

**A MARKET STUDY
of
CHILE**

WP-OI-95.06

Working Paper

CANADA-BRITISH COLUMBIA PARTNERSHIP AGREEMENT ON FOREST RESOURCE DEVELOPMENT: FRDA II

Canada 

BC 

**A MARKET STUDY
of
CHILE**

WP-OI-95.06

by

The Western Canadian Wood Machinery
&
Services Export Association

This study was prepared as part of the Opportunity Identification Program (Program 5), Canada-British Columbia Partnership Agreement on Forest Resource Development: FRDA II.

Project Director

Bill Wilson
Pacific Forestry Centre
Canadian Forest Service
506 West Burnside Road
Victoria, BC V8Z 1M5

October, 1995

Preamble

This report is part of a larger project undertaken by the members of the Western Canadian Wood Machinery and Services Export Association in cooperation with FRDA. The objectives of the project were:

- .. to assess the potential for exports of wood machinery and engineering products into select jurisdictions with either emerging or an established forest products industry; and

- .. to develop a sound market development plan for those jurisdictions where the export opportunities warranted.

The report was initially released within the Association and has led to considerable market development effort and some very positive export success.

Acknowledgment

WCWMSEA would like to acknowledge the support and contribution of those who assisted in the completion of this report. The preparation, organization and mission logistics as well as the documentation, writing and printing could not have been possible without the generous input and support of Dr. Bill Wilson, Canadian Forest Service, Mr. Jeremy Pallant, Canadian Embassy in Chile, Sr. Rodrigo Undurraga, CORMA, and the management and staff of the British Columbia Trade Development Corporation.

Disclaimer

The views expressed in this report do not necessarily represent those of the Canadian Forest Service or the B.C. Ministry of Forests.

TABLE OF CONTENTS

1.0	Executive Summary	7
2.0	Political Overview	9
3.0	Chilean Business Environment	9
3.1	Economic Trends	9
3.2	Currency and Foreign Exchange	12
3.3	Import Duty	12
3.4	Taxation	12
3.5	Business Practices	12
3.6	Foreign Investment	13
3.7	Labour	13
3.8	Access to other Countries in South America	14
4.0	Forest Industry Overview	14
4.1	Private Ownership	14
4.2	Forest Resource	15
4.2.1	Native Forests	15
4.2.2	Plantation Forests	16
4.3	Log Exports	17
4.4	Structure of Wood Products Manufacturing Sector	17
4.5	Lumber	17
4.6	Secondary Manufacturing	19
4.7	Veneer Plywood	20
4.8	Particle, Medium Density Fibre Board, Oriented Strand Board	20
5.0	Background Data on the Chilean Forest Industry	21
6.0	Consulting Engineering Services Market Overview	25
6.1	Market Opportunity for Canadian	26
6.2	Market Approach	27
6.3	Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis for Canadian Engineering Consultants in Chile	28
7.0	Sawmill Sector Overview	30
7.1	Sawmill Operations	30
7.2	Wood Based Panels	32
7.3	Sawmill Equipment: State of the Art Review	32

7.4	Sawmill Sector Opportunities for Canadian Companies	34
7.4.1	Sawmills	34
7.4.2	Kilns	35
7.4.3	Market Implications for Association Companies	36
7.4.4	Existing Competition	37
7.4.5	Marketing Framework	37
7.4.6	Agents/Dealers	38
7.5	Customer Service and Training	38
7.6	Project Financing	38
7.7	Strengths, Weaknesses, Opportunisms and Threats (SWOT) Analysis for Canadian Sawmill Equipment Suppliers	39
8.0	Harvesting Sector Overview	42
8.1	Harvesting Methods	42
8.1.1	Thinning	44
8.1.2	Use of Contractors	44
8.1.3	Existing Equipment	44
8.2	Existing Competition	45
8.3	Opportunity for Association Companies	46
8.4	Channels of Distribution	47
8.4.1	Potential Agents and Dealers	49
8.5	Customer Service Expectations	49
8.6	Customer Training Requirements	50
8.7	Financing Expectations	50
8.7.1	Sales Potential	51
8.8	Strengths, Weaknesses, Opportunities & Threats (SWOT) Analysis for Canadian Harvesting Machinery Suppliers	52
9.0	Market Strategies	54
9.1	Creating a Comparative Advantage	55
9.1.1	Consulting Services	55
9.1.2	Sawmill Equipment	55
9.1.3	Harvesting Equipment	56
9.1.4	Choice of Market Representative	56
9.1.5	Tactical Approaches to the Chilean Market	56
10.0	Appendices	58

10.1	Map of Chile	59
10.2	Chilean Agents	61
10.3	Forest Companies Forest and Sawmill Operations	67
10.4	Chilean Mills	79
10.5	Market Investigation Meeting Notes	96
10.6	World Bank Case Study: Arauco	143
11.0	Bibliography	146

1.0 EXECUTIVE SUMMARY

1.1 Chilean Forests

Chile is politically and financially stable and is recognized as a significant player in the global marketplace. Chile is recognized as being a world class forest resource manager.

The forest industry is established as a national priority and is expected to triple its harvest level from 15 million cubic meters in 1992 to 48 million cubic meter in 2020. The primary production forests are radiata pine, managed primarily for a solid wood end use and eucalyptus for pulp and paper. The natural forests, made up of indigenous species, have not been intensively managed. Current government focus on improving the natural forests may make this resource more viable in the future, but it will be small compared to plantation forests.

Ninety-five percent of all forests including the natural forests are privately owned and are primarily controlled by six companies.

1.2 Market Opportunities

The projected Chilean forest growth provides opportunities to sell process engineering services, sawmill and harvesting equipment.

In the consulting services sector, Chile has well established discipline engineering capability but lacking is solid wood process engineering. The opportunity for Canadian consulting services is in providing feasibility studies and process engineering working is association with forest owners and/or Chilean engineering firms.

In the sawmilling sector the annual equipment capital investment is expected to be \$20-\$25 million Canadian per year for the next five years. In the silviculture and harvesting sector annual equipment sales are estimated to be 423 million/year plus related parts and service.

1.3 Competition

In the sawmilling sector, Canadian supplied equipment has been primarily replaced by European supplied equipment with US suppliers making in-roads. The change in buying patterns has evolved through the increased presence of European and, recently, US equipment manufacturers in Chile and the perceived reluctance of Canadian suppliers to meet and service the needs of the Chilean industry. In the harvesting equipment sector, a similar pattern to the sawmilling sector has evolved except US suppliers have a dominant share in the skidder market.

Although Chile initially looked to Canada for their process and equipment requirements, the Chileans view Canadians as opportunistic in their marketing/sales approach and unwilling to provide equipment that meets their needs.

1.4 Approach to the Market

The fundamental learnings of the Market Study are:

1. Chileans want to do business with Canadians
2. There are sales opportunities in the process engineering, sawmilling and harvesting sectors. (the panel sector also will grow, but currently there are no association members whose BC manufacturing base is aimed at this market.)
3. To do business in chile, Western Canadian manufacturers will have to:
 - a) develop a local presence in Chile in the form of representative and/or local alliances;
 - b) develop the trust and long term relationships with customers;
 - c) be prepared to negotiate final sales directly with the Chilean buyers.

2.0 POLITICAL OVERVIEW

The geographic isolation of Chile from other South American countries and the rest of the world has been a major influence on the social and economic development of the country. Unlike many developing countries in the world, the political and social climate in Chile is stable.

In 1973, the Government of Chile, lead by General Pinochet, implemented a number of economic reforms targeted at controlling government spending, reducing the government's role in the economy, and expanding the economy and reducing government debt.

The current government, lead by President Patricio Aylwin, was elected in 1989 after a national referendum called for an end to military control. This government has continued on the same path of economic reform.

The country is divided into 12 economic regions and each region is further divided into provinces for administrative purposes. The national government is, however, the dominant force in Chilean politics.

3.0 CHILEAN BUSINESS ENVIRONMENT

3.1 Economic Trends

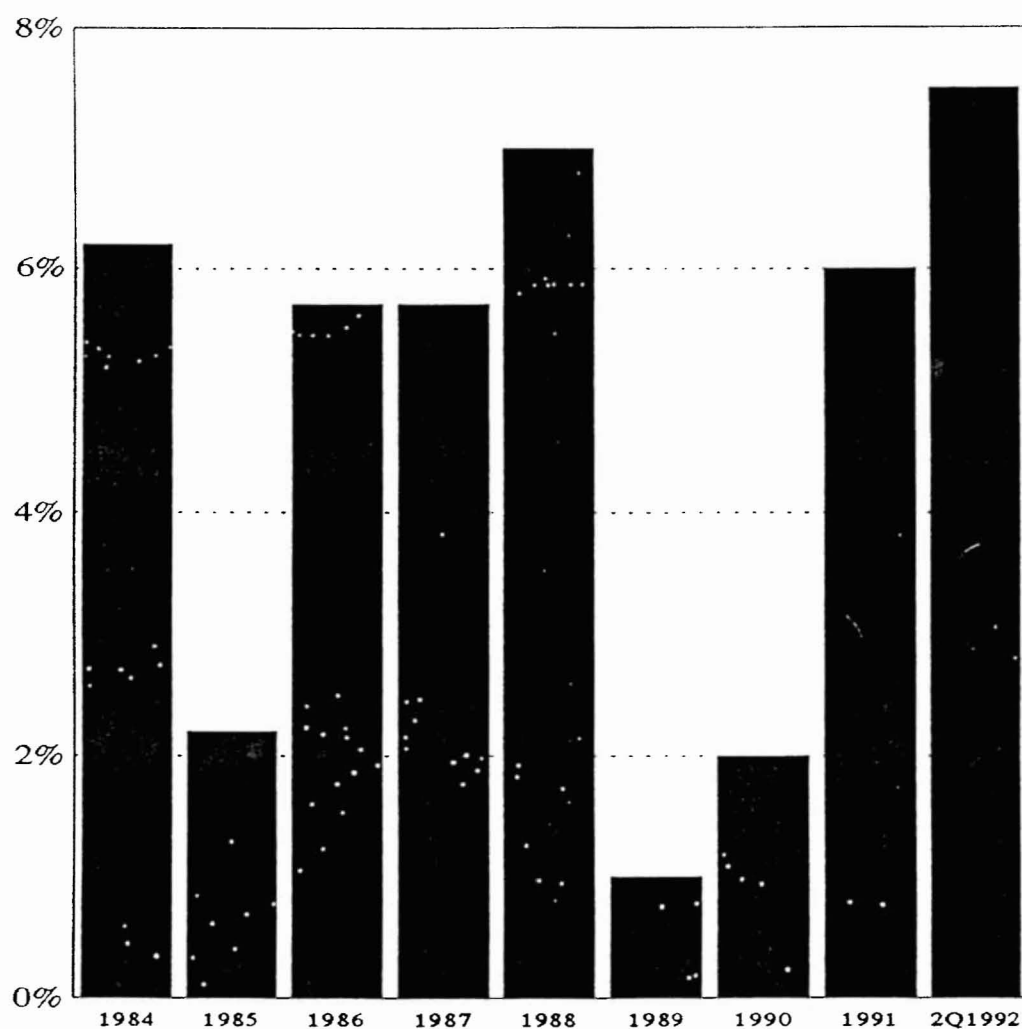
Chile has a relatively small domestic market and geographic separation has traditionally limited trade with other South American countries. Economic growth has, therefore, been based on a strong presence in international markets.

Public support in the mid 1970's for the development of an open market economy lead to economic and political reform. Government privatized state-owned industries, simplified government procedures and regulations, reduced corporate taxes and more effectively managed government debt.

The current government has continued to support economic expansion based on efficient utilization of natural resources. Forestry, mining, fishing and agriculture are the basis for the strong economic growth expected to continue into the next century.

Some Chileans, however, feel that the current high economic growth rate cannot be sustained in the short term. Falling world prices for agriculture, mining and fishery products suggest a reduced rate of growth over the next year.

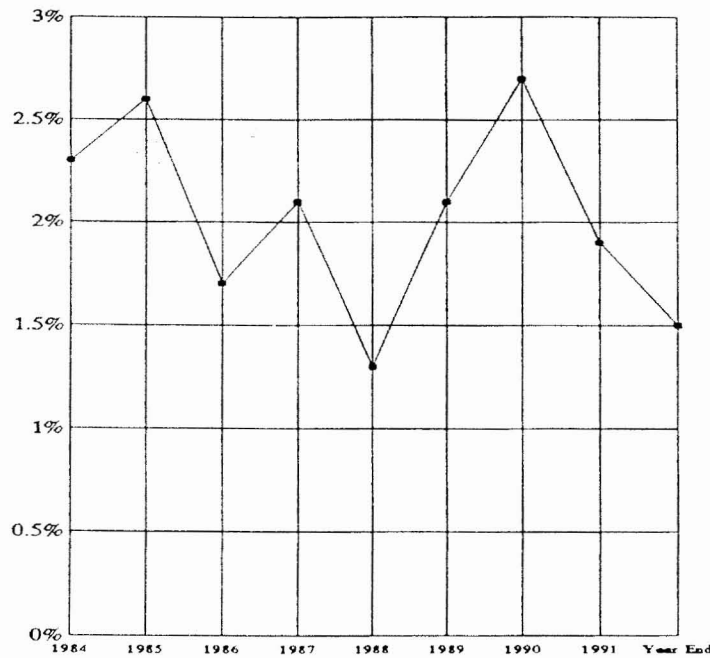
CHILE: GROSS DOMESTIC PRODUCT Annual Percentage Change, 1984-1992



Source: Chile Economic Report

Government efforts to reduce inflation have been successful relative to other South American countries. The current downward trend is also expected to continue.

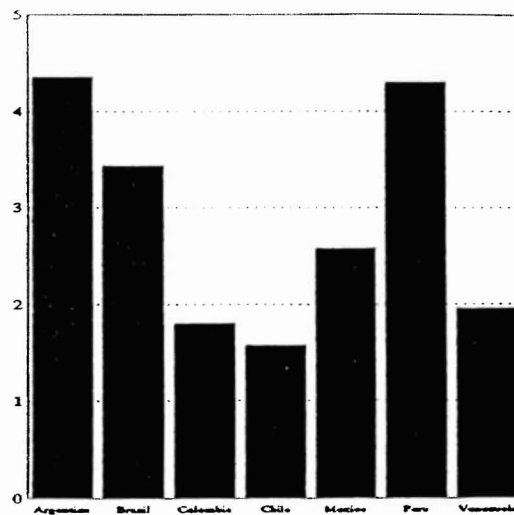
CHILE: CONSUMER PRICE INDEX
Annual Percentage Change, 1984-1992



Source: Chile Economic Report

Reduced government spending and a "debt-swap" program have reduced the national debt to the point where it is no longer considered a significant problem. Chile now has the highest Standard & Poor's rating of any South American country. Economic development has been further stimulated by the resulting improved private sector access to foreign capital at more favorable rates of interest.

**LATIN AMERICAN FOREIGN
 DEBT AND EXPORTS, 1991**



Source: Central Bank of Chile

3.2 Currency and Foreign Exchange

The Central Bank of Chile sets interest rates, issues currency, regulates the banking system and controls foreign exchange operations. Interest rates have been maintained at a level higher than available to most international investors to slow movement of capital out of the country.

The Chilean peso has strengthened in recent years and it is currently trading in the range of 400 pesos to the United States dollar.

Economic reform has heightened international investor interest in various sectors of the Chilean economy. As a result of this interest, financial institutions have a strong presence in Chile with most locating in the capital, Santiago.

It should be noted that the Chilean is a seasoned international businessman. It is not uncommon for a potential purchase to be affected by foreign exchange considerations. While the Chileans typically do business in U.S. dollars and relate all purchases to the prevailing U.S. exchange rate, they will source other currencies if there is an advantage. Arauco's recent Italian kiln purchases at a new mill in Constitucion were based in large measure on the foreign exchange advantage of the lira.

3.3 Import Duty

The Chileans take great pride in their open market economy and the open market policies that are in place today are expected to remain in place for the foreseeable future. Import duty is calculated on the CIF value at the rate of 11% for all imports. There are few exceptions to this rate with no forestry or woodworking equipment eligible for exemptions at this time. In addition to the import duty, all goods imported to Chile are subject to a 18% Value-Added Tax. The VAT is calculated on the duty paid CIF value of the goods imported (thus the effective VAT rate is 19.98%).

3.4 Taxation

The corporate tax rate for Chilean industry is 15%. An incentive for corporate ownership allows owners of firms to deduct their personal tax from their corporate tax. The personal tax rates are similar to those of Canada and can be as high as 50%.

3.5 Business Practices

The Chileans have realized that to be successful in an open market economy a business infrastructure that is conducive to dealing in the world markets is imperative. The Chilean legal system and contract law recourse is capable of providing a foreign business adequate means to protect ones business interest and dealings in the country.

The Chileans follow traditional business practises. The typical manager is well educated and make a great effort to ensure a potential purchase or project is thoroughly researched. The Chileans are known as slow buyers and will only purchase when they are confident all the technical and economic questions are answered.

Another aspect of traditional business practise in Chile is the importance placed on the social aspect of a business relationship. Business generally comes first and the best perceived business decision is generally made but the Chilean values the social relationship with an international businessmen as much as he does the commercial.

3.6 Foreign Investment

Foreign investment is encouraged by the government and accepted by the people of Chile. Foreign capital and technical expertise is generally viewed as an essential component in the continued development of the economy.

Foreign investments are governed by Decree Law No. 600 and the Foreign Exchange Regulations of the Central Bank. The ownership of businesses, land and buildings are generally unrestricted and profits can be repatriated annually. Capital from the sale of an investment, however, must remain in Chile for 3 years.

Although government does not take a major role in business activities, the Chilean Foreign Investment Committee must approve foreign investments greater than \$5 million. In addition, financial incentives may be available for certain types of investments.

3.7 Labour

The population of Chile is relatively stable at about 13.4 million people. More than one half of the population is under 25 years of age with a literacy rate greater than 90% for that portion over the age of 15.

Unemployment has fallen to about 4% and wages have doubled in the last 5 years as a result of strong economic growth. This trend will continue with wages forecast to double in the next few years as the economy continues to expand. Current wage rates in the sawmill sector are based on a minimum wage of \$300 per month U.S. plus an incentive bonus based on cubic meters of output. Typical wages range from \$500 to \$1000 U.S. per month.

Labour organizations are not a major factor in the Chilean work force. Less than 13% of workers are represented by a union.

The labour force is generally viewed as hard working and able to adapt to new processes and technologies. Worker flexibility, so essential to the start up of new operations and achieving international competitiveness, has been maintained.

Wages in the forest industry are usually above a government mandated minimum with provision for incentive bonuses based on productivity. Based on today's labour rates, Chilean labour costs, in nominal terms, are less than one half those in the forest industry in British Columbia.

3.8 Access to Other Countries in South America

Chile has for some time been regarded as an attractive country for major capital investment.

Foreign forest products companies have formed alliances with a number of Chilean forest companies to capture opportunities based mainly on plantation forests. Fletcher Challenge from New Zealand and Stora from Sweden have made major investments over the last 10 years.

Success in plantation forestry in Chile has heightened interest in the forest sector in other South American countries. Similar growing conditions exist in certain regions of both Argentina and Brazil. At least one major British Columbia forest company was directly involved in a Radiata Pine plantations in Brazil for a period of time in the 1970's. Business alliances with a Chilean company and a firm foundation in the Chilean forest industry are generally viewed as desirable steps to diversified investments in South America. Chileans are now starting to invest in Argentina and Brazil.

4.0 FOREST INDUSTRY OVERVIEW

Much of the Chilean forest industry is based on the philosophy that value added logs (i.e. pruned pine) from forest plantations are the number one priority. High returns from log exports have focused forest plantation owners on intensive forest management. The increase in investment and employment in this part of the forest sector has yielded a greater return to forest owners utilizing intensive forest management and expanded the economic impact of the sector.

4.1 Private Ownership

A history of government expropriation of forest companies had slowed investment in the forest industry in the early 1970's to the point where the industry was not a significant component of the Chilean economy. Government recognized the need for substantial investment in forest management followed by significant capital expenditures in plants and equipment in order to develop a world competitive forest industry. As a result, 95% of Chilean forests are now privately owned.

Private ownership of both native and plantation forest land became the cornerstone of the forest industry in Chile. Security of ownership has been guaranteed since 1974 under Decree Law 701 to encourage the conversion of marginal agriculture land to intensively managed forests. An assured supply of wood and incentives to plant trees has led directly to the construction of capital intensive pulp mills, sawmills and secondary manufacturing facilities and major investments in intensive forest management.

The industry shares a common view that major capital investment cannot be based on the uncertainties associated with a spot market for logs. A predictable supply of fibre has provided the certainty to encourage long term strategic planning in the forestry sector and attract major capital investments.

4.2 Forest Resource

CHILE: FOREST LAND AREA			
(Million Hectares)			
TOTAL LAND AREA	75.50		
Forest Lands	34.15		
Protected Forest Lands	26.05		
Non-stocked		14.90	
Forested		11.50	
Productive Forest Lands	8.10		
Native Forests		3.45	
Non-stocked		3.15	
Plantations		1.50	
Source: Subcomisión Forestal.			

4.2.1 Native Forests

The forest industry in Chile until the 1960's was based on the harvest and processing of native species. Approximately 3.45 million hectares of productive forest lands remain in native species. Recent estimates suggest that only about 1.0 million hectares are economical for harvest and management.

The native forests in Chile today, however, are very poor quality because of conversion of better forestlands to agriculture, past logging practices and an almost total lack of forest management. From years of past neglect, the majority of native forests contain a mixture of generally low quality, high defect, temperate hardwood species (coigue, lenga, tepa, olivillo, ulmo).

The current strong chip export market for hardwoods has, however, renewed interest in native forests. Japanese investors have constructed a number of chipping and chip loading facilities since 1988. Some hardwood species are increasingly being used for the production of veneer, plywood, furniture and furniture components primarily for export markets. Although some production is based on the native forests, significant increases in wood production will come from plantation forests.

Concern about the deterioration and the conversion of native forests to plantations has prompted the Chilean government to propose legislation to protect and manage remaining native forests. This legislation is expected to be finalized after the December 1993 elections.

4.2.2 Plantation Forests

Privately owned Radiata Pine plantations and, to a lesser extent, Eucalyptus are the success stories of the Chilean forest industry. Over 80% of the plantations are Radiata Pine with more than half of that in Region 8, Concepcion, (see page 22).

The rapid expansion of plantation forests resulted directly from an incentive program started in 1974 that has subsidized planting on private land for the last 20 years. The program has covered up to 50% of the cost of plantation establishment and provided some forestland tax exemptions. Projected to end in 1994, the program has lead to the establishment of over 1.5 million hectares of plantation.

Radiata Pine

The harvest of Radiata Pine has increased from about 4 million cubic meters in the mid-70's to over 11 million in 1991. This level is expected to increase to over 20 million cubic meters by the year 2000 and to almost double again by 2020.

Most plantations today are managed intensively to maximize the production of clear wood by pruning up to 8 meters high. Included in the management strategy is at least one pre-commercial thinning operation and another commercial thinning for pulp quality wood in the 5 years just prior to final harvest. The volume of wood from thinning is expected to increase significantly in the years ahead as the plantations reach the appropriate age. The practice of pruning on good growing sites and thinning provides maximum clear wood when harvested.

The average growth rate of intensively managed Radiata Pine is approximately 21 cubic meters per hectare per year in Chile. By comparison the average growth rate on coastal plantations in British Columbia is approximately 4 cubic meters per year.

Eucalyptus

Eucalyptus plantations are managed to maximize fibre for pulp production. Genetically improved stock, along with fertilization, often yield short rotation cycles of 7-8 years on better sites and growth rates of up to 35 cubic meters per hectare per year. Only a small proportion of this fiber is used for the manufacture of specialty lumber.

4.3 Log Exports

The unrestricted export of all forest products from private land is almost universally viewed as a right of private ownership and not expected to change. Log producers have been free to export logs in Chile since 1975.

The export of logs, mainly to Japan, South Korea and China, has increased significantly since 1986. This trend is expected to continue in the short term in response to growing wood shortages in a number of producing areas. The United States government recently approved the importation of logs from Chile to ease supply shortages of domestic logs.

The industry in Chile views log exports as a short term window of opportunity to generate capital necessary to continue the investment in intensive forest management. In addition, it is an opportunity to make the necessary investments in sawmilling and secondary manufacturing. The level of investment throughout the industry indicates industry is capitalizing on this opportunity.

Some world markets have been slow to accept Radiata Pine lumber products particularly as an appearance grade product. Revenue from log exports has been used in some cases to support lower lumber prices during initial market development efforts.

4.4 Structure of the Wood Products Manufacturing Sector

The Chilean forest industry is committed to realizing the full market potential of Radiata Pine plantation forests. The forest industry is moving systematically through a development process leading to the production of increased volumes of higher value products from intensively managed forests.

4.5 Lumber

The structure of this component of the forest industry is reminiscent of the industry in British Columbia during the 1950's and 1960's. Although over 1,000 sawmills are currently active in Chile, the largest 8 produce over 30% of the lumber while the smallest 1,000 sawmills produce only 36% of the lumber.

Also like British Columbia in the 1970's and 1980's the sawmill industry in Chile is going through a transition. The smaller, less efficient sawmills, often without an assured supply of timber and usually based on the processing of native forests, are closing. Lumber production is increasingly being concentrated in the medium to larger sawmills with plantation timber, capable of competing in world markets.

By British Columbia standards, even the "larger sawmill" are relatively small. Lumber output from this category of sawmill currently ranges from 50,000 to 200,000 cubic meters per year.

Over the next 7 years, another 4 to 7 sawmills will be constructed primarily in the Concepcion area to handle increased volumes of Radiata Pine. Most companies will tend to construct larger facilities to compete in world markets.

In excess of 85% of the lumber is manufactured from Radiata Pine. Increasing volumes of pruned timber are now being processed into clear lumber as the plantation stands reach maturity. The proportion of Radiata Pine could increase as proposed government conservation policies designed to protect native forests are implemented. Approximately 400,000 cubic meters of lumber was manufactured from native hardwoods in 1991 (predominantly Coigue, Lenga, Tepa and Tineo) and only 60 thousand cubic meters from eucalyptus.

Total lumber output in Chile has increased from 960 thousand cubic meters in 1975 to well over 3 million cubic meters in 1992. This trend will increase with production expected to more than quadruple over the next 20 years.

Several major forest companies are re-organizing operations to further process increasing volumes of Radiata Pine. Arauco, for example, has created a new operating structure to separate the management of the forest resource from the manufacture of solid wood products and pulp and paper. This separation is consistent with New Zealand Radiata Pine production.

The technology in the larger sawmills is being improved to compete successfully in export markets with high quality products. New equipment is being added to existing mills and new mills constructed.

Since labour is inexpensive relative to many producing regions of the world, the adoption of new technology has not advanced as far as in B.C. With the increase of pruned pine and the need for operational flexibility to meet global niche markets, new mills in Chile are installing computer optimization similar or equal to that used in North America. New equipment has usually been installed with, at minimum, computer optimization.

The selection of new sawmill equipment is usually based on a thorough review of equipment used by competing countries that serve the same export market. For example, some sawmill owners have based equipment decisions on a complete analysis of the equipment used by lumber manufacturing companies servicing the housing market in the United States.

The industry is based primarily on the processing of increased volumes of second growth Radiata Pine. Export markets are demanding increased volumes of kiln dried wood. However, dry kiln technology and capacity in Chile has not kept pace. The demand for new kilns is increasing.

A large proportion of the larger diameter logs (40 to 80 cm) are currently being exported because of high offshore demand. Many of the new sawmills expected to come on stream in the next few years will be designed to efficiently handle logs in the 15 to 20 cm diameter range.

Radiata Pine lumber is being promoted as a substitute for Ponderosa Pine. The impact of this increasing volume has not, as yet, been felt in international market. In some markets it is generally viewed as an inferior product used for packaging and is exported as green lumber. As the Japanese invest more heavily in the New Zealand pine forests, Radiata pine is increasingly entering the higher value end in competition with the traditional high value lumber products from traditional species.

4.6 Secondary Manufacturing

The philosophies on adding more value to the forest resource through secondary manufacturing is as diverse in Chile as it is in British Columbia. Low labour costs and a focus on a single species, however, contrast to conditions faced by the industry in British Columbia.

The secondary manufacturing industry in Chile is evolving rapidly in a number of directions:

Stand-alone secondary manufacturing facilities independently owned without private forests or a sawmill.

Lumber is usually purchased from sawmills for further manufacture. As in British Columbia, lack of an assured supply of wood negatively impacts significant capital investment and long term customer relations. Current high export log values have impacted on the viability of this type of operation.

Secondary manufacturing facilities linked directly to a sawmill.

A number of sawmills in Chile have been built to produce lumber specifically for an adjacent secondary manufacturing facility. This direct link back to the log input ensures maximum lumber recovery and efficiency in the production of the final product.

Stand alone secondary manufacturing facilities.

Contrasted to a direct relationship between facilities is the approach taken by other major forest plantation owners. Secondary manufacturing facilities have been built somewhat independent of company sawmills. These facilities purchase lumber products at export prices from either company owned sawmills or independent sawmills. The sawmills, in this case, are usually more focused on producing lumber products for export.

Low labour costs are clearly an even greater advantage for secondary manufacturers. Quality and judgement decisions are required extensively throughout most secondary manufacturing processes. The human mind and eye, at this stage of technological development of equipment manufacturing, often has a clear advantage over computers.

4.7 Veneer and Plywood

The production of veneer and plywood is currently based mainly on the processing of native species. However, the processing of Radiata Pine is expected to increase rapidly in the next few years. The production of veneer and plywood is viewed as a major investment opportunity by some in the Chilean forest industry.

Most of production facilities are small by Canadian standards and do not utilize the latest technology. In total, the industry is expected to produce about 70,000 cubic meters of plywood by 1995.

Particleboard, Medium Density Fibreboard, Oriented Strand Board

Like other sectors of the forest industry in Chile, the production of particleboard and medium density fiberboard is also expected to continue the rapid growth of recent years. Currently 250,000 cubic meters of fiberboard are produced by one company (Masisa) in 3 facilities. Two companies (MDF Chile and MDF de Fibranova) now produce about 200,000 cubic meters of MDF from Radiata Pine and Eucalyptus.

Oriented strand board is not produced in Chile. However at least two companies have expressed an interest in investigating the opportunities.

5.0 BACKGROUND DATA ON THE CHILEAN FOREST INDUSTRY

With the objective of not repeating information, this section provides an overview of market data that has relevance to all three association sectors reviewed.

The basis of this data is the dramatic growth in Radiata pine as a plantation resource. This resource is the critical factor in Chile's evolution as a value added processor of lumber.

Of Chile's total land area of 75.5 million hectares, 34.15 million (45%) are classified as land suitable for forest activities. Of that total, 8.10 million hectares are classified as productive forests and 26.05 million are protected. The breakdown of productive forest is shown in the following table:¹

Forest Land Use in Chile

Forest Land Status	Area (mill. ha.)	Percentage (%)
Commercial Natural Forest	0.8	6.8
Degraded Natural Forest	4.4	37.3
Second Growth Nat. For.	0.3	2.5
Plantations	1.4	11.8
Dunes	0.15	1.3
Cleared Forest Land (Agr)	4.75	40.3
<hr/>		
TOTAL	11.8	100.0

The most productive growing area, which includes the plantation resource, is concentrated in three central regions, as shown on Chilean maps on page 60.

The above table indicates that there are 1.4 million hectares of plantation growth in Chile. Approximately 46% is held by the two largest forest companies, Arauco and CMPC. The following is a list of Chilean companies with plantation holdings exceeding 30,000 hectares:²

-
1. "The Forest Industry in Chile", World Bank ASTAG/LATAG Technical Paper, December 1992, Page 2, Table 1.
 2. "The Chilean Market for Canadian Goods and Services in the Forest Sector", Eladio Susaeta, September 1992, Annex III, Page 75-78.

Chilean Plantation Holdings

<u>Company</u>	<u>Hectares</u>	<u>Plantation Wood Type</u>
Arauco	370,000	Mostly Pine
Forestal Mininco (CMPC)	248,000	Mostly Pine
Forestal Rio Vergara & Forestal Crecex	90,000	Mostly Pine
Forestal Bio Bio	80,000	Mostly Pine
Forestal Millalemu	60,000	Pine
Forestal Colcura & Forestal Monte Aguila	35,000	Eucalyptus
Forestal Cholguan	50,000	Mostly Pine
Bosques Chile	35,000	Mostly Pine

The total plantation holdings of these companies is estimated at 70% of the plantation resource in Chile. Several smaller companies have plantations under 30,000 hectares.

The availability of Radiata pine from these plantations is shown in the following table:

Industrial Wood Availability By Source³ (Annual Harvest) (1,000,000 m³/yr)

<u>Year</u>	<u>Plantations Radiata</u>	<u>Eucalyptus</u>	<u>Natural* Forests</u>	<u>Total</u>
1990	10.7	.9	2.7	14.3
1995	16.3	1.7	2.6	20.6
2000	23.3	3.5	2.6	29.4
2020	35.0	10.0	13.0	48.0

* Estimate based solely on existence of the resource.

3. Ibid. Page 29, Table from Section 5.1.

In 1992, Chilean industrial wood production totalled 15 million m³. Of that total, 12 million was Radiata pine, the balance was mostly eucalyptus and a small portion of natural species. By 1995 it is projected that consumption will exceed 20 million m³, and by the turn of the century, consumption will reach 30 million, with plantation Radiata pine representing 80% of the consumption.

It has been further estimated that by the year 2020, Chilean industrial consumption will reach 45 million m³. Put in context, this compares to the 1992 British Columbian harvested reported by the Ministry of Forests of 75 million cubic meters and a projected sustained harvest of 60 million m³ in British Columbia for the year 2000.

While the above projections suggest that Chile's natural forest resource will be used, a World Bank report published in December 1992 stated that 95% of Chile's wood production in 1991 came from plantation growth, and it further forecasted that within 8 years, this figure may reach 100%.

The end users of this growing supply of lumber have been charted in the following table.⁴ These figures indicate a significant growth in sawmill capacity. Output figures for the sawmill sector are expected to grow 15% between 1990-1995, and an additional 26% by the year 2000.

End Users (Input) of Chile's Industrial Wood
(1,000 m³/YR)

Yr	Pulp & Paper	Sawmills	Wood Based Panels	Exports Logs	Pulp
85	3393	4578	316	1260	14
90	2596*	6998	608	1033	2829

* This figure is underestimated. It includes only round wood use and does not include sawmill chips. This information is not available.

Chilean Associations

Fundacion Chile and CORMA are two of the primary forestry associations in Chile.

Fundacion Chile is a private, self-supporting organization that provides technical support to several industries including fish meal, mining, solid wood products and forestry/harvesting. They operate somewhat like Forintek. Feasibility studies, market studies, technology assessments, and testing services are regularly provided.

Fundacion Chile will invest in new, higher risk ventures such as furniture and component manufacture with a view to developing new products and processes.

The other major association is CORMA which is made up of 85% of the operating companies from all the forest regions of Chile. The function of CORMA is to promote co-operative efforts between operating companies in areas where mutual benefits can arise, i.e. fire protection policy, policy for management of the natural forests, etc.

4. Ibid. Page 24.

Investment Opportunities

The growth of the forest industry in Chile will be based on the successful management and utilization of its Radiata Pine and Eucalyptus plantations. The industry has made major investments to acquire marginal agricultural land for conversion into management forests. This has been prompted by government planting subsidies and tax exemptions.

The attractiveness of land investment is decreasing as government subsidies are eliminated and the true value of marginal agriculture lands managed as forest lands are recognized by international investors. However, dramatic increases in the price of wood products are improving the investment climate in forestry.

6.0 CONSULTING ENGINEERING SERVICES MARKET OVERVIEW

Chile's domestic forest equipment industry and wood processing engineering capabilities have not kept pace with the rapid growth in the harvesting and processing sectors. The engineering design of wood processing facilities is one area where this factor is evident.

Chileans have historically always looked offshore for the process design and layout component of their wood processing facilities. They have relied on the expertise of countries that have a track record in this discipline, most notably Canada, and then the United States, Scandinavia, and Germany.

Once process design and layout has been done, Chileans prefer to use local consultants for the detail design for three reasons:

1. Local consultants have a better understanding of local building codes, seismic conditions, structural shapes and construction methods used in Chile.
2. The cost of having detail work done on a local basis is less expensive than using imported services. Detail drawings cost about \$960 (60 man hours @ \$16 hour), compared to the Canadian norm of 100 hours per drawing at the applicable rate, usually in the range of \$40 per hour.
3. The compounding impact of Chile's duty structure. A 40% tax on gross fees is levied on foreign consultants working in Chile, with 20% levied if the service is provided from outside Chile.

For these reasons, there is little chance that a foreign consultant can rely on getting detail work in Chile.

Unlike the British Columbia market, where Consultants will also recommend and source specific equipment as part of the process design and layout, in Chile the trend in the industry is to keep this decision under the mill owners control.

The Chileans also indicated that there is a trend towards vendor supplied engineering, with an in-house or local consultant or contractor coordinating the design. The larger companies like Arauco and CMPC have developed an in-house capability in the process design and project management areas.

There are six reasonably large engineering consultants in the wood processing sector in Chile that provide study, design and project management services.

	<u>No. of People</u>
Arze Recine Y Assoc.	400
B.Y.R.	200
G & V	66
ICSA	51
Minmetal	460
Omega	80

While these companies have varying degrees of process expertise, mill operators are not confident in their process capability and continue to look offshore for process design.

At the time of the Association's market investigation, none of its member consulting companies had established affiliations with a local design firm.

In addition to engineering consultants, there is one contractor, Puga and Mujica Associates (P&MA), which provides both engineering and construction services. P&MA have a total staff of 100, (45 engineers) and a construction work force presently at 2,000. P&MA does work in all industrial sectors.

6.1 MARKET OPPORTUNITY FOR CANADIAN CONSULTING COMPANIES

Sawmill Sector

The opportunity for Canadian companies can be categorized as follows:

- * Process design and layout.

It is not expected that Chilean consulting engineering capability will evolve as quickly as the processing needs of the sawmill sector. Therefore, it is projected that Chilean companies will continue to use foreign companies for process design and layout.

- * Material handling automation.

With increasing labor costs and a fixed labor supply, as Chilean mills evolve into value added processing of radiata pine, they will need to automate the material handling side of the mill operations, a process that is now labor intensive.

- * Design support of B.C. vendors with design/supply contracts.

Given the trend in the Chilean market toward vendor supplied engineering, it may be strategically prudent for engineering consultants to align with equipment vendors to create a marketing/technical synergy.

Based on interviews with the major forest company managers, capital investment in the sawmilling sector is expected to be approximately \$20-25 million CDN per year for each of the next five to seven years. This represents one new mill per year with an annual output of 250,000-300,000 m³, plus upgrades to existing facilities. It should be noted that most of the new mill activity will be concentrated in ARAUCO and CMPC, with upgrades planned in other mills.

Secondary manufacturing Operations

Due to their reliance on export markets that demand grade cuts of lumber, the Chileans are rapidly becoming leaders in grade sawing and secondary manufacturing.

However, the Chilean consulting industry does not have an expertise in the niche markets for secondary manufactured products. There is a market opportunity for Canadian consultants with this expertise.

Harvesting Operations

Current harvesting techniques range from chain saw and oxen, to state of the art equipment. With no historic concern about labor saving productivity, the harvesting sector will only evolve as quickly as equipment suppliers can prove to the plantation owners that their equipment can provide cost savings.

There is opportunity for consultants related to harvesting planning, for example logistical support for plantation expansion; and for harvesting operations.

Silviculture

Given its reliance on plantation resource, the Chilean's are advanced in the areas of tree planting and management of Radiatu Pine and Eucalyptus. In fact, Chile is more advanced than Canada in this discipline. As such, there is not a market opportunity for Canadian companies in this area.

6.2 MARKET APPROACH

The opportunity for Canadian consulting companies is primarily the provision of process design services. To successfully penetrate the Chilean market, Canadian companies should consider three approaches.

1. The basic approach to the market would entail the use of a local agent to identify project opportunities for the consultant. This is the minimum level of commitment the consultant should consider if intending to penetrate the Chilean market.
2. A better approach would entail an affiliation with a local detail design engineering company. This would provide the consultant with representation, and enable the consultant to provide a complete process/detail engineering package to the client.

3. Alternatively, in concert with either of the above options, affiliation with an equipment supplier(s) would allow the consultant to address the market trend toward vendor supplied engineering.

6.3 STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS (SWOT) ANALYSIS FOR CANADIAN ENGINEERING CONSULTANTS IN CHILE

Strengths

Chileans recognize Canadian's have world class primary sawmilling expertise.

Canada has an international reputation and our success in United States market is impressive to Chileans.

Pulp & paper capabilities have been demonstrated in the market.

Full range of engineering design capabilities offered.

Weaknesses

Lack of knowledge/capability in remanufacturing.

Chilean perception that Canadians spend too much time on drawing (drawings more detailed than market requires).

Charge out rates are too expensive (\$22 versus \$55/hour).

Lack of market presence and market linkages in Chile.

Lack of knowledge re: Chile's product markets.

Lack of understanding re: local building code and structural requirements.

Opportunities

Opportunities exist in process design, not detailed design (require joint venture with local companies).

Feasibility studies.

Chile's excellent economic performance and stability makes it a platform to enter other South American markets such as Brazil and Argentina.

Threats

Strong international competitors with established market positions.

Good local capabilities exist in detailed design.

Tax Structure: Expatriate services in Chile subject to higher tax charges than if foreign company services are done outside the country.

Choice of consultant can have a significant impact on ultimate equipment choices (strategy implication).

7.0 SAWMILL SECTOR OVERVIEW

7.1 Sawmill Operations

Approximately 1600 sawmills operate in Chile. About 1500 are categorized as "mountain sawmills" that produce square cants with old circular mills. The majority of these mills operate in the native forests, while about 600 process pine. The operation of these mills is typically limited to two months of the year, producing on average 5000 m³ of poor quality cants. It is estimated that on an aggregate basis this category of mills produces only 36% of the lumber in Chile.

Of the remaining 100 or so mills, the largest 8 produce over 30% of Chile's annual lumber output. However, by British Columbia standards, these medium to large mills are comparatively small. Outputs from these categories of mills range from 50,000 - 200,000 m³ per year. The majority of these mills are comparable to operations typical of the interior of British Columbia during 1960 - 1970, which processed logs smaller than 20 inches in diameter, using scragg type saws.

The following table illustrates lumber production by mill size:⁵

Lumber Production Range	Number of Sawmills	Lumber Production
(1,000 m ³ /yr)		(1,000 m ³ /yr)
60 plus	8	990
20 to 59	11	355
10 - 19	26	368
5 - 9	64	409
Less than 5	1,000+	<u>1,205</u>
TOTAL		<u>3,327</u>

For the purpose of comparison British Columbia sawn timber output as reported by the Council of Forest Industry for 1992 was 14,152.3 million board feet which is equivalent to 34 million cubic meters per year. This is the reported output from 205 mills. New Zealand's Forest Industry reported an output of 2.4 million cubic meters from 253 mills.

Like British Columbia in the 60'S and 70'S, Chile's sawmill industry is experiencing a significant transformation. The smaller less efficient mills, largely dependent on native forest and without a guaranteed supply of resource, are closing. The production of lumber is evolving to a concentration of medium

5. Ibid, Page 11

and large mills that are owned by companies that also own their plantation resource.

As noted earlier in this report, the two largest forest producers in Chile, CMPC and Arauco, control about 46% of the plantation forests. They also operate three and six mills respectively and each expects to build a minimum of two new mills within the next five years. These mills will be designed to handle 300,000 - 400,000 m³ input and produce 150,000 - 200,000 m³ output.

These new mills are dramatic illustrations of the rapid change occurring in the Chilean sawmill sector. It is a 1960's industry moving directly into the 1990's. Canadian companies evaluating the Chilean market should not be misled by the state of the existing older mills. Chile is a country that is jumping ahead of its existing technology on an exponential basis.

During the Association's market investigation, it had the opportunity to tour several facilities and meet the operational staff of many other operations. It was determined that Chile's new mills are as advanced, if not more so, than their British Columbia counterparts. This is a result of two facts.

1. Unlike British Columbia operations, who upgrade their facilities on a continual basis, Chileans will close down their small out dated facilities and build state-of-the art mills.
2. The evolution of the Chilean sawmill sector is to value added processing of their plantation resource, primarily grade quality cuts for export markets. In British Columbia 85% of wood processed goes to the United States as dimensional lumber. By comparison, Chilean mills are producing grade cuts of lumber for up to 110 packaging specifications per month.

Thus, the trend in the Chilean sawmill sector is grade type mills with the down stream flexibility to produce cuts to meet any export market demand. With a good supply of clear wood from plantation forest about three years away, the major lumber producers are restructuring operations to rationalize and optimize fibre.

The trend and evolution of the Chilean sawmill industry is not consistent with the mill operations in British Columbia. The typical Chilean's mill process design from primary break down to sorting and packaging is towards primary cutting for secondary manufacturing. This is distinctive from British Columbia mills whose primary cutting is for the lumber markets of the United States dimension and European markets. The second priority of the British Columbia mills is the cutting for secondary manufacturing.

Chilean sawmilling is evolving on a path distinct from British Columbia, for this reason, Chileans feel Canadian process and equipment manufacture may not fit their future needs. The Chileans want to work with Canadians, but adaptation of equipment and technology to the needs and directions of the Chileans is required. The Chileans are directing their plantation forests to the needs of the global market.

7.2 WOOD BASED PANELS

Four basic panel products in Chile are: plywood, particleboard, chipboard and medium-density fibre (MDF). Oriented Strand Board is not yet produced in Chile, but there are two companies currently interested in this possibility.

Wood based panels have been a relatively small segment of Chile's forest industry, as illustrated in the following table:

<u>Wood Based Panel Production</u> (1,000 m ³ /YR)				
Year	Particleboard	Chipboard	Plywood	MDF
1981	42	72	17.5	--
1985	43	136	21	--
1991	52	178	40	70

This sector of the forest industry was not explored in detail during the Association's investigation, as none of its member companies manufacture primary processing equipment for this market. At the current time, supply of this equipment is predominantly by Scandinavian companies.

7.3 SAWMILL EQUIPMENT: STATE-OF-THE-ART REVIEW

As discussed above, the Chilean sawmill industry is one moving from the 1960's directly to the 1990's. Chile's older generation of mills, including the mid size and larger mills, did not target fibre optimization. The availability of low cost labor contributed to people intensive manual operations instead of mechanized recovery systems, which resulted in poor fibre recovery.

However, the combined impact of the following factors have resulted in a strategic realignment of the Chilean sawmill sector to maximize fibre utilization from plantation resources.

1. The objective of Chilean operators to evolve into value added processors of plantation resources.
2. The objective of plantation owners to maximize the fibre utilization of its plantations.
3. The need to produce grade quality products for export markets.

The move to greater fibre utilization by the Chilean creates an opportunity for Canadian equipment designed to maximize recovery. The Chileans are currently exporting raw logs as the revenues from log sales currently generate more profits than sawn lumber. To approach the market with a program to increase raw material recovery will generate good interest. The Chileans have reported an average recovery of 45% at the mills visited. Technology to improve their average recovery rate is required.

The mills toured illustrated the dichotomy that exists in the sawmill sector. In one mill visited 26 people were counted on the operating floor from the scragg saw to the trimmer infeed. This mill had manual board and cant edgers. Two other mills were running log carriages with circular saw headrigs. The carriages used rack and dog manual networks, with 5-6 people loading and handling the logs, cants and flitches by hand.

In contrast, the strategic and modern approach of the Chileans has resulted in several modern mills. The following is an overview of those operations.

CMPC at Forestal Mininco

This mill had recently been upgraded and had only been in operation one month at the time of the visit. The modernization included:

- * New **ARI** two sided canter with close coupled horizontal arbor saw section. This line has auto rotation and in-line position scanning.
- * Two **CONTECH** (Swedish) Edger Optimizer systems.
- * **DENIS** double arbor edger with clamshell opening and guided saws.

Forestal Celco S.A. (ARAUCO) at Constitucion

The mill is scheduled to start up in March 1994. It is a \$13 million U.S. project that includes a new sawmill, 8 dry kilns, and a reman plant. The kilns and sawmill equipment are on order. The reman plant will probably use U.S. equipment and will be ordered by the end of May.

The equipment currently on order consists of:

- * Eight dry kilns from **Germany**.
- * **NICHOLSON** debarker.
- * **DENIS** sharp chain twin band with simple scanner. Future plans include adding chipper heads and In-position scanning.
- * **DENIS** 5 foot horizontal single band resaw with merry-go-round capability.
- * Manual cant optimizer infeed with **KOCKUMS CANCAR** bottom arbor gang (multi-bank).
- * **KOCKUMS CANCAR** board optimizer system. Future plans call for a second line.
- * Future plans also include an optimized trimmer and sorter.

Aserradero El Colorado (ARAUCO) at Curanilahue

This mill is approximately 2.5 years old and produces 10 million board feet per year. Log input is sorted by diameter. The equipment in this mill consists of:

- * LINCK two sided canter with the ability to merry-go-round the two sided cants.
Two LINCK triple saw edgers with manual infeeds.
- * Twin band resaw (4 foot) for cant breakdown (merry-go-round).
- * Single band resaw (3.5 foot) for splitting boards and grade recovery.

A general review of the equipment in other large and medium size sawmills in Chile is attached in Appendix. The profiles have been excerpted from a report commissioned by the Canadian Embassy in Santiago.⁶ As the reader will note, most of the equipment in Chile's mills comes from Europe. The reason for this trend will be addressed in following sections.

The last of the three mills described above is Arauco's El Colorado mill. This mill is a good example of two factors Canadian companies must understand about the Chilean sawmill equipment market and business philosophy.

1. The equipment for this project was supplied by LINCK out of Germany on a sole source basis. Before the manager of this mill, Roberto Bravo, made the decision to use LINCK, he visited British Columbia with the intention of purchasing Canadian equipment. Unable to identify a "LINCK style" of vendor, who would assume a lead role in the supply of the equipment, Bravo instead went to Europe, where the equipment suppliers had a history of this type of supply.
2. This mill is an example of the flexibility and forward thinking that Chileans have adopted to ensure that their mills operate profitably. Confronted with operating inefficiencies and labor problems that resulted in operating losses, Arauco now contracts the mill management and operations. They rent the mill to the operating contractor. Arauco plans to continue operational contracting.

7.4 SAWMILL SECTOR OPPORTUNITIES FOR CANADIAN COMPANIES

Sawmills

Based on meetings with strategic personnel in several sawmill companies, including both CMPC and Arauco, the investigation team concluded that one new mill will be built in each of the next five years. These mills will be large mills by Chilean standards, medium size by British Columbia standards.

-
6. The Chilean Market for Canadian Goods and Services in the Forestry Sector", Annex III.2, Pages 78 - 87. Eladio Susaeta, July 1992.

Arauco, the largest player in the sawmill sector in Chile with six mills, has plans to expand with a minimum of 2 mills over the next four years, the first in 1995. The mills will be designed to process 300,000-400,000 m³ input, and will be high tech, concentrating on the housing and remanufacturing markets.

In a best case scenario, Arauco may build as many as 5 mills over the next seven years. In general parameters, these mills will be in the 200,000 m³ input range capable of producing a diversified clear lumber product offering.

Equipment suppliers interested in these project opportunities should note that Arauco will more commonly buy individual equipment pieces to fill the process specification established by the Consultant. The sole source purchase for the El Colorado mill was an exception.

CMPC, the second largest operator in Chile with three mills, plans to build two new mills in the next five years with inputs of 300,000 m³/yr and output of 150,000 m³/yr. Processing flexibility to match raw material to market niches will be the key design criterion defining these facilities.

CMPC, unlike Arauco, has in the past preferred to buy mill packages rather than shop for individual equipment components. However, based on the feedback from senior executives in both of these companies, the trend in the sawmill sector is towards component equipment purchases as the major companies develop in-house capability.

The Andinos sawmill of the Terranova Group plan on redesigning or building a new mill to primary saw 100% of the mill input for secondary manufacturing.

It is estimated that these new mill opportunities will be worth \$15-20 million CDN based on current market prices. (Arauco's new mill at Constitucion cost \$13 million US.) It is also estimated that other capital purchases planned by the sawmill sector will approximate \$5 million annually, **resulting in an annual capital investment by the sawmill sector of approximately \$20-25 millions CDN in the next five years.**

7.4.1 Kilns

The almost total reliance of the Chilean sawmill sector on Radiata Pine has created significant market opportunity for kiln suppliers. This is a result of several factors.

1. The trend in Chile's export markets is toward kiln dried lumber as opposed to green wood.
2. Many export markets are sensitive to lumber treated with PCB, and are alternatively demanding kiln dried lumber. The use of PCB in Chile's forest sector is to be phased out within the next four years, leaving kilns as the key means of treating lumber.
3. Remanufacturing operations, which are playing an increasing important role in the down stream processing of wood in Chile, require a kiln dried raw material.

Arauco's new mill at Constitucion has ordered eight German kilns. Arauco has also ordered four other Italian kilns for its operations. CMPC acknowledged that it will require new kilns to accommodate its planned increases in capacity, and the company is interested in Radio Frequency Kilns. Several other companies are expected to buy kilns in the immediate future, as their existing production capacity is limited by their drying facilities.

7.4.2 Market Implications for Association Companies

The theme consistent to almost every meeting the Association market investigation team had was the professional respect the Chileans had for the Western Canadian forest industry. The Chileans also felt that Western Canadian equipment suppliers have some of the most advanced wood machinery in the world.

It was also a consistent theme, especially from the senior management in both Arauco and CMPC, that the companies would be interested in Canadian technology for their upcoming projects. Obviously, there appears to be an immediate opportunity for Association members in Chile.

Chilean sawmillers do consider the conversion equipment used in their forest lumber markets as they feel this gives them a product marketing advantage. i.e. Radiata to replace U.S. ponderosa pine, they look at the U.S. sawmiller's ponderosa pine conversion equipment.

However, almost unanimously the Chileans echoed the sentiment that few Western Canadian companies have attempted to create a presence in Chile, and this has lead to a reluctance of Chilean mill operators to consider their products for their upgrades and new projects.

The Chief Executive Officer at CMPC, Fernando Leon, was quick to point out that LINCK does not have the best equipment in the marketplace, but the company does have the best sales and service organizations in the Chilean marketplace. He also stated that the only time he recalled seeing Canadian companies was on trade missions or at EXPOCORMA, not as companies with a presence in Chile. CMPC, as a company that plans to spend \$30-50 million on sawmills over the next five years, with a few exceptions does not believe that Canadian companies have made a commitment to the Chilean market that would justify CMPC's consideration.

He reiterated that:

- * Direct contact with the equipment manufacturer is important
- * The supplier must established after sales service support as a part of the sales process or there is no commitment
- * While Canadian companies and their equipment are well known, the companies must send technical people to sell and support the equipment on a regular basis.

These facts were repeated by the President of Arauco, Felipe Leniz.

The strategic implication for Association companies is, if they expect to sell equipment in Chile, they must make a strong commitment to the marketplace with a high degree of personnel contact by the company at the client level, not vis-a-vis an agent.

7.4.3 Existing Competition

The competition for Western Canadian manufacturers in Chile in the Sawmill sector comes from Europe, the United States and eastern Canada.

What clearly provided these competitors with a distinguishable comparative advantage in the marketplace was their commitment to the marketplace through a concerted local sales effort and a strong commitment to post sales service and technical support.

The only reason LINCK is a major player in this market is because of its sales and service efforts, not because it markets the best equipment in the world.

The strategic implication for Canadian companies is: a comparative advantage in Chile, as long as their equipment is competitive, will be defined by the effort and commitment the company exerts in creating a marketing network in Chile.

7.4.4 Marketing Framework

All of the sawmill companies were asked what type of a marketing structure they preferred when considering the use of a foreign supplier. With little exception, the response received from these companies keyed on these factors.

1. It is imperative that foreign suppliers have local representation, the form of which is left to the discretion of the supplier. **Once opportunities are identified by the local representative, final negotiations must be done by the equipment and service supplier directly.**

Personal contact with the supplier, over an extended period of time was the best way the companies could feel confident in commitment to the market, and feel confident about the capability of the suppliers equipment.

2. The foreign supplier should consider an affiliation with a local company that can manufacture at least a portion of its equipment in Chile. This relationship will give the customer the comfort that the supplier has made a commitment to the market, and that a local facility has been established for post sales service.

A related issue is the fact that foreign suppliers should ensure that the component parts they use in their equipment are easily sourced on a local basis, and spare parts can be purchased locally.

3. The foreign supplier must be prepared to support the sale by modem and telephone. Once the sale has been made, Chilean's insist on having

technical questions answered by technical staff of the supplier, not by the local affiliate.

7.4.5 Agents/dealers

It is imperative to have a local presence in the market. This representation should primarily act as a bird dog for sales opportunities. Sales efforts must be made directly by personnel of the foreign supplier.

In choosing a local representative, it is important that the foreign supplier be prudent in selecting an individual or entity that has a good reputation in the local market. Chileans will measure the image and credibility of the foreign supplier by the representation it has elected.

This market investigation did not attempt to establish the credibility of local agents and dealers, but a list of companies providing these services is attached in Appendix 10.2. Assistance in determining the credibility of these companies can be fostered by the Association through contacts with the Canadian Embassy in Santiago, consultants that the Association utilized to assist in the market investigation, and through CORMA, with whom the Association has established a formal relationship.

7.5 CUSTOMER SERVICE AND TRAINING

Ideally, customer service should be supplied through a local dealer/affiliate, with a high level of customer support on technical issues by the foreign supplier.

From the discussions with companies in the sawmill sector, it was determined that they recognized that it was not always practical for the foreign supplier to have foreign service personnel based in Chile. They recognized that a viable alternative may be to send their personnel to Canada to be trained in the shops of the Canadian supplier.

This training would also relate to mill personnel who would be involved in the start up of new facilities.

The other point that was reiterated was that equipment should be supported by technical documents that show the OEM (Original Equipment Manufactures) numbers, so components can be purchased readily from local supply houses.

7.6 PROJECT FINANCING

Before the market investigation was undertaken, it was generally perceived that project financing was a critical variable in the Chilean purchase decision process.

However, the Chileans prefer that project financing not be a part of the sale package. This was a function of two facts.

1. The Chileans believe they lose ability to negotiate price if financing is a part of the package.

2. The Chileans like to take advantage of international currency fluctuations to save money on project purchases.

The Chileans did mention that project financing would be considered on a project basis if it was a secondary issue to the equipment technology, quality and price. But generally, project financing is not a project consideration.

7.7 **STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS (SWOT) ANALYSIS FOR CANADIAN SAWMILL EQUIPMENT SUPPLIERS**

Canadian Strengths

- * Chilean sawmill sector is aware of and impressed by Canadian products.
- * Chileans recognize Canadian quality (have come to Canada on an unsolicited basis to shop for equipment).
- * Canadian equipment technology is appropriate, if not leading edge, for the Chilean market.

Chileans respect the cultural and geographical similarities of the two countries.
- * The Association presents a full range of capabilities in primary sawmilling operations.
- * Canada is viewed as an industry leader by Chile. Canada's success in the United States market is seen as a model to be followed.

Weaknesses

- * Lack of representation in the market.
- * No continuity of presence. Canadian suppliers are viewed as opportunistic sellers who go in and out of the market as it suits their needs, not the client's.
- * Chilean perception is that Canadians are not willing to listen to their needs.
- * Association companies do not have major remanufacturing equipment lines.
- * Continual industry restructuring (buyouts, mergers, takeovers) has created an impression that Canadian suppliers are:
 - * financially unstable;
 - * cannot assure continuity of technical, service or management personnel;
- * After sales service considered poor because no commitment is made to the market.
- * Lack of local affiliations or sub-manufacturing in Chile exacerbates perceptions of no market commitment.
- * Chileans perceive that Canadians do not understand Chilean lumber grade quality and tolerance requirements.

Opportunities

- * Major forest Radiata Pine plantations coming on-stream over next 4-5 years
- * **Annual capital investment is expected to be \$20-25 million CDN for the next five to seven years.**
- * Trend to value added processing of Radiata Pine will create other equipment supply opportunities for Canadian companies i.e. optimization equipment.
- * Only six major sawmill companies in market, thus marketing/sales efforts can be focussed.
- * The Chilean economy is stable and can act as gateway to other South American markets.
- * The Chileans have a keen knowledge of world technology and markets, and a strong will to improve.
- * Increasing labour costs are leading to more sawmill mechanization.

- * Demand driving industry to PCB elimination within 4 years will result in need for more drying equipment.

Threats

- * Strong international competitors with established market positions, Germany (1), Sweden (2), USA (3), Quebec, Brazil.
- * Chile's sawmill operators will purchase sawmill equipment made by the company that makes the equipment used by their wood products customers to enhance their competitive advantage to sell Radiata pine products.
- * Window of opportunity in the Chilean market is 1 year and closing fast as European competition improves its foot hold.
- * Chileans prefer to arrange their own financing so not available as source of revenue or sales enhancement.

8.0 HARVESTING SECTOR OVERVIEW

8.1 HARVESTING METHODS

Harvesting methods in Chile range from chain saw and oxen to the use of chain saws and skidders or feller bunchers on flat land, to the use of yarders on steeper terrain.

Thinning operations are undertaken with chain saw and oxen, skidders or yarders, but this equipment is cumbersome to use in thinning purposes. Specialized equipment to achieve a cost effective commercial thinning process has yet to be developed to suit the Chilean market needs.

Currently, chain saws and rubber tired cable skidders account for 40% of the harvesting market. This type of operation is common to the smaller harvesting contractor.

Larger harvesting contractors, which in a British Columbia context would be considered medium sized contractors, use tracked Bell feller bunchers on flat to medium slope terrain. Chain saws and yarders are used for steep terrain.

On the mechanized side of the harvesting sector, Chile's practices and equipment are similar to those used in the B.C. interior, particularly the Kamloops and Kelowna regions. However, the Chileans prefer smaller harvesting equipment than commonly used in B.C. Where in B.C. might be 60-80,000 lbs. in size the Chileans want equipment in the 30-50,000 lb. range.

It is important to note that in the mechanized operations utilizing fuller bunchers trees are manually delimberd. The Chileans feel the delimeter common to B.C.'s interior operations is not effective when used in Radiata pine and Eucalyptus plantations. As a result mechanized delimiters are very uncommon.

Truck loading methods are similar to those in North America. Rubber tired hydraulic loaders, Barko and Prentise, as well as wheel loaders are common as are self loading logging trucks. The only exception is the size of the trucks. Off-highway rigs are not utilized as transportation is limited to 30 tons maximum legal load capacities.

The first harvester forwarders went into operation in Chile in one of CMPC's forests in September 1992, and although there are currently 8 units in operation in Chile, its use is still considered to be in the trial stage. As noted below, the harvester forwarder is now at the high end of the scale in both production and cost. CMPC believes that continued trials will bring production down in the \$6 - 6.50 m³ range.

Harvesting Method Cost/Production Comparison

Harvesting Method	Cost Per M ³	M ³ Monthly Production
Chain Saw/Oxen	\$2.50	250
Cable Skidders	\$4.00	2,500
Yarders	\$6.50	2,000
Harvester Forwarder (Trial only)	\$8.00	7,000

All of the above costs are to roadside.

The advantages of the harvester forwarder are being considered seriously by the Chilean harvesting sector for two reasons.

1. The operation of one harvester forwarder would require a four person crew without supervision. It would replace 4 cable skidders with 4 support people per skidder, or a total of 20 people, plus supervisory staff.
2. There is a need to handle increasing volumes of plantation growth over the next thirty years.

The historical smaller volumes of harvested plantation wood, combined with low labor rates and a ready supply of labor, have not driven the advantages of mechanization to the Chilean harvesting sector. However, several market factors make this evolution likely.

1. It is estimated that the real wage of unskilled labor has increased 25-30% over a three year period while productivity has remained low. This figure is expected to continue its increase, as it is becoming increasingly difficult to maintain a harvesting work force in the field.
2. The size of the Chilean workforce is expected to remain fixed and Chilean workers are becoming increasingly reluctant to live and work in the field for prolonged periods of time.
3. Plantation owners are faced with the need to double harvesting capacity over the next decade.
4. With the objective of maximizing the return on investment of their plantation resource, plantation owners are investigating mechanized means of improving fibre recovery in both the thinning and harvesting stages.

8.1.1 Thinning

The cost of a hectare of land ranges from \$600-1000 U.S. The cost of planting 1,200 seedlings doubles the above cost, net of any Chilean government subsidies to stimulate plantation farming. The guideline in the Chilean forest sector is a maximum cost per hectare planted of \$2,000 U.S. current day dollars.

A hectare of plantation land will normally be planted with 1,200 seedlings. In year 10, the hectare will be thinned to 750 trees. In year 15, further thinning will leave 350 trees, which are harvested after 25 years. The expected gross return in today's dollar for the 350 fully grown trees is \$75,000 U.S.

The economic objective of current commercial thinning operations is to have the by-product, which is chipped for pulp, cover the operation and maintenance costs of the plantation forest. This objective is currently not being achieved largely because there is no efficient mechanized means of thinning. This is currently done with chain and oxen, skidder or yarder. Development of thinning equipment that would guarantee the plantation owner could recover his maintenance costs, or turn his thinning operation into a more profitable scenario, would have tremendous market potential in Chile.

8.1.2 Use of Contractors

All thinning and harvesting is done by companies contracted by the plantation owner. Most of these contractors are small to medium size companies without the resources to invest in new equipment and technology. Hence, in most cases the plantation owner will secure financing or actively participate in the equipment purchase for the contractors.

The inability of the small to medium size contractor to secure financing for equipment purchases has limited the growth and development of the harvesting industry. Because the contractor has no planning capacity, the major companies are being forced to investigate new harvesting technology for their own economic advantage.

The period of the operating contracts is year-to-year with a fixed term. However, the contract is usually extended year-to-year and based on longer term relationships.

8.1.3 Existing Equipment

Traditionally in the more level inland areas of region VII and VIII chain saws and cable skidders are utilized. On the coastal areas and in the more sloped areas Yarders equipped with high lead carriages are in use. The yarders are relatively small in size and come in two classes 70 hp to 90 hp and 120 to 150 hp.

The three wheeled Bell loader and the Techfor Bell clone have been used in the market over the past few years. The tracked Bell with a directional felling head has been the industry standard for feller bunchers.

The industry is very cost sensitive and equipment selections in the past were driven solely by price. As production demands have increased, the industry has become more receptive to higher priced advanced production equipment. Timberjack's feller bunchers are now working in the CMPC forests as are the latest FMG Timberjack Clam bunk forwarders.

The cable yarder market continues to expand. There is a broad range of equipment represented. Chapman and Cypress yarders with the Talkie Tooter communications gear are well known in the industry and have a good reputation. The yarders are considered easy to service because they use standardized components and Talkie Tooter is the industry standard for field communication devices.

Trucks are generally sourced from Brazil or Europe and are used as carriers for the yarders and knuckle boom loaders and for log transport. The maximum highway load is 30 tonnes.

Forwarders and Harvesters are a relatively new addition to this market over the past year. CMPC is more open to new technology than its competitors, and the company has seven systems working with its eighth combination expected to arrive by September 1993. The harvester forwarder that has dominated the market has been the FMG Timberjack line. The harvester is the Timberjack feller buncher with a tilting carbody manufactured in Woodstock Ontario equipped with a processing head designed and manufactured in New Zealand. The Chileans have investigated a number of processing heads and CMPC have determined that the New Zealand head, designed for Radiata Pine is the most effective.

8.2 EXISTING COMPETITION

Yarders/Carriages

Urus, Sigu, Techfor, Krohler, and Christie. In Chile, yarders are generally rated by horse power in two classifications, 70 to 90 hp and 120 to 150 hp.

Skidders

John Deere, Caterpillar, Franklin, Clark (VME Valmet), and Timberjack. The majority of the skidders are winch style with a few grapple skidders entering the market. John Deere maintains a 50% market share in Chile.

Wheel Loaders

VME, Caterpillar, Komatsu, Fiatallis. The market is dominated by VME machines. The majority of the VME equipment is equipment with quick attach couplers and a series of attachments. Pulp wood grapple, log forks, paller forks and buckets are most common.

Hydraulic Loaders

Hood, Prentice, Barko. The common practice when a loader is purchased includes the sourcing of a used truck as the carrier. Chilean law allows the importation of new trucks only. A few companies assemble used trucks to get around this technicality. Most foreign supplied loaders are imported to Chile less carrier.

Techfor: Initially Techfor concentrated on the distribution of forestry equipment. To address some pricing obstacles it began ingenious manufacturing of yarders and a clone of the three wheeled Bell loader.

Krohler: Austrian Yarders are manufactured in Chile in a Joint Venture 95% Krohler 5% Chilean partnership.

8.3 OPPORTUNITY FOR ASSOCIATION COMPANIES

Based on the conversations the market investigation team had with companies in the forest industry, and based on the projected future volumes of plantation resource, the following projections were developed for annual sales of new harvesting equipment, not including parts and service.

Harvesting Equipment	Total	Average Units \$ Per Unit	Total
Skidders	20	50,000	1,000,000
Yarders	10	150,000	1,500,000
Feller Bunchers	10	100,000	1,000,000
Harvester Forwarder	5	700,000	3,500,000
Hydraulic Loaders	12	100,000	1,200,000
Trucks, with trailer	150	100,000	15,000,000
Total Annual Sales			23,200,000

The opportunities for specific member companies are as follows:

Skidders:

Most of the skidders used in Chile are rubber tired with winches, although the grapple skidder had been introduced to the market. The general size of the skidders used in Chile is smaller than British Columbia, KMC has already introduced a smaller version of its tracked skidder to the Chilean market. This product is targeted at adverse conditions, in both natural and plantation forests.

Yarders:

The size of yarders used in Chile are again smaller than those used in British Columbia, as discussed above. Madill currently has equipment located in Chile, sold as Chapman and Cypress equipment. The market potential for the company remains good provided equipment can be downsized to meet Chilean requirements.

Loaders:

While there are no wheel loader manufactures in the association there is a market for loader attachments. The challenge for the two Association companies who manufacture these attachments, namely IMAC and Weldco Beales, is the need to concentrate their attachments on the smaller sized loaders used in Chile.

To successfully penetrate the attachments segment of the loader market, companies should consider two options. The company must establish a local joint venture to manufacture the attachments locally to capitalize on lower labor rates; or the company must market its attachments directly to the loader manufacturer, and attempt to have the attachments incorporated as a part of the final product.

Cable Yarding and Connectors:

Given the fact that the majority of skidders in Chile are winch skidders and given the number of cable yarders there is a market opportunity for cable accessories. Association members like I'Anco and Robar should note that wire rope is not manufactured in Chile.

Communication Equipment:

Talkie Tooter is the standard for field communication equipment in Chile, and as such is considered the industry leader. Service commitment is an important component of this market position.

Thinning Equipment:

Communicated several times was the need for equipment that will mechanize the plantation thinning process. There is a defined market niche opportunity for companies like KMC, IMAC and Weldco Beales if they can develop equipment or an attachment to satisfy this need. This area is a major priority.

8.4 CHANNELS OF DISTRIBUTION:

The established channels of distribution in Chile are similar to those used in North America. Most of the major heavy equipment lines are represented through an established dealer network. The only general exception is a franchised equipment dealer may in turn be supported through a series of sub dealers. The sub dealer will co-represent the franchised dealer's product lines. This effectively expands the sales coverage in the country and ensures a local sales contact in a given region.

The Chilean buyer, on major purchases, prefers to deal direct with the manufacturer throughout the purchase process. The buyers have a good understanding of the available international equipment technologies and wish to confirm technical specifications and performance claims directly with the manufacturer. Chileans are traditionally slow methodical buyers who will not make a purchase decision until all technical and economic concerns are addressed.

The local dealer is important in opportunity identification and supporting the products in the field, but the manufacturers who have enjoyed the greatest success in Chile have been actively involved with their dealers selling and servicing this market.

The manufacturer must have a distribution system in place that ensures the end user confidence that he is gaining the best pricing advantage and highest level of customer service through the local representative. The Chileans have had numerous experiences with local dealers who do not possess the necessary technical skills to address the sophisticated needs of the market.

The end user must have a link to the manufacturer to address service inquiries and technical questions. The dealers in Chile are not known for their after sales service support and traditionally the manufacturer is blamed for poor dealer performance.

To be successful in this market you must maintain a presence with a Native Chilean, he must be your eyes and ears, but when the sales process starts the manufacturer must be prepared to work directly with the end user to negotiate the sale, parts and service support, and the financing of a potential sale.

One of the methods discussed for introducing new equipment and technology to this market and gaining industry approval is to introduce the product through the Fundacion Chile.

The Fundacion Chile mandate is improving the level of technology in the forest industry and is aggressively seeking the latest technologies. The group has work in a number of different areas but are regarded by industry as a group that would test and certify the performance claims of a piece of equipment.

The most effective way to sell in Chile is to demonstrate the equipment in local conditions with local operators. Too often the Chilean industry has been unable to attain the performance and service levels quoted by a manufacturer and this form of controlled demonstrations can show that the equipment can perform as quoted.

Most foreign suppliers of harvesting equipment ship directly to the dealer, who in turn delivers to the client. The dealer is generally quoted CIF in U.S. dollars. The more advanced dealers will accept equipment in a knocked down kit and assemble locally. The knock down kits help reduce shipping costs and substitute cheaper local labor for the North American labor component. Some of the dealers have manufacturing capabilities. Techfor and Atom are both dealers who manufacture various products for the market.

8.4.1 Potential Agents and Dealers

There are a number of qualified dealers in Chile. Generally, the dealers are well informed about the equipment needs of the industry sector. If a dealer has problems with a manufacturer or a piece of equipment does not perform to specification, it is well discussed in the industry.

The weakness of the dealer network in Chile is their inability to technically support and service equipment. The Chileans are well educated and are looking for advanced technologies and improved methods of harvesting and wood handling. The maintenance requirement has been neglected by the dealer network, yet it is a critical component to creating a comparative advantage in the market.

The discussions concerning existing Canadian equipment in service in Chile generally included a dialogue regarding inadequate service support and the local dealer not being technically able to handle the service requirements of the equipment. When selecting a dealer an evaluation of the technical competence of the sales team as well as the service group is essential. The Chileans are constantly looking for new products to represent but too often they are not suited to sell and service or even support a manufacturers product.

The blue collar work force has been somewhat neglected during the rapid development of the Chilean economy during the late seventies and early eighties. Management is well versed in what is available but staff are not as well versed in how to keep it running. It is important to emphasize that the more common the components of the equipment, the easier the equipment is to support.

Choosing the right dealer or representative is essential to the success of a manufacturer in this market. The market is small and there is constant communication within the industry regarding equipment performance and manufacturers. If a product does not live up to expectations, it quickly develops a bad reputation, warranted or not.

Please refer to Appendix 10.2 for a list of potential dealers in Chile.

8.5 CUSTOMER SERVICE EXPECTATIONS

The Chileans realize that due to their market size and geographic location they must make certain concessions to deal with foreign suppliers. Chileans recognize that all parts can not be stocked at a local level, but when the parts are needed, the client must have a hotline to the suppliers service department. The Chilean customer must feel a priority is given to his parts requirements. Caterpillar has a special parts distribution arrangement for Chile that ensures parts in Chile within 48 hours of the order.

Standardized components that can be sourced from local hydraulic or bearing suppliers are a must. An example of how not to service a Chilean client involves a Yale forklift truck at the CenTec Mill. The forklift was the principle piece of equipment for the infeed of the mill and without the forklift the entire mill would stop. When contacted for a replacement bearing the Yale dealer was slow to respond and when the manufacturer was finally contacted, a lengthy

delivery date was advised, and the manufacturer would not provide a cross over replacement part number.

Fortunately the mill had full time engineering staff to maintain the production equipment. In this particular case the client had to send the worn bearing out to be sized and identified, thus averting an extended plant shut down.

A foreign supplier must demonstrate a commitment to the market, including a local parts and service structure. This structure must be in place or designed before entering this market, or it is unlikely the Chileans will feel you have made a firm commitment to them. The Chileans are informed international buyers that demand a high commitment to technical support and service when making an equipment purchase decision.

The FMG Timberjack group is an excellent example of a firm which demonstrated a commitment to their customers and reaped a return on their investment in the market. FMG invested in training programs for their dealers and the end users of the equipment. All product support and operating information is now available in Spanish specifically for this market.

8.6 CUSTOMER TRAINING REQUIREMENTS

As the level of mechanization continues to develop in this market it becomes more critical to provide training for maintenance and operating personnel. **The greatest criticism of foreign supplied equipment that the market investigation team encountered was "the machine does not generate the level of productivity specified".**

Because the foreign supplier cannot always rely on the performance of his dealer, it must remain the suppliers responsibility to train the operating personnel in the client company to ensure performance claims are realized.

8.7 FINANCING EXPECTATIONS

Vendor financing is critical in the sale of harvesting equipment in Chile. Most harvesting operations are carried out by contractors. The contractors operate on year to year, or harvest to harvest contracts and they typically do not have the financial strength to investment in new equipment. In some cases the only way the forest owner can ensure he has the best equipment working in his plantation is by securing the equipment lease or rental agreement entered into by his contractor.

John Deere maintains the largest market share of skidders in Chile, over 50%, one of the reasons is the John Deere Financing Company. The form of this financing may be in the form of a purchase or lease, whatever is best for the harvesting contractor.

Canadian companies who are nervous about this means of doing business in a foreign country, whose legal system they are not familiar with, can take some consolation in the fact that Chilean law is particularly onerous on individuals who default on debt. Punishment for non compliance on a financial agreement in Chile is severe. If a contractor defaults, he could be imprisoned.

8.7.1 Sales Potential

Site prep equipment:

There is keen interest in site prep and tree planting equipment. Maintenance and development is critical to the financial viability of plantation forests. The equipment of most interest and in demand is mounding plows and planting equipment. A site prep contractor from Ontario has just completed a contract in Chile.

Thinning equipment:

The industry is using a variety of methods currently to thin its plantations. The chain saw, oxen, small skidder and yarder are all employed. An opportunity exists for a piece of equipment that could cost effectively thin plantations.

Yarders:

The newer plantations and those maturing over the next few years are in the more adverse areas with respect to terrain. As expected in the early stages of the development of the Chilean forest industry the more accessible land was the first planted and harvested. As the industry developed, more difficult terrain was planted. As the steeper sloped areas are harvested and the harvest volume doubles the demand for yarders will increase correspondingly.

Harvesters/Forwarders/Skidders:

The relatively fixed supply of labor in the Chilean forest industry and the increase in harvest will tend to increase the demand for more mechanized equipment. The industry will require greater production from existing equipment but as the effective life of the standard equipment ends more mechanized and productive equipment will be required.

Trucks/trailers:

The demand for trucks and trailers over time will continue to expand. Arauco is looking at putting in private road ways to accommodate 100 ton loads. Current legal maximum load is 30 tons.

8.8 STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS (SWOT) ANALYSIS FOR CANADIAN HARVESTING MACHINERY SUPPLIERS

Strengths

Market aware of Canadian products.

Recognition of Canadian quality, Chileans have had favorable product experience with Canadian equipment.

Technology appropriate, products durable.

Cultural & geographic similarity.

"Talkie-Tooter" sets the industry standard for field communication devices.

Canada regarded as industry leader, success in the U.S. market seen as a model to be followed.

Weaknesses

Limited representation in the market.

No continuity of presence, viewed by Chileans as opportunistic sellers who go in and out of the market as it suits their needs.

Chilean perception that Canadians are not willing to listen to their needs.

Industry restructuring left perceptions that:

- A) companies are financially unstable;
- B) no continuity in personnel, and;
- C) companies are "not committed to clients".

After sales service considered poor.

Lack of partnerships or manufacturing in Chile.

Performance claims not realistic.

Product range limited [(e.g. no mobile (with tires) equipment manufactured)].

Opportunities

Harvesting activity to double increasing demand for:

- A) skidders.
- B) site preparation equipment (scarifying/planting/spacing etc).
- C) truck/trailer equipment.
- D) thinning equipment.
- E) small yarders.

Market potential: \$27 million annually.

Chilean economy stable and can act as gateway to other South American markets.

Labour cost increases and fixed labour supply leading to more mechanization.

Chileans exhibiting increased willingness to spend more money on equipment.

Financing and leasing arrangements can enhance package and sales revenues.

Threats

Strong international competitors with established market positions (Scandinavia, Brazil, South Africa, USA, Chile, Austria).

Chilean manufacturers pose additional competitive threat from their propensity to copy designs.

9.0 MARKET STRATEGIES

The objective of the Association's market investigation on Chile, and this subsequent report, was to communicate to the membership of the Association what it needed to create a *Comparative Advantage* in the Chilean market place.

Throughout the meetings the market investigation team had with forest companies in Chile, there were several recurring competitive factors all of which are significant considerations in the achievement of this Comparative Advantage.

1. Canadian equipment and services are considered to be as good, if not superior, to any other equipment or services in the Chilean market.
2. To be viewed as viable market players by the Chileans, Canadian companies have to make a firm commitment to the marketplace. As a part of this commitment, the Canadian supplier should have a service and parts network established before it comes to the Chilean market.
3. A Canadian company should have a local representative, but the role of the representative should be limited to that of a market contact and finding opportunities. Chileans prefer to do final sales negotiations with the supplier.
4. Chileans will only do business with companies with whom they have established a comfortable commercial relation, and it may take several meetings to develop this trust.

Given point 1 above, if Canadian equipment and services are as good if not superior, to any in the marketplace, then it must be concluded that the achievement of a comparative advantage in Chile will be a function of a company local marketing commitment.

Supporting this conclusion is the fact that the market investigation team heard on several occasions that LINCK was perceived as the number one player in the market, not because it had the best equipment, but because it had the best marketing structure and people.

Therefore, the membership of the Association should recognize that as long as they have determined that their product or service is competitive or superior in the marketplace, then their strategic approach to Chile must focus on their marketing structure.

9.1 CREATING A COMPARATIVE ADVANTAGE

9.1.1 Consulting Services

1. At minimum, the consultant should establish a local agent or representative. This role of this representation should be limited to a project identification or bird dog function.
2. An employee of the company should plan regular sales calls to Chile to meet with prospective clients and support its representative.
3. Because foreign consultants will supply the process design, and detail design will be done by local consultants, an affiliation or joint venture with a local design consultant would be an ideal way to penetrate and serve the market.
4. Given the trend to vendor supplied engineering, the consultant should explore a strategic alignment with one or several equipment suppliers.

9.1.2 Sawmill Equipment

1. The supplier should have a local representative or agent but this role should be limited to the identification of sales opportunities.
2. The supplier should have a commitment to service and parts supply before it makes sales contacts in the marketplace.
3. The supplier should make regular sales calls, preferably three to four months apart. Regular contact will indicate to the Chileans that a commitment has been made to the market.
4. The supplier should develop an affiliation with a local company to manufacture component parts of its equipment, and/or manufacture replacement parts. By doing so, the supplier can create a price advantage by utilizing local labor, and ensure prospective clients it has a local parts operation.

A joint venture with a Chilean company would be the ideal method of creating a committed marketing network.

5. The supplier should make every effort to use standardized parts and components in its equipment, thus facilitating local part replacement and service.
6. The supplier should be prepared to service technical requirements and questions from the client by:
 1. Modem for software maintenance
 2. Fax and telephone for minor technical repairs
 3. Air travel

7. Based on the feedback from the marketplace, a strategic alliance with a consulting company would prove to be a competitive advantage in the marketplace.

9.1.3 Harvesting Equipment

1. The harvesting equipment supplier should follow the conventional structure in Chile by establishing a dealer network.
2. The supplier must make regular sales calls in Chile, as the purchaser prefers to deal directly with the supplier as often as possible, but especially on major purchases.
3. The supplier should affiliate with a local company to create a service network in Chile, and entertain the possibility of sub-manufacturing or equipment assembly in Chile. By doing so, the supplier will ensure the prospective purchaser that he is receiving a price advantage and a high level of service support.
4. As a sales feature, the supplier must have an operating training program in place. The supplier must ensure that the performance claims for their equipment are backed up by operator.
5. Suppliers of harvesting equipment should create financing packages to lease or sell equipment in Chile. The leading harvesting equipment company in Chile also has the best equipment package.
6. Equipment trials, coordinated through an entity such as Fundación Chile, is an excellent sales strategy that would help the supplier validate equipment performance claims.

9.1.4 Choice of Market Representative

The selection of a market representative should be weighed carefully by the consultant or equipment supplier. Even though the above mentioned strategies recommend that the role of your local representation be limited to that of project identification, the image of your representation in the Chilean market will have a direct bearing on your image in the marketplace.

9.1.5 Tactical Approaches to The Chilean Market

The above strategies have focused on a framework for an individual company to enter the Chilean market. These strategies did not explore the synergies that may be achieved through tactical alliances of member companies. Examples of these tactics are outlined below.

1. Consultants and sawmill equipment suppliers should consider a strategic alliance to focus on the market trend toward vendor supplied engineering on mill upgrades and new mill construction.

2. Companies from within the membership, with or without vertical product synergies, should consider the joint use of a Chilean agent to capture cost efficiencies and ensure that the agent is dedicated only to their products.
3. Companies from within the membership with vertical product synergies should consider an alliance, either corporate or informal, to market their products jointly under one banner. In essence, this group of companies would establish a new entity to market a range of products, such as consulting services and mill equipment.

These tactics are examples of vehicles that, based on feedback from the Chilean market, would prove to create a comparative advantage in the market. It is not the role of the Association or the objective of this paper to create these alliances. However, the Association solicits feedback from the membership on how synergistic marketing advantages can be created for the Chilean market.

APPENDICES

- 10.1 Map of Chile
- 10.2 Chilean Agents
- 10.3 Forest Companies
 - 10.3.1 Arauco
 - 10.3.2 CMPC
 - 10.3.3 Inforsa
 - 10.3.4 Cholguan S.A.
 - 10.3.5 Terra Nova S.A.
 - 10.3.6 Sante Fe Group
 - 10.3.7 Asserraderos Copihue
 - 10.3.8 Masisa
 - 10.3.9 Tasman Chile
- 10.4 Chilean Mills
- 10.5 Market Investigation Meeting Notes
- 10.6 World Bank Case Study: Arauco
- 10.7 Bibliography

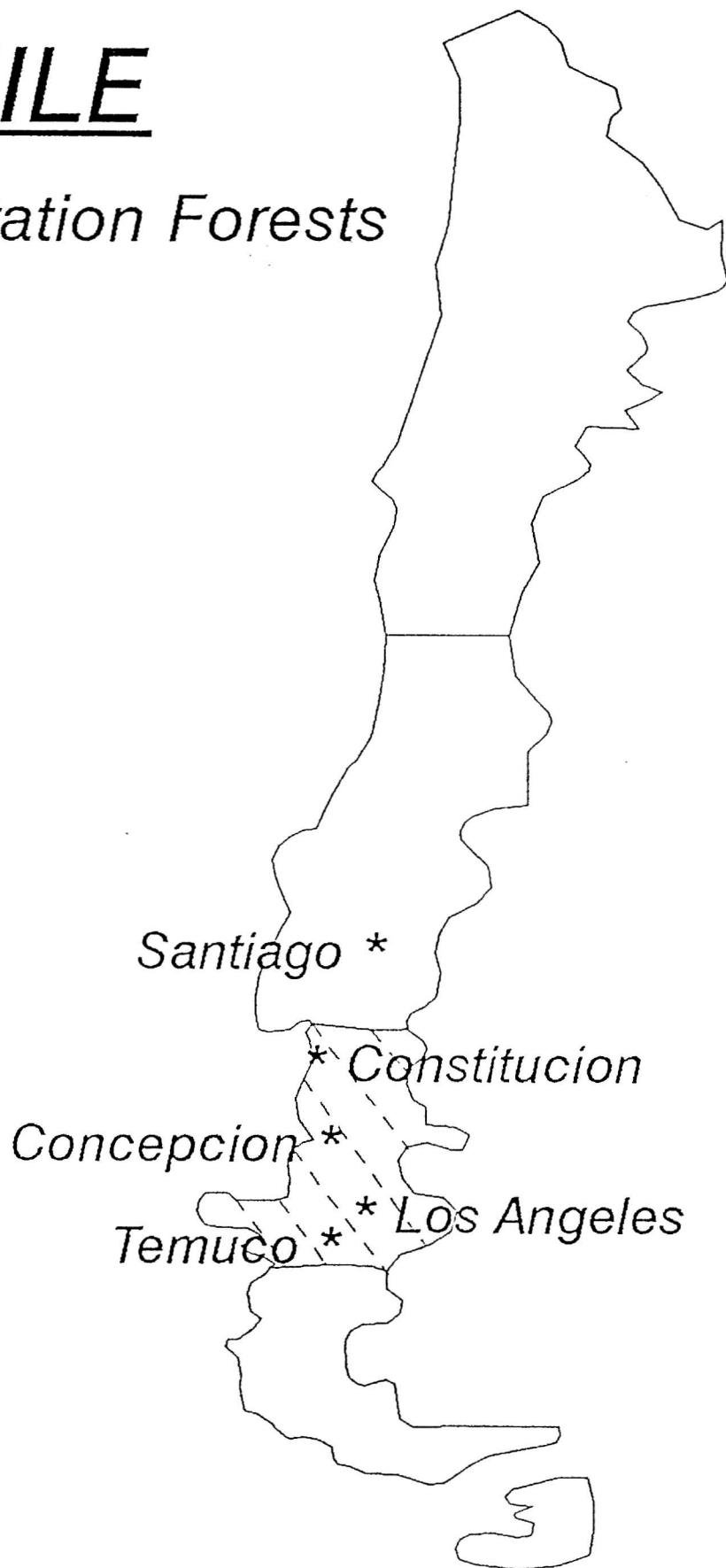
APPENDIX

10.1

MAP OF CHILE PLANTATION FORESTS

CHILE

Plantation Forests



APPENDIX

10.2

CHILEAN AGENTS

CHILEAN AGENTS

1. Logging and Transport Equipment and Tools

Comercial CIDEF S.A.

Address: Av. 5 de Abril 5757
Santiago
Telephone: 56-2-7764071
Fax: 56-2-7794288

Product Line: Case, Monck (USA), Valmet Logging (Canada), Nissan (Japan)

Annual Sales: Over US\$50-million

2. Distribuidora Cummins S.A.C.I.

Address: Bulnes 1203
Santiago
Telephone: 56-2-6972929
Fax: 56-2-6717037

Product Line: Blount Inc. Forestry Equipment Div. (USA) - cranes, feller, buncher, Hydro-ax tractors Komatsu Inc. and Dresser Int. Co. - crawler tractors, front-end loaders, retro excavators Cummins Engine Co. - diesel engines.

Annual Sales: Over US\$50-million

3. Distribuidora Perkins Chilena S.A.C.

Address: Av. Espana 69
Santiago
Telephone: 56-2-6972929
Fax: 56-2-6717037

Product Line: Perkins Engine (U.K., Brazil, Argentina) Clark, Link Belt, Bob Cat (USA)

Annual Sales: Around US\$15-million

4. Jaras. S.A.

Address: Baron de Jaras Reales 5250
Santiago
Telephone: 56-2-6231215
Fax: 56-2-6231547

Annual Sales: Between US\$10 and 15-million

5. Maco Industrial y Comercial S.A.

Address: Av. Vicuna Makenna 3212
Santiago
Telephone: 56-2-2381311
Fax: 56-2-2380315

Product Line: Husky, Precision, Hyster, International Navistar (USA),
Farmi (Finland), O & K (Germany), VW (Brazil)

Annual Sales: Between US\$15-and 20-million

6. Lanz y Cia. Ltda.

Address: Dr. Manuel Barros Borgono 233
Santiago
Telephone: 56-2-2352707
Fax: 56-2-2351070

Annual Sales: Below US\$10-million

7. Maga Ltda.

Address: Toesca 2096
Santiago
Telephone: 56-2-6980252
Fax: 56-2-6953155

Product Line: DMC Kootoney Manufacturing Co. (Canada) Tree
Farmer, Peerless (USA), Cremona (Italy), Shindiwa
(Japan)

Annual Sales: Less than US\$10-million

8. Manfred Brauchle S.A.

Address: Agustinas 1070
Santiago
Telephone: 56-2-6963294

Product Line: Paulan (USA), Jack (Denmark)

Annual Sales: Less than US\$10-million

9. Salina y Fabres S.A.C.I.

Address: Rondizzoni 2130
Santiago
Telephone: 56-2-6835866
Fax: 56-2-6836750

Product Line: Fiat Allis, General Motors, Mack Trucks Inc. (USA), The
Yokohama Rubber Co., Toyota (Japan)

Annual Sales: Over US\$50-million

10. Sigdo Koppers Comercial S.A.

Address: Panamericana Norte 5151
Santiago
Telephone: 56-2-6234883; 56-41-237506; 56-41-241845
Fax: 56-2-6234531

Product Line: Volvo BM (Sweden) Volvo - Michigan (Brazil), IVECO (Europe, Argentina), Case International (U.K.), Toyota (Japan), Barko (USA)

Annual Sales: Over US\$50-million

11. Tecfor Ltda.

Address: Agustinas 611, Of. 91
Santiago
Telephone: 56-2-6330925
Fax: 56-2-6381654

Product Line: European cable logging equipment, portable sawmills, steel cables, and accessories

Annual Sales: Less than US\$10-million

2 Industrial Equipment

12. BSC Ltda.

Address: Panamericana Norte 3026
Santiago
Telephone: 56-2-7355609
Fax: 56-2-7375649

Product Line: Morbark International; Salem Internaitonal, Price Industries, Peerless

Annual Sales: Less than US\$10-million

13. Comercial e Industrial ESESA.S.A.

Address: Av. Pedro Aguirre Cerda 4693
Santiago
Telephone: 56-2-6213423
Fax: 56-2-6213019

Product Line: SIA, VALLORBE (Switzerland)

Annual Sales: Less than US\$10-million

14. Coofor Ltda.

Address: Av. Einstein 760
Santiago
Telephone: 56-2-6213423
Fax: 56-2-6213019

Product Line: Simonds, Pacific Hoe, Nicholson, Demhorst (USAO, Criptogil (France), Hoseler, Lauser, Casco (Germany)

Annual Sales: Less than US\$10-million

15. G. Weiblin y Cia. Ltda.

Address: Dr. Sotero del Rio 326, Of. 704
Santiago
Telephone: 56-2-6983168
Fax: 56-2-6983168

Product Line: International Knife and Saw Inc. (USA), Northern Vibrator Manufacturing Limited (Canada)

Annual Sales: Less than US\$10-million

16. Ingemad Ltda.

Address: General Ghana 576
Santiago
Telephone: 56-2-5566371
Fax: 56-2-5566818

Product Line: Watkin (UK), Ogam (Italy)

Annual Sales: Less than US\$10-million

17. Kupfer Proveedores Industriales S.A

Address: Lincoyan 601
Concepcion
Telephone: 56-41-233002
Fax: 56-41-224941

Product Line: Simonds Industries, Wisconsin Knife

Annual Sales: Less than US\$10-million

18. Linares Maquinaria Ltda. (changed to LIMAQ Ltda.)

Address: Marinez de Rosas 3305
Santiago
Telephone: 56-2-7738852
Fax: 56-2-7751215

Product Line: Linares Metalurgica (Argentina), A. costa (Italy), Biesse (Germany)

19. Max Hamdord Maquinaria Ind. S.A.

Address: Lira 2310
Santiago
Telephone: 56-2-6982605
Fax: 56-2-6995788

Product Line: Several makes of used equipment, mainly of German origin

Annual Sales: Less than US\$10-million

20. Raab Rochette S.A.

Address: Av. Libertador B. O'Higgins 1869
Santiago
Telephone: 56-2-6982605
Fax: 56-2-6995788

Product Line: Invicta Delta, Schifer (Brazil), The Taylor, Armstrong (USA), Kadoret (Canada), Gottert (Argentina), Udelhom (Sweden)

Annual Sales: Between US\$10 and 20-million

21. Solecia Ltda.

Address: Av. Holanda 27
Santiago
Telephone: 56-2-2333608
Fax: 56-3-2325880

Product Line: Saderhamns Verkstader, Bruks, Waco-Jonsereds (Sweden), Vollmer Werke (Germany), Stenner (UK)

Annual Sales: Less than US\$10-million

22. Ricardo Schmidlin

Address: Box 14245
Santiago
Telephone: 56-2-2293623
Fax: 56-2-2293623

Product Line: Siempelkamp GmbH, Lignomat, Linck (Germany), Valoncane (Finland)

APPENDIX 10.3

Forest Companies

10.3.1	Arauco
10.3.2	CMPC
10.3.3	Inforsa
10.3.4	Cholguan S.A.
10.3.5	Terra Nova S.A.
10.3.6	Sante Fe Group
10.3.7	Asserraderos Copihue
10.3.8	Masisa
10.3.9	Tasman Chile

ARAUCO

(Majority Ownership by Anacleto Angelini & Carter Holt of New Zealand)

Parent Address:

Celulosa Arauco y Constitucion S.A.
R
Agustinas 1070, Piso 6
Santiago, Chile
Tel: 56-2-698-1961
Fax: 56-2-698-5967

Contacts:

Sr. Alejandro Perez
General Manager

Subsidiary Address:

Forestal Arauco S.A.
Agustinas 1070, Piso 6
Santiago, Chile

Sr. Felipe Leniz
President

Sr. Antonio Grass
Manager Planning

Sr. Antonio Leque
Manager - Sawmill

Division

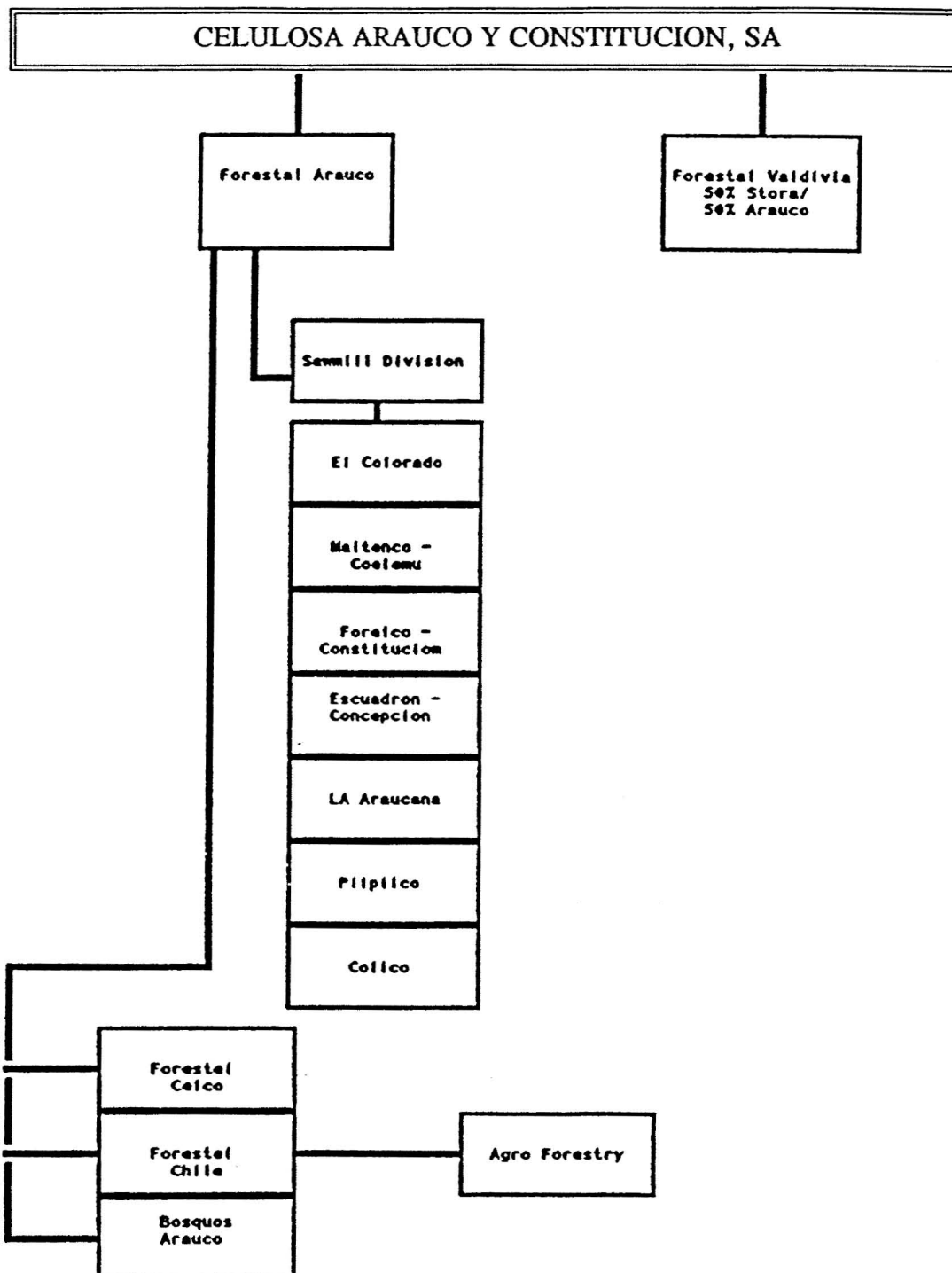
Forest Reserves - Arauco

	Radiata Pine	Euc	Land/Has
Forestal Celco	78,000	--	101,000
Forestal Chile	102,000	--	146,000
Bosques Arauco	122,000	7,100	191,000
Forestal Valdivia	<u>58,000</u>	<u>2,600</u>	<u>84,300</u>
	<u>360,000</u>	<u>9,700</u>	<u>522,300</u>

Arauco - Sawmill

Mill output/average per year in Cubic Meters

El Colarado	70,000
Maitenco - Coelemu	30,000
Forelco - Constitucion	30,000
Escuadron - Concepcion	55,000
LA Araucana	35,000
Pilpilco	30,000
Colico	<u>20,000</u>
	<u>270,000</u>



CMPC

Parent Address:

Compania Manufacturera de Papeles y Cortones SA
Agustinas 1343, Piso 3
Santiago

Tel: 56-2-698-1941
Fax: 56-2-671-1957

Contacts:

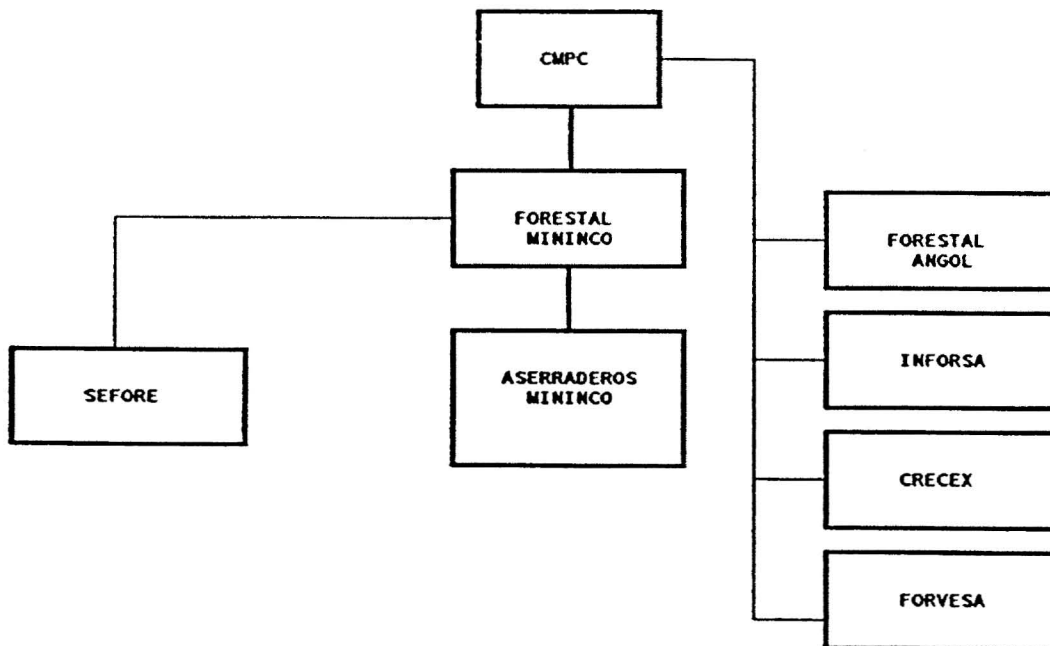
Sr. Aruro Mackennal
General Manager

Sr. Pedro Schlack
Manager

Sr. Fernando Raga
Manager Development

Aseraderos Mininco S.A.
Agustinas 1357, Piso 3
Tel: 56-2-698-1941
Fax: 56-2-696-5437

Sr. Fernando Leon S.
Manager



Forest Reserves	Radia Pine	EUC	Land/Has
Forestal Mininco	147,089	13,200	260,692

Forestal Mininco	147,089	13,200	260,692
CMPC	340	2,683	5,876
Forvesa	45,636	3,951	72,533
Crecex	36,819	184	55,558
Forestal Angol	<u>500</u>	<u>9450</u>	<u>20,195</u>
	<u>230,384</u>	<u>29,468</u>	<u>414,854</u>

CMPC Sawmills

Mill Output - Average per year cubic meter

Maderas Mininco - Las Angeles	100,000
Maderas Mininco Mulchen	-----
	<u>100,000</u>

SANTE FE GROUP

Forestal y Industrial Sante Fe S.A
(Shell 60%, Scott 20%, Citicorp 20%)

Sante Fe - Santiago

Marchant Pereira 10, Piso 18
Providencia, Santiago
Tel: 56-2-231-6616
Fax: 56-2-231-6614

Contacts:

Manual Francisco Diaz
General Manager

Fanta Fe - Mill and Forest Operations

Alberto Rubinstein
Forest Operations

Av. J. Hemmelmann 670
Nacimiento
Tel: 56-43-511352
Fax: 56-43-51142

Santa Fe - Forest Companies	RPine	Euc	Other	Land/has
1. Forestal Colcura	11,000			15,000
2. Forestal Monte Aguila	<u>24,000</u>			<u>40,000</u>
	<u>35,000</u>			<u>55,000</u>

INFORSA

(Company 79.71 owned by CMPC)

Parent Address:

Industrias Forestales SA
Agustinas 1350, Piso 6
Santiago

Fax: 56-2-695-4477

Subsidiary Address:

Forestal Rio Vergara - AA - Forvesa
AV. J. Hemmelmann 198
Nacimiento

Tel: 56-43-511-405

Fax: 56-43-511-400

Forest Reservas - InforSA
Rio

InforSA - Sawmill

Maderas Nacimiento - Madex

Contacts:

Sr. Andres Larra
President

Contacts:

Sr. Jorge Gomez
Manager

(See CMPC Forest Reserves)
Vergara - Forvesa

Mill output/average per year

150,000

CHOLGUAN S.A.

(Angelini)

Parent Address:

Estado 337 Piso 2
Santiago Chile
Tel: 56-2-395-097
Fax: 56-2-698-5967

Contacts:

Rene Katz S.
President

Eduardo Zanartu
Managing Director

Mill and Forest Operations

Forest Reserves

1.	Forestal Cholguan S.A. (Near Chilian)	R. Pine 50,000	Land/Has <u>65,000</u>
----	--	-------------------	---------------------------

Mills

Per Year in		Mill output - Average
		Cubic Meters
1.	Asserraderos Cholguan S.A. Sawmill - Panels - Moulded Products	<u>40,000</u>
2.	Manufacturera de Fibropanels (MDF)	<u>100,000</u>
3.	Maderas Prensadas Cholquan S.A. (Hard Board - High Density Fiber Board)	60,000 (Tons per year)

TERRANOVA. SA

Subsidiary of CAP.SA

Parent Address:

Terranova
Huerfanos 669, Piso 6
Santiago, Chile
Tel: 56-2-632-2322
Fax: 56-2-633-7082

Contacts:

Jorge Vribe
President

Jose Meli
Director Development

Agustin Abarca

Subsidiary Address:

Sociedad Forestal Millalenu SA
Arauco 343
Chilean
Tel: 56-42-225-690
Fax: 56-42-224-020

Contacts:

Sergio Valdes

Juan Orlando Gutierre
Manager Development

Forest Operations

	RPine	Euc	Land/Has
Forestal Millalenu SA	60,000	3,000	<u>110,000</u>

Mill Operations average cubic	Mill output per year in meters
---	--

1. Andinos S.A. Cabrero	216,000
2. Andinos S.A. Chilean (Large reman Facility)	11,000
3. Andinos S.A. Menque	60,000
4. Firanova S.A. Cabarero	<u>100,000</u>
Total	<u>297,000</u>

MASISA
(Pathfinder Group U.K.)

Parent Address:

Masisa
 Exposicion 1258
 Santiago, Chile
 Tel: 56-2-683-7202
 Fax: 56-2-683-6398

Contacts:

Jose Ignacio Letamendi
 President

Patricio Silva
 Planning Manager

Forest and Sawmill Operations

Forest and Sawmill Operations

	RPine	Euc	Land/Has
Forestal Aragon S.A.	10,000	10,000	<u>25,000</u>
Mill Operations average cubic			Mill output per year in meters
1. Aserraderos Aragon S.A.			20,000
2. Bosques y Maderas S.A.			8,000
3. Maderas y Sinteticos S.A. (Particle board and plywood)			<u>295,000</u>
Total			<u>323,000</u>

TASMAN CHILE S.A.

(Fletcher Challenge N.Z. 100%)

Parent Address:

Tasman Chile
Av Apoquindo 3076, Piso 6
Las Condes
Santiago, Chile
Tel: 56-2-234-1545
Fax: 56-2231-065

Subsidiary Address:

Forestal Bio Bio
Tucape 374, Piso 6
Concepcion
Tel: 56-41-233-857
Fax: 56-41-229-505

Contacts:

Bryce J. Whitcher
President

John Scott
Manager Development

Contact:

Jamie Ugarte
Manager

Forest Operations

	RPine	Land/Has
Forestal Bio Bio	41,000	<u>59,000</u>

ASERRADEROS COPIHUE

(55% Shell)

Parent Address:

Il de Septiembre 2155
Piso 14C
Santiago, Chile
Tel: 56-2-231-1831
Fax: 56-2-231-1903

Contact:

Guillermo Guelle
General Manager

Mill Address:

Casilla 147
Constitucion 942
Tel: 56-71-671-942
Fax: 56-71-671-938

Contact:

Pedro Galli G.
Manager

Forest and Sawmill Operations

Forest Operations	RPine	Euc	Land/Has
Bosques de Chile	23,500	1,500	<u>36,000</u>
average cubic			Mill output per year in meters
Aserraderos Copihue			<u>120,000</u>

APPENDIX

10.4

CHILEAN MILLS

1. Aserraderos Andinds S.A.

This mill is completely owned by CAP (100%). It has offices at:

Huerfanos 669, Piso 6
Santiago
Telephone: 56-2-6322322
Fax: 56-2-6337082

Products(s): Lumber, millwork, furniture
Capacity: Sawmill: 100,000 m³/year
Millwork and furniture: 20,000
Market(s): USA, Middle East, Europe
Equipment: Sawmill, Canalli (Germany), Indumet (Chile),
Hildebrand, The Taylor (USA)
Operating: 14 years
Expansion Plans: Not disclosed

2. Aserraderos Arauco

Six mills, both sawmills and millworks, are operated by 1 corporation. Detailed information on each of the units is not available, except for output which are given in the following table:

One operation is new, El Colorado. The rest have been established for several years. El Colorado has basically German equipment (Linck).

Celulosa Arauco and Constitucion S.A. is the owner of these mills (100%).

Sawmill	Annual Lumber Output (m³)
El Colorado	70,000
Escuadron	55,000
La Araucana	35,000
Pilpilco	30,000
Maiteneo	30,000
Colico	20,000
TOTAL	240,000

3. Aserraderos Copihue S.A.

This company is owned by Shell Chile (55%) and Citicorp of the USA (45%). It has offices at:

Av. 11 de Septiembre 2155, Piso 14
Santiago
Telephone: 56-2-2326681
Fax: 56-2-2311903

Product(s): Lumber, millwork, furniture components, treated lumber and roundwood, logs, chips and pulp wood.

Capacity: Sawmill: 120,000 m³/year
Millwork: 20,000 m³/year
Furniture components: 10,000 m³/year

Markets: Middle East, Japan, Europe, Argentina, local

Equipment: Sawmill: Frick, Schurmann, USA)
Kilns: Bollmann (Germany), Moore (USA)
Components: USA, Italy, Brazil

Operating: About 15 years

Expansion Plans: None

Note: This company is currently up for sale

4. Aserraderos Mininco S.A.

Completely owned by CMPC (100%), this company has offices at:

Agustinas 1343, Piso 4
Santiago
Telephone: 56-2-698194

Product(s) Lumber

Capacity:	100,000 m ³
Market(s):	Middle East, Japan
Equipment:	Linck (Germany) Ari (Sweden)
Operating:	8 years
Expansion Plans:	Replacement of equipment in 1993-1994 Construction of new mill in 1993-1994

5. Forestal Carampangue S.A.

This company is owned by a French entrepreneur, M. Porte. Its offices are at:

Estado 10, Piso 14
Santiago
Telephone: 56-2-633968
Fax: 56-2-711957

Product(s):	Lumber
Capacity:	150,000 m ³ /year
Market(s):	Middle East, Japan, Europe
Equipment:	Linck (Germany)
Operating:	15 years
Expansion Plans:	None

6. Maderas Nacimiento S.A. (MADEX)

It is a completely owned subsidiary of Industrias Forestales S.A. (INFORSA) with head office at:

Estado 10, Piso 14
Santiago
Telephone: 56-2-633968
Fax: 56-2-711957

Product(s):	Lumber
Capacity:	150,000 m ³ /year
Market(s):	Middle East, Japan, Europe
Equipment:	Kockumns, Dennis, Linck (Canada, Germany)

Operating: 15 years
Expansion Plans: Partial replacement of equipment

7. Aserraderos Aragon S.A.

This company is a subsidiary of Maderas y Sinteticos S.A. and has head offices at:

Exposicion 1258
Santiago
Telephone: 56-2-6837202
Fax: 56-2-6836398

Product(s): Lumber, millwork
Capacity: 20,000 m³/year
Market(s): Argentina, local
Equipment: Premultini (Italy), Weinig (Germany)
Operating: 2 years
Expansion Plans: None

8. Aserraderos Cemento Bio-Bio S.A.

The owner of this company is Cementos Bio-Bio S.A. and the head office is at:

Camino Concepcion-Coronel Km 11
Telephone: 56-41-371726
Fax: 56-41-374234

Products(s): Lumber
Capacity: 80,000 m³/year
Market(s): Middle East, Japan, Europe, local
Equipment: Linck (Germany), multiple circular saws and chipper canter
Operating: About 14 years
Expansion Plans: None

9. Aserraderos Cholguan S.A.

The owner of this company is Anacleto Angelini, A Chilean entrepreneur. The company has offices at:

Estado 337, Piso 2
Santiago
Telephone: 56-2-6395097

Product(s): Lumber, dimension stock
Capacity: 40,000 m³/year
Market(s): Local, Korea, the Netherlands, Germany, USA
Equipment: Chipper canter and multiple circular saws (Germany)
Operating: 12 years
Expansion Plans: In panels and millwork

10. Agrícola y Forestal Casagrande Ltda.

The owners of this company is the Casagrande family. Company headquarters for the company are:

Ac. Recabarren 03160
Temuco
Telephone: 56-45-250004
Fax: 56-45-250005

Product(s): Lumber, dimension stock, finish furniture
Capacity: 15,000 m³/year
Market(s): Furniture: USA, Europe
Lumber: local
Equipment: Sawmill (Chile), re-manufacturing plant (USA, Italy, Chile)
Operating: About 5 years

11. Aserradero San Vicente S.A.

The owner of this company is IMASA, a Spanish corporation. The offices are located at:

Av. Gran Bretana 4793
Talcahuano
Telephone: 56-41-411934
Fax: (3641) 411115

Product(s): Lumber
Capacity: 80,000 m³/year
Market(s): Middle East, Korea, Japan
Equipment: Chipper canter, multiple circular saws, Linck (Germany)
Operating: About 12 years
Expansion Plans: None

12. Aserradero Vista Alegre Ltda.

The owner of this company is Universidad Austral, a regional university in Valdivia. The company's headquarters are at:

Av. Pedro Aguirre Cerda 2001
Valdivia
Telephone: 56-63-216185
Fax: 56-63-216964

Product(s): Lumber, millwork
Capacity: 20,000 m³/year
Market(s): Middle East, Japan, local
Equipment: Frame saw, Linck (Germany)
Operating: About 16 years
Expansion Plans: None

13. Central Maderera

The owner of this company is a family in the Curico area. The offices are at:

Av. Alessandri 2102
Curico
Telephone: 56-75-311327

Product(s): Fruit crate components
Capacity: 30,000 m³/year

Market(s): Local

Equipment: Band re-saw, cut off saws, lathe (Chile, Spain, Italy)

Operating: About 12 years

Expansion Plans: None

14. Forestal Tromen S.A.

The offices for this company are located at:

Parque Industrial Escuadron, sitio 6
Coronel
Telephone: 56-41-712043
Fax: 56-41-712044

Product(s): Lumber

Capacity: 30,000 m³/year

Market(s): Japan, Middle East

Equipment: Band saw and carriage, multiple circular saws (Brazil)

Operating: About 8 years

Expansion Plans: None

15. Maderas Rio Itata S.A.

The owner of this company is Chilean entrepreneur Roberto Izquierdo. The company's headquarters are at:

Camino Coelemu-Quirihue Km 3
Telephone: 56-42-511461
Fax: 56-42-511462

Product(s): Lumber, dimension stock

Capacity: 30,000 m³/year

Market(s): Local, Middle East, Europe, Japan

Equipment: Sawmill: Ari (Sweden), Components (Germany)

Operating: About 4 years

Expansion Plans: In re-manufacturing plant

16. Industrias Fourcade S.A.

Marcelo Fourcade is the owner of this company, which has its head office at:

Manuel Montt 850, Piso 2
Temuco
Telephone: 56-45-210189
Fax: 56-45-367077

Product(s): Lumber, dimension stock, finished furniture

Capacity: 40,000 m³/year

Market(s): Local, USA, Europe
Furniture (USA, Italy, Germany)

Equipment: Band saw and carriage, band re-saw (USA, Chile)

Operating: About 18 years

Expansion Plans: None

17. Sociedad de Industrias Madereras S.A.

The owner of this company has not been disclosed. Its offices are at:

Logitudinal Sur Km 461
Los Angeles
Telephone: 56-41-295050
Fax: 56-41-295050

Product(s): Plywood

Capacity: 8,000 m³/year

Market(s): Local (for fruit crates)

Equipment: Lathe, press, clippers (Spain)

Operating: About 3 years

Expansion Plans: None

FIBREBOARD PRODUCERS

1. Maderas Prensadas Cholguan S.A.

The company's owner is Chilean entrepreneur Anacleto Angelini. Its headquarters are at:

Estado 337, Piso 2
Santiago
Telephone: 56-2-395097
Fax: 56-2-332676

Product(s): Fibreboard
Capacity: 60,000 m³/year
Market(s): Local, Europe, Asia, USA
Equipment: Sunds Defibrator (Sweden)
Operating: Over 20 years
Expansion Plans: None

PLYWOOD PRODUCERS

2. Bosques y Maderas S.A. (MASISA)

A British company, known as the Pathfinder Group, owns this company, with offices at:

Av. 11 de Septiembre 1480, Piso 12
Santiago
Telephone: 56-2-2352880
Fax: 56-2-497613

Product(s): Plywood
Capacity: 8,000 m³/year
Market(s): Local and export to Europe, USA, Argentina, Venezuela
Equipment: Finland, Italy, Brazil and Japan
Operating: About 20 years
Expansion Plans: Phenolic and melamine-coated plywood

3. Emasil S.A.

A local family owns this company, which has offices at:

Pedro Aguirre Cerda 1551
Valdivia
Telephone: 56-63-216263
Fax: 56-63-216165

Product(s): Plywood, doors, blockboard
Capacity: 25,000 m³/year
Market(s): Local, Europe, Mexico, USA
Equipment: Lathe R F R (Germany) and (Brazil) Press OTT (Germany), Clippers (USA), Driers Omeco (Brazil)
Operating: Over 20 years
Expansion Plans: None - the company has recently expanded

4. Infodema S.A.

This company is owned by a local family, and it has offices at:

Av. Espana 1000
Valdivia
Telephone: 56-63-216151
Fax: 56-63-216961

Product(s): Plywood, veneer, dimension stock, furniture components
Capacity: 30,000 m³/year
Market(s): Local, USA, Germany, Venezuela, Australia
Equipment: Italy, Germany
Operating: Over 20 years
Expansion Plans: None

5. Maderas y Sinteticos S.A.

The owner of this company is the Pathfinder Group, based in the U.K.
The company has offices at:

Exposicion 1258
Santiago
Telephone: 56-2-6837202
Fax: 56-2-6836398

Product(s): Particle board, doors, plywood
Capacity: 280,000 m³ particle board
650,000 m³ doors
15,000 m³ plywood/year
Market(s): Local, South East Asia, Central and South
America, Europe
Equipment: Germany, Italy, USA
Operating: Over 20 years
Expansion Plans: Not disclosed

6. Forestal Curacautin S.A.

This company, whose ownership has not been disclosed, is located at:

Ac. Jose Joaquin Perez V. 9580
Santiago
Telephone: 56-2-5586586
Fax: 56-2-5584720

Product(s): Plywood, particle board
Capacity: 9,500 m³/year
Market(s): Local, Argentina
Equipment: Germany
Operating: Over 20 years
Expansion Plans: None

MEDIUM DENSITY FIBREBOARD (MDF) PRODUCERS

7. Manufacturera de Fibropaneles Chile S.A.

The owners of this company are Chilean entrepreneur Anacleto Angelini and the Carter Holt Group from New Zealand. The company has offices at:

Estado 337, Piso 1
Santiago
Telephone: 56-2-6392555
Fax: 56-2-6336760

Product(s): MDF
Capacity: 100,000 m³/year
Market(s): Local and export
Equipment: Sunds Defibrator (Sweden)

8. Fibranova S.A.

The owner of this company is CAP S.A.

Product(s): MDF
Capacity: 100,000 m³/year
Market(s): Local and export (Far East)
Operating: 6 months
Expansion Plans: None

PULP AND PAPER PRODUCERS

1. Celulosa Arauco y Constitucion S.A.

Arauco S.A. owns this company, which has offices at:

Agustinas 1070, Piso 6
Santiago
Telephone: 56-2-6981961
Fax: 56-2-6985967

Product(s): Bleached and unbleached Radiata Pine kraft pulp
Capacity: Around 750,000 m^t/year

2. Celulosa del Pacifico S.A.

The co-owners of this company are CMPC and Simpson Lumber. Its offices are at:

Agustinas 1350, Piso 4
Santiago
Telephone: 56-2-6981941
Fax: 56-2-6993964

Product(s): Bleached Radiata Pine kraft pulp

Capacity: 315,000 m^t/year

3. Compania Manufacturera de Papeles y Cartones S.A.

CMPC has offices at:

Agustinas 1343, Piso 4
Santiago
Telephone: 56-2-6981941
Fax: 56-2-711957

Product(s): Kraft pulp, papers and boards

Capacity: 650,000 m^t/year

4. Forestal e Industrial Santa Fe S.A.

This company has its offices at:

Marchant Pereira 10, Piso 18
Santiago
Telephone: 56-2-2316616
Fax: 56-2-2316614

Product(s): Bleached Eucalyptus kraft pulp

Capacity: 240,000 m^t/year

5. Industrias Forestales S.A.

This company is owned by CMPC and a number of small shareholders. Headquarters for the company is:

Agustinas 1350, Piso 7
Santiago
Telephone: 56-2-6954477
Fax: 56-2-6954477

Product(s): Newsprint

Capacity: 130,000 m^t/year

6. Papeles Bio-Bio S.A.

The company's owner is Tasman Chile S.A. The company's offices are located at:

Pedro Aguirre Cerda 1054
Concepcion
Telephone: 56-41-371229
Fax: 56-41-371090

Product(s): Newsprint

Capacity: 100,000 m^t/year

SMALL COMPANIES IN PAPER AND BOARDS

7. Cia. Papelera del Pacifico S.A.

The headquarters for this company are:

Km 563, Ruta Sur
Santiago
Telephone: 56-2-6721430

Product(s): Writing paper: 2,000 m^t/year
Wrapping paper: 2,000 m^t/year
Corrugated kraft: 6,000 m^t/year
Couche: 4,000 m^t/year

Capacity: 14,000 m^t/year

Market(s): Local

Equipment: Beloit DD, Broth Shark, Voith, Sulzer, Tolosa, Keinefewers

Operating: Over 20 years

Expansion Plans: None

8. Fabrica de Papeles Carrascal S.A.

This company has offices at:

Carrascal 5150
Santiago
Telephone: 56-2-7731165
Fax: 56-2-732146

Product(s): Corrugated board, paper
Capacity: 36,000 m^t/year (recycled fibre)
Market(s): Local
Equipment: Spain and Sweden
Operating: Over 20 years
Expansion Plans: In printing paper

9. Schorr y Concha S.A.

The address for this company's offices is:

Av. Carlos Schorr 433
Talca
Telephone: (071) 226406 - 223757

Product(s): Liner paper and corrugated board
Capacity: Liner paper 2,600 m^t/year, corrugated board 500 m^t/year (recycled fibre)
Market(s): Local
Operating: Over 20 years
Expansion Plans: At the feasibility stage

11. Vera y Giannini S.A.C.I.

The offices for this company are located at:

San Ignacio 1538
Santiago
Telephone: 56-2-5567894
Fax: 56-2-5567863

Product(s): Board, paper and corrugated board
Capacity: 40,000 m^t/year

Market(s):	Local
Equipment:	Black Clawson, Bauer (refiners, depurators)
Operating:	More than 20 years
Expansion Plans:	None

APPENDIX

10.5

MARKET INVESTIGATION MEETING NOTES

**PAUL COX
TRIP REPORT**

**Market Investigation Study (Chile)
May 1-16, 1993**

CORMA

May 3/93

Eladio Susaeta, President

Agustinas 814 - OF. 407

Santiago, Chile

Phone: 6335728 - 6384194/Fax: 6397485

Monday May 3/93

- ♦ 80% of Pulp business has been completed by Canadians. This is the only real area Canadians have experience any real success.
- ♦ Price competition and the lack of know how in dealing with the Chilean customers is the reason for poor showing in harvesting and sawmilling.
- ♦ Chileans are traditionally slow buyers. They look for the economic/technical answers which they do not always get.
- ♦ Linck has been successful in Chile. The success has been tied to a local representative. He knows everyone. The who, what, and why of the local sawmill industry. He sells with good local technical support - he almost designs the sawmill.
- ♦ Logging has had a good initial start but has fallen off lately.
- ♦ Stihl chain saws have had the market share in Chile but with their move to Brazilian manufacturing a major drop in quality has been experienced.
- ♦ Local technical assistance and the ability to adjust to local conditions is a must in Chile and without a local presence it is difficult. For example Simons.
- ♦ The GIS void has been filled by the Fundacion Chile because after working with Simons for 8 years nothing had developed. No one is around.
- ♦ South America comes to Chile to see what is happening in the forest industry.
- ♦ Canadians have had the opportunity to be the leaders in this market but have not maintained their presence.
- ♦ Open an office with a Chilean and you will be much more competitive. You must also think of the opportunities in Paraguay, Argentina, and even Brazil.
- ♦ Linck sends representatives from Germany to address technical problems. They do not address a problem with a fax.
- ♦ A local news print mill, a Sandwell design and Simons upgrade, was originally equipped with Canadian equipment. The new equipment was supplied by Voith because the Chilean buyer could not get the interest of the Canadian Suppliers.

- ♦ Linck and Stihl are represented by Chilean Citizens
- ♦ The 120,00 ton chip board plant being dismantled in Scotland is now an exception. The equipment is mostly German (chip and fiber board equipment). The domestic mills may buy used mills and used equipment but to compete in the global market there is a trend to use the latest technology.
- ♦ Chilean law does not allow the importation of used trucks. Some people are assembling used trucks to get around the law.
- ♦ Used equipment represents a small part of the market.
- ♦ Value added products are generally exported. About 40% is exported and the domestic market is over supplied driving the price down. This is particularly evident in the board market.
- ♦ Chip board market is well supplied with the latest technology. One major mill produces 2.5 times the domestic capacity.
- ♦ MDF 80% for export from 2 mills
- ♦ Number of small plywood mills with good quality but their costs are marginal.
- ♦ New products (OSB) must come through the larger companies with good financing and support.
- ♦ All the major companies are looking at high tech equipment. The companies do not want to specialize they want to be diversified. They must have a strong domestic market before they can have success.
- ♦ CMPC and MASISA are looking and establishing operations in Argentina and Paraguay.
- ♦ Chip exports to Argentina are growing.
- ♦ The costs of unskilled labour are rising in the forestry operations. There has not been the same impact in the sawmill operations.
- ♦ Skilled labour has enjoyed a slow increase in real wages but the increase cost has been offset by increases in productivity. The unskilled wage rate will slow after its rapid increase in the last three years. The Country is now a full employment and any increases in real wage rates will be offset by corresponding gains in productivity.
- ♦ There is a move to greater automation.
- ♦ Austrian yarders are being manufactured in Concepcion. It is a Joint Venture 95% Austrian / 5% Chilean.

ARAUCO
Felipe Leniz, President
Forestal Arauco S.A.
Agustinas 1070, 6th floor
P.O. Box 880
Santiago, Chile
Phone: 6981961/Fax: 56-2-6985967

- ♦ A new mill in Constitucion is in the early stages of construction. The mill will be equipped with Dennis and Kockums equipment. The mill will contain advanced canter technology.
- ♦ Clear wood is the principle product of the industry. The clear wood is obtain through effective forestry management of pruning and thinning. Japan and United States are large markets for the clear timber. To process the clear timber they have been relying on North American technology. They are employing the same techniques used to process Ponderosa pine for the Radiata pine.
- ♦ The US is the biggest market for clear cants.
- ♦ The Constitucion mill was developed through a series of studies by an American consultant. He made recommendations on equipment based on the markets for the processed lumber. ARAUCO then went out and asked for quotations. The quotations were rated based on Price, Quality, and after Sales Service.
- ♦ The companies principle markets include Japan, Middle East, United States, and South America. ARAUCO must have the ability to adapt mills for the different markets.
- ♦ The ARAUCO marketing department sells the products from the different mills. The companies chief export product to day is logs.
- ♦ In the future the company plans to concentrate on the clear timber market.
- ♦ In the first half of 1995 a new sawmill is planned. The capacity of the mill will be 250,000 cubic meters and will handle 75 % pruned timber. It will be a high tech mill concentrating on the housing and remanufacturing markets. It will be similar to the Constitucion mill.
- ♦ The company must increase its drying technology. It is currently buying 4 Italian kilns.
- ♦ Standardization of the mills is becoming more important to ARAUCO.
- ♦ When choosing equipment the company has found good quality equipment around the world. The key factors considered when making a purchase decision is price and service.
- ♦ Spare parts availability, technical support as require - fax, phone, and when require expertise flying to site. Good communications is a must with timely responses most important.

- ♦ US and Canadian equipment is generally priced competitively while the US maintains higher customer service levels.
- ♦ Companies must have the latest technology to respond to problems i.e. modems.
- ♦ The logistics to support the spare parts requirements of a customer must be in place prior to supply spare parts requirements.
- ♦ Company representatives should keep the customer informed of the latest technology and the general direction of the firm.
- ♦ Price and quality are always important.
- ♦ To ensure good product support manufacturers should offer standard components with their equipment packages. For example vickers pumps are available from local hydraulic shops. The Germans usually supply all German components which are hard to source and require large spare parts inventories for the mill and the local agent.
- ♦ ARAUCO has 6 saw mills operating to date and expect to build 4 to 5 mills in the next seven years. The mills will be in the 200,000 cubic meter range and will be capable of handling a diversified clear lumber product offering.
- ♦ ARAUCO will build and negotiate the mills and will set up a contractor to operate them.
- ♦ The company will attempt to maximize its yields from the clear lumber will export green and dried product.
- ♦ ARAUCO has traditional established the equipment requirements for their harvesting operations for the harvesting contractors. This program has been some what of a disappointment for ARAUCO as they are not happy with the quality of communications between the contractor and the firm. ARAUCO sets the operating procedure which is somewhat of a historical problem.

FUNDACION CHILE

Mario Hermosilla, Forestry Director
Janina Gysling Caselli, Jefe Comercializacion
Ave. Parque Antonio Rabat Sur 6165
P.O. Box 773 - Santiago, Chile
Phone: 56-2-2185211/Fax: 56-2-2426900

Janina Gysling Caselli
Jeff Comercializacion
Av. Parque Antonio Rabat Sur 6165
P.O. Box 773 - Santiago, Chile
Phone: 56-2-2185211/FaxL 56-2-2426900

- ♦ The organization was establish and operates from a 50 million dollar endowment received from the government and ITT. In the mid 70's ITT, who was an original sponsor of the organization, gave up its share of the Fundacion Chile and its share of the assets. The organization is a non profit self funding

research, development, testing and marketing organization. It is supported by 80% of the forestry companies in Chile.

- ♦ The forestry group is made up of 4 different forestry divisions: Plantations, Industrial, Market/Sales, and Publications.
- ♦ The FD generates revenues from the sale of proven commercial developed technologies, JV projects with industry (local and International), and fee for service projects such as product testing and market research and surveys.
- ♦ The mandate of the organization is to search and secure technology to enhance Chilean industry.
- ♦ To be successful in Chile a good sales and promotion effort is critical. A training process must be planned to ensure the company gets the most from the equipment purchased. The labour supply in Chile is somewhat fix so training is critical to ensure improved productivity.
- ♦ The proper representative is critical. One must understand the market and the process in the market.
- ♦ With most of the manuals and training in English it important that a technically competent rep is critical.
- ♦ The countries and companies that are doing a good job have utilized their embassy to get an overview of the market. To make an informed decision investment and feasibility studies can be undertaken and preformed by the FC.
- ♦ The most effective way to sell new products is through live demonstrations in the Country. A group such as CIDA could possible assist and cover some of the costs of the demonstration.

MUJICA ASOCIADOS SA

Jose Puga C.

Coronel Pereira No. 72

Las Condes - STGO, CHILE

Phone: 2083031/Fax: 2281373

- ♦ In Chile the Client always buys the equipment. Do not concentrate your time with the consultants spend your time with the end user.
- ♦ There is three projects underway currently in Chile. Madex with Kockums/Linck, Mininco with USNR/Swedish, and Celco with Denis/KKC.
- ♦ Puga generally assists the client and advises on projects definition at cost or as business development. they attempt to avoid the bid process. Once the project is defined and project goes ahead will work with the client on market price basis.
- ♦ If the client has limited experience Puga will source the necessary expertise in conjunction with the client.
- ♦ Very few turnkey projects - only could think of one.

- ♦ Engineering projects in Chile Cost Plus/Fixed Fee lump sum for original drawing based on \$960/drawing
Charge for reimbursables at 10% of budget costs
Home office costs \$16/hr @ 60 man hour per drawing (\$960)
Does not include client purchase of capital equipment.
generally 220 drawings per sawmill @ \$960 ~\$200,000
Construction costs @ 10% ~ \$4,000,000 = 400,000
\$600,000 fees for an average 10,000,000 project
- ♦ This is compared to US at 16% - EPCM usually 10% more than EPC - Projects under Canadian control not competitive.
- ♦ US \$50 to \$55 versus \$16 Chile
- ♦ Generally North American firms charge 100 hrs for drawings.
- ♦ Use local company so you can benefit from Chilean costs - only bring outside talent (process) when local expertise not available.
- ♦ Local representation key to success for equipment
- ♦ Puga has 100 employees in house and close to 2000 in the field.
- ♦ \$50,000,000 revenue backlog in 20 different projects
- ♦ 25 engineers in Santiago and 20 sub contract eng.

ARAUCO
Antonio Grass, Manager Planning
Forestal Arauco S.A.
Agustinas 1070, 6th floor
P.O. Box 880
Santiago, Chile
Phone: 6981961/Fax: 56-2-6985967

May 04/93

- ♦ No new investment in pulp mill planned - Investment in sawmills, drying, remanufacturing in the next 5 years.
- ♦ Expect 1 or 2 additional sawmills 100,000 cubic meters output/200,000 cubic meters input
- ♦ Do not expect any change in the size of the sawmills until the turn of the century when the wood supply increases. The increase in the wood supply would then lead to larger mills.
- ♦ preference is for the larger mill given wood supply
- ♦ With respect to mill design they are currently reviewing specialization versus diversification.

- ♦ Currently in the middle of a three year wood supply study. After the study is complete and review expects to be looking for mills with some flexibility to serve markets - cost benefits to a specialized material.
- ♦ Pruned harvest is increasing which will require a more specialized sawmill (higher recovery) to service the Japanese, US, European, and Middle East markets. Even Korea and Argentina
- ♦ Evaluation of technology versus costs given low labour rate. Technology to reduce labour is of limited value - Technology for improved recovery is of value if cost effective. The market in Chile for logs is \$100 cubic meters at the sawmill or \$200 cubic meters FOB Chile for export logs. Better market for logs than sawn lumber.
- ♦ The sawmills in operation now are servicing existing customer base for future benefits.
- ♦ OSB is under analysis but demand of pulp wood has slowed process. Log prices has also slowed the development of veneer.
- ♦ Scandinavians are now offering logs to Korea. 20% more product than they can utilize. To address surplus they will prospect other markets which will bring the price of logs down in the long run.
- ♦ The log market is very volatile currently Europe is low and the Middle East is high and there is no equilibrium.
- ♦ With respect to harvesting equipment over the next 5 years does not expect much change in harvesting methods. The company is studying the feller buncher but tests have proved that the FB is not appropriate for all applications
- ♦ Thinning is very important as a commercial crop for the pulp mills @ 12.5 years. Economics of harvest and plantation is based on the commercial thinning harvest for the pulp mill. Current methods are not working. They must develop new methods for thinning.
- ♦ Environmental concerns re soil disruption is not much of a concern but it is growing. When company is run by Chileans environmental issues are not a concern. When an expatriate is running a company the community is much more sensitive to the environmental issues.
- ♦ Only market environmental concern is from Europe - very limited interest from the Middle East.
- ♦ First pruning in the 5th year followed in the 7th and on good site in the 8th year then again in the 9th - attempt to have 4 pruning cycles. The 4th pruning is generally up to 7 meters. Trees are pruned to 50% of height at any pruning.
- ♦ Thinning per ha- 1000 - 1250 stems planned; year 5 thinning 700; year 12.5 350 stems; year 12 250 stems remain; and in year 25 harvest.
- ♦ 450 cubic meters is harvested per ha in 25th year. 18 cubic meters of pulp, 150 pruned logs, 30 to 35% clear logs - 50% of the 35% clear lumber.

- ♦ Oxen are generally used for thinning and in some cases yarders.
- ♦ Cost to log with yarder \$6 to \$7 per cubic meter to road side. - output 2000 cubic meters per month.

- ♦ Average contractors cost to outfit for a yarder operation approx \$250,000

\$100,000 yarder
 \$ 5,000 cables
 20,000 carriage
 5,000 communications
 8,000 carrier for yarder

 \$230,000

- ♦ Harvester forwarder costs 600,000 to 700,000. - 6000 to 7000 cubic meters per month
- ♦ 10,000 cubic meters per month with 4 skidder and 5 guys per sider - 20 people directly plus lots of supervision - Hitech harvested forward 4 people no supervision.
- ♦ Yarders Kohler of Austria and Udels of S. Africa most common. These are the small market yarders focus of Austria and S. Africa - this is not the focus of all the suppliers in the market - special applications have used Chapmans, Cypress and Christie.
- ♦ Currently in excess of 130 yarders in the field.
- ♦ Cables - imported
- ♦ Carriages - Kokler, Maki, and Christie
- ♦ Communications - Talkie Tooter
- ♦ Vehicle - what ever is available
- ♦ Loaders - Brazil Fiat and Clark wh loader
- ♦ - Prentice, hoodm, Barko
- ♦ 50% of skidders is the JD648/748.
- ♦ When Canadians are doing business in Chile it is important to approach the key people who select the equipment - production manager, sawmill manager, and major contractors
- ♦ The new ARAUCO sawmill manager Antonio Luque will be more a coordinator that provide technical direction for the sawmill operations.
- ♦ A person is not required on the ground but it would be better for service. But it is important to find the right people to represent your products - organize demonstrations.
- ♦ Fundacion Chile is a key for testing your product and introducing new logging equipment. Corma has transfer technology group for sawmilling (Production group forestal?)
- ♦ Personal contact very important and personal trust

ASERRADEROS MININCO S.A.
Fernando Leon, CEO
P.O. Box 297
Santiago, Chile
Phone: (562) 698-8817/Fax: (562) 696-8833

- ♦ Suppliers must make a real commitment to the market
- ♦ Kockums took 10 years before they made a market visit
- ♦ Have spent \$20 million on renewing two mills and a new mill and have sourced no equipment from Canada. They have seen no one from Canada expect at Expocorma.
- ♦ Only see missions from Canada not the individual firms.
- ♦ When we don't feel a commitment they are not confident in the after sales service support they will receive.
- ♦ The CMPC group prefers direct factory contact - they do not feel that agents are equipped to provide technical support. Must send technical people to sell and support equipment. Canadian companies and their equipment is well known but the level of support is questionable.
- ♦ Linck is not the best sawmill equipment but has the best sales/service and support in the market.
- ♦ Direct contact with the factory is most important.
- ♦ With respect to future plans there will be expansion of the harvesting equipment and some further expansion in the sawmills.
- ♦ Expect two sawmill projects in the next 5 years. The mills would be small diversified operations. 150,000 cubic meters output close to 300,000 input. Flexibility the key word when designing the mills.
- ♦ With three sawmills will try to focus by market and by product.
- ♦ A separate remanufacture plant expansion is just about complete. Equipment came from Italy and the US.
- ♦ Interested in Radio frequency dryers.
- ♦ See opportunities for the complete system from Canadian versus piece meal particularly in the green field projects.
- ♦ New mill designed on a full project basis USNR runs the project.. The decision on the company was based on location, the performance guarantee, and the process design. Local engineering firms and the construction are coordinated through USNR.
- ♦ OSB?Plywood?Engineered wood products?LVL- Veneer and Plywood are all good products and possible a chance for the company but OSB is unlikely given the pulp dedication by MININCO.

- ♦ The concept of buying packages for mills was started by the Swedes.
- ♦ With respect to harvesting the company is starting a process of updating its equipment. The real wages of the labour in the woods has increased dramatically while the level of productivity has remained low. Mechanization a trend to improve productivity in the woods.
- ♦ The harvesting division is starting to mechanize operations.
- ♦ Harvest is 30,000 cubic meters per month.
- ♦ Currently two harvesting operations - thinning and clear cut.
- ♦ With respect to the question of contractors versus divisional management; the wood supply and equipment upgrades is questionable in the case of the contractor.
- ♦ The wood supply has dropped in North America over the last two years and do not expect a change next year. In fact only expect a change in wood supply levels until the Russian market opens up. But don't expect that to have an impact for 10 years.
- ♦ Company is just now investing in remanufacturing.
- ♦ Services - training is required at the technical level regarding applications in the industry. Log optimization - CMPC have forced suppliers to develop solutions for the Chilean market.
- ♦ There will be an opportunity for dry kilns because of growth in capacity.
- ♦ Process design is when CMPC looks to the consulting companies. Local firms do not have process design technologies. Chileans have good machine and equipment knowledge but require help putting the process together.

INFOR

Nelson Vergara R., Ingeniero Forestal, Jefe Division Industrias
Laboratorio Div. Industrias
Pasaje Fresia 1223
Penalolen, Santiago, Chile
Phone: 2711318/Fax: (056) 02-6381286

- ♦ 20 people work in the industrial division - sawmills
- ♦ Small and medium size mills are the focus of this group.
- ♦ Infor does regular surveys of these operations. A regular costing of raw materials for the mill is done in every survey.
- ♦ 1600 sawmills operate in Chile. 1500 of these sawmills are call mountain sawmill and produce square cants with old circular sawmills. The cost of these mills is \$8,000 to \$10,00 without the motor.

- ♦ The majority of the mills operate in the native forest about 600 operate in pine. The mills generally only operate two months a year and average 5000 cubic meters of poor quality cants.
- ♦ Infor feels part of their mandate is to help replace these operations with better quality band mills but this would require government financial assistant.
- ♦ Another major initiative for Infor is training of saw filing to develop a higher level of expertise.
- ♦ Infor is involved in a CIDA project with wood homes - 2 x 4 home construction but quality construction is a problem. They are working in conjunction with Canastoga College in new Brunswick.
- ♦ Infor feels the biggest opportunity in Chile is drying of lumber. Currently only have 10% capacity.
- ♦ Other opportunities include personal protection equipment and noise protection.

GILDEMEISTER S.A.C
Alfonso Gazitua, Gerente, Mercado de Equipos
Las Rejas 113
Santiago, Chile
Phone: 7764040/Fax: 7763616

- ♦ 40% of the forestry equipment market is skidders. Cat has 40 cable skidder and 2 cable skidders in operation.

FORESTAL DEL SUR LTDA.
Jose Rafael, Managing Director
Apoquindo 3200 - 4th Floor
Santiago, Chile
Phone: 2331283/Fax: (56-2) 2466300

May 05/93

- ♦ Good demand for logs and lumber
- ♦ Has a concern over the business cycle re log prices versus US economy and what Clinton and Gore will do regarding US wood supply.
- ♦ This concern over the log process affects long term investment decisions.
- ♦ 14 to 20 cm logs in good supply
- ♦ 5.4% unemployment and 7% growth in the economy
- ♦ There is a leasing opportunity to the small contractor for logging equipment
- ♦ Because the contractor has no planning capacity, technology or asset capacity the major companies are forced for to develop, test, and search for new technology - for example thinning equipment.

- ♦ The inability of the small to medium size contractor to finance equipment has limited the grow and development of the contractor.
- ♦ The large market of the John Deere skidder over 50% is due to John Deere financing the contractors.
- ♦ Finnish banks and dealers work together.
- ♦ There is a good supplier protection system in the Chile legal system. Punishment for not complying with financial agreement is very sever. If a contractor defaults on an agreement he could go to jail.
- ♦ Harvests 300,000 cubic meters per month with 60% going to the pulp mills. Uses used Swedish equipment complete with extended warranty.
- ♦ In a three year period the real wage of unskilled labour has increased 25 to 30 per cent.
- ♦ The poor availability of labor and the lack of technology for the contractors is a big concern. Expect further labour increases to be 1 or 2 per cent per year from here forward.
- ♦ 15% corporate tax rate.
- ♦ 88% of the employees rate is the tax base the balance of the wage is for health, education, and social programs. The companies deduct the tax from the employees checks and forward funds to a private sector group who administers the social programs.
- ♦ The personal tax rate can be as high as 50% but CEO/owners can deduct their companies 15% tax from their personal tax.
- ♦ With respect to Brazil - the country is a mess, the law is questionable, lots of corruption, and the infrastructure is questionable.
- ♦ Argentina has only one good port, very serious people, currently under going a change in the tax structure but it will take 3 to 4 years before the country is up to speed.

CHOLGUAN

Eduardo Zanartu, Managing Director

Estado 337 -2^o Piso

Santiago, Chile

Phone: (56-2) 395097/Fax: (56-2) 332676

- ♦ In the next 5 years expect to increase their harvest by 50%
- ♦ The current split is 40% pulp wood and 60% saw logs.
- ♦ With respect to experience with Canadian suppliers all their contractors buy their own equipment. The final decision is the contractor but they will consult with the company.

- ♦ The debarker in the mill is a Nicholson
- ♦ Minimum sawmill size is - output of 70,000 to 100,000 cubic meters with an average cost of between 10 to 15 million US dollars
- ♦ The company has three mills - hardboard mill 60,000 tons per year, MDF mill 100,000 cubic meters per year and a sawmill 40,000 to 50,000 cubic meters output per year.
- ♦ Total harvest is 50,000 cubic meters per month.
- ♦ The company is currently in the middle of a \$ 2 million sawmill upgrade. Future plans include development into the panel markets for export.
- ♦ The hardboard market is 50% export to Latin America, US and Europe - the MDF is 60% export to Asia and Europe.
- ♦ The MDF plant was a JV package where the New Zealand partner had some of the equipment and the balance was purchased individually. The NZ partner had the press.
- ♦ The company has four contractors under one year contracts for their harvesting. The contracts have a legal time frame of one year but all the contractors have been with the company for over five years. This long term relationship is traditional. The contractors finance their equipment but the company certifies their contracts.
- ♦ To assist the contractors with new technology (feller bunchers) the company has arranged financing for the contractor.
- ♦ The Brazilian forestry industry has both E and P plantations. The mature stands are harvested with agricultural equipment - surprised there was no specialized equipment in Brazilian forests. The majority of the firms were pruning and mature stands have few branches.
- ♦ The company has gone in the panel business versus the sawmill because the company can use pulp logs for boards. Much better cost effectiveness exporting logs and using pulp logs for boards.
- ♦ The company uses 100% round wood input only 15% sawdust for hardboard. 100% pulp logs - 50% MDF pulp wood.
- ♦ Argentina has 600,000 ha in R pine plantations. They manufacture some logging equipment but is of poor quality. - front end loaders. Brazil is better equipped to compete internationally.
- ♦ With respect to engineered wood products - plywood - OSB - Veneer: The FDA has just approved the importation of debarked logs for the US market. - Plywood peeler logs of R pine is a good market in US and Korea. This is also a potential market for Veneer.
- ♦ This market will require a small log debarker. Also looking for a 2" diameter lather for veneer. He has seen one and this technology is available from B.C.

- ♦ R pine clears could be good for the plywood market.
- ♦ Chile has had to develop high quality wood products to address the market barriers to entry. For example solid R pine has been used for MDF versus residual products.
- ♦ Several Chilean products are labour intensive because of labour costs.
- ♦ Good quality of labour as compared to the rest of Latin America and expect to see a major increase in productivity with improved training.
- ♦ The long term perspective is that the current peak in log process will drop but, higher process will be experienced over the next 5 year period. The mitigating factor is Brazil and Russia. Feel Brazil is a greater threat than Russia.

IGNISTERRA

May 06/93

Rodolfo Tirado, General Manager
Camino Troncal 049
Casilla 46
Villa Alemana
Phone: 56-32-955730/Fax: 56-32-957260

- ♦ The company has used Canadian equipment in its reman plant - Doucette
- ♦ The company's 15,000 cubic meter out put is limited by its kiln capacity. - Hildibrant Kiln
- ♦ Harvesting is handled by a Teckfor loader, a skidder and one truck. They also buy lumber for their dry kiln.
- ♦ The company services the furniture market. They have 3 people in direct sales in the US and an agent in Germany and one in Italy.
- ♦ The company cuts to order so waste is hard to track.
- ♦ 50 people employed in one shift.
- ♦ Pay the reman plant workers on average 400 US Dollars per month - 100 people work in the south in the harvesting and sawmill operation.
- ♦ The length competes in the red alder markets.
- ♦ The operation is a 10% Fundacion Chile owned project.
- ♦ The company enjoys 45% recovery before the kiln and 40% recovery on logs 30 cm in diameter and up. There is 10% shrinkage. It takes 2 weeks drying of a 1" board to achieve an 8% moisture level.

MASISA
MADERAS Y SINTETICOS S.A
Patricio Silva P., Sales Manager
Enrique Escobar Gattás
Exposicion 1258
Casilla 663
Santiago, Chile
Phone: 56-2-6837202/Fax: 56-2-6836398

- ♦ Only Chilean particle board producer.
- ♦ Setting up mill in Argentina - 150,000 m³/year.
- ♦ Plywood used mostly for doors, largest manufacturer of doors in Chile.
- ♦ Same sawmill for remanufacturing.
- ♦ Mostly particle board c/w facings, for Korea highest quality.
- ♦ Quality STD E1
- ♦ Forestry sub-sector 30,000 ha, mostly native forest 3,000 planted per year Pine & Eucalyptus.
- ♦ All production supplied by third parties - most chips supplied.
- ♦ Plants located close to resource. New market:
 - chips
 - shavings
 - sawdust
 - only 1/3 by round logs - long fibre.
- ♦ Additional operations:
 - Veneers/division produces resins.
- ♦ Working on chemical to get around Formaldehyde.
- ♦ Fast development in chemical area.
- ♦ Resin sourced from Europe.
- ♦ Chemical sole operation; Methanol from Chile.
- ♦ Will produce all resin required.
- ♦ Will set up mill from Scotland. Will set up in Valdivia 320,000 m³/year. Particle mill will provide 70,000 m³ more from Valdivia.
- ♦ Three plants in Concepcion.
- ♦ This board in continuous length.

- ♦ MDF represents only 20% of current MASISA market.
- ♦ Over capacity of MDF in SA have kept price down so have decided to invest in particle board.
- ♦ Better cost advantage particle versus MDF.
- ♦ MDF growing faster than particle board in Europe but only 10% of board market.
- ♦ Price is chief concern.
- ♦ For new plants/expansion company does its own engineering/planning and works closely with German manufacturing of production machinery.
- ♦ Trend of Chilean companies to utilize stock exchange to generate currency - has helped bring the Chilean people from a Third World standard to developing country standard.
- ♦ As the companies market has expanded, have utilized the stock exchange to finance growth as apposed to increase debt.
- ♦ Environmental - no regulations in Chile but all regulated by global market and have assumed German standards for air.
E1 - Korea market
E2 - domestic

Solid Wood Development:

- ♦ Similar to Canada - moving to remanufacturing and value-added. Trying to move from commodities.
- ♦ 15,000 m³/year output sawmill, only produce for own production for manufactured products.
- ♦ Mostly pine for sawmill.
- ♦ Also process Eucalyptus but raw materials of Eucalyptus becoming in short supply.
- ♦ ???? may be part of solution.

Canada Equipment:

- ♦ Technology versus price.
- ♦ Impressed with how Canadian Government could make things happen - both technically and expertise.
- ♦ Surprised how Canadian Government sponsored event (CIDA).

FORESTAL QUILPOLEMU S.A.
Luis Elton B., General Manager
Maderera Rio Itatas
Mar del Plata 2111
P.O. Box 10374
Santiago, Chile
Phone: 56-2-204746/Fax: 56-2-2256190

May 07/93

- ♦ Harvesting
- ♦ Sawmill
- ♦ Remanufacturing Plants
- ♦ New project with a veneer and possible chip board plant.
- ♦ Production line in sawmill.
- ♦ Pallet line twins saw - Dunboss, Brazilian circular saw, Italian rip saw.
- ♦ Pulp - round log line.
- ♦ All used equipment. This line will be rebuilt.
- ♦ Second line a Swedish line: limited production as a result of lower prices. Traditional Middleast market.
- ♦ Third line: band saw/carriage, band saw for resaw, multi saw for thin material for German. All second-hand except multi saw.
- ♦ 30,000 m³ annual output capacity.
- ♦ Harvest maximum 60,000 m³ - a limitation.
- ♦ Have been buying 15,000 on market with 45% yield.
- ♦ All development based on own wood.
- ♦ Large companies are controlling raw material market - difficult to get wood. (CMPC/ARAUCO).
- ♦ Does not see many possibilities for new sawmill equipment.
- ♦ Possible upgrades for better recovery.
- ♦ No scanning or optimizing possible in future but will increase with the price of logs.
- ♦ Have drying capacity at 10,000 m³/year.
- ♦ Bring third kiln on line.
- ♦ Built in Valdivia (drying kilns) with control equipment from Germany.

- ♦ Boilers built in Chile.
- ♦ Most kilns local construction except for the odd Hildbrant.
- ♦ Harvesting - all done by contractors, mostly hand labour/skidlers. Mostly steep slopes but is studying mechanized equipment. Cost is high versus low cost labour.
- ♦ Will start thinning closely at 12 years - 1200 trees to 25th year 250 trees.
- ♦ Starts pruning at 8 years.
- ♦ Planning fertilizing in 12th and 18th years.
- ♦ own 9,400 ha/planted 6,000.
- ♦ Will plant 1500 with Radiata Pine.
- ♦ Fertilizing 1000 ha/year.
- ♦ How many m^3 for 250 @ 25 year. Approximately 500 m^3 /ha. 1 to 1.5 m^3 /truck log.
- ♦ Production design done by Louis because of project engineering background.
- ♦ Remanufacture plant - 10,000 m^3 /year input. Output 5,000 to 6,000 m^3 /year.
- ♦ Finger joint/cross cut new industrial equipment.
- ♦ Conveyors/boilers/roundtable from Chile manufacturers.
- ♦ Medium rip saw new.
- ♦ How do you make equipment decisions? Fundacion Chile. Visited plants, aboard.
- ♦ Investigating chip board market. Same as particle board.
- ♦ Will use waste from mill for this particle board.
- ♦ One opening press - not continuous.
- ♦ Engineered wood products - good opportunities for laminated veneer, lumber and very interested in small plant.
- ♦ Currently producing 4' short-grain veneer.
- ♦ Interested in splicing veneer for 4 x 8 panel.
- ♦ Interest for continuous peeling line.
- ♦ Also value added products from particle board.

- ♦ Peeling about 15,000 m³.
- ♦ Particle wood is residual from both plants.
- ♦ "They continue to upgrade our products."

Problems/Opportunity with Natural Forests

- ♦ Only in very small scale because of legislative/environmental concerns.
- ♦ Plan to test very soon. Have to build industry based on uncertainty around legislation.
- ♦ Best opportunity in value added products.

COPIHUE

Guillermo Guell E. Gerente General

11 De Septiembre 2155 P. 14-C

Santiago, Chile

Phone: 56-2-2311831/Fax: 56-2-2311903

- ♦ Moving to in 1994 the "eddie" system - single system like Singapore banking.
- ♦ Telephone - fibre optics.
- ♦ Industrial machinery - large investment in 1990. Pulp investment - large investment in 1997-2000.
- ♦ World demand for pulp - Chile has a sustainable supply of raw materials.
- ♦ 50% of resource is held by integrated Forestry companies.
- ♦ Forest cutting/harvesting contracted and planned by COPIHUE.
- ♦ Only one small pulp mill under contract now - but expect large industrial expansion in 1997.
- ♦ Everyone knows Canadian sawmill equipment.
- ♦ Sawmill industry situation different because of lack of definition. Small mills going out of business - development in medium size operations.
- ♦ Mill size output 250,000 m³/year will be the size of the new projects.
- ♦ More specialized/automated new mills.
- ♦ Only 4% unemployment rate.
- ♦ Double wage in last five/hope will double, again in next three years in real terms.
- ♦ Expect 3 to 4 mills to be built in next 2 to 3 years - by the integrated firms.

- ♦ 75% of forests are 20 years and younger. Majority of plantation will mature - will improve in next 5 years.
- ♦ Problems of Northwest/Canada will be seen in other markets - causing other traditional sources of logs to shrink.
- ♦ Demand side forcing the environment issues.
- ♦ Cheap labour, easy to train; expect growth in remanufacture. Radiata Pine is gaining acceptance - Northwest have stated better than the Ponderosa Pine.
- ♦ Expects large industry - small companies in remanufacturing products.
- ♦ Because of small manufacturing related to forestry equipment, excellent opportunity for joint venture and expansion of marketing to Argentina etc. In medium term Argentina will become plantation forestry company country.
- ♦ Eucalyptus good for short fibre - too much supply from 2,000/year. 6,000,000 m³ per 30,000 ha in year 2000.
- ♦ Will become a cheap supply of wood.
- ♦ Native forests will be limited if current government attitudes remain - expect change with the election at end of year.
- ♦ Native forest has tremendous potential.
- ♦ Native forest in bad shape - mostly see use as fibre.
- ♦ Export value logs - export versus convert?.
- ♦ Best thing for forestry is open market.
- ♦ Export logs to Japan, Korea, Turkey and China. Only Japan does not charge duties on remanufacture wood - so results in good return to forest owners.
- ♦ A large commitment to forest/silviculture - creates many opportunities for employment.
- ♦ Sells \$130 CNF logs; 230 \$CNF lumber to Korea.
- ♦ Logs cost the same as the lumber which will break sawmillers.
- ♦ Return going to forest owners where it should be to the sustainable forest.
- ♦ Consider his company a forest company.
- ♦ Engineered wood products? OSB/LVL.
- ♦ Feel they have a good opportunity in solid wood products.
- ♦ Because of good duplicity of Radiata Pine expects a growth opportunity for veneer and plywood.

- ♦ 1995 Japan is claiming a 20% shortfall for plywood - Japan will be sourcing Radiata Pine from Chile/New Zealand - Russia hardwood.
- ♦ Japan is searching for veneer opportunities in Chile.
- ♦ Japan is starting to look at investment Chile.
- ♦ Japan is #1 trade partner.

Canadians should attend Expocorma:

- ♦ Require an eye for an ear to find opportunities.
- ♦ Canadians are not seen in the production area, i.e., operating joint ventures.
- ♦ John Irving has investigated opportunities.
- ♦ West Fraser has made contact.
- ♦ Of forest lots in third rotation - 1945 was start of plantation industry.
- ♦ Government raising trees is like government raising cows.
Cophihue has: 10,000 ha pine, 30,000 Eucalyptus and 3,000 ha reforestation/agricultural, native hardwoods.
- ♦ Seed orchard.
- ♦ Genetic program.
- ♦ Reproduction from seed clone program.
- ♦ Many seedlings - for own needs and sell to the other parties.
 - Pine
 - Eucalyptus
 - flower
- ♦ 100% managed for clear wood.
 - Fertilize - irrigation, thinning, pruning, 25 year cycle.
 - Pine at beginning; 3rd or 4th year.
- ♦ Logs - clear wood - sell to sawmill or third party.
- ♦ 50% lumber product sold as lumber/ 50% by remanufacturing plant.
- ♦ Remanufacture stock stored - furniture.
 - garage doors.
 - moving into sash and windows.
- ♦ Finger joint molding and door jams.
- ♦ Everything is import (equipment).

- ♦ Chips/pulp/5% lumber domestic market.
- ♦ Engineering thermal electric plant - new project.
- 8 megawatts plant for two mills as well as steam for dryers.
- ♦ Sells as part of 8 company consortium, approximately 120,000,000 total sales.
\$40,000,000 company sales.

CORPORACION NACIONAL FORESTAL

Juan Moya Cerpa, Director Ejecutivo

Avda. Bulnes 285 - Oficina 501

Santiago, Chile

Phone: 56-2-6986373/Fax: 56-2-6715881

- ♦ More important in future than today.
- ♦ Native forest hoped to come into market.
- ♦ Fire/disease - principle problems.
- ♦ Formation of laws:
 - 1) CONAF - because of growth of forest industry - and native forest - new law to enforce CONAF.
 - 2) Native forests - modification for management/protection/regulation of native forest.
 - 3) National parks/reserves etc.
 - 4) Incentive of plantation in C702 is being evaluated.
- ♦ All forest for production is privately held.
- ♦ Native forests have legislation regarding aspects of natural forests. Private sector must become sensitive to environment.
- ♦ Private plantations will be regulated by the law:
 - incentives
 - regulations
 - research
 - inventory of natural forests.
- ♦ Should stop exporting natural resources.
- ♦ Log imports.
- ♦ A need for a second trend of development in value added sector.
- ♦ No way will legislation change to restrict log imports.

- ♦ Furniture has grown from \$500,000 to \$16,000,000 in 4 years.
- ♦ Why special laws just for natural forest - what is purpose?
 - 90% of export from 1 species.
 - All development of forest sector in region 7/8/9.
 - Chile has reputation as a mono export wheat/nitrates/copper.
 - Looking at this law to diversify regional and within species.
 - 12 million ha - plantation 1.5 in ha.
 - The new law will allow the development of the native wood as a separate export.
 - Products from native forest will be significant in the future.
 - Because of longer growing cycle have risked the political benefits.
 - Would Bank GIS Study of Inventory of native forests will start this year.

INVERSIONES FORESTALES C.C.A. S.A.

Pedro Sebok K., Gerente de Operaciones.

Bucarest 215

Santiago, Chile

Phone: 56-2-2324212/Fax: 56-2-2318117

- ♦ Plan to diversify - possible sawmill.
- ♦ 90% process native wood.
- ♦ Primary chip exports - 40 ships/year.
- ♦ Small pilot operation in sawmill hardwood - 300 m³/month.
- ♦ Process 30,000 m³/month - only 5% saw recovery.
- ♦ Native species - good to show to society.
- ♦ Also good business.
- ♦ Pallets, flitches, local market.
- ♦ Species - Nothofagus - not uniform in colour (southern Beeches).
- ♦ Traveling to Sweden/Europe to look at mechanized harvesting in the next year. Will have to change logging systems.
- ♦ Everyday harder to find people and the cost is increasing.
- ♦ Market with Beech forest only and want to market Eucalyptus.
- ♦ Have Nicholzen A5 Debarker - not good for Beech forest.
- ♦ Export open for logs debarked for U.S.A.
- ♦ Projects labour problem in next two years.
- ♦ Have to pay more next season. All wages in forest based in volume.

- ♦ 38,000 pesos/yr minimum wages by law - plus incentive month.
- ♦ Logging season November to March.
- ♦ Volume - must mechanize.
- ♦ Local contracts tied to Japanese contract.
- ♦ Has 10-year contract with Japan. Volume fixed year to year. Price fixed every 6 months.
- ♦ Have Japanese partner.
- ♦ CitoH - 15% INTEREST IN COMPANY.
- ♦ Need Assistance With Harvesting Expertise Because Such A Small Company - Possible Reed-Collins.
- ♦ New laws - are very difficult to answer. Current government ok but will be passed with new government - election is getting closer.
- ♦ Average 150 m³/ha. Process 450,000 m³/year - 3,000 ha.
- ♦ Rauli replanted after clear-cut would be best solution. Seed developed trees better than copied trees.
- ♦ Universities developing a seed project to improve seed availability/quality.
- ♦ Canadian Manufacturing:
 - Timberjack - good
 - Nicholson - very happy.
 - very reliable people. - WAJAX.

May 10/93

COPIHUE

Pedro Galli G., Abastecimiento

Arturo Rock Tarud, Jefe Depto.

Juan Retamal A., Dpto Administracion Y Finanzas

11 De Septiembre 2155 Pl 14-C

Santiago, Chile

Phone: 56-2-2311831-2326681/Fax: 56-2-2311903

- ♦ 200,000 m³ in input.
- ♦ Two shifts.
- ♦ 400 men.
- ♦ 30% last year, 50% this year - furniture components.
- ♦ Log length 4 metric maximum mill length.
- ♦ Japan, Middle East, Korea, Far East, North Africa - markets.
- ♦ 200 in component plant - 2 shifts.
- ♦ Rough green recovery 50%.
 - 16 cm diameter minimum.
 - 24 cm diameter average.
 - 45 cm diameter.
- ♦ Changing technology for Kerf.
- ♦ Studying type of saw/teeth to reduce Kerf.
- ♦ 8mm breakdown - scrag saw.
- ♦ 4mm edge will be reduced to 2.5mm.
- ♦ Carbide tip saws.
- ♦ Chips for firewood.
- ♦ 300 US/month minimum wage plus incentive. Average 500/month plus to 1,000 per month. Cost to company 20% to government.
- ♦ Total yield in sawmill/production in total remanufacture wage incentive bast.
- ♦ Biggest problem with the plant (REMAN) is layout.
- ♦ Band mills or circular saw for breakdown? Prefer high speed bandmill complete with scanner.
- ♦ Edger - prefer edger with optimization.
- ♦ Capital investment based in greater recovery wood quality.

- ♦ Level of Japan quality expected - .3 to .5 tolerance/normal deviation of saw.
- ♦ Anti stain - Penta chloride or MP1 - if not accepted.
- ♦ All wood for remanufacture dried 50%.
- ♦ Plan to increase production in 4 to 5 years.
- ♦ Why three types of kilns?
 - purchased at different times.
 - different technology/price.
- ♦ Using system of sensors to optimize for kilns/tied to PLC.
- ♦ Normal drying time 5 days - size of mill too small to get into moisture detection.
- ♦ Goes in +100 (stain bath) out 8% moisture.
- ♦ Equilibrium moisture 12%.
- ♦ Volvo - L-4400 c/w Kat log fork.
- ♦ John Deere skidders cable winch
- ♦ Cat winch skidders
 - major winch problems
- ♦ Chapman yarder/cypress yarder.
- ♦ Krohler carriage.
- ♦ Techfor 3 wheeler.
- ♦ Talkie Tooter.
- ♦ Barko/Prentise.
- ♦ Volvo loaders.
- ♦ Kenworth/Mercedes trucks.
- ♦ STHIL saws.
- ♦ Harvest 18,000 m³/month.
- ♦ Cost \$5.5 to 6.0 m³ roadside.
- ♦ Handling costs \$4-\$6/m³.
- ♦ Loading Costs \$1/m³.
- ♦ Costs \$10.50 - \$12.00 landed at mill per Cubic meter.

ARAUCO**Wenceslao Sánchez C., Jeff de Estudios y Proyectos Industriales****Forestal Celco****Av. E. Mac-Iver 495****Casilla 215****Constitucion, Chile****Phone: 071-671119-671165/Fax: 071-671903**

- ♦ Sawmill manager at Celco
- ♦ New mill will have Dennis Cimaf - KKC & CSMI
- ♦ New mill will have Douche handling equipment.
- ♦ Handle 10 logs/minute.
- ♦ Complete with flying log turner.
- ♦ Dennis - decision based on experience with CETEC.
- ♦ Joe Denny recommendation brought in by Fundacion Chile.
- ♦ Dennis price lower/offset/grade optimization. Debarker better than KKC.
- ♦ Have been studying project for 3 - 4 years.
- ♦ This will be a integrated operation 50% of sawmill to remanufacturing plant.
- ♦ Co-generation plant - buy power/sell chips/sawdust. Buy steam/ sawdust/bark.
- ♦ 5 mega watts - 10 tons steam @ low pressure.
- ♦ Nardi - dry kilns from Italy (2 units).
- ♦ Kiln purely price (exchange rate). Quoted in Lira so Chile could take advantage of exchange.
- ♦ Mill capacity 5 logs/minute, 250,000 m³ input.
- ♦ Recover 55 %.
- ♦ Mill size limited by current size of forest.
- ♦ With upgrade chipper/optimizer/expand to 350,000 m³.
- ♦ Average diameter 28", range 18" to 50" - 4 meter length.
- ♦ Will be working in conjunction with existing mill. Large diameter logs will go to existing mill - new mill is designed for volume.
- ♦ 2nd stage will need scanner/sorter 100 boards/minute.
- ♦ Total project cost for machine \$3.5 million - 2 year payback.

- ♦ Total cost installed \$13 million.
- ♦ Focus in final stage to increase recovery.
- ♦ Remanufacture \$2 million equipment.
- ♦ Total project \$13 million - c/w kilns.
- ♦ 80% lumber expected to be clear.
- ♦ 20% knots/small knots.
- ♦ Green lumber - 50%.
 - Panels
 - Moulding.
- ♦ \$750.00 m³ for moulding sell price.
- ♦ March/April start.
- ♦ 200 people total project.
- ♦ Standardized all components possible. For example Bradley PLC's.
- ♦ Advantage of Quebec equipment is labour cost.
- ♦ U.S. advantage is that they are the market for the remanufacture product. Also they are the manufacturers of the equipment for Ponderosa Pine the key competition of Radiata Pine.
- ♦ ARAUCO - expects one mill every two years.
- ♦ Dennis - one year parts supply in inventory - have local agent.
- ♦ Person learning electric and mechanical in Quebec now.
- ♦ Guaranteed of production levels after one month operation by Dennis.
- ♦ Went to Canada to look for Dennis as a result of CETEC:

<ul style="list-style-type: none"> - Dennis - Kockums - Salem - COE - USNR 	} } } } }	Contacted all
---	-----------------------	---------------
- ♦ Started project close to 4 years ago - purchase six months ago.
- ♦ Sawmill equipment was purchased by single individual.
- ♦ Have local contact with local knowledge of industry.. Want to deal directly and not pay costs of agency.
- ♦ Does not look to supplier for credit. Goes to world - looking for financing.

- ♦ Do not rely on credit from supplier because loose ability to squeeze supplier purse.

ARAUCO
Ronald Agurto Colima, Subgerente de Produccion
Forestal Cello
Schepeler 515
Constitucion, Chile
Phone: (071) 671986-671119/Fax: (071) 671903

Harvesting:

- ♦ Six separate contractors for harvesting and transportation.
 - Towers 8 Kohler, Chapman, Uris.
 - Skidders 20 J. 640, Timberjack, Clark.
- ♦ 800,000 m³/year - 30% winter/70% summer.
- ♦ Teno to buy from third parties (wood).
- ♦ Replace labour for machines - trend to mechanism market over next four years.
- ♦ Maintain production level - but still getting better production from existing equipment i.e., pre-setting chokers.

Cost Production:

- ♦ 5.20 m³ Total.
 - ♦ 4.00 m³ skidders in winter cut to length.
 - ♦ 80 cents - loading.
 - ♦ (150 + 80 cents - for pulp.)
 - ♦ 3.60 m³ in summer skidders.
 - ♦ 6.5 m³ for yarders to roadside.
 - ♦ .8 loading cu meter.
 - ♦ 7.3 over truck.
 - ♦ 2000 m³/month big yard - 150 hp winches.
 - ♦ 1250 m³ small yard - 80 hp.
 - ♦ 2 skidders per 3 bell feller. 23 m³/hour.
 - ♦ 160 hours/month - 3680 m³ per month.
 - ♦ Minimum wage - 90,000 peso/month plus 24,000 peso food allowance - cost of food.
-
- ♦ No blue staining - improving quality, then leave for pulp.

- ♦ Same contract for last 8 years - 6 contractors.
- ♦ Biggest contractor has 6 skidders - smallest has 3.
- ♦ Trying to improve current systems to improve yields - longer hours with new equipment.
- ♦ Will he move to new technology?:
 - Problems include:
 - 1) Not sure which technology to use.
 - 2) Have just purchased new skidders.
 - 3) Not likely to make new purchases until new capital expensed.
- ♦ Machine dep. 4 years but should last 5.
- ♦ Last year highest year of contract.
- ♦ Contractors lease equipment.
- ♦ Transport opportunity - current fleet old and must be replaced. New trucks for next season or so 72 units in winter, 144 in summer. Changing 2 or 3 units a month.
- ♦ Cost for road construction \$8,000/US km dirt x 4 = 32,000/km gravel.

ARAUCO
Jorge Serón, Gerente
Caupolican 567 - 2 Piso
Casilla 2293
Concepcion, Chili
Phone: 041-238954/Fax: 227878

May 11/93

Osvaldo Cirano, Subgerente Producción
Caupolican 567 - 2 Piso
Concepcion, Chile
Phone: 041-238954/ 227878

Antonio Luque, Sawmill Manager

- ♦ Bosques ARAUCO - pulp mill - 4 or 5 sawmills.
- ♦ Forestry - 4,000,000 m³/year.
- ♦ Forestal Chile 1,000,000 m³/year.
- ♦ Trying to introduce highest level of mechanism possible - harvest/transport.
- ♦ 10-12 years ago introduced Chapman yarder to industry.
- ♦ Hope to introduce mechanization for thinning operation.

- ♦ Have private road to introduce a higher level of transportation - 100 tons/truck. B. ARAUCO/Forestal Chile. (Have seen a New Zealand system).
- ♦ New technology in silviculture tool - to eliminate fire - for site preparation. Testing hydroax currently.
- ♦ Attempting to introduce pest control for smooth Pine moth.
- ♦ Frontier Helicopters - 5 year contract for spraying. 10,000 Ha this year, 30,000 ha next year.
- ♦ 28 tons maximum highway load.
- ♦ Bell feller buncher/grapple skidders/clamp bunks.
- ♦ Next step is mine to delimbing.
- ♦ \$100,000 USD direction feller Bell.
- ♦ When making equipment purchase decision they
 - Evaluate dealer information and inspect operation life cycle costing (US. cost per m³).
- ♦ Most felling downhill.
- ♦ Will double production in next two years.
- ♦ 6 yarders will be replaced twice in next 5 years.
- ♦ 12 skidders - will replace with harvesters. Will take place the end of the next 5 years - year 4 & 5.
- ♦ Trouble is basically dealing with thinnings.
- ♦ First thinning 50 m³/ha in good soil.
- ♦ Average 35 m³/ha average Forestal Chile.
- ♦ Chipping of wood is too costly in woods at \$3.00 m³, 60 cents per ha meter mill.
- ♦ Looking at hog fuel for power - boiler. If system good will sell power to MASISA.
- ♦ Good experience with Canadians. Yarders.
- ♦ Chapmans - strone machine. Only problems wear components/parts. Simple machine - good for maintenance.
- ♦ Timberjack - good.
- ♦ Not married to any specific brand.

- ♦ Because of drop in the size tree size most likely a small yarder.
- ♦ 1.5 m³ per tree @ 200 to 250 trees/ha. Unmanaged - 800/ha, managed 200/250/ha. Now .6 or .7 m³/tree.
- ♦ Minimum 20 cm diameter - average 25 cm. diameter.

Sawmills:

- Antonio Luque - projects 6 new mills, 3 small sawmills approximately size of new mills 250,000 m³/year and 3 larger mills..
- Volume mills - profit in volume.
- Specialty mills - profit in range of specialty products.
- 24,000 m³ lumber/month. Company's mills largest in South America.
- Two lines: one for large logs; one for small logs and chips.
- Two style mills are for lumber for export market. Another is for clear wood. Same special cut mills.
- 4 years for all clear wood.
- 7 year for Forestal Chile clear wood.
- Should average 50 cm diameter.
- Diameter Over Stump (DOS) = maximum 20 cm.
- Link has developed slicing unit for cants. 0% sawdust, 100% recovery. 4mm x 6" x 6" cants.

FORESTAL MININCO S.A.
Sergio Alvaez Gutiérrez
Emprasa Forostal CMPC
Los Canelos 79 - Villa San Pedro
Casilla 43-C
Concepcion, Chile
Phone: (041) 371526/Fax: (041) 373431

- ♦ Plan for reduce supervision with greater control in future.
- ♦ Moving to full mechanized contracts.
- ♦ With mechanized system harvesting/loading/transfer all by same contractor.
- ♦ Ability to increase labour limited by supply.

YEAR	LABOUR REQUIRED USING MECHANIZED SYSTEMS	LABOUR REQUIRED USING EXISTING METHODS
91/92	1380	1380
92/93	2640	1960
93/94	3160	1874

Projections includes increase in harvesters/forwarders and feller bunchers.

- Harvesters +6
 - Skidders +10
 - Cable yarders +8 @ 120 Hp
 - Cable yards +6 @ 70 Hp (Thinning)
 - Harvesters +4 to +6
- ♦ Not many people want to live in camps and work in forests.
 - ♦ Average harvesting cost 5.00 - harvester, costs now \$8 but expect to drop with more training.

- ♦ Thinning for Mininco:
 - 1,360,000 m³/year - 1991 15% thinning.
 - 3,390,000 m³/year - 1994 40% thinning.
 - 3,260,000 m³/year - 2000 35% thinning.
- ♦ Silviculture treatment mechanized.
 - mechanized soil preparation
 - planting
 - remove native forest?
- ♦ Biggest problem is slope.
- ♦ Require program to address slope - 50% of plantation is sloped terrain.
- ♦ In thousand ha 1991 Mininco in all 3 regions (activity)
 - 15 planting
 - 30 pruning
 - 20 thinning
 - 5 harvesting
- ♦ Thinning ha 1992
 - 12.5 planting
 - 21 pruning
 - 5.9 thinning
 - 3.3 harvesting

ASERRADERO EL COLORADO
 Roberto Bravo Denegri, Administrador
 Fundo La Colcha Km. 3 Ruta 160
 Casilla 26 - Curanilahue - Vill Region
 Phone: 041 - 242602/Fax: 041-242602

- ♦ 20 to 30 km distance from log supply.
- ♦ Mill designed originally by Canadian consultants.
- ♦ Grade logs by diameter class.
 - Low quality lumber.
 - Produce only lumber can sell.
 - Minimum log inventory.
 - Minimum lumber inventory.
- ♦ Brand saws - circular saw.
- ♦ Japanese concept- small area.
- ♦ Total project \$7.5 million, \$5.0 equipment.

- ♦ Normal measure 40% equipment, 60% balance (in this mill it is opposite).
- ♦ Production - 50,000 m³/year/1 shift output. - 100-120,000 m³/year. 16 cm to 34 cm.
- ♦ Specialize in small logs.
- ♦ People = 70 men/shift. Total 140 people in all the plant.
- ♦ Logs come from forest in 12.4 m lengths.
- ♦ Market - Japan purchasing 11,12,13,14, 16 x 58, 78, 100, 120, 180, 210.
- ♦ Tolerance 30.5 mm - throughout board.
- ♦ Middle East, Europe, Taiwan, India, Domestic 20 mm to 36 mm thickness.
- ♦ Japan recovery 42-45% in nominal size.
- ♦ Other markets - 50%.
- ♦ 12m logs entering yard sorted by ϕ and cut in 4m lengths.
- ♦ Buys logs at the sawmill deck sorted.
- ♦ Debark.
- ♦ Scanner - grade by diameter 16, 18, 20, 22, ... 34 2 cm intervals.
- ♦ Link - Braun Cawali.
- ♦ 110 different package specifications shipped per month.
- ♦ 10 m³ minimum order.
- ♦ Originally 70% cost of production logs - now 90%.

ANDINOS S.A.
Jaime Fernandez
Empresa Cap
Guillermo Chavarri Del Campo
Gerente De Operacions
Cabero Casilla 73
Chile
Phone/Fax: 56-41-235660

May 12/93

- ♦ 3 mills.
- ♦ 500,000 m³/year - product.
 - 75,000 moulding
 - 50,000 doors in Chillian.

- 1,200 people - two shifts:
250 sawmill, 120 maintenance. Balance remanufacturing.
- ♦ Sawmill 8 years old (1985). Moulding plant from 1987/88.
- ♦ Started with small sawmill until the Swiss became involved.
- ♦ Furniture plant in Chillan 4 years old. After 2 years expanded.
- ♦ MDF started last year.
- ♦ Processing of the logs - sawmill/mill work principle operation.
- ♦ Try to maximize added value.
- ♦ Largest added value Radiata Pine project.
- ♦ \$12 million investment 6 years ago.
- ♦ California experts designed plant and equipment selection.
- ♦ Finger joint principle product.
- ♦ \$5 million door project.
- ♦ Currently add value to 70% of log.
- ♦ Total added value investment \$30 million over last 6 years.
- ♦ Looking for fundamental change in sawmill. Require a sawmill to serve value added concept.
- ♦ May change or adapt existing mill - currently evaluated a number of alternatives.
- ♦ Impressed with Wymia - John Ferguson in New Zealand.
- ♦ Average recovery 51%.
- ♦ Small logs < 26" largest percentage of logs.
- ♦ Sawmill to address small log recovery.
- ♦ At initial stage of 3 stages.
- ♦ COE looking at package.
- ♦ Swedish approach - change line or add.
- ♦ Internal method - to look at less expensive investment.
- ♦ No end dog system with KKC.
- ♦ Traveling to Alaska to look at mill (May 28).

- ♦ Own's forest - Cap.
- ♦ Buys 35% of logs.
- ♦ By improving log recovery - requires less logs.
- ♦ MDF capacity 110 m³ based on majority of brands thin board < 6mm.

FORESTAL MONTEQUILT

Sante Fe - Forest Operations

A. Rubinstien

Av J. Hemmelman 670

Nacimiento, Chile

Phone: 56-43-511352/Fax: 56-43-51142

- ♦ Eucalyptus pulp producers.
- ♦ Harvesting plans (next 6-7 years):
 - Require over next 5 years 800,000 m³ wood
 - 25% will be purchased
 - 600,000 ha company harvest
 - possible mill expansion
- ♦ 1994/95 - harvest coastal range.
- ♦ Cable yarders, skidders, harvesters.
- ♦ Mid 1995-98:
 - 500,000 m³ central valley harvesters.
 - 200,000 coastal log - yarders.
 - Possible road side processing for safety/processing cost.
 - Finish harvesting - large units may require smaller processing/harvests.
 - Transportation - harvesters/forwarders to road side.
 - Coast by rail.
 - Valley by track - maximum distance 100 km.

Santa Fe Ownership - Shell/Scott/Citicord

- ♦ Eucalyptus all to pulp not to sawn lumber because of pulp forces.
- ♦ Does not know of anyone managing the Eucalyptus plantations for sawn lumber.
- ♦ Good idea but not practical.
- ♦ Price of solid Eucalyptus doubled in last two years.
- ♦ Contract harvesting.
- ♦ Implement new technology - pass to contractors after process perfected.

- ♦ 20 years ago labour policy really restrictive - went to contractors to improve flexibility in employment.
- ♦ Same concerns labour laws will become more restrictive - and labour restrictive.
- ♦ Cable yarding by contractors.
- ♦ Contractors are not specialist - therefore no more different than company.
- ♦ Seasonal problems with labour supply.
 - Absolute supply of labour - good.
 - Availability of employees willing to work in forestry - problem for certain contractors (planting).
- ♦ Pay more than minimum and getting higher productivity.
- ♦ Harvesting high level of technology/increased cost with increase productivity - but silviculture has shown no increases.
- ♦ Finn's added and included all changes recommended by customer for (harvesters/forwarders).
- ♦ Finns provide operator/service training.
- ♦ Company searched for initial units subsequent units will be based on successful trial.
- ♦ Sante Fe - pulp mill 2 years old.
- ♦ Harvesters 3 teams end '93, to 5 '94 and to 8, '95.
- ♦ 4 coastal contractors.

SEFORE

Rodrigo Hermosilla

Sefore Ltda

Empresa CMPC

Avda Alemania 751

Casilla 240

Los Angeles, Chile

Tel/Fax: 56-43-315916

- ♦ Timberjack c/w New Zealand processing head - Fmg clam bunk forwarder. Cost \$400,000 + \$300,000.
- ♦ 7 units in Place - 8th is being shipped.
- ♦ Forwarder 2 loads per truck load.
- ♦ 3 towers.

**CENTRO TECNOLOGICO DE PRODUCCION
MADERERA S.A. (CENTEC)
Juan A. Montes Santander, Gerente General
Ruta 5 Sur Km. 666
Casilla 1204 Temuco Chile
Phone: 56-45-221776/Fax: 56-45-221490**

May 13/93

- ♦ Input 2,000 m³/month.
- ♦ Output 450 m³/month.
- ♦ 180 people.
- ♦ 1985 - \$500,000
- ♦ 1992 - \$30,000,000
- ♦ 2000 - \$100,000,000 forecasted remanufacture export sales.
- ♦ Average salary 2 times minimum wage - all increases based on incentives.
- ♦ New industry - biggest problem lack of knowledge - marketing/technology.
- ♦ CENTEC assigned to help transfer technology for industry in conjunction with Fundacion Chile mandate.
- ♦ CENTEC point of view - profit centre.
- ♦ Main purpose was to acquire experience for the sector.
- ♦ Harvesting and processing logs - Never expected to undertake forestry planned to buy cants.
- ♦ CENTEC attempting to attract investors.
- ♦ Poor vendor service.
- ♦ Distributors quick buck mentality - no spare parts.
- ♦ CENTEC to develop work shop for maintenance and part supply - 2 mech. eng.
- ♦ Douchette equipment.
- ♦ Expects secondary management/mill work industry will continue to grow and require lots of equipment.
- ♦ A larger number of small players.
- ♦ 100% ownership by Fundacion Chile. One of 20 operating companies of Chile.
- ♦ Marketing areas of furniture sector:

- fully assembled
- RTA (ready to assemble)
- Parts & components
- Industrial market.
- Focussed on parts and component market. Is best suited for CENTEC systems.
- ♦ Pine manufacturers target.
- ♦ Use fully machined components.
- ♦ Cuts conical to maximum return.
- ♦ Cuts primarily to service remanufacture market.
- ♦ Looking at head rig carriage.
- ♦ Project two years old.
- ♦ Designed by Richard Geer.
- ♦ Product support is critical from manufacturer. Manufacturer must deal direct with end user. Local agents slow to react.
- ♦ Claims for quality come out of bonus.
- ♦ If worker away 5 days because of injury - out of bonus.

BOMASA

Victor Granifo Lavin, Director Ejecutivo

Camino Lanco

KM 30

Panquipulli, Chile

Phone: 56-45-0633411/Fax: 56-45-0633357

- ♦ 4 years old.
- ♦ Plywood mill.
- ♦ Native wood.
- ♦ 60% export to Europe.
- ♦ 60% ha of forest; 70 km from plant.
- ♦ 2 mills for wood in forest. Plywood/timber in forest.
- ♦ 20% of wood processed by this mill.
- ♦ Balance saw logs or pulp. Pallets for Japan. Green lumber.
- ♦ 200,000 m³ harvested/year.

- ♦ Limited buying - mostly pine.
- ♦ Coique - Native wood, hard to dry, working on process.
- ♦ New legislation creates some uncertainty but do not feel it will hurt the economy of operation.
- ♦ Think they can rotate supply every 50 years.
- ♦ Planting Rauli - 600,000 plants this year. Coique next year.
- ♦ Skidders and bull dozers for skidding - D4 size.
- ♦ Peeling production not exactly correct.
- ♦ Should have hot water not steam for veneer/peeling.
- ♦ Slice veneers appears to be good business.
- ♦ 8' x 4' panel size.
- ♦ European and local market.
- ♦ Japan want 6 x 3 but plant not set up.
- ♦ Japan has interest in new veneers.
- ♦ Coique plywood.
- ♦ Sorting line and detection in-line system.
- ♦ New/used - tongue and groove machine.

Plywood Equipment Sales:

- ♦ Veneer dryer 9 m³/hour for pine.

INDUSTRIAS FOURCADE

Patricio Baselli Gonçalves, Gerent Industrial
Planta Industrial
Logitudinal Sur 01549
Loncoche - Chile
Phone: 471038/Fax: 56-45-471028

Oficina Comercial

Av. Holanda 1122, Providencia
Santiago, Chile
Phone: 2335708 - 2310570/Fax: 56-2-2324347

- ♦ 1000 employees, established 1963.
- ♦ Forest Manufacturing, Wood/sawmill, Wood house division,
 Harvesting/maintenance.

- ♦ Santiago/Temco/Puerto Montt Construction Division.
- ♦ 100% export production.
- ♦ 4 or 5 years since product sold in Chile.
- ♦ Near future - house industrial construction, automization, large quality middle class - low income, panalyzed construction, fully automated.
- ♦ Next project - doors/windows/new furnititure.
- ♦ Buys equipment at act - see Maynards.
- ♦ Always looking for new project.
- ♦ Must own forest for long term production/and profitability.
- ♦ 30 year rotation will be harvested in 3 years.
- ♦ 40,000 m³/year.
- ♦ 2/3 - 1/3 native wood (P. Beech).
- ♦ clients design RTA furniture - furnished, refinished.
- ♦ Currently used skidders. Contractors use company equipment/skidders/trucks.
- ♦ Generate own energy 1.5 megawatts.
- ♦ Government approved construction plans to participate in government program - currently use plywood/OSB.
- ♦ 2,000,000 plus houses 5,000 US/36 m².
- ♦ Exporting houses to Argentina - middle class houses.
- ♦ Interest in OSB plant - talking Louisiana Pacific for used plant 30,000 m³ output for Chile/Argentina construction.
- ♦ Buy used or joint venture new.

FUNDACION CHILE
Marcial Cortes Toro, Jefe de Proyectos
Departamento Forestal
Alonsode Ribera 2556
Lomas de San Andres
Casilla 3662
Concepcion, Chile
Phone: 56-41-246190/Fax: 56-41-228627

May 14/93

- ♦ Geosig 2 1/2 years old developed by six men = 15 man years.

- ♦ Develop software for forestry (GIS).
- ♦ Work systems - network - PC integrate.
- ♦ Capable of 50 maps/day.
- ♦ Working with "Crestbrook Forest Products".

FORESTAL BIO BIO S.A.

J.H. (Jaime) Ugarte, General Manager

Paicavi 3280

P.O. Box 151 C

Concepcion, Chile

Phone: 041-233857/Fax: 041-233859

- ♦ Sub-Fletcher Challenge/holding company Tasman.
- ♦ 43,000 ha Radiata Pine.
- ♦ 105,000 ton newsprint mill
- ♦ 220,000 m³ consumption.
- ♦ Bio Bio 600,000 m³.
- ♦ 200,000 Export log.
- ♦ 200,000 sawmills.
- ♦ 140,000 pulp logs - Bio Bio, balance other pulp mills.
- ♦ All contract loggers. Contract sawmill sells back logs (5,000 to 6,000 m³/month).
- ♦ Work with small forestry owners or broker.
- ♦ Next three to nine years stable average through 9th year will increase to 1,000,000 m³.
- ♦ Will give 4 year contract - but mostly season to season.
- ♦ Contractor purchase own equipment. Contractor secure financing with Bio Bio support.
- ♦ Winch skidders - because of characteristics of the plantations (size).
- ♦ Possible move to grapple skidders.
- ♦ Cannot justify cost of new harvesters/forwarders.
- ♦ Possible opportunity in transportation.

- ♦ Currently bidding for next two seasons.
- ♦ Re Chapman loader - could have yields with cheaper machine.
- ♦ Preloading trailers - transportation.
- ♦ One contractor for harvesting/loading/transportation.
- ♦ Require more coordination in harvesting plans. GIS to solve.

DATE: May 20, 1993

DISTRIBUTION:
FILE

APPENDIX

10.6

WORLD BANK CASE STUDY:

ARAUCO

Case Study: Arauco Sawmill

The Arauco sawmill, located in Curanilahue in the eighth region near Concepcion, provides an excellent example of an innovative structure for a company/industry, employing and extensive contractual systems of operation, which provides ultimate flexibility and transparency.

History of the mill development

This mill (and a large pulpit nearby) was originally built and run by a large company called Arauco to process timber from its extensive plantations in the area. The company had 4000 employees involved in all stages of product development from wood supply to marketing. The company was losing money, due to inefficient practices and had labor problems (the workforce was strongly unionized).

The company eventually decided to lay off all employees. It then broke up the operations into smaller unites and offered the management and operations of them to the best employees - the ultimate exercise in privatization? The company provided all inputs needed by the new entrepreneurs, mainly in the form of capital and training. Hence, all stages of production are now run separately; one small company harvests the trees, another transports them to buyers; the pulp mill and (this) sawmill process and package the wood, which is then transported and marketed by yet another small, independent company.

Sawmill Operations

The mill is run by Roberto Bravo Denegri, a very dynamic young man in his mid-thirties, who used to be employed by Arauco. He leases the mill itself, with all equipment included, from the main company, on a yearly basis. He therefore has the option of leaving when he wishes. He pays a rent plus a sum which is equivalent to the IRR which Arauco want from the facility - a huge 24%!!

The initial investment in the mill, which was built two years ago was US \$7 million. It has been in operations for 18 months. The mill has only 130 employees in total with 95 at the plant and 35 sub-contractors. The employees are drawn from the population of a nearby town which was traditionally a mining town. The mill took mostly young, unemployed people and provided training for them, and they have proved to be excellent workers.

The mill produces 100,000 m³ of output per year, from 200 - 220,000 m³ of raw material (radiata pine). The mill works 2 shifts a day, and is maintained through the remaining period. The main product is thin boards. The buyers are the Japanese, other Asian countries and the Middle East. The raw material is bought on the "market", which is, in effect, the production of the Arauco plantations. It is bought on a "stump to mill" basis and delivered by one of the small firms run by ex-Arauco employees.

The design of the mill is very efficient. The logs are first debarked, sorted and then taken to the mill, processed and stored, all in a small area. A very low stock is maintained (which is possible due to the proximity and guaranteed supply of raw material) and there is a high throughput. The equipment is state-of-the-art and computerized, supplied from Germany. There is a large area for saw maintenance, also

furnished with automated equipment. Recovery is high; approximately 50% for thin boards and 60% for thicker boards (nominal).

Waste is minimal: some chips are produced which are sold to the pulp mill, and the sawdust is used to fuel the mill. The whole mill area, both inside and out, is extremely clean. The cleaning and maintenance contracts are also sub-contracted out to another company.

There are only 10 people on the mill floor, who all rotate jobs, in the Japanese style of production. This enables higher output and makes it easy to cover a staff shortage. They are also encouraged to offer suggestions for improvements to operations and have the opportunity to be trained for management positions. They are paid a basic salary and production bonus.

The production process is extremely flexible, to respond to market demand. All production decisions (i.e. which dimension board/product to product) are made in a central office and the computers programmed from there.

The group was extremely impressed with this system of operations; it would serve as an excellent model to other countries worldwide. The sub-contractual system enables extreme flexibility and optimal efficiency. It allows the managers of the sawmill to concentrate on what he does best - produce a variety of high quality products. And so far it seems to be nicely profitable.

The Forest Sector of Chile
Annex 3
World Bank
ASTAG/LATAG Technical Paper

December, 1992

Bibliography

- Aserraderos Copihue Bosques de Chile
- Chile, Economic Report, April 1993
- Chile , Exports Economy Investment
No. 45, July 1993
- Compania Manufacturea de Papeles y Cartones SA
7th Annual Report 1992
- Jaramillo, Patricia. The Forestry Equipment: Logging/Sawmills Market in
Chile, American Embassy Santiago, September 1991
- Jay Gruenfeld Associates Inc. Chile Forests, Forest Products Businesses, and
Opportunities 1992
- Susaeta S. Eladio. The Chilean Market for Canadian Goods and Services in the
Forestry Sector. July 1992.
- The Cholquan Group of Companies
- World Bank, the Forest Sector of Chile, ASTAG/LATAG Technical Paper
December 1992