, etc.)	43.7	40.1	41.0	50.9
4. Total Brnt Production cost	<u>827.4</u>	<u>773.0</u>	<u>787.2</u>	<u>1000.8</u>
5. Depreciation 1/	<u>33.6</u>	<u>40.8</u>	<u>41.2</u>	<u>40.2</u>
6. Annual profit net of depreciation	<u>264.0</u>	<u>311.2</u>	<u>296.6</u>	<u>84.0</u>
7. Less tax at 2%	<u>66.0</u>	<u>77.8</u>	<u>74.2</u>	<u>21.0</u>
8. Net profit	<u>198.0</u>	<u>233.4</u>	<u>222.4</u>	<u>63.0</u>

1/ Interest included in annual capital costs.

Financial Rate of Return
Asociación de Industriales de la Madera y Afines del Uruguay
(In 1.000 US\$)

Table 13

Year	Investment	Working capital	Sales income	Operating costs	Operating Surplus	Net flow	Present value (at 12%)
1	585.4	-	-	-	-	-	-
2	-	204.1	562.5	414.8	147.7	(585.4)	(585.4)
3	-	153.9	1.125.0	710.8	414.2	(56.4)	(50.36)
4	-	-	1.125.0	710.8	414.2	260.3	207.51
5	-	-	1.125.0	710.8	414.2	414.2	294.82
6	-	-	1.125.0	710.8	414.2	414.2	263.23
7	-	-	1.125.0	710.8	414.2	414.2	235.03
8	-	-	1.125.0	710.8	414.2	414.2	209.85
9	-	-	1.125.0	710.8	414.2	414.2	187.36
10	-	-	1.125.0	710.8	414.2	414.2	167.29
11	-	-	1.125.0	710.8	414.2	414.2	149.36
							133.36

Note: Financial Rate of Return: 40%
Present value at 12%: 1.212.000 US\$

Table 14

Financial Rate of Return
Campichuelo S.A.
(In 1,000 US\$)

Year	Investment and reinvestment	Working capital	Sales income	Operating costs	Operating surplus	Net flow	Present value (At 12%)
1	356.5	-	-	-	-	(356.5)	(356.5)
2	60.0	213.2	562.5	449.6	112.9	(160.3)	(143.13)
3	2.0	170.8	1,125.0	775.1	349.9	177.1	141.18
4	2.0	-	1,125.0	775.1	349.9	347.9	247.63
5	32.0	-	1,125.0	775.1	349.9	317.9	202.03
6	4.0	-	1,125.0	775.1	349.9	345.9	196.27
7	2.0	-	1,125.0	775.1	349.9	347.9	176.26
8	32.0	-	1,125.0	775.1	349.9	317.9	143.80
9	2.0	-	1,125.0	775.1	349.9	347.9	140.51
10	2.0	-	1,125.0	775.1	349.9	347.9	125.46
11	-	-	1,125.0	775.1	349.9	349.9	112.66

Note: Financial Rate of Return 42%
Present Value at 12%: 986,000 US\$

Table 15

Financial Rate of Return
Darricarrere Solari
(In 1.000 US\$)

Year	Investment	Working capital	Sales income	Operating costs	Operating Surplus	Net flow	Present value (At 12%)
1	581.0	-	-	-	-	(581.0)	(581.0)
2	-	200.6	562.5	414.2	148.3	(52.3)	(46.7)
3	-	151.4	1.125.0	691.3	433.7	282.3	225.05
4	-	-	1.125.0	691.3	433.7	433.7	308.70
5	-	-	1.125.0	691.3	433.7	433.7	275.62
6	-	-	1.125.0	691.3	433.7	433.7	246.09
7	-	-	1.125.0	691.3	433.7	433.7	219.73
8	-	-	1.125.0	691.3	433.7	433.7	196.18
9	-	-	1.125.0	691.3	433.7	433.7	175.16
10	-	-	1.125.0	691.3	433.7	433.7	156.40
11	-	-	1.125.0	691.3	433.7	433.7	139.64

Note: Financial Rate of Return: 42%
Present value at 12%: 1.315.000 US\$

Table 16

Financial Rate of Return
Industria Maderera del Norte
(In 1,000 US\$)

Year	Investment	Working capital	Sales income	Operating costs	Operating surplus	Net flow	Present value (At 12%)
1	575.5	-	-	-	-	(595.5)	(575.5)
2	-	257.6	562.5	533.2	29.3	(228.3)	(203.84)
3	-	194.4	1,125.0	920.6	204.4	10.0	7.97
4	-	-	1,125.0	920.6	204.4	204.4	145.49
5	-	-	1,125.0	920.6	204.4	204.4	129.90
6	-	-	1,125.0	920.6	204.4	204.4	115.58
7	-	-	1,125.0	920.6	204.4	204.4	103.56
8	-	-	1,125.0	920.6	204.4	204.4	92.46
9	-	-	1,125.0	920.6	204.4	204.4	82.55
10	-	-	1,125.0	920.6	204.4	204.4	73.71
11	-	-	1,125.0	920.6	204.4	204.4	65.81

Note: Financial Rate of Return: 13%
Present value at 12%: 38,100 US\$

Proposal	Net profit in percent of sales value
-Asociación de Industriales de la Madera	
-Campichuelo S.A.	20%
-Darricarrere - Solari	18%
-Industria Maderera del Norte	21%
	6%

The profitability of the first three proposals is good, the unsatisfactory profitability for the fourth proposal is mainly explained by high raw material prices.

The financial rate of return on the capital invested, over the ten-year period is as follows:

Proposal	Financial rate of return in percent on capital invested
-Asociación de Industriales de la Madera	
-Campichuelo S.A.	40%
-Darricarrere - Solari	42%
-Industria Maderera del Norte	42%
	13%

The first three proposals have a very satisfactory financial rate of return, as the minimum used in calculations in the Finance Department is set at approximately 12% (variation depending on different kind of projects).

3.4.3 Economic-technical viability

3.4.3.1 Asociación de Industriales de la Madera

The organization of activity is proposed through establishing a company (Ltd) with shareholders representing the plantation forest owners, the wood industry and the wire-box users. The board of directors should also consist of representatives for these three groups.

As to the financial arrangements of the company, the own input should cover the building costs of the factory. For imports of machinery a loan (85% of value) will be requested from Inter-American Development Bank (IADB). The remaining machinery value (15%) and the working capital would be covered through loans from local banks. The approval of IADB takes however normally considerable time (1-2 years) which in practice means 3 years until the start of factory.

The localization of factory is favourable from the point of view of box-supply to the fruit-producing areas in the southern part of the country. In this area is however already scarcity of poplar, pine and willow in sizes suitable for the industry, especially for peeling. This fact was clearly established through the enumeration made by Ministry of Agriculture mid 1974. The raw material prices are already now for e.g. salix-poplar (sauce-álamo) with diameter above 25 cm US\$ 35 per m³, i.e. on a much higher level than the medium prices the profitability calculation is based on. In coming years the increase of medium price will surely continue. It should be noted that also the eucalyptus species in the southern area (Euc. globulus and saligna) are scarce in diameters above 20 cm and eucalypt sources would therefore not be either a base for additional industrial activity in this area.

The estimated profitability (20%) and financial rate of return (40%) are good, but calculated on the production set-up proposed. The inevitable price-rise on proposed raw materials and investments in logging equipment would change the picture.

Taking in account mainly the localization of factory and proposed raw-material supply and species, it is considered that this proposal is not the best of the four.

3.4.3.2 Darricarrere - Solari

The organization of activity will start with establishing a independent company (Ltd) with participation of fruit-exporters and forest owners. The preliminary contacts for this purpose have already been taken.

As to the financial arrangements the intention is following:

- a) The shareholders will cover the building costs and the equipment bought in the country with "own capital" of the company.
- b) Loan for imports of the machinery from IADB, through foreign credits or through credits from the group participating in the enterprise.
- c) The working capital will be raised from local bank against short and long-term obligations.

The localization of factory is favourable from point of view of box-supply to citrus growers as Paysandú is close to the citrus expansion area. As to the raw-material supply there is less shortage than in San José area of poplar, pine and willow, and satisfactory amounts of eucalyptus (saligna and grandis) are available. Also establishing of own forest plantation is considered.

The estimated profitability (21%) and financial rate of return (42%) are good, calculated on wire-bound box production. The proposed integration with production of pallets would still improve these figures. However approximately half of the raw-material amount are species which are subject to price-increases in near future due to the large demand from other industries. Furthermore the proposed technical process does not guarantee high quality boxes necessary for exports. The main technical shortcomings are: absence of pre-treatment (heating) of eucalyptus logs and lack of artificial drying of veneers and sawn-wood for boxes.

The unavoidable raw-material price increase of salix, poplar and pines and additional investments will influence the profitability calculation.

It is considered that the organization, financial arrangements and localization are favourable. When therefore the question of the second factory arises, to fill the wire-box requirements for 1981-82, Darricarrere-Solari should be considered as candidate. It would be suitable in good time to have the re-elaboration of the previous proposal made, including the technical improvements and also considering eucalyptus as main raw-material for production.

3.4.3.3 Industria Maderera del Norte

The organization of activity will be implemented through integration with the existing plywood-factory and other activities, with raise of the present share capital of the company.

As to the financial arrangements the own input would be the present value of machinery and equipment of plywood factory. The building costs will be covered through loan from IADB or local bank. For imports of machinery a foreign loan (Spanish) on 80% of value is under negotiation. The remaining funds for machinery (20% of value) and for working capital would be raised from local bank.

The localization of factory at Bella Unión would be acceptable considering the box deliveries to the citrus expansion area in Salto region. From the point of view of raw material supply it is less favourable since the wood-species to be processed (poplar pines, Euc. globulus) have to a large extent be transported from the middle and northern parts of the country. Their possible alternative of localization to Paysandú would be therefore more advantageous, although it does not give the same possibilities for integration as at Bella Unión.

The estimated profitability (6%) and financial rate of return (13%) are low compared with other proposals. This depends mainly on high raw-material prices (plywood and transport cost for logs). The investments include drier for veneers but neither pre-treatment arrangements for eucalyptus logs nor logging and transport equipment is included. Own logging activity will be necessary also considering other expansion plans of the company.

It is considered that the organization, financial arrangements and technical process are satisfactory. The localization and profitability is not favourable. Industria Maderera del Norte may be considered for the second factory 1981-82 with localization in Paysandú.

3.4.3.4 Campichuelo S.A.

The organization of activity will be implemented through integration of wooden-box factory with the plywood factory, which has been declared by Government in February 1975 as "industry of national interest". The present share capital of the company will be raised to the required level.

As to the financial arrangements following is planned:

- a) building costs for box-factory are already included in the proposal for the plywood factory. Own capital input will be 15% and 85% of the costs will be received through local banks.
- b) For imports of machinery foreign loans (french-spanish) have been negotiated for 85% of the machinery value (with 7,8% interest). The remaining 15% of machinery value will be covered through rise of share capital.
- c) Working capital will be raised from local bank.

The localization of factory in Salto is favourable from point of view of box supply to citrus growers being in the middle of the citrus expansion area (see Appendix 2). Also for raw-material transports (Euc. rostrata) the medium distance for first 5 years of operation is estimated to be 35 Km. and thereafter 50 Km. The log volume to be extracted from Salto Grande dam area will cover the raw-material needs for the new integrated factory for at least 3 years (approx. 35.000 m³ solid volume logs per year).

Also for the future the raw-material supply is secured as eucalyptus rostrata is in abundance and has not been utilized hitherto to larger extent for industrial purposes. The new plantation areas to be created in Paysandú district (see Appendix 3) are also within the economic transport distance for raw-material.

The estimated profitability (18%) and financial rate of return (42%) are good, calculated on wire-bound boxes. The proposed second line for small boxes will additionally improve the profitability. In connection with small box production it should be however noted that the recently (September, 1974) started box factory in San José has an estimated output of 400,000 boxes per year (in one shift) and intends to market their produce on mainly the internal market.

Due to the present low demand of Euc. rostrata for industrial purposes the future price development is assessed to be normal.

Some additional investments will be needed, mainly debarker for logs, larger space for storage of ready boxes and laboratory equipment for production control of plywood. This will however not influence significantly the estimated profitability of box manufacture.

Cash flow projections (see Table 17) show a good liquidity position over the ten years period and the accumulated profits are sufficient to cover the prospective re-investments in the wire-bound box machinery scheduled after ten years operation and the logging equipment during years 5, 8 and thereafter.

The direct employment effect is good. Each job for the box factory requires an investment of U\$S 19,000 per job which is on the low side in Uruguayan conditions. Additional 22 jobs are created for the logging and transport activity.

As the project shows a good profitability no shadow-price for unskilled labour has been calculated with, in spite of very good availability of labour in Salto area.

For same reason no opportunity cost of foreign exchange has been taken in account, in spite of the considerable import substitution effect the wire-bound box manufacture will have for the country now and in future.

Projected Cash Flow for Campichuelo S.A.
(In 1.000 US\$)

Table 17

	1	2	3	4	5	6	7	8	9	10
<u>Inflows</u>										
Operational surplus	356.5	257.9	529.9	349.9	349.9	349.9	349.9	349.9	349.9	349.9
Own capital	-	112.9	349.9	349.9	349.9	349.9	349.9	349.9	349.9	349.9
Foreign loans (FL)	70.5	-	-	-	-	-	-	-	-	-
Loan for increase of working capital (IL)	286.0	-	-	-	-	-	-	-	-	-
	-	245.0	180.0	-	-	-	-	-	-	-
<u>Outflows</u>										
Investment and reinvestment	356.5	252.2	512.9	267.3	98.4	65.8	2.0	32.0	2.0	-
Amortization FL	365.5	60.0	2.0	2.0	32.0	4.0	2.0	32.0	2.0	2.0
Amortization IL	-	57.2	57.2	57.2	57.2	57.2	-	-	-	-
Interest FL	-	-	245.0	180.0	-	-	-	-	-	-
Interest IL	-	22.9	18.3	13.7	9.2	4.6	-	-	-	-
Working capital increase	-	-	19.6	14.4	-	-	-	-	-	-
	-	213.2	170.8	-	-	-	-	-	-	-
<u>Net inflow (incl. possible taxes)</u>	-	4.6	17.0	82.6	251.5	284.1	347.9	317.9	347.9	347.9
<u>Cumulative cash</u>	-	4.6	21.6	104.2	355.7	639.8	987.7	1305.6	1635.5	2001.4

It is considered that the organization, financial arrangements, localization, technical process and profitability are good. In addition, due to the already taken steps for the plywood factory, this proposal compared with the others has the best possibility for soon implementation.

3.5 Quality control of wire-bound boxes

The best solution for quality control may be the system of seals of quality administered by independent body offering guarantees of impartiality.

The Analysis and Quality Control Laboratory (Laboratorio de Análisis y Ensayos) in Montevideo has since 1966 provided technical advice on matters related to the products of various industrial enterprises. Furthermore, the Laboratory (LAE) has carried out a standardization, certification and publication programme. For strengthening the LAE's activities within special areas the UNDP/UNIDO Project URU/71/521 - Quality Control Laboratory for Leather and Leather Products started operation 1974.

It is obvious that LAE is the suitable body for quality control of wooden boxes, including wire-bound boxes for exports, but they lack both suitable testing equipment and personnel trained for that purpose.

Wooden boxes are to be checked at three stages:

- a) The laboratory stage, where, in both the initial tests and routine quality checks, the level of strength is established
- b) During actual use, both at the place of dispatch and at the destination.
- c) At the manufacturing stage.

In principle the seal of quality should not be based on the checking of output, but rather on the checking of the quality control carried out by the manufacturer himself.

Factory checking verifies compliance with a given specification for e.g. wire-bound boxes and includes following points in particular:

- a) The quality of wood, plywood or veneer.
- b) The accuracy and quality of cutting and peeling of wood.
- c) The quality of stapling
- d) The quality of assembly

The ECE resolution N° 203 gives testing methods and details of test results that should be obtained for fruit and vegetable boxes, thus also giving the necessary specification of the box.

The quality testing of wire-bound boxes could commence through Centre Technique du Bois (CTB), Paris. As to the information received from Campichuelo, the Department of Packaging of CTB is prepared to carry out the initial tests and issue a "certificate of quality" for Campichuelo. The follow-up tests could be, to start with, made through taking samples at the destination ports in France by the representatives of CTB. As soon as LEA has the necessary equipment and the trained technicians, the quality testing would commence through LEA at the manufacturing stage and the place of dispatch.

4. RECOMMENDATIONS

4.1 Requirements for manufacture of wire-bound boxes

The implementation of Citrus Improvement and Expansion Plan and the Small Farm Development Project within the National Development Plan calls for the start of box-manufacture in the country to save considerable amounts of foreign currency for imported boxes.

The delay in implementation of box-manufacture will mean quick rise of foreign currency expenditure:

In year 1976	1.3 mill. US\$
In year 1977	1.7 mill. US\$
In year 1978	2.5 mill. US\$

The present manufacture of wire-bound boxes (from Sept. 1974) does not fill the requirements quantity and quality-wise and caters for the demands of one citrus plantation (exporter) only.

The existing card-board box factory can fill the demands for this kind of boxes. Using imported semi-chemical pulp as raw-material, this industry is however only partially import-substituting.

It is recommended that manufacture of wire-bound boxes in Uruguay should start as soon as possible.

4.2 Choice of the best proposal for wire-bound box manufacture.

After the technical-economic evaluation it has been concluded that the proposal from Campichuelo S.A. is the most advantageous for the national economy for following reasons:

a) It will utilize raw-materials (Eucalyptus rostrata) which hitherto have not been to a larger extent used for industrial purposes. The wood-amounts from the Salto Grande dam area, representing an approximate value of 500.000 US\$ (on root) will be "saved".

b) In integration with the plywood mill it will have the possibility to produce a high quality product.

c) It has the best possibility to commence the operation by end of 1975, the year when the import requirements of wire-bound boxes will already be on the level of US\$ 1.300.000. This is to compare with the import-value of machinery which in total is US\$ 1.900.000 (1.4 mill. for plywood, 0,3 mill. for wire-bound boxes, 0,2 mill. for stapled small boxes).

d) It shows good technical-economic viability with a profitability of 18% and financial rate of return of 42%.

e) Technical tests concerning the utilization of *Eucalyptus rostrata* have been carried out at the Centre Technique du Bois (CTB), Paris, and collaboration established with the french firm delivering the machinery for wire-bound box manufacture. This firm has erected a similar factory in Argentine, is building another one in Brazil and will thus have the possibilities (and interest) to cater for spare-parts' supply and service.

f) The financial arrangements seem to be in hand including the necessary external credits for machinery (french loan).

g) The plywood factory in the proposed set-up has been in Feb. 1975 declared by the Government as "industry of national interest".

It is recommended that Campichuelo S.A. is given the task to start the wire-bound box manufacture and that in addition to the plywood factory also the box factory should be declared as "industry of national interest".

4.3 Implementation of Campichuelo's project

The final glueing tests for plywood manufacture utilizing *Eucalyptus rostrata* will be carried out at CTB, Paris, in December 1975 or January 1976. At the same time the final choice of machinery and equipment for plywood and wire-bound box manufacture will be made. Campichuelo's representative has requested the possibility of a neutral expert to participate in these activities.

It is recommended to request through UNIDO the participation of a neutral expert in these activities (approx. 2-3 weeks in France).

4.4 Wire-bound box quality and quality control

The wire-bound box manufactured by Campichuelo will be of plywood from Eucalyptus rostrata. This wood specie gives a strong product with a brownish colour. Majority of fruit and vegetable boxes are made in light-colour wood species, due to the low prices in many countries of these species. East-European countries, having good availability of beech, are however manufacturing export-boxes of beech, having only slightly lighter colour than Eucalyptus rostrata. Also the contacts with box-manufacturers in France indicate that they would import plywood from Eucalyptus rostrata for their own production of wire-bound boxes.

The strength properties of plywood-box is superior to the one made with veneer. Plywood-boxes are therefore often used for long distance transports of fruit.

The quality control is important and should be carried out by the Analysis and Testing Laboratory (LAE) in Montevideo. LAE lacks however at present the necessary equipment and for box-testing trained technicians.

The initial tests for Campichuelo's wire-bound box and issue of a "certificate of quality" will be carried out through CTB. If necessary the follow-up tests could be carried out by the same institution.

It is recommended:

- a) To request through UNDP/UNIDO a fellowship for a technician from LAE for 2-3 months to receive the necessary training in box-testing techniques at CTB's laboratory.
- b) To request funds for necessary additional equipment for LAE (approximately US\$ 20.000).

If LAE is not ready (as to the equipment and training of technician) to commence the box-testing when Campichuelo starts the production:

- c) To request CTB to carry out in the beginning the tests on wire-bound boxes manufactured by Campichuelo.

4.5 Future production of wire-bound boxes

Campichuelo's proposal includes plywood manufacture for exports in one shift and utilization of other shift for manufacture of wire-bound and stapled small boxes.

As three shifts work is questionable in practice, the practical capacity for box manufacture is 1.500.000 wire-bound boxes and 1.000.000 stapled small boxes. It has to be noted, that the small-box line also can be utilized for wire-bound boxes. Already year 1980 the total demand of wire-bound boxes and small-boxes is estimated to be 3.6 million.

At that stage an additional factory should be in production to fill the continuously increasing box demand which reaches the level of 4.8 million boxes year 1986. Two factories would also be of advantage from point of view of competition. If loans through the Inter-American Development Bank (IADB) are to be acquired, which may take approximately 2 years until funds are received, it is advisable to start the planning at an early stage.

The proposal of Darricarrere-Solari showed in general several advantages as to the localization, utilization of wood species, etc. It is therefore advisable to consider their proposal, after re-scrutinization, as the best one for the second factory to be built. The estimated investment costs (in present value) would be:

For buildings approx.	US\$ 300.000
For machinery approx.	US\$ 400.000

It is suggested that prior to the decision a feasibility study is carried out, say end of 1976, as to the market development for fruit-boxes and pallets, the raw-material resources', manufacturing techniques, etc.

This feasibility study should also consider the activity of the box-factory in San José and their possibilities to fill one part of the box market demands. This factory adapts a suitable manufacturing techniques, sawing logs to thin boards, considering the small diameters of logs. However, it is doubtful whether this utilization of poplar and salix is in the interest of the country.

The logging of small diameters (except thinnings) will prevent for the future the possibility for existing plywood and veneer factories, to receive larger diameter logs, necessary for their production.

It is recommended:

a) To carry out a feasibility study by the end of 1976 through the National Industrial Technology and Productivity Centre in collaboration with OPYPA and possibly with an UNIDO expert (3 weeks).

b) To consider Darricarrere-Solari for building of the second factory for manufacture of wire-bound boxes and small boxes for the supply mainly to the Southern Zone.

c) To advice Darricarrere-Solari to review their proposal as to the manufacturing process considering eucalyptus species as main raw-material source. The reviewed proposal should be one of the backgrounds for the feasibility study end of 1976.

APPENDIX 1

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

U N I D O 17 December 1974.-

Request from the Government of the Eastern Republic of Uruguay
for Special Industrial Services

JOB DESCRIPTION

TS/URU/74/020/11-01/07 rev.1(*)

POST TITLE: Expert in Forest Industries Specialized in Packing Crates (Bruce-Boxes) for Fruit Exports

DURATION: One month

DATE REQUIRED: As soon as possible

DUTY STATION: Montevideo

PURPOSE OF PROJECT

: To assist the Agricultural and Planning Office (OPYPA) and the National Industrial Technology and Productivity Centre in the selection of alternative technologies for installing a factory to manufacture crates for fruit exports. The best solution, in the interest of the country, should take into account the economic aspects as well as the quality of the product.

DUTIES:

The expert will work together with a team formed by representatives from the National Technology and Productivity Centre, OPYPA, and the Planning and Budget Office. This team will:

1. Analyse the bids presented indicating the technical viability of the processes suggested in relation to the need for crates of acceptable quality;

(*) The revision of this Job Description, previously distributed in Spanish on 8 November 1974 is being issued due to a change in the Language Requirements.

2. Propose the best technical solution for a packing crate factory with regard to the wood to be used, production methods, treatment required, equipment involved, etc.;
3. Evaluate the alternatives and select the most convenient one taking into account the present availability of forest and human resources in Uruguay;
4. Formulate the final project for the installation of the factory, incorporating the best tenders.

QUALIFICATIONS: Industrial or forestry engineer with wide industrial experience in fruit packing factories and knowledge of the different technological processes in this type of industry.

LANGUAGE: Spanish; English or French acceptable

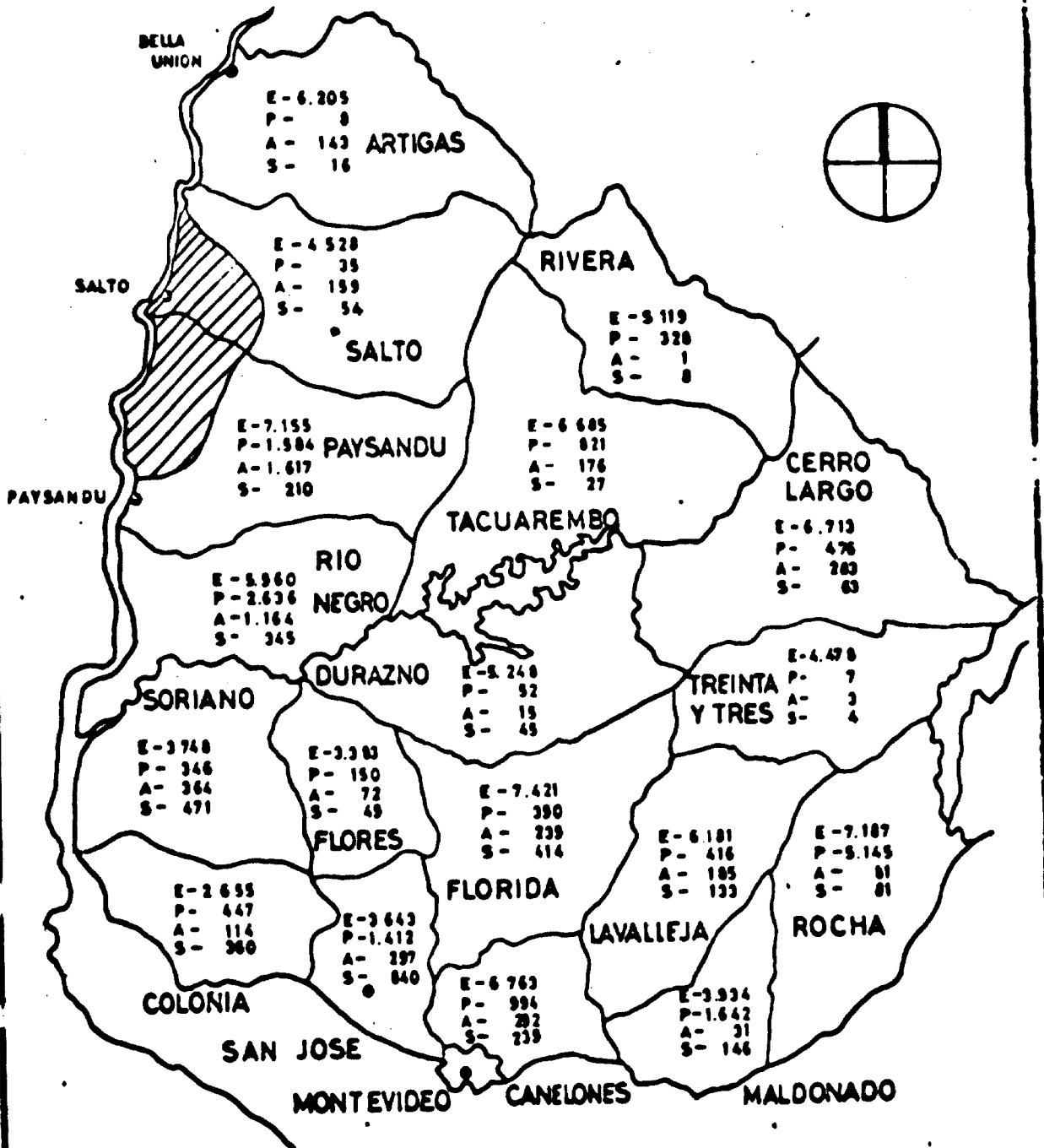
**BACKGROUND
INFORMATION:**

Assistance in creating a new industry for manufacturing packing crates locally is very important for Uruguay. The agrarian policy of the Government is placing special emphasis on non-traditional exports such as fruits and vegetables. With this goal in mind, the Small Farm Development Project and the Citrus Development and Expansion Plan were created in order to increase the production available for exports. In the north, principally in the Salto district, an important citrus growing area is being developed with a view to exporting the produce to neighbouring countries and to the Northern Hemisphere. In the eastern part of the country, around the capital Montevideo, for several years fruit production, each year more favourable, has been encouraged. The Small Farm and Citrus Plans are presently orientated towards the development of high quality produce acceptable in international markets. It is hoped that export earnings from this sector will be significant. Aside from being a source of foreign currency, the development of this sector is providing a new source of job opportunities which are badly needed in Uruguay. There is no doubt that the installation of

a packing crate factory is fundamental to the export promotion of these products. At the present time the boxes being constructed locally are of limited quantity and poor quality. The major portion of the boxes being used are imported from Brazil at high prices in hard currency. The economic importance of having a good packing crate factory in Uruguay therefore is obvious.

DISTRIBUTION OF PLANTATION FOREST AND THE CITRUS EXPANSION AREA IN URUGUAY

(In ha.)



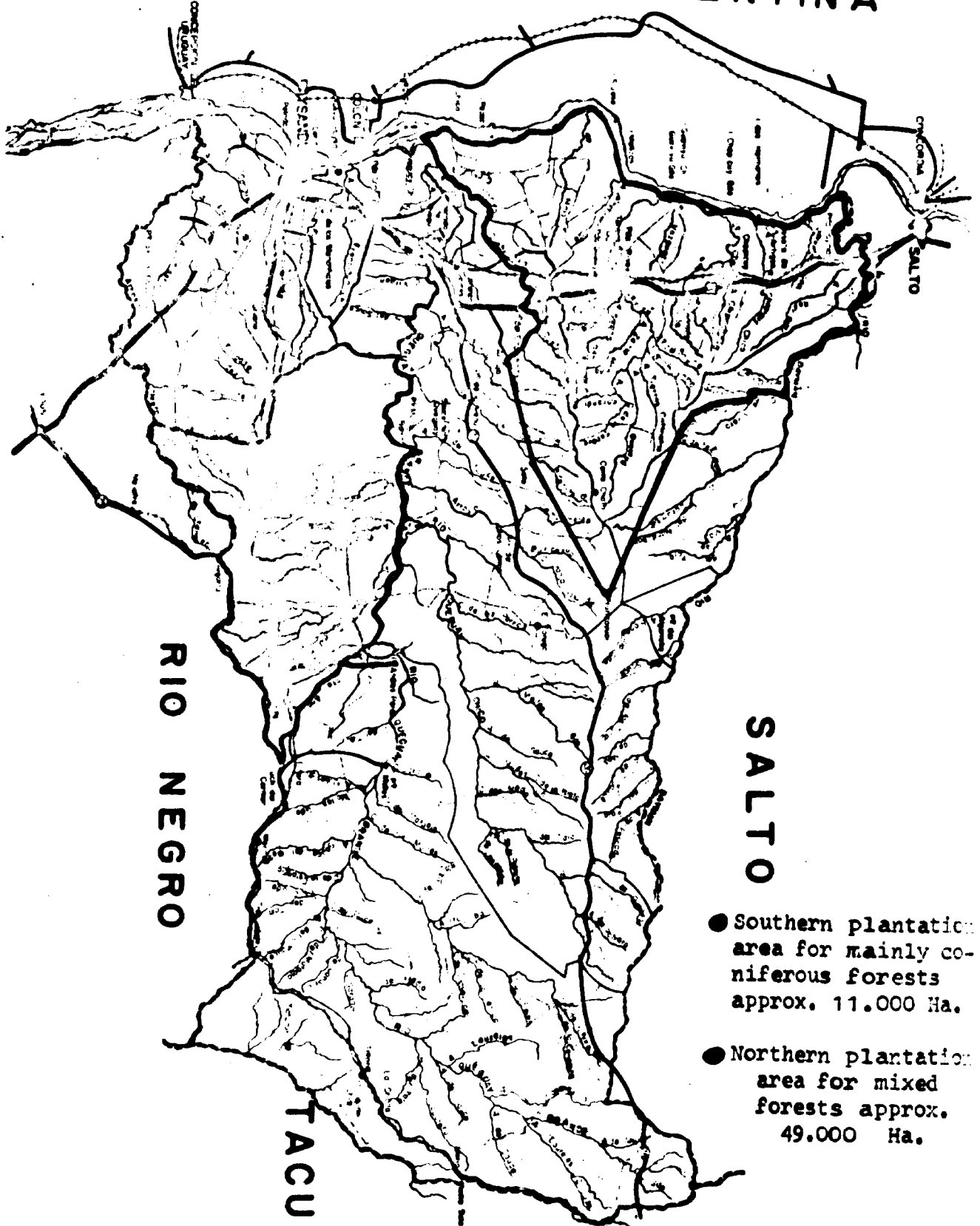
E - EUCALYPT spes.
 P - PINES spes.
 A - POPLAR spes.
 S - SALIX spes.



Citrus expansion area

REPUBLICA

ARGENTINA



RIO NEGRO

SALTO

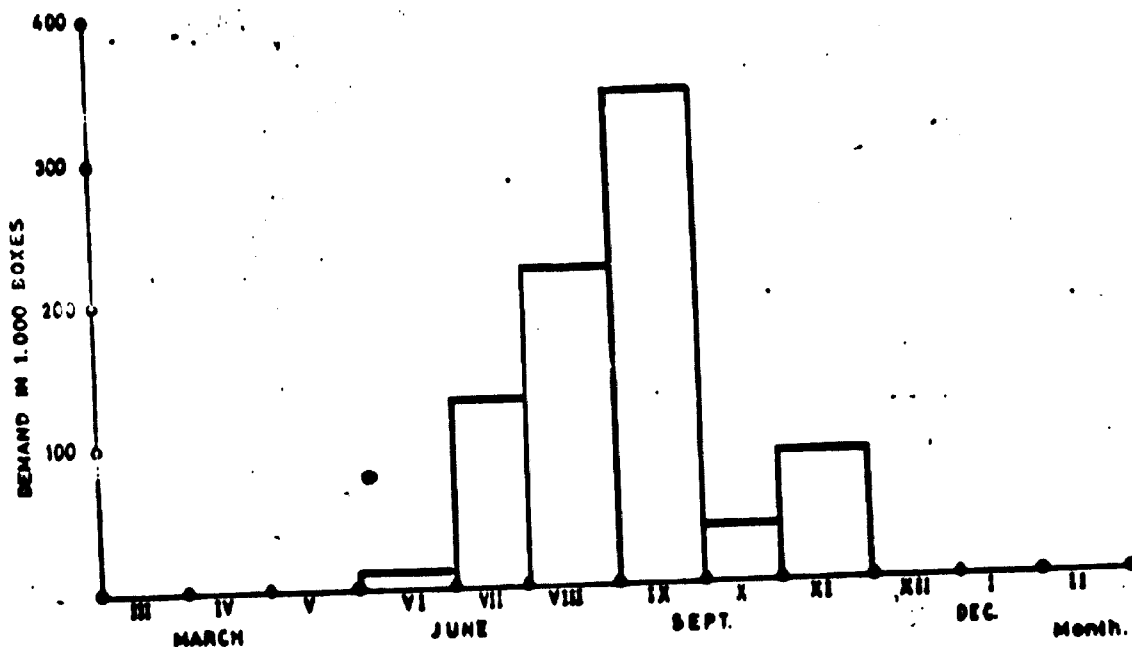
TACUAREMBÓ

- Southern plantation area for mainly coniferous forests approx. 11.000 Ha.
- Northern plantation area for mixed forests approx. 49.000 Ha.

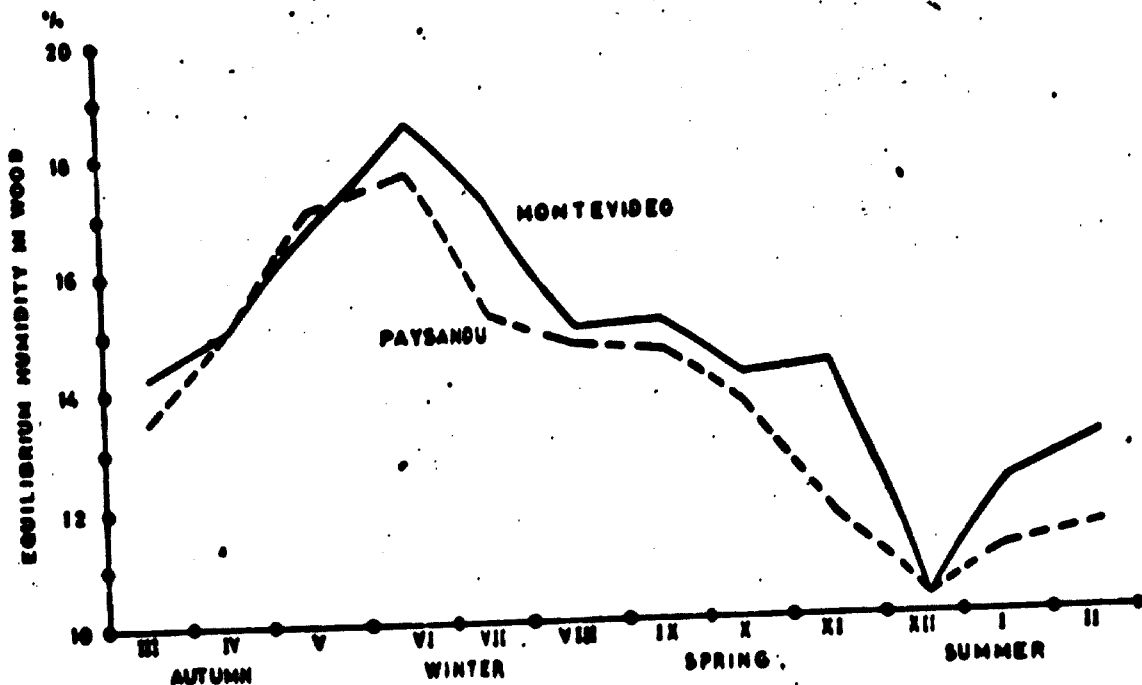
FOREST DEVELOPMENT PLAN FOR PLANTATION FORESTS IN PAYSANDU AREA FOR 1975-1980

DISTRIBUTION OF FRUITBOX DEMAND — FOR EXPORTS IN URUGUAY 1974 —

Total for 1974 = 834.000 boxes



VARIATION OF EQUILIBRIUM HUMIDITY — IN WOOD DURING THE YEAR —



APPENDIX 5

Distribution of citrus fruit exports from Uruguay
on importing countries year 1974

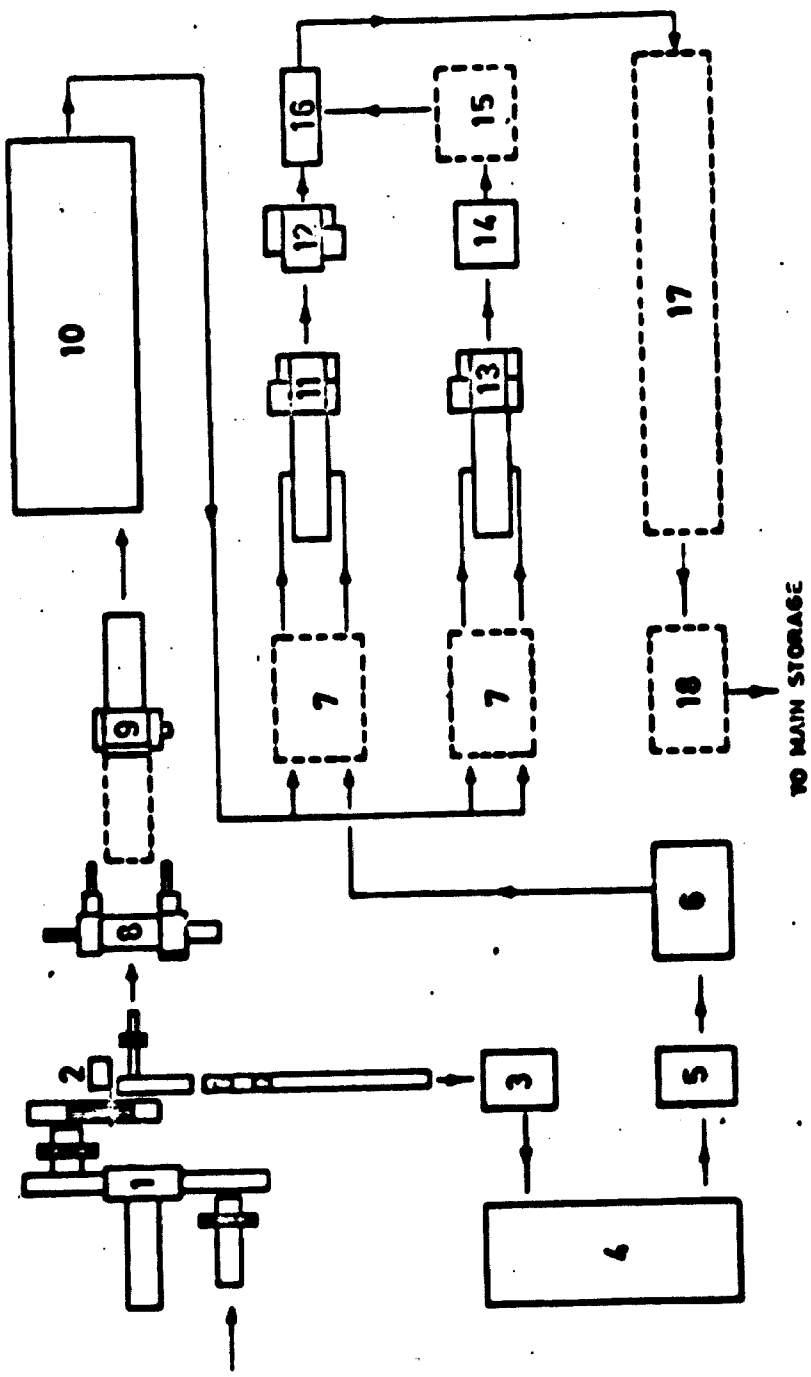
Countries	Netherlands	France	Britain	West-Germany	Norway	Poland	Total
Quantity in number of boxes	559.649	132.247	37.854	6.000	8.500	89.608	833.858
Quantity in ton net weight	9669.1	2328.0	650.2	96.6	154.4	1605.3	14503.7
Value in 1.000 US\$	2498.1	571.0	150.3	28.5	41.1	347.5	2715.8
Value per box FAO US\$	4.46	4.31	3.97	4.75	4.83	3.88	4.36
Medium net weight of fruit per box	17.2	17.6	17.1	16.1	18.1	17.9	17.3

Source: Exports Statistics - Citrus Fruits
Ministry of Agriculture and Fisheries.

(anh)

MATERIAL FLOW IN THE FACTORY FOR WIREBOUND BOXES

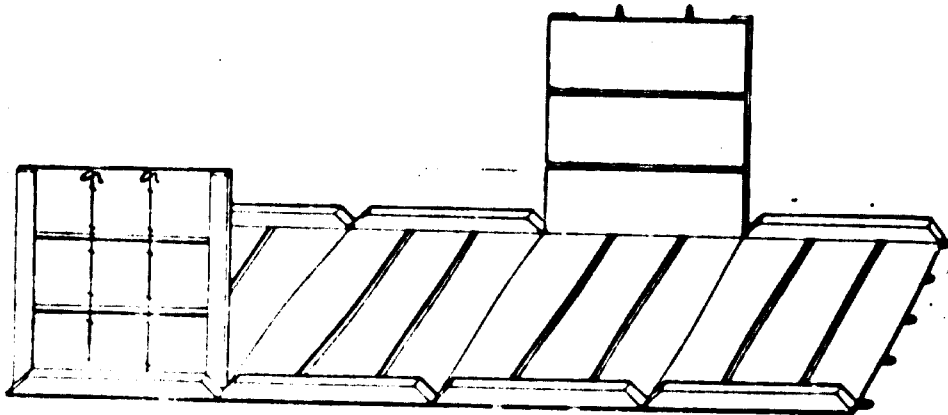
- 1 — DEBARKING
- 2 — CROSS-CUTTING
- 3 — MULTIPLE RESAW
- 4 — DRYING OF BOARDS
- 5 — SHAPING AND CROSSCUTTING
- 6 — MULTIPLE RESAW
- 7 — STORAGE OF ELEMENTS
- 8 — VENEER PEELING (Lathe)
- 9 — VENEER CLIPPING (Knife)
- 10 — DRYING OF VENEERS
- 11 — STAPLING OF BOX-SIDES (Sheet)
- 12 — LOOPING OF BOX-SIDES (Sheet)
- 13 — STAPLING OF BOX-ENDS
- 14 — LOOPING OF BOX-ENDS
- 15 — STORAGE OF BOX-ENDS
- 16 — ATTACHMENT OF ENDS TO SHEETS.
- 17 — PACKING IN BUNDLES AND STORAGE
- 18 — CONTROL OF PRODUCT



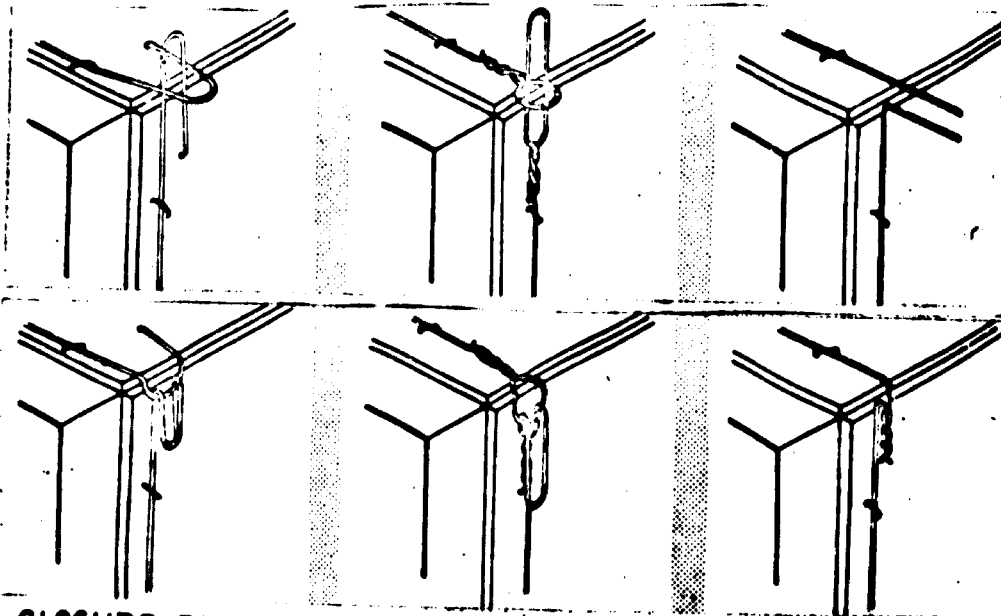
MANUFACTURE OF CLEATS (LIN) 3-4-5-6



PRINCIPLE OF WIRE-BOUND BOX

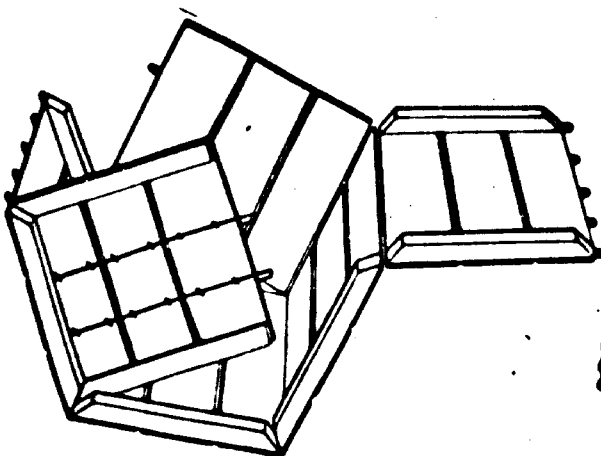


BOX-SIDES (Sheets) with assembled box-ends

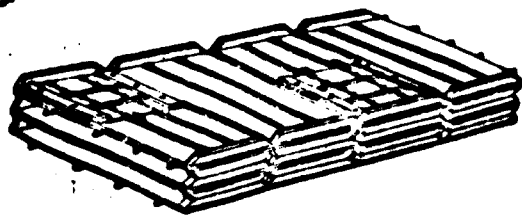


CLOSURE TECHNIQUES

Closure capacity: one person 150 boxes per hour



Assembly of box:
One person 125 boxes per hour



STORAGE ROOM SAVING

APPENDIX 8

Summary and conclusions from the French Technical
Cooperation Mission

Report of Mr. Roger Dubois, Centre Technique Forestier
Tropical, Nogent-Sur-Marne, France of June 1969

Resumen y conclusiones

Esta misión comprendía inicialmente tres objetivos:

- la difusión de los resultados de pruebas de laboratorio sobre las posibilidades de empleo de las esencias de reforestación y particularmente de los Eucaliptos;
- la realización de pruebas industriales;
- la proposición de un plan de desarrollo para las industrias forestales.

Durante los dos meses que pasó el experto en Uruguay, sólo el primer punto pudo ser tratado completamente, mientras que los otros dos tan sólo pudieron ser esbozados.

Así pues la Dirección Forestal del Ministerio de Ganadería y Agricultura pidió al experto el modificar su programa y realizar una crítica constructiva del comercio y de las industrias de la madera y proponerle un plan de trabajo para la mejora y el desarrollo de este sector.

1. La situación general de las empresas de la madera es bastante difícil. Este sector padece, como los demás, del retroceso de que sufre la economía uruguaya. Numerosas empresas se han visto en la obligación, ya sea de cerrar ya de reducir considerablemente su actividad. En estas condiciones la competencia es aguda, sobre todo al nivel de las pequeñas y medianas empresas (serrerías, cajerías, carpinterías, muebles). Esta competencia opone sobretodo las empresas del interior a las de Montevideo. Las primeras benefician, respecto a las segundas, de una diferenciación del régimen fiscal en su favor, de una mano de obra más barata y de maderas menos caras procedentes muy a menudo de compras hechas de contrabando.

No es extraño pues, que a pesar de los costos de transporte elevados, puedan las empresas del interior aprovisionar Montevideo a precio menor que las empresas situadas en la capital y que no disponen de las mismas ventajas. En cambio la competencia no es tan severa al nivel de las industrias más concentradas (compensado, tableros, pulpas y papeles) en las que los productores desde hace ya varios años, en el ámbito de un acuerdo profesional, imponen prácticamente sus precios a los utilizadores.

Hay que subrayar por fin, que las ofertas y las demandas de productos forestales no son siempre muy bien conocidas de los interesados. Por consiguiente, Montevideo desempeña a menudo, en la distribución, un papel de placa giratoria no siempre justificado.

2. Las industrias de la madera se han quedado casi siempre en un estado artesanal. Debiera hacerse un esfuerzo notable en el sector de la tecnología para mejorar el afilado de las cintas de sierra (adopción de la dentadura triturada y del estelitage), el secado de las mederas, la preservación de las piezas de madera al contacto con la humedad o que no resistan al ataque de los insectos xilófagos.

Convendría desarrollar, cuanto antes, diferentes industrias entre las cuales conviene citar:

- las serrerías móviles que se adaptarían perfectamente bien a la dispersión de las plantaciones uruguayas y que permitiría ofrecer en el mercado, aserrados de buena calidad de madera nacional;

- la fabricación de tableros de madera aglomerada a base de Eucaliptos que debiera substituirse progresivamente en el arreglo y la construcción de muebles al Pino importado de Brasil;

- la fabricación de cajas grapadas para el mercado local y de cajas armadas para el mercado de exportación que permitiría utilizar mejor las maderas disponibles y ofrecer productos de mejor calidad;

- la fabricación de pulpa mecánica de Pino o de Alamo para la elaboración del papel periódico actualmente importado;

- por fin la fabricación de carbón activo y la extracción de aceites esenciales de Eucalipto podrían tal vez, tras previos estudios, revelarse como actividades no tradicionales interesantes en Uruguay.

3. Para favorecer la mejora y el desarrollo de las industrias de la madera, la Dirección Forestal tendrá que esforzarse pues:

- en hacer previsiones a largo y mediano plazo para conocer bien la oferta y la demanda de productos forestales;

- en obrar sobre las materias primas realizando un inventario forestal para conocer mejor los recursos existentes y esforzándose en desarrollar nuevas plantaciones;

- en contribuir en la mejora de la tecnología realizando pruebas industriales y haciendo un esfuerzo de vulgarización técnica;

- en obrar sobre el plan económico lanzándose en una acción de promoción de las maderas nacionales, publicando informes sobre los mercados y los precios de las maderas y esforzándose en suscitar nuevas realizaciones industriales.

4. Para sostener la acción de la Dirección Forestal, la Cooperación Técnica Francesa puede:

- seguir desempeñando el papel de consejero técnico de la Dirección Forestal, por misiones a intervalos regulares relativas cada vez a un programa preciso;

- realizar un inventario del potencial forestal de Uruguay, documento indispensable para planificar el desarrollo de nuevas industrias;

- contribuir a hacer progresar el empleo de los Eucaliptos, principales recursos de madera de Uruguay, instalando una serrería piloto dotada de un secador artificial;

- favorecer la modernización de las serrerías y de las pequeñas y medianas empresas de la madera poniendo en pie una unidad móvil de asistencia técnica encargada de dar consejos prácticos, tanto para el afilado como para la organización general de los talleres;

- por fin, ayudar a la Dirección Forestal a definir un plan general de desarrollo de sus industrias de la madera cuando disponga de un inventario forestal preciso y de informes suficientemente sólidos sobre el mercado nacional.

5. Parece muy deseable que Uruguay pueda seguir regularmente el desarrollo de sus industrias forestales, sector muy complementario de sus actividades agro-pastorales tradicionales que le ha de permitir, en particular, el realizar importantes economías de divisas y responder así al desafío de la naturaleza que no dotó al país con abundantes bosques naturales pero donde sin embargo los árboles plantados por el hombre crecen tan bien.

APPENDIX 9

Summary of main features for wire-bound box factory

	Boqui S.A.	Esteras Castell S.A.	Melvi S.A.
1. Localization	Young, Rfo Negro	Colon, Montevideo	San José
2. Wood raw material	Eucaliptus globulus(prob.)	Willow (saucé alamo)	Willow, poplar, pines, eucaliptus
3. Wood supply reliability	Not specified	Partially own forests	Logging organized by themselves
4. Production per year	1.400.000 boxes	1.500.000 boxes	Not specified
5. Industrial plot	Not specified	4 hectares	1.471 m ² (insuf.)
6. Industrial building	Not specified	2.500 m ²	Not specified
7. Labour	Not specified	Not specified	Not specified
8. Investment			225.600
8.1 Machinery (US\$) 1/	200.000	150.000	Not specified
8.2 Buildings (US\$)	66.000	150.000	
9. Inputs per box			
9.1 Wood	Not specified	2 kg/box (insuf.)	Not specified
9.2 Wire	Not utilized	107 gr/box	Not specified
9.3 Labour	Not specified	Not specified	Not specified
10. Costs per box	Not specified	US\$ 0.35 (incomplete)	Not specified
11. Technological process	Not specified	Incomplete	Incomplete

1/ FOB Montevideo estimations actualized.

Summary of main features of proposals for final evaluation

APPENDIX 10
Table 1

Asociación de Industriales
de la Madera y Afines del
Uruguay

Oricorore-Solari

1. Localization	Libertad - San José	Uruguay
2. Wood raw material	Poplar Pines Willow	Local Pines Poplar Pines Willow
3. Wood supply reliability	Possible participation of forest growers	Possible participation of forest growers
4. Production per year	1.500.000 boxes	1.500.000 boxes 1/ 30.000 pellets
5. Industrial plot (in m ²)	10.000	not specified
6. Industrial buildings (in m ²)	(2.000) 1.000	(2.000) 1.050
7. Storage buildings (in m ²)	(0.01 US\$ per box) 1.500	(0.01 US\$ per box) 410
8. Investments		
8.1 Machinery (in US\$)	(325.400) 221.000	(521.000) 206.000
8.2 Buildings (in US\$)	(260.000) 155.000	(250.000) 110.000
9. Inputs per box		
9.1 Round wood	(7.5 dm ³) 3.6 dm ³	(7.75 dm ³) 5.9 dm ³
9.2 Wire No 16	(140 gr) 141 gr.	(140.000) 166 gr.
9.3 Labour (In US\$)	0.05	0.05
10. Costs per box (In US\$)	(0.55) 0.41	(0.54) 0.45
11. Technological process	According to standard para 3.3.1 with exemption of: a) drying of assembled box shooks is proposed b) treatment of veneers with pentachlorophenolate sodium	According to standard para 3.3.1 with exemption of: a) Continuous pre-treatment (steaming) of logs, necessary for glue lights. b) Drier for veneers and timber for chests not included there-fore. c) Treatment for veneers with borax soda salts d) Mounting of box-ends to box-sheets prior to storage
12. Financial arrangements	Building costs through own capital machinery (85%) loan from IADB Remaining each (15%) and working capital through local bank loan.	Building costs through own capital. Machinery loan from IADB or through financiers. Working capital through local bank loan

Notes: Figures in brackets are the ones used in economic calculations.
1/ In evaluation only production of boxes was considered

Summary of main features of proposals for final evaluation

APPENDIX 10
Table 2

Campichuelo S.A.

Industria Maderera del Norte

Salto

Bella Unión - Artigas or Paysandú or
Canelones

1. Localization	Eucaliptus rostrata
2. Wood raw material	own logging and transport equip.
3. Wood supply reliability	(1.500.000 boxes) 1.250.000 w.b.
4. Production per year	boxes 1.000.000 small boxes 5.3 hectares
5. Industrial plot	(0.01 US\$ per box for storage)
6. Industrial buildings (in m ²)	(2.000) 2.020 58 persons
7. Labour	(336.500) 1/ 600.000 Included in plywood factory 2/
8. Investment	(1.7) 1.5
8.1 Machinery (in US\$)	(0.71) 0.71
8.2 Buildings (in US\$)	(140) 107
9. Inputs per box	0.05
9.1 Round wood (in dm ³)	(0.57) 0.52
9.2 Plywood (in m ²)	According to standard para 3.3.1 with exemption of: a) Debarker needed for high total production of plywood and boxes; b) No ade- quate area for storage of boxes
9.3 Wire No 16 (in gr)	Local loans for buildings secu- red (for both plywood and box manufacture). Foreign loan for machinery (85% of value) secured (french). Remaining machinery costs and working capital loan secured from local bank.
9.4 Labour (in US\$)	
10. Costs per box (in US\$)	
11. Technological process	
12. Financial arrangements	

1/ For the evaluation only machinery costs for wire bound box line was taken

2/ The building cost is included in the production costs of plywood, debited as part of raw material costs

LIST OF INSTITUTIONS, AUTHORITIES AND PERSONS

Evaluation team for the Project

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- Edgardo Favaro - Oficina de Planeamiento
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National Industrial Technology
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United Nations Development Programme (UNDP), Office in Uruguay

- Luis Gómez - Resident Representative of UNDP
- Juan Galecio Gómez - FAO Country Representative,
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Ministry of Agriculture and Fisheries

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- Ilda Perich - Deputy Director, OPYPA
- Jorge Saxel - Director of Citrus Board
(Presidente de la Comisión
Honoraria Nacional del
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- Yanil Brunc - Agric. Engineer
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- Gabriel M. Caldevilla** - Director, Forestry Department
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Industries

- Héctor Faroppa** - Director, Carpintería Aquiles Faroppa
- Héctor Becchino** - Director, Cía. Industrial Comercial Sur S.A. (Manufacture of cardboard boxes)
- Juan Blasco** - Director, Juan Blasco y Cía., Concordia, Argentine. (Sawmill)
- Juan A. Mussini** - Owner of sawmill, San José (rented to Melvi S.A. for box manufacture)
- Pindapoy** - Wire-bound box factory, Concordia, Argentine.

Asociación de Industriales de la Madera y Afines del Uruguay

- Gregorio Przepiorka** - General Manager
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Campichuelo S.A.

- Juan C. Cámpora** - General Manager
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- Michel Fortea** - General Manager for TEMSA, France.

Darricarrere - Solari

- Federico Berro - Companys' Lawyer,
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- Rinaldo Tuset - Engineer,
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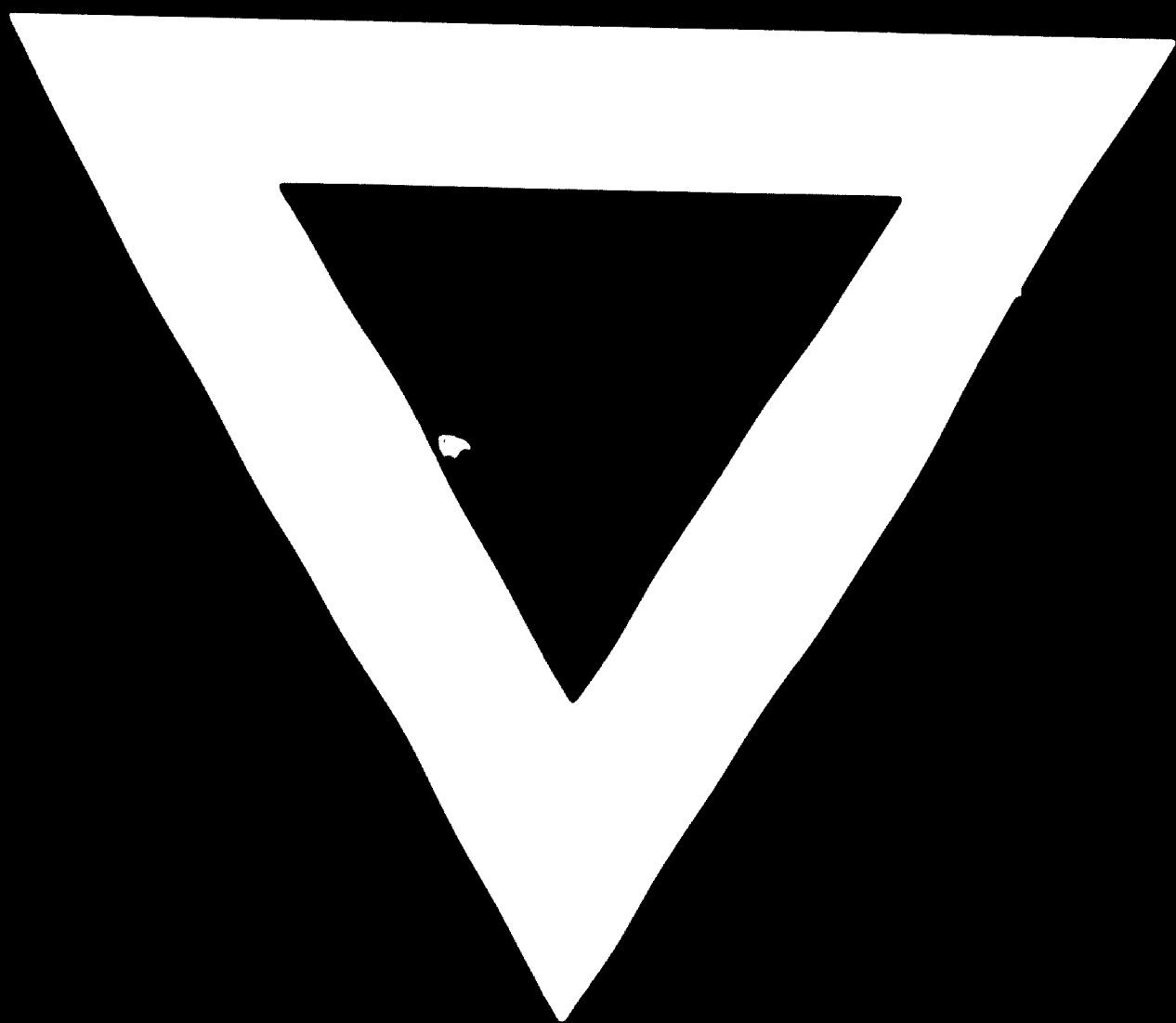
Industria Maderera del Norte

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