



WINROCK INTERNATIONAL

**MEXICO
BIOMASS COGENERATION
DEVELOPMENT PROGRAM
ANNUAL ACTIVITY REPORT**

FOR THE PERIOD FROM AUGUST, 1993 THROUGH AUGUST, 1994

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR LATIN AMERICA AND THE CARIBBEAN

COOPERATIVE AGREEMENT No. LAG-5737-A-00-3018-00

MEXICO BIOMASS COGENERATION DEVELOPMENT PROGRAM
(Cooperative Agreement LAG-5737-A-00-3018-00)

FIRST ANNUAL REPORT

Introduction

The Biomass Cogeneration Development Program is a component of the Bureau for Latin America and the Caribbean's Environment and Global Climate Change Project (E/GCC). The Program exists through a parallel Cooperative Agreement to the Biomass Energy Systems and Technology (BEST) Cooperative Agreement with Winrock International Institute for Agricultural Development (Winrock). The activities under the Biomass Cogeneration Development Program address Congressional concerns about renewable energy and global climate change.

The Biomass Cogeneration Development Program advances E/GCC by supporting pilot demonstration of biomass cogeneration systems and by promoting policy reforms and host-country capabilities. Five constraints to the use of biomass resources in Mexico have been identified, including the following:

1. Sugarcane and forest products companies are not aware of the potential of cogeneration.
2. Awareness of suitable and appropriate technologies is limited.
3. The national utility does not appreciate the full value of waste biomass resources for power generation.
4. the contractual arrangements and incentive structures that would encourage this type of "independent" power generation are not well understood.
5. Potential developers often do not know how to access capital markets to finance power generation projects.

The primary objective of the Biomass Cogeneration Development Program is to promote innovation in the form of investment in the construction of specific new biomass energy conversion facilities where the technologies involved are both economically attractive and environmentally sound. An ancillary objective is to facilitate policy reforms that will lead to a shift from public-sector investment to private-sector investment in electricity services. A related, ancillary objective is to identify and create opportunities for U.S. trade and investment in Mexico. By reducing the foregoing constraints Winrock seeks to achieve these objectives.

Reducing these five constraints to biomass cogeneration involves research and analysis on technical, financial, economic, and institutional issues relevant to the target industries, the national utility, and investors and developers. It also involves effective information dissemination to target institutions and decision makers, as well as direct financial and technical support for specific projects at the pre-investment stage.

This Program is proceeding in two phases. During the first phase Winrock is conducting surveys to obtain information on the market potential for biomass cogeneration development. This information is necessary for the second phase of the Program. In the second phase Winrock will identify and support, on a cost-share basis, three to five pre-investment (prefeasibility and feasibility) studies for site-specific applications of these technologies. The aim of this second phase is to offset the financial risk to early adoption of technologies not in common use locally.

This Annual Activity Report outlines accomplishments during the past year against plans and targets, and it discusses outstanding issues that may impede progress and the actions being taken to resolve them. This Report is also accompanied by a report of the financial status of the project.

Accomplishments

Technical Progress

On a technical level, the project team has made considerable progress in collecting background data on the Mexican electric system as well as the country's sugar and sawmill industries. Most of this information is from published sources in the US or was collected during two trips to Mexico in the Fall of 1993 and Spring of 1994. (See trip reports, Annex IV.)

In the case of the electric utility system, the first round of field investigation has been completed, involving not only collection of published materials, but also extensive face-to-face discussions with representatives of the national electric utility (CFE), the ministry that oversees it (SEMIP), and the Energy Regulatory Commission, charged in recent legislation with approving formulas for determining prices for power generated by the private sector. In contrast to other countries where Winrock has worked in the past, the Mexican authorities have not been anxious to share data from which we can derive marginal electricity costs and incremental greenhouse gas emissions. While we have some general information from which to calculate such an estimate, we hope to get better data, now that a draft of the long-awaited "Prospectiva" describing the future needs for additional generating capacity has been published by SEMIP.

Our collection of baseline forest products industry data resulted in a report (See Annex V.) on potential availability of wood residues for energy production. The analysis formed the basis of a workshop on March 29, 1994, organized in cooperation with the National Wood Energy Association, attended by 26 US firms interested in expanding

business in Mexico. In preparation for the workshop, we published a trade guide for biomass energy projects in Mexico. (See Annex V.)

We have compiled preliminary data on the sugar industry, including production statistics for each of the country's 61 operating sugar mills over the last three years. Our initial observation, consistent with opinions expressed in Mexico, is that much of the industry is antiquated and inefficient, owing to management by the public sector until recent years and to subsidized prices for electric power and fuel oil. For example, in the grinding season ending in 1993, fuel oil consumption amounted to over 20 litres per ton of cane, or 780 million litres nationwide. This figure could be reduced to zero with appropriate energy conservation measures, even without instituting cogeneration.

Scientific Progress

While the project does not entail scientific research strictly defined, the project team responded to a request from USAID/Mexico for an estimate of the potential CO₂ reduction potential that could be achieved theoretically by the sawmill and sugar industries. Based on published industry statistics and measures of available biomass waste fuel, we estimated that the annual savings could amount to between 1.2 million and 1.8 million Tonnes of carbon. The memorandum presenting these estimates to USAID appears in Annex V.

Winrock is also transferring knowledge drawn from a related project to the Mexican Energy Regulatory Commission. As part of an assessment of sugarcane cogeneration in El Salvador, we persuaded one of the country's regional electric distribution companies to conduct a load flow analysis to establish the impact of receiving power from cogeneration systems at two sugar mills connected to an overloaded distribution line. The conclusion was that losses could be reduced substantially and low voltage problems overcome, improving service along the line, with only modest amounts of power purchased from the mills. Since the Comisión Reguladora de Energía in Mexico seemed to be interested only in generation system impacts in calculating tariffs for independent power purchases by the utility, we sent the results of the El Salvador analysis to them to illustrate the importance of transmission and distribution considerations. From the acknowledgement that appears in Annex I, it appears that the Comisión valued the illustration.

Managerial Progress

Although delayed due to circumstances described later, the project has been organized, the team staffed, and the major analytical tasks begun. Among the accomplishments to date are:

- Conducted initial planning meetings in Mexico City with USAID/Mexico and industry representatives
- Drafted the Project Implementation Plan and First Annual Workplan

- Revised the plans based on comments from USAID/Mexico and USAID/G/ENV/EET and submission to USAID
- Prepared material for USAID Initial Environmental Examination and negotiation of Environmental Action Plan
- Identified staff and expert consultants for the project team
- Formulated and drafted terms of reference for consultants
- Negotiated and executed consultant appointment agreements
- Scheduled field fact-gathering activity
- Conducted initial field activity for electric utility market component
- Submitted of regular quarterly reports

Beyond the foregoing accomplishments, we have established close collaboration with USEPA's Climate Change Division. EPA has expressed interest in this project in relation to Mexico's role in the interagency Climate Change Country Studies Program, which EPA funds and manages. EPA has provided useful contacts and has asked us to help their environmental agency counterparts in Mexico to estimate greenhouse gas implications of biomass-fueled power generation. Additionally, the Climate Change Division has funded the National Renewable Energy Laboratory (NREL) to test its newly-devised greenhouse gas emissions assessment methodology in the context of sawmill and sugar mill cogeneration in Mexico. In collaboration with NREL's program, Winrock has agreed to integrate NREL's scientists into our field activity and to share data with them.

Fiscal Information

Annex II contains a financial statement covering the period from the date the agreement was signed until July 31, 1994. As the statement shows, cumulative expenditures amount to \$51,223.48, an amount considerably lower than the original forecast contained in the budget submitted with the first annual workplan. This is due to several factors, discussed below, that caused delays in beginning the field work, and to the fact that many of the expenditures are for consultant services, which do not show up in the accounting records until they are billed and paid for. Accrued commitments to consultants, which are not reflected in the cash-based financial statement are as follows:

Consultant	Amount*
Wood Cogeneration Expert	\$23,995
Sugarcane Cogeneration Expert (a)	15,940
Sugarcane Cogeneration Expert (b)	13,435
Electric Utility Expert	29,851
Local Coordinator	22,560
Total	\$105,781

*Including compensation, transportation and *per diem*

In contrast to the project as a whole, the amount budgeted specifically for salaries is more than half expended. This is in part because planning and organizing the project required

proportionally more in-house staff time than the remaining tasks, which involve a proportionally larger number of outside consultants.

When we expanded the the project's original proposal to include both sugarcane and forest products industries, in response to USAID's expressed interest, we did so with the understanding of the USAID project officer for the Biomass Energy Systems and Technology (BEST) project, which the agreement for this project parallels, that in-house salaries would be partly absorbed by the wood energy and sugarcane assessment components of the BEST project. As long as this holds true, we foresee no difficulty keeping within the staff salary allotment as the project progresses to its final stages.

Key Issues

Technical Issues

So far, we have encountered two technical problems: 1) the industries under study are large in relation to the resources available to the project and 2) Mexican authorities have been reluctant to divulge data needed for the electric utility component of the analysis. The first problem will be addressed by adopting a case study approach, in which a manageable number of installations in representative categories will be selected for in-depth analysis to illustrate the application of cogeneration technology under specific conditions. Estimates of national potential will then be derived from the case study results and from available industry statistics using a parametric approach.

Regarding electric utility data, we have managed to acquire sufficient information to perform a limited analysis, as indicated earlier. However, we are also attempting to convince the Instituto Nacional de Ecología, which administers the EPA greenhouse country study in Mexico, that they need the same information we do about the utility system, its management and expansion plans to estimate the greenhouse gas impacts of conservation measures. If we can gain access to these data through a Mexican government agency, perhaps in return for technical help from the National Renewable Energy Lab, we will be in a position to estimate the value and impacts of biomass cogeneration more precisely.

Managerial Issues

The principal managerial issue is the delay of approximately 6 months in the performance of the scheduled tasks in comparison to the original schedule. The most significant problem has been the difficulty in securing suitable expert consultants both willing to work for within USAID's rate ceiling and available for the specific times they would be needed. A small part of the delay is also due to the time required to free project staff from other ongoing activities after initial contract signing and to the initial difficulty (since overcome) in identifying a suitable in-country coordinator.

The difficulty in securing consultants results from our commitment to engage consultants who have substantial commercial and technical experience with cogeneration in the two

industries we are studying. In the case of wood-fueled cogeneration, practical expertise resides for the most part in a limited number of engineering firms, which generally seek to recover indirect costs through contracts. Under USAID rules, such contracts entail procurement through lengthy formal competitive solicitations, which would have delayed the project considerably, and the cost of the work would be higher. We have been fortunate to locate an appropriate individual for this work, but it took time.

In obtaining consultants for sugarcane processing, the challenge is not so much a matter of cost as the experts' limited time availability. We have found that the most effective way to obtain expertise has been to tap the sugar industry in Hawaii, where cogeneration is widely practiced. Besides having relevant experience, these people often think in similar managerial terms as their developing country counterparts and enjoy a certain credibility for this reason. The drawback is that we have to work around competing schedule commitments and other demands that their employers place on their time. After considerable effort, we were able to engage experts with well-established credentials, but we needed to divide what was to have been the work of one consultant between two, in order both to meet project requirements and, at the same time, to fit their schedules.

The consequence of the delay is that it will be difficult to complete the entire project, including the time necessary for subgrant recipients to complete feasibility studies, within the allotted two-year period. Our recommendation would be to complete the assessment phase of the project and solicit proposals for feasibility studies in early 1995 and then to request a no-cost time extension from USAID to complete them. At that time we will know the precise duration of the studies and be able to settle on a firm date for project completion.

One benefit from the delay could be improved effectiveness of the project in promoting positive changes in Mexico. This is because while the project has been delayed, so also has the process of legalizing private sector power generation and establishing the terms for purchase of electricity by the national utility from independent generators.

Regulatory Issues

The Initial Environmental Examination for the project recommended "categorical exclusion" for the assessment study and information dissemination phase of the project and a "conditional negative determination" for the phase two preinvestment feasibility studies. To meet the condition, Winrock was asked to impose certain conditions on the selection and conduct of the feasibility studies and to provide environmental guidance with respect to project planning and design. Winrock is also expected to address environmental issues in the post-assessment workshop and to include Mexican government agencies and environmental NGO's in feasibility study proposal selection. Activities to meet these requirements were not budgeted in the original proposal that USAID accepted, and they may be time consuming. We hope that USAID/Mexico, with its involvement in a broad range of environmental issues, will help to identify appropriate Mexican agencies and NGO's and to encourage their participation.

**Mexico Biomass Cogeneration Development Program
For the Period From August, 1993 to August, 1994**

Activity	Position	Location	3rd Quarter		4th Quarter			1st Quarter			2nd Quarter			3rd Quarter					
			Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug				
Phase 3: Pre-feasibility and Feasibility Studies for Biomass Projects																			
8.0 Solicit proposals																			
8.1 Solicit proposals for pre-investment study assistance	Local Specialist, Institutional subgrantee	Mexico City																	
8.2 Organize review committee	Local Specialist, Institutional subgrantee	Mexico City																	
8.3 Evaluate Proposals	Local Specialist, Institutional subgrantee	Mexico City, Arlington, VA																	
8.4 Negotiate terms and award contracts	Principal Investigator	Mexico City, Arlington, VA																	
9.0 Monitor project and provide ongoing TA																			
9.1 Monitor Progress	Local Specialist, Institutional subgrantee	Mexico City																	
9.2 Supply technical assistance as needed	Local Specialist, Institutional subgrantee	Mexico City																	
10. Identify future needs																			
10. Recommend future actions	Principal Investigator	Arlington, VA																	
			Reports & Deliverables																
										Fourth Quarter Report				First Quarter Report				Second Quarter Report	Year Two Workplan, Annual Report

* Task Complete

ANNEXES

I Impact Analysis Report

Public Sector

(See letter that follows describing reaction of Comisión Reguladora de Energía to analysis of transmission and distribution system impacts of independent power.)

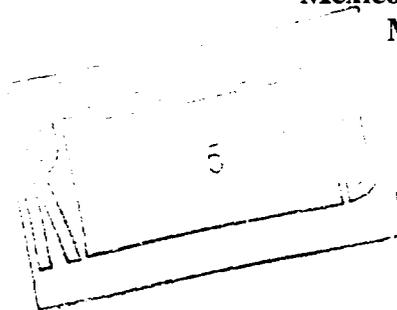
Private Sector

(Before completion of the assessment phase, impact is manifested in terms of interest by industry groups in collaborating with the study. The sugar industry's Grupo Beta San Miguel and the Asociación de Industrias Forestales de Durango have been particularly active.)

MEXICO D.F., a 13 de julio de 1994

Benjamín Contreras A.
Gerente de Análisis Económico y Financiero
Comisión Reguladora de Energía
Puente de Tecamachalco 26
Col. Lomas de Chapultepec
C.P. 11000
México, D.F.
México

WINROCK INTERNATIONAL
USAID
Proyecto de Energía a Través de Biomasa
1611 North Kent Street. Suite 600
Arlington, VA 22209-2134
USA



Estimado Sr. Hollomon:

Le agradezco la atención de enviarme el estudio de flujo de carga de el Salvador, que ilustra la importancia de transmisión y de distribución como medidas de los costos marginales de energía del sector privado según su localización.

El estudio de los costos marginales de energía independiente, mediante la introducción de 6.3 MW por ingenios de azúcar y su efecto de aliviar el problema de bajo voltaje y la consiguiente eliminación de aproximadamente la mitad de las pérdidas por causa de resistencia, me parece muy interesante. De igual forma, la forma como funciona el paquete denominado MILSOFT, los datos que requiere el paquete, las corridas del programa y los diagramas unifilares de cada caso, pueden ser útiles para conocer sus alcances para determinar su utilidad en redes mexicanas.

En la Gerencia de Análisis Económico y Financiero de la Comisión Reguladora de Energía de México, nos gustaría seguir en contacto con ustedes para conocer y ampliar la gama de programas de simulación existentes que podrían aplicarse a nuestro sistema. Asimismo, me permito pedirle cualquier otro trabajo que pueda ser útil para nuestras actividades en las áreas relacionadas con el sector eléctrico.

Por más por el momento, me permito agradecerle la atención prestada a la presente y le envío un cordial saludo.

A T E N T A M E N T E

BENJAMIN CONTRERAS ASTIAZARAN
GERENTE DE ANALISIS ECONOMICO Y FINANCIERO

7

II Financial Statements

Winrock International Institute for Agricultural Development

FINANCIAL REPORT

For Year One: July 20, 1993 - July 31, 1994

Biomass Cogeneration Development Project - Mexico
Cooperative Agreement No.: LAG-5737-A-00-3018-00

<u>Line Item</u>	<u>Budget Amount</u>	<u>Cumulative Amount Claimed</u>	<u>Amount Remaining</u>
I. Salaries	\$ 26,099	\$17,676.88	\$8,422.12
II. Fringe Benefits	11,191	6,922.58	4,268.42
III. Travel	45,284	4,771.98	40,512.02
IV. Consultants	71,388	3,320.00	68,068.00
V. Other Direct Costs	6,930	611.96	6,318.04
VI. Subcontracts	160,000	0.00	160,000.00
VII. Indirect Costs			
1. Overhead (55%)	59,773	15,355.71	44,417.29
2. G & A (7.7%)	12,388	2,564.37	9,823.63
3. Fee (3%)	4,800	0.00	4,800.00
TOTAL COSTS	\$397,853	\$51,223.48	\$346,629.52

III Quarterly Reports

WINROCK INTERNATIONAL

December 17, 1993

Mr. Ross Pumfrey
Project Officer
Office of Energy and Infrastructure SA-18
US Agency for International Development
320 Twenty First Street, NW
Washington, DC 20523

Dear Ross:

Enclosed please find five copies of the first quarterly technical progress report for the Mexico Biomass Cogeneration Development Program, as called for in Cooperative Agreement LAG-5737-A-00-3018-00. I hope you find it satisfactory and look forward to hearing any questions or concerns you may have.

Sincerely,



Brad Hollomon
Program Officer
Renewable Energy and the Environment

c: USAID POL/CDIE/DI w/enclosure (2 copies)

BEST AVAILABLE COPY

MEXICO BIOMASS COGENERATION DEVELOPMENT PROGRAM
Cooperative Agreement LAG-5737-A-00-3018-00
Winrock International Institute for Agricultural Development

QUARTERLY TECHNICAL PROGRESS REPORT
September 1 -- December 1, 1993

I. Goals Established For Period

Program Planning & Organization:

Plan Trip To Mexico
Initial Meetings in Mexico
Year One Workplan
Identify Project Team

II. Actual Accomplishments

Travelled to Mexico from September 7-10 to establish initial contacts and present proposed workplan for the biomass assessment in Mexico.

During trip, met with individuals representing the sugar industry, the primary and secondary forestry products industries, personnel from several different governmental departments within or associated with the national electrical utility, an environmental engineering firm, and a PVO. For further information, see attached trip report.

Project Implementation Plan submitted to USAID.

Year One Workplan submitted to USAID.

Responded to comments on plans by AID/R&D/E&I and AID/Mexico.

Identified two members of a proposed 4-5 member team for the Biomass Assessment; working with the National Wood Energy Association to identify a cogeneration engineering to participate on team. This activity is behind schedule due to staff commitments in Honduras and El Salvador. Plan to make up time in next quarter.

Working to develop scope of work and biosheets for identified team members.

III. Other Tasks

Responded to USAID questions on initial environmental assessments; commented on draft recommendations developed by USAID/LAC contractor

Conducted discussions with USEPA on coordination of effort on biomass assessment and global warming studies to be conducted in Mexico.

17



WINROCK INTERNATIONAL

April 20, 1994

Mr. Ross Pumfrey
Project Officer
Office of Energy and Infrastructure SA-18
US Agency for International Development
320 Twenty First Street, NW
Washington, DC 20523

Dear Ross:

Enclosed please find five copies of the second quarterly technical progress report for the Mexico Biomass Cogeneration Development Program, as called for in Cooperative Agreement LAG-5737-A-00-3018-00.

As you may recall, we have fallen somewhat behind schedule on account of difficulty securing appropriate expert engineering services through individual consultants, and we discussed alternative approaches to acquiring these services when Jorge Landa was here from USAID/Mexico. I have attached a revised project schedule reflecting the changes.

I hope you find the report otherwise satisfactory and look forward to hearing any questions or concerns you may have.

Sincerely,

Brad Hollomon
Program Officer
Renewable Energy and the Environment

c: USAID POL/CDIE/DI w/encl. (2 copies)

MEXICO BIOMASS COGENERATION DEVELOPMENT PROGRAM
Cooperative Agreement LAG-5737-A-00-3018-00
Winrock International Institute for Agricultural Development

QUARTERLY TECHNICAL PROGRESS REPORT
December 1, 1993 - March 1, 1994

I. Goals Established For Period

Program Planning & Organization:

Identify and contract project team

Assessment Phase:

Preliminary data collection

II. Actual Accomplishments

Collected preliminary data from the sugar industry and from published literature on Mexican sugar industry.

Acquired forest products industry data through coordination with parallel AID/R&D/E&I/BEST project activity.

Drafted Terms of Reference for project team members.

Identified prospective members of a proposed 4-5 member team for the assessment phase; encountered problems with time availability and willingness of cogeneration engineering experts to accept AID maximum rates for daily compensation. Solution may require competitive RFP to procure engineering services for one or two of the planned activities.

III. Other Tasks

Responded to draft Initial Environmental Evaluation developed by USAID/LAC contractor; negotiated proposed Environmental Action Plan and submitted it to USAID/Mexico.

In response to a request from USAID/Mexico, developed estimates of potential atmospheric CO₂ impacts of the Biomass Cogeneration Development Program.

Continued extensive discussions with USEPA Climate Change Division on coordination of the biomass assessment with the Climate Change Country Study being conducted in Mexico and with EPA-sponsored activity at the National Renewable Energy Laboratory.

MEXICO BIOMASS ASSESSMENT

ID	Name	September 1993					October 1993				November	
		8/29	9/5	9/12	9/19	9/26	10/3	10/10	10/17	10/24	10/31	11/7
1	Project Start	◆										
2	Planning and Organization	▬										
3	Plan Trip to Mexico	▬										
4	Initial Meetings in Mexico	▬										
5	Year One Workplan	▬										
6	ID Project Team	▬										
7	Contract Project Team	▬										
8	Assessment Phase	▬										
9	Preliminary Data Collection	▬										
10	Initial Field Investigation	▬										
11	Sugar Industry Field Data	▬										
12	Sawmill Industry Field Data	▬										
13	Utility/Regulatory Field Data	▬										
14	Preliminary Analysis & Eval.	▬										
15	Supplemental Fact Gathering	▬										
16	Sugar Industry Field Data	▬										
17	Sawmill Industry Field Data	▬										
18	Utility/Regulatory Field Data	▬										
19	Final Analysis	▬										
20	Technical Report Preparation	▬										
21	In-Country Workshop	▬										
22	Preparation & Arrangements	▬										
23	Conduct Workshop	▬										
24	Year Two Workplan	▬										
25	Preinvestment Assistance	▬										
26	Proposal Solicitation	▬										
27	Project Selection	▬										
28	Contract Negotiation	▬										
29	Project Monitoring	▬										
30	Final Report	▬										
31	Final Report Preparation	▬										
32	Final Report Submission	▬										
33	Project Management	▬										

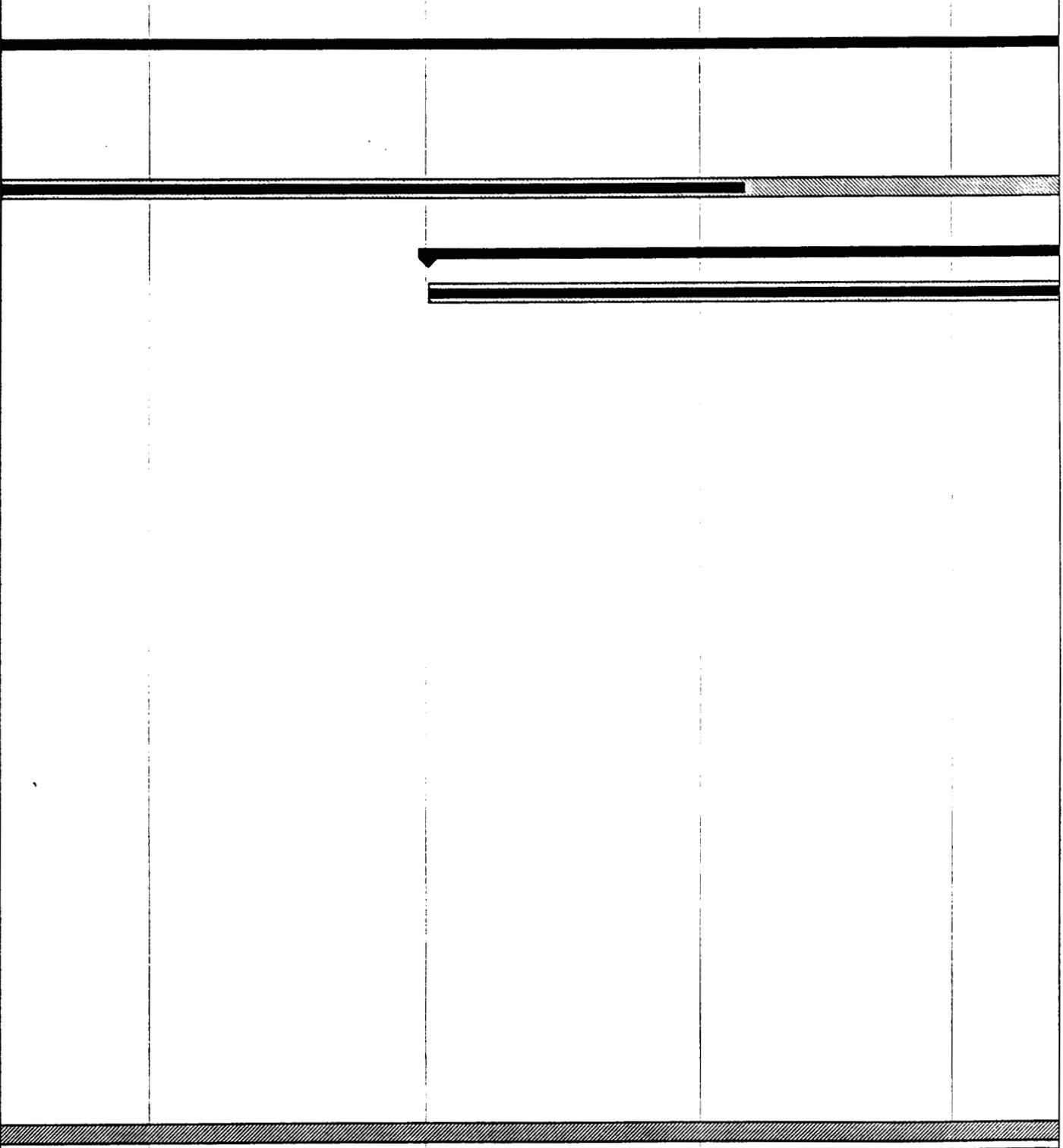
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4/20/94

Critical 
 Noncritical 
 Progress 

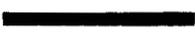
Milestone 
 Summary 

MEXICO BIOMASS ASSESSMENT

ber 1993		December 1993					January 1994					February 1994				M
11/14	11/21	11/28	12/5	12/12	12/19	12/26	1/2	1/9	1/16	1/23	1/30	2/6	2/13	2/20	2/27	3/6

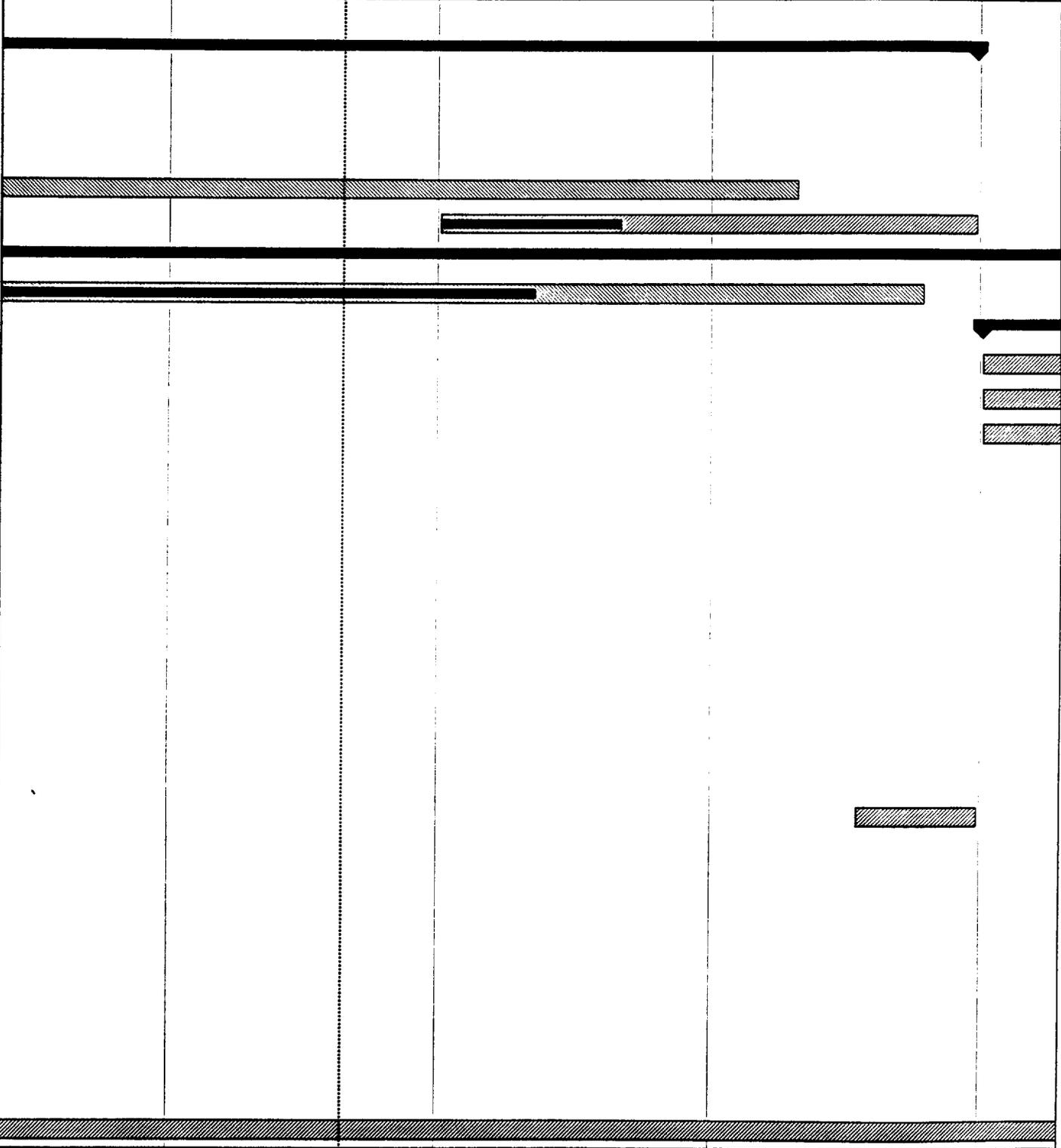


Winrock International
4/20/94

Critical		Milestone	
Noncritical		Summary	
Progress			

MEXICO BIOMASS ASSESSMENT

rch 1994			April 1994				May 1994					June 1994				
3/13	3/20	3/27	4/3	4/10	4/17	4/24	5/1	5/8	5/15	5/22	5/29	6/5	6/12	6/19	6/26	7/3

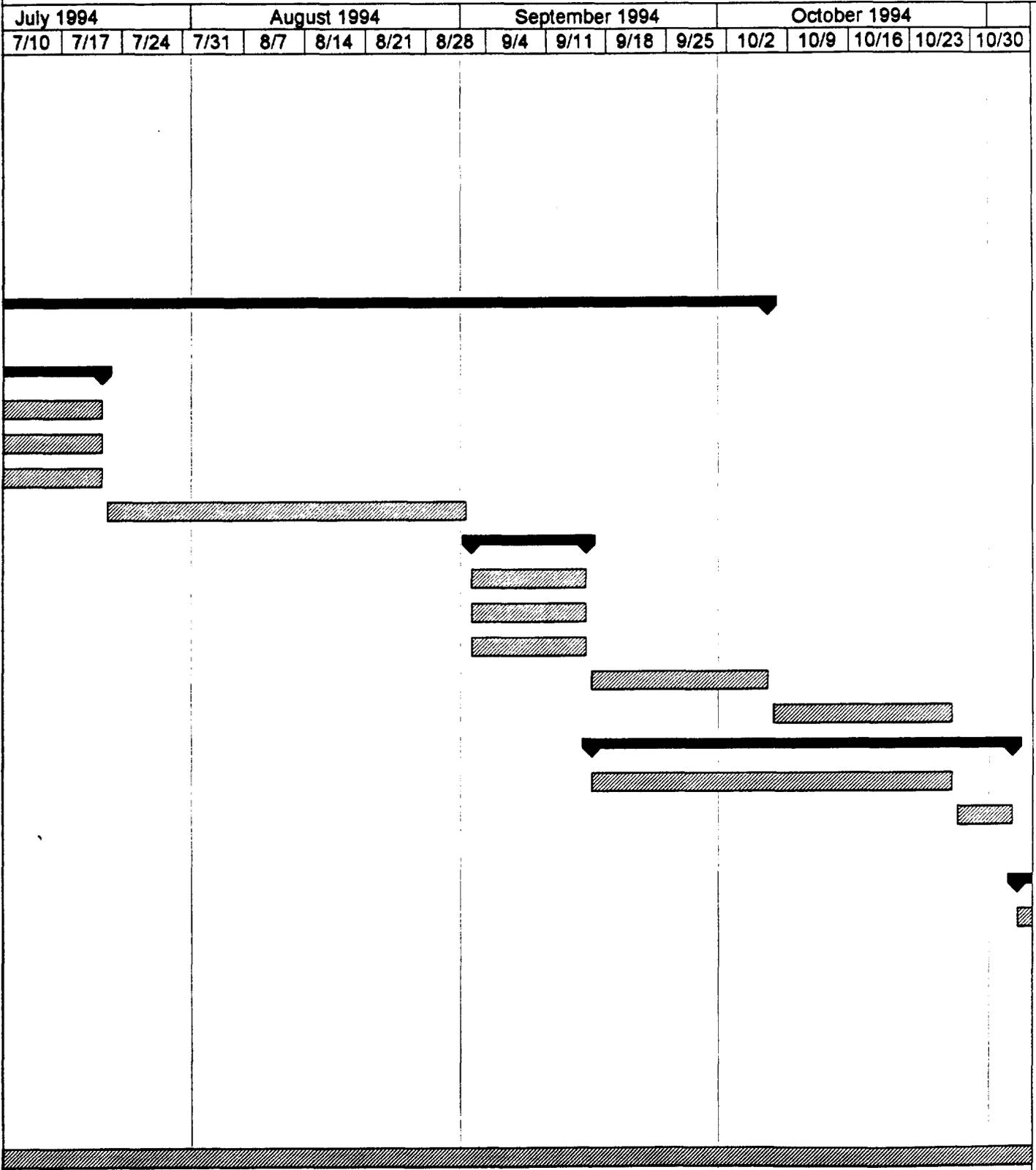


Winrock International
4/20/94

- Critical Milestone
- Noncritical Summary
- Progress

27

MEXICO BIOMASS ASSESSMENT



Winrock International
4/20/94

Critical		Milestone	
Noncritical		Summary	
Progress			

MEXICO BIOMASS ASSESSMENT

November 1994				December 1994				January 1995				February 1995				
11/6	11/13	11/20	11/27	12/4	12/11	12/18	12/25	1/1	1/8	1/15	1/22	1/29	2/5	2/12	2/19	2/26
<p>The Gantt chart displays project progress from November 1994 to February 1995. A thick black bar at the bottom represents the overall project duration. A hatched bar spans from approximately 11/13 to 1/15. A solid black bar spans from approximately 1/15 to 2/12. A hatched bar spans from approximately 2/12 to 2/26. A diamond symbol is located at the end of the timeline on 2/26.</p>																

<p>Winrock International 4/20/94</p>	<p>Critical </p> <p>Noncritical </p> <p>Progress </p>	<p>Milestone </p> <p>Summary </p>	
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MEXICO BIOMASS ASSESSMENT

March 1995				April 1995				May 1995				June 1995				
3/5	3/12	3/19	3/26	4/2	4/9	4/16	4/23	4/30	5/7	5/14	5/21	5/28	6/4	6/11	6/18	6/25
Gantt chart area with bars <div style="position: absolute; top: 70%; left: 5%; width: 15%; height: 10px; background-color: #cccccc; border: 1px solid black;"></div> <div style="position: absolute; top: 78%; left: 18%; width: 80%; height: 10px; background-color: #cccccc; border: 1px solid black;"></div> <div style="position: absolute; top: 87%; left: 5%; width: 95%; height: 10px; background-color: #cccccc; border: 1px solid black;"></div>																

Winrock International
4/20/94

Critical		Milestone	◆
Noncritical		Summary	
Progress			

23

MEXICO BIOMASS ASSESSMENT

July 1995				August 1995				September 1995				October 1995				
7/2	7/9	7/16	7/23	7/30	8/6	8/13	8/20	8/27	9/3	9/10	9/17	9/24	10/1	10/8	10/15	10/22

Winrock International
4/20/94

Critical



Noncritical



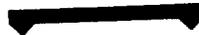
Progress



Milestone

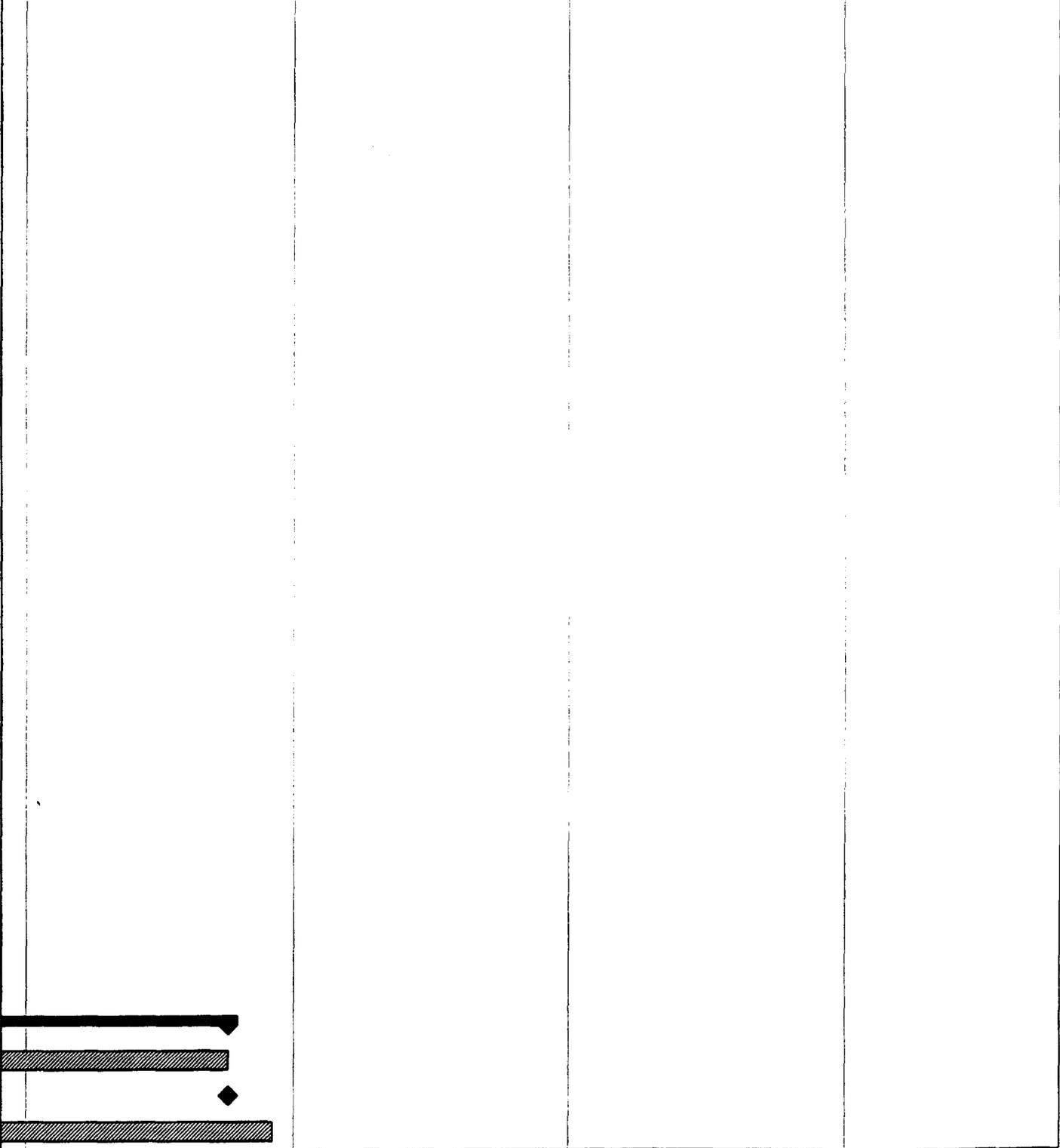


Summary



MEXICO BIOMASS ASSESSMENT

November 1995					December 1995				January 1996				February 1996			
10/29	11/5	11/12	11/19	11/26	12/3	12/10	12/17	12/24	12/31	1/7	1/14	1/21	1/28	2/4	2/11	2/18



Winrock International
4/20/94

Critical		Milestone	
Noncritical		Summary	
Progress			



WINROCK INTERNATIONAL

June 28, 1994

Mr. Ross Pumfrey
Project Officer
Office of Energy, Environment and Technology
US Agency for International Development, SA-18
320 Twenty First Street, NW
Washington, DC 20523

Dear Ross:

Enclosed please find five copies of the third quarterly technical progress report for the Mexico Biomass Cogeneration Development Program, as called for in Cooperative Agreement LAG-5737-A-00-3018-00. I hope you find it satisfactory and look forward to hearing any questions or concerns you may have.

Sincerely,

Brad Hollomon
Program Officer
Renewable Energy and the Environment

c: USAID POL/CDIE/DI w/encl. (2 copies)

MEXICO BIOMASS COGENERATION DEVELOPMENT PROGRAM
Cooperative Agreement LAG-5737-A-00-3018-00
Winrock International Institute for Agricultural Development

QUARTERLY TECHNICAL PROGRESS REPORT
March 1, 1994 - June 1, 1994

I. Goals Established For Period

Program Planning & Organization:

- Identify project team
- Contract project team

Assessment Phase:

- Preliminary data collection

II. Actual Accomplishments

- Completed Terms of Reference for project team members.
- Identified members of a proposed 5 member team for the assessment phase.
- Contracted Electric Utility Expert; began negotiations with the others.
- Met with potential institutional collaborators in Mexico.
- Collected preliminary data from the sugar industry and from published literature on Mexican sugar industry; met with sugar industry representatives in Mexico.
- Acquired forest products industry data through coordination with parallel AID/G/ENV/EET BEST project activity; met with the director of the Cámara Nacional de Industria Forestal in Mexico.
- Performed initial field investigation in Mexico to obtain utility/regulatory field data.
- Began utility avoided cost analysis.

III. Other Tasks

- Continued discussions with USEPA Climate Change Division on coordination of the biomass assessment with the Climate Change Country Study being conducted in Mexico and with EPA-sponsored activity at the National Renewable Energy Laboratory (NREL).
- Met with the climate change country study team in Mexico to discuss coordination and common electric utility data needs; mentioned possible NREL involvement in our project.

IV Trip Reports

WINROCK INTERNATIONAL
USAID OFFICE OF ENERGY AND INFRASTRUCTURE
BIOMASS ENERGY SYSTEMS AND TECHNOLOGY PROJECT
1611 N. Kent Street, Suite 600
Arlington, Virginia 22209-2134 USA
Phone: (703) 525-9430 Fax: (703) 243-1175

TRIP REPORT

TRAVELER: Brad Hollomon, Marc Andraca

USAID PROJECT: Biomass Energy Systems and Technology (BEST) Project
(Project No. DHR-5737-A-00-9058)
Renewable Energy Applications and Training Project (REAT)/
U.S. Export Council for Renewable Energy (US/ECRE)

PROJECT SITE(S) VISITED: Mexico

DATES OF VISIT: September 7-10

PURPOSE OF VISIT: To establish initial contacts and present proposed
workplan for the biomass assessment in Mexico

PEOPLE CONTACTED:

Fideicomiso de Apoyo al Programa de Ahorro de Energía del Sector Eléctrico	Lic. Jorge Landa Bonilla Lic. José Antonio Urteaga Dufour Ing. Gonzalo Martínez Flores
Subdirección de Programacion, Comisión Nacional de Electricidad (CFE)	Ing. Jorge Zendejas Olivares Ing. Faustino Lara Nuñez
Programa de Ahorro de Energía del Sector Eléctrico (PAESE/CFE)	Ing. Norberto Granados Santacruz Ing. Adolfo Martínez
Asociación Nacional de Técnicos Azucareros	Ing. Manuel Enriquez Poy
Instituto Autónomo de Investigaciones Ecológicas (INAINE)	Lic. Rosemberg Maldonado O.
Cámara Nacional de la Industria Forestal	Lic. Armando Santiago Pineda
Secretaría de Energía, Minas y Industrias Petroleras (SEMIP)	Dra. Georgina Kessel Lic. Pedro Ortega

Cámara Nacional de la Industria Maderera	Luis Arrieta Mondragon
Environmental Ecology and Energy	Ruben Lozano
Cámara Nacional de las Industrias Azucareras y Alcoóleras	Silverio Flores
Grupo Elai, S.A. de C.V.	Guillermo Segura Hernandez

COMMENTS AND OBSERVATIONS:

In the course of our visit, we met with individuals representing the sugar industry, the primary and secondary forestry products industries, personnel from several different governmental departments within or associated with the national electrical utility, an environmental engineering firm, and a PVO. In these meetings, we introduced the biomass assessment program, requested assistance in obtaining information about the relevant sectors for the analytic components of the study, and emphasized our interest in integrating the appropriate governmental and private sector actors in the development and implementation of the study.

The private sector representatives of the sugar and forestry product industries indicated a willingness to assist in providing information for the study. In spite of overriding concerns for their economic survival, the sugar mill representatives indicated they were very interested in exploring the potential for cogeneration and welcomed any assistance we could provide to bring such projects on-line. Many mill owners were familiar with cogeneration technologies and processes, and had considered cogeneration schemes in the past, however the economic difficulties facing this industry at this time and uncertain markets for exported power seem to have prevented any capital investments. The forestry products industry representatives were not as familiar with cogeneration, but expressed interest in providing assistance in conducting the study and planned to mention our upcoming project to his board of directors the following week.

Winrock staff met with several different departmental groups to learn about the regulatory framework and identify the appropriate actors addressing cogeneration and private power issues within the national utility. Initial discussions indicated that recently promulgated regulations allow for private power contracts under 20 MW on an *ad hoc* application basis. An IPP could estimate CFE costs for producing electricity and propose terms and conditions for sale to the utility through SEMIP. Projects offering more than 20 MW require a formal solicitation by CFE followed by an open bidding process, under which the utility would purchase power from the lowest bidder. At this time, the combination of very recently promulgated regulations, institutional overlap between departments focusing on electricity, and an uncertain stance with respect to private power by officials at SEMIP suggests that intermediation between the relevant actors will be constructive in fostering an environment conducive to bringing private power agreements on-line. The responsible agencies within SEMIP have only recently been formed and are not fully staffed, so they

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represent an opportunity to render help in achieving the capability to address independent power issues without relying solely on the national utility.

In conclusion, the visit accomplished the purpose of identifying the relevant organizations we need to work with at the national level, and it gave us the opportunity to introduce to them the objectives of the project. We believe that we succeeded in eliciting interest in cooperating with us as the project proceeds. However, we were left with the impression that, as in many other countries, the electric power sector still has some distance to go before independent power from biomass or any other resource becomes a financeable proposition, and our project will need to focus a major portion of its efforts on avoided cost and power purchase considerations.

Paul H. ...

John D. ...

WINROCK INTERNATIONAL
USAID MEXICO BIOMASS COGENERATION DEVELOPMENT PROGRAM
1611 N. Kent Street, Suite 600
Arlington, Virginia 22209-2134 USA
Phone: (703) 525-9430 Fax: (703) 243-1175

TRIP REPORT

TRAVELER: Brad Hollomon, Winrock; H. Mike Jones, Consultant

USAID PROJECT: Biomass Energy Systems and Technology (BEST) Project
(Project No. DHR-5737-A-00-9058)

PROJECT SITE(S) VISITED: Mexico City

DATES OF VISIT: May 29-June 3, 1994

PURPOSE OF VISIT: To collect electric utility data and to establish contacts with organizations involved in regulation of private power and in evaluation of greenhouse gas emissions for the biomass assessment in Mexico

PEOPLE CONTACTED:

Fideicomiso de Apoyo al Programa de Ahorro de Energía del Sector Eléctrico (FIDE)	Ing. Felipe David Angeles Molina Lic. José Antonio Urteaga
Comisión Nacional de Electricidad (CFE)	Ing. Jorge Zendejas Olivares Lic. Luís Lágunes Rodríguez Ing. Enrique Villanueva
Programa de Ahorro de Energía del Sector Eléctrico (PAESE/CFE)	Ing. Jesús Sada Gamiz Ing. Horacio Buitrón Sanchez Ing. Rosa María Merlos Rueda
Comisión Nacional para el Ahorro de Energía (CONAE)	Ing Enrique Portes Mascorro Ing. Arcadio García Arrecillas Ing. Arcadio García A.

Grupo de Países Latinoamericanos y del Caribe Exportadores de Azúcar (GEPLACEA)	Ing. José Antonio Cerro Dr. Helmut C. C. Bourzutschky Lic. Ernesto Feilbogen
Instituto Nacional de Ecología	Dra. Julia Martínez
Secretaría de Energía, Minas y Industrias Petroleras (SEMIP)	Lic. Fernando Bueno Lic. Benjamin Buzali Aguilar
Cámara Nacional de la Industria Forestal	Lic Armando Santiago Pineda
Comisión Reguladora Eléctrica	Dr. Benjamin Contreras
Grupo Beta San Miguel, SA de CV	Lic. José Pinto Mazal Lic. Alfonso Abarca Mercado Ing. Quim. Ernesto Gonzalez Rios Ing. Alfonzo Arreola Mora
Santaló y Cia., SA de CV	Ing. Luís E. Noriega Giral
Bufete Industrial	Ing. Adolfo Martinez Resendiz
ENPRO, SA de CV	Ing. Manuel de Diego Muñoz Ing. Manuel de Diego Olmedo
Instituto de Investigaciones Eléctricas	Ing. José Luís Hernandez Galán Ing. Eduardo H. Buendía Dominguez
Universidad Nacional Autónoma de México	Lic. Hilda Suarez Lira Prof. Carlos Gay
Grupo Elai, SA de CV	Lic. Guillermo Segura Hernandez
USAID/Mexico	Mr. Frank Zadroga Lic. Jorge Landa Bonilla

COMMENTS AND OBSERVATIONS:

Utility Sector -

The primary objective of the trip was to obtain data from CFE with which to calculate avoided costs associated with independent power from cogeneration at sugar mills and sawmills and to ascertain the legal and regulatory framework that will guide the tariffs and other terms governing the sale of independent power to CFE. Although we obtained some data and a lot of information

on how the system is intended to work in principle, the main actors (CFE, SEMIP and the Comisión Reguladora) were not particularly forthcoming with specifics. CFE appeared unwilling to share capacity expansion plans or powerplant dispatching and operating cost data, partly because an official Perspective outlining projected needs for independent power was being prepared by SEMIP and supposedly would be issued "within a month." Also, the Comisión Reguladora, which is responsible for advising the Secretary of SEMIP on tariffs, has formulated tariffs for backup power for self-suppliers but has not completed its work on rates for wheeling and purchase by CFE from plants under 20 MW. In the meantime, the staff are reluctant to divulge the data and methodologies on which the tariffs would be based.

Sugar Industry -

We met with the managers of Grupo Beta San Miguel, at their request, to reiterate the objectives of the study and to answer questions. (We had met with a smaller group of them the last time we visited.) José Pinto agreed to help us to get on the agenda of the Cámara Nacional de Industria Azucarera y Alcoolera to secure participation by other sugar companies, and others explained about their proposal to install 27 MW of cogeneration capacity at the Constanca sugar mill, which is in need of upgrading and has access to natural gas for off-season operation. Later in the week, Antonio Cerro, the Executive Secretary of GEPLACEA explained some useful historical details on the Mexican sugar industry and steered us to the Comité Azucarera as a convenient source of data.

Sawmill Industry -

At the Cámara Nacional de Industria Forestal, we were informed that the Board of Directors had expressed interest in our project since the last visit, but that we should work through the state-level organizations in Chihuahua and Durango, where the majority of lumber is produced. The Director gave us the names of Gerardo Peyro for Durango and Alberto León Sanchez for Chihuahua.

Institutional Collaborators -

We met with several organizations that we thought might be able to work with us on the project. While it appeared that both ENPRO and IIE could contribute to the project and would perhaps benefit from the experience, they seemed likely to be expensive as sources of help. We also brought FIDE, PAESE and CONAE up to date on the project and asked about ways to get around the utility data problem, which it appears they all share.

Climate Change Country Study -

Because one of the objectives of our assessment is to establish the greenhouse gas implications of biomass cogeneration, we visited with some of the participants in the Country Study for

Mexico, which is partly underwritten by USEPA. We explained that we wished to carry out the CO2 element of our project in such a way as to strengthen their efforts and to adhere to standards and conventions that they may have established, especially in the area of reductions due to reduced load on the electric utility. We also mentioned that some discussion had taken place between the EPA Climate Change Division and the National Renewable Energy Lab (NREL) concerning NREL's possibly working in coordination with us to test a biomass energy greenhouse gas impact assessment methodology. It became clear during the discussion that the people in CONAE and UNAM working on the Country Study had also been unable to obtain the data they needed to estimate the likely reductions in CFE's air emissions due to postulated conservation measures, a problem analogous to ours. I suggested that our needs were similar, and that perhaps requests directed to CFE might have better results coming from them.

V Other Reports and Publications

LATCO

Events - Resources - Trade Shows



Market Report:
Mexico
Forest Industry

March 29, 1994

Tel: (503) 464-8889
Fax: (503) 464-2299
E-Mail: tmiles@agora.rain.com
CompuServe 71331,3651

Latin American Trade Council of Oregon 121 S.W. Salmon, Suite 1100 Portland, OR 97204

Mexico's Forest Industry: Potential Availability of Wood Residues for Energy Production

Prepared For:
Renewable Energy and the Environment Program
Winrock International

and

National Wood Energy Association
Arlington, Virginia

Prepared by

Robert Flynn
Robert Flynn & Associates
6824 19th Street West, #330
Tacoma, Washington 98466
Bus: 206-565-4846 Fax: 206-565-7265

Eugene Borstel
Global Marketing
17702 Overlook Cir
Lake Oswego, OR 97034
Bus: 503-699-0646 Fax: 503-699-0528

Thomas R. Miles, Jr.
T.R. Miles, Consulting Design Engineers
5475 S.W. Arrowwood Lane
Portland, Oregon 97225
Bus: 503-292-0107 Fax: 503-292-2919

March, 1994

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TABLE OF CONTENTS

Section	Page
Executive Summary	i
Mexico's Forest Resource Base	
Forest Area	1
Deforestation	7
Reforestation	9
Commercial Plantations	11
Growth Rates	12
Ownership of the forests	12
Timber Production	15
Mexico's Forest Industry	
Sawmills	18
Lumber Production	20
Lumber Usage in Mexico	22
Problems Facing the Lumber Industry	23
Logging and Transportation Costs	24
Sawmill Technology	25
Sawmill Cost Structure	27
Major Companies	28
Plywood Industry	29
Particleboard and Other Reconstituted Panels	31
Mexican Furniture Industry	36
International Trade and Mexico's Forest Industry	38
U.S. Imports of Mexican Forest Products	46
Maquiladora Plants	47
Significance of NAFTA	47
Pulp and Paper	
Declining Wood Use	50
Pulp Production Decline	50
Current Wood Pulp Production	53
Pulpwood Markets	55
Paper Industry	56
Mexican Market for U.S. Wood Working Equipment	58
Biomass Equipment	60
Wood Residue Availability	61
Bibliography	45
Appendix: Directory of Mexico's Pulp and Paper Industry	65

FIGURES

Figure	Page
Figure 1. Mexico: Forest Area By State	2
Figure 2. Mexico: Total Forest Volume, Percent by State 1992	3
Figure 3. Mexico: Coniferous Forest Area By State 1992	4
Figure 4. Mexico: Total Coniferous Volume By State 1992	4
Figure 5. Mexico: Tropical Forest Area By State 1992	6
Figure 6. Mexico: Industrial Roundwood Harvest 1985-1993	15
Figure 7. Mexico: 1992 Timber Production by State	17
Figure 8. Mexico: Timber Production Trends 1985-1993(est)	17
Figure 9. U.S. Forest Products to Mexico 1981-1993	40
Figure 10. U.S. Log Exports to Mexico 1981-1993	41
Figure 11. U.S. Exports of Softwood Lumber 1984-1993	42
Figure 12. U.S. Plywood Exports to Mexico 1981-1993	43
Figure 13. U.S. Panel Exports to Mexico, 1981-1992	44
Figure 14. Mexico: Pulp Production and Imports, 1983-1992	45
Figure 15. Mexico: U.S. Woodchip Exports, 1981-1993	46

MAPS

Map	Page
Map 1. Forest Regions of Mexico	2A

TABLES

Section	Page
Table 1. Mexico's Forest Area	1
Table 2. Mexico's Forest Area By State and Type	2B
Table 3. Amount of Deforestation: Inventory Comparison	3
Table 4. Principal Causes of Deforestation in Mexico	8
Table 5. Area Reforested in Mexico	10
Table 6. Distribution of Forest Industry Facilities	19
Table 7. Mexico's Lumber Production By State, 1992	21
Table 8. Softwood Lumber Production in Mexico	21
Table 9. Mexico's Hardwood Lumber Production	21
Table 9. Uses of Lumber in Mexico, 1992	15
Table 11. Major Lumber and Plywood Producers in Chihuahua and Durango	28
Table 12. Mexico's Softwood Plywood Production and Trade	30
Table 13. Mexico's Temperate Hardwood Plywood Production, Imports, Consumption	30
Table 14. Mexico's Particleboard Production	34
Table 15. Mexican Particleboard Plant Capacity 1993	34
Table 16. Mexican Tariffs on Imports of U.S. Wood Products	39
Table 17. Mexico's Pulp Production and Imports, 1983-1992	52A
Table 18. Mexico Wood Residue Availability Analysis	61
Table 18. Total Surplus Wood Residue in M Cubic Meters	62

MEXICO'S FORESTS AND FOREST PRODUCTS INDUSTRY

Executive Summary

There are numerous challenges facing Mexico's forest products industry. However, Mexico is currently the third largest supplier of forest products to the United States, and rapid economic growth in Mexico (aided by NAFTA) is expected to stimulate domestic consumption of wood products. A number of policy changes by the Mexican government will help the industry, which is expected to grow in importance during the coming decade.

Forest Base

Mexico has almost 50 million hectares of forest lands, 34 million of which are classified as Productive Forests. These forests are split roughly evenly between tropical forests and temperate forests. The temperate coniferous forests, primarily various species of pine, represent 34 percent of the total forest resource base, and are by far the most important forests, from a commercial standpoint, in Mexico.

The largest concentration of coniferous forests is found in the northern states of Chihuahua (23.7% of the total) and Durango (20.8%), followed by Guerrero (6.7%) and Michoacan (6.6%). Tropical forests are found primarily in Campeche (28.3% of the total), Chiapas (18.8%), and Quintana Roo (18.1%). Forest growth in Mexico is relatively slow, primarily because of poor management practices.

Deforestation

A recent satellite survey confirmed that deforestation in Mexico continues to be a very serious problem. An estimated 365,000 hectares of forest land were lost each year during the 1980s. Reportedly, the amount of deforestation in 1991 and 1992 was reduced to less than 300,000 hectares.

Reforestation efforts have accomplished very little to date. Over the last 25-30 years, probably no more than 500,000 hectares have been successfully reforested. This is less than 6 percent of the area deforested over the same time period. Commercial plantations amount to only about 15,000 hectares, although the government hopes to encourage new plantations through changes in some of the forest laws, and several new projects have been announced.

Forest Ownership

The state owns almost all of the forest land in Mexico. However, most of the land has been controlled by rural villagers under the "ejido" structure. Until recently under this system, timber could only be contracted out on an annual basis. This has discouraged investment by forest companies in improved forest management, better infrastructure, and more efficient facilities. The laws governing this land tenure system were amended in November, 1991, to encourage greater participation by the private sector. However, companies have been slow to respond to the changes.

Timber Harvesting

The industrial timber harvest in Mexico has been declining steadily for the last 7 years. In 1987, total industrial wood production was 9.8 million m³. The U.S. Foreign Agricultural Service estimates that the 1993 harvest was about 6.91 million m³. Of this total, 88 percent was coniferous species, 5 percent was temperate hardwoods, and the remainder was tropical species. The states of Durango and Chihuahua accounted for almost 50 percent of the coniferous timber harvest in 1992.

The above volumes are only for the officially licensed industrial roundwood harvest. Informally, the total industrial harvest is estimated to be twice as large as officially reported. In addition, various reports estimate total national fuelwood consumption in Mexico to be 10 to 28 million m³ per year.

Sawmills

In 1991, there were an estimated 1543 sawmills in Mexico. Sixty-seven percent of the sawmills in Mexico are located in the states of Durango, Chihuahua, Michoacan, Jalisco, and Oaxaca. According to one recent estimate, these five states account for about 77 percent of the country's lumber production.

Eighty-seven percent of the lumber produced in Mexico in 1992 was softwood, 5 percent was of temperate hardwood species, and 8 percent was of tropical hardwood species. Softwood lumber production in Mexico declined from a recent high of 2.6 million m³ in 1989 to an estimated 2.1 million m³ in 1993. (For perspective, this is about the same level of production as the state of Virginia.) Sawmills are currently operating at very low rates (25-30 percent of capacity) and many have closed down because of capital and roundwood shortages. The decline in production has been attributed to weakness in the furniture sector and problems with log supply.

The majority of sawmills are small, (uneconomical in size), and scattered throughout the mountains in remote locations. The larger sawmills, still small by international standards, are clustered in a few commercial centers, located far from the forest resource. Roads are in poor condition, and transport costs very high. Most sawmills are old, with primitive technology. Their inefficiency and high raw material costs make their products uncompetitive by international standards.

Most mills do not have chippers, or material handling capability to recover the residual chips and/or hog fuel. There are few dry kilns at the sawmills, and little anti-stain treating capability. The quality of logs available, especially of peeler grades for plywood, has become increasingly worse.

There are a wide range of species in Mexico (55 types of pine, more than 130 species of oaks), which makes it difficult to standardize production and grading. In general, there is no uniform, standardized grading system, and much lumber sells without a quality grade at all. At the mills, there is a general lack of production management/quality control.

Other Forest Industries

The plywood industry in Mexico consists of 35 plants which consume roughly 7-8 percent of the total roundwood harvest, or about 556,000 m³ in 1991. The total production of plywood in Mexico in 1991, about 565 million square feet (on a 3/8") basis, is the production equivalent of 3.5 average-sized mills in the United States.

There are 9 particleboard plants, three hardboard (fiberboard) plant, and one MDF plant operating in Mexico. These plants are scattered through Mexico to take advantage of residual or waste fiber produced by the nation's sawmills.

There are approximately 2,000 domestic furniture manufacturers (does not include maquiladora plants) in Mexico today. About 40 percent of these are located in Jalisco, 40 percent in the Mexico City area, and the remainder are mostly concentrated in Tijuana, Aguascalientes, Monterrey, Chihuahua and San Luis Potosi. The furniture industry has traditionally used domestic pine or tropical species such as mahogany. The domestic lumber supply is viewed as unreliable and of low quality by furniture manufacturers.

There are approximately 200 furniture manufacturers (as of 1991) in the maquiladora industry, of which 78 percent are located in the sates of Baja California, Chihuahua and Tamaulipas along the U.S./Mexico border. Although exact statistics on this industry are unavailable, these 200 plants reportedly produce

nearly as much product (by value) as the 2,000 domestic furniture manufacturers. A number of these maquiladora plants are using U.S. based raw materials to produce moulding and millwork products, picture frames, and other value-added products. Some of these plants are quite large, and even though they are not primary lumber producers, they generate enough wood waste to power cogeneration facilities.

The use of virgin wood fibers in the pulp and paper industry in Mexico has been declining since 1987. This decline has been offset with imported wood pulp, which in 1992 represented 52 percent of all wood pulp consumed in the country (chemical and mechanical). The virgin wood pulp produced in Mexico is even less significant when compared to total pulp consumption: it is less than 20 percent of the total.

Many reasons have and will continue to dictate the low usage of Mexican wood fiber for pulp and paper.

- dwindling domestic wood sources.
- the worldwide industry recession which has flooded the market with high quality, low priced, imported pulp.
- a yet unproven government sponsored reforestation program consisting of fast growing eucalyptus and pine.
- continued availability of low cost, high quality pulp from the U.S. and Canada under NAFTA.
- significant pulp production capacity dedicated to secondary and non-wood fibers, although both bagasse and straw will probably decline in use in favor of imported wood pulps.

International Trade

Imports of foreign wood products, primarily from the United States, have been taking an increasing share of the Mexican domestic market. Some forecasters expect that with the changes due as a result of NAFTA, imports from the U.S. will accelerate, taking an even greater share of the Mexican market, thus driving Mexican primary forest production even lower than its current level.

However, the importance of NAFTA should not be exaggerated. First, there is a shortage of lumber, and to a lesser extent, panel products in the U.S. This has forced prices higher, and most analysts do not expect prices to lower significantly from current levels. Second, the duties under NAFTA are being phased out gradually, most over a ten year period, which should give the Mexican industry adequate time to adjust. Finally, NAFTA is expected to boost economic development in Mexico, which will mean a higher level of construction and infrastructure development, all of which will mean a much greater demand for wood.

Available Wood Residues

Using official (unreliable) statistics on Mexico's timber harvest and wood products production, it appears that in 1991 there was a "surplus" of 1.6 million green tonnes of wood residues which were not consumed for pulp or reconstituted board products. Some of this volume was unrecoverable, i.e., produced at small mills in remote locations, and a small portion was utilized by some of the larger sawmills and planer mills for energy production. However, there was an unknown, but sizable, quantity of wood residue produced at the wood-using maquiladora plants, none of which was included in this estimate.

The states of Chihuahua and Durango produce about 18 percent and 28 percent, respectively, of Mexico's lumber production. Based on some gross assumptions on residue generation and recovery, we estimate that there are about 20 dry tonnes per hour of available wood residue in the state of Durango and 12.5 dry tonnes per hour of wood residue in Chihuahua. Further investigation, including interviews with Mexican producers, will be needed to refine the estimates in this report.

END OF SUMMARY

Mexico's Forest Resource Base

Forest Area

The most recent inventory of Mexico's forests ("Inventario Nacional Forestal de Gran Vision", 1992) relied primarily on the use of Landsat satellite photos taken in December, 1990. According to this latest survey, about one-fourth of Mexico's total area, 49.6 million hectares, is classified as forested land. This is split almost equally between temperate forests, both coniferous and deciduous, and tropical forests (Table 1). However, only 34 million hectares are classified as Productive Forests, because many forests, especially in the Low Tropical type, are considered Conservation or Protected forests. The Productive Forests include some areas classified also as Protection Forest Zones, where no management is allowed. Due to environmental restrictions, several experts estimate that only one half of the total crop area, or less, is available for commercial forestry purposes.

Table 1. Mexico's Forest Area

Type of Forest	Area	Standing Volume
	(million hectares)	(million m)
Temperate Coniferous	17.0	1,408
Temperate Deciduous	8.4	356
Tropical Moist (high/medium)	8.7	725
Tropical Dry (low)	15.4	301
Transition (Mesofilos)	0.1	9
Total	49.6	2,799

Source: SARH, Inventario Nacional Forestal de Gran Vision, 1992

Note: See Appendix for lists of forest area and volume by type and by state.

The state of Chihuahua has more forest area than any other state in Mexico (10.2 percent of the total) (see Fig. 1). Durango contains 8.5 percent of the total, and Campeche 7 percent.

Chiapas, Guerrero, Jalisco, Oaxaca, and Quintana Roo all have slightly more than 6 percent of the total forest area.

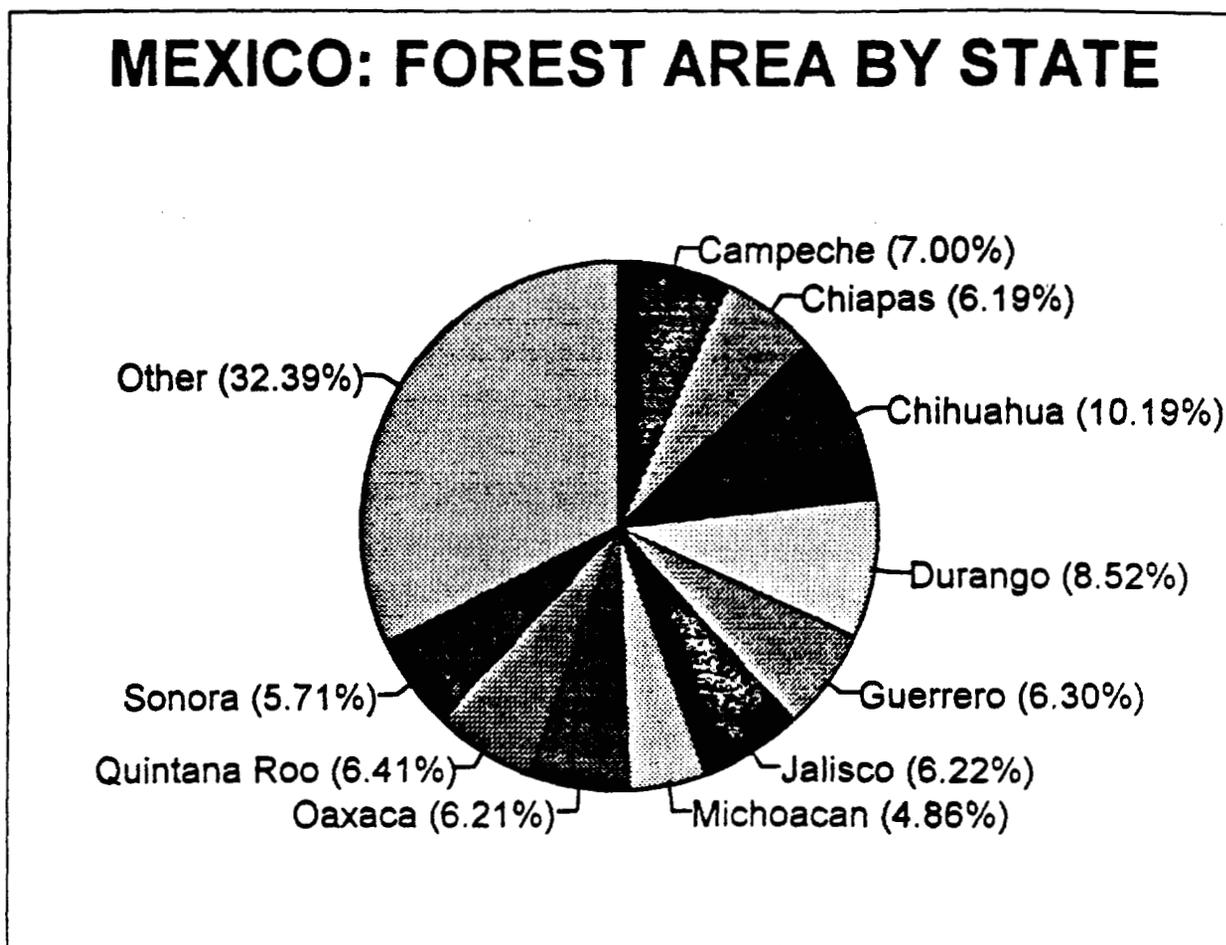


Figure 1- Source: SARH, 1992

The total standing volume of timber on Mexico's forests is estimated at 2.8 billion cubic meters. This includes both temperate forests in the higher altitudes and tropical forests, primarily in the southern portion of the country (Table 2). The temperate coniferous forests are by far the most important forests in the country, from a commercial standpoint. Chiapas has the largest total forest volume (12.3 percent of the total), although much of this is non-commercial (Fig. 2). Chihuahua and Durango have the next largest concentrations of standing forest volume.

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Map 1. Forest Regions of Mexico

FOREIGN ECONOMIC ADMINISTRATION, OFFICE OF ECONOMIC WARFARE
SUPPLY AND RESOURCES DIVISION



Table 2. Mexico's Forested Area and Productive Forest Area

ESTADO	Area Total	"Tierra forestal"	"Bosque"	"Bosque Productivo"
AGS	547	227	64	64
BCN	6,992	6,356	378	162
BCS	7,348	7,232	1,687	175
CAM	5,081	4,158	3,468	2,460
COAH	14,998	13,428	182	182
COL	519	319	261	92
CHIS	7,421	4,853	3,092	2,783
CHIH	24,494	15,553	5,047	4,949
DF	148	40	38	38
DGO	12,318	9,361	4,218	3,852
GTO	3,049	1,446	329	329
GRO	6,428	4,717	3,133	1,971
HGO	2,081	1,566	495	419
JAL	8,084	5,222	3,076	2,550
MEX	2,136	839	483	472
MICH	5,993	4,267	2,408	1,836
MOR	495	183	66	32
NAY	2,698	2,077	1,247	1,000
NL	6,492	5,354	507	507
OAX	9,395	6,482	3,107	2,260
PUE	3,390	2,235	881	412
QRO	1,145	853	200	193
QROO	5,021	4,755	3,175	1,571
SLP	6,307	5,040	710	381
SIN	5,833	4,202	3,251	1,751
SON	18,205	14,347	2,827	1,407
TAB	2,527	648	123	106
TAMPS	7,938	4,770	1,825	466
TLAX	402	176	53	53
VER	7,170	2,993	1,562	796
YUC	3,840	2,535	975	71
ZAC	7,325	5,344	779	721
TOTALES	195,820	141,578	49,647	34,061

MEXICO: TOTAL FOREST VOLUME PERCENT BY STATE, 1992

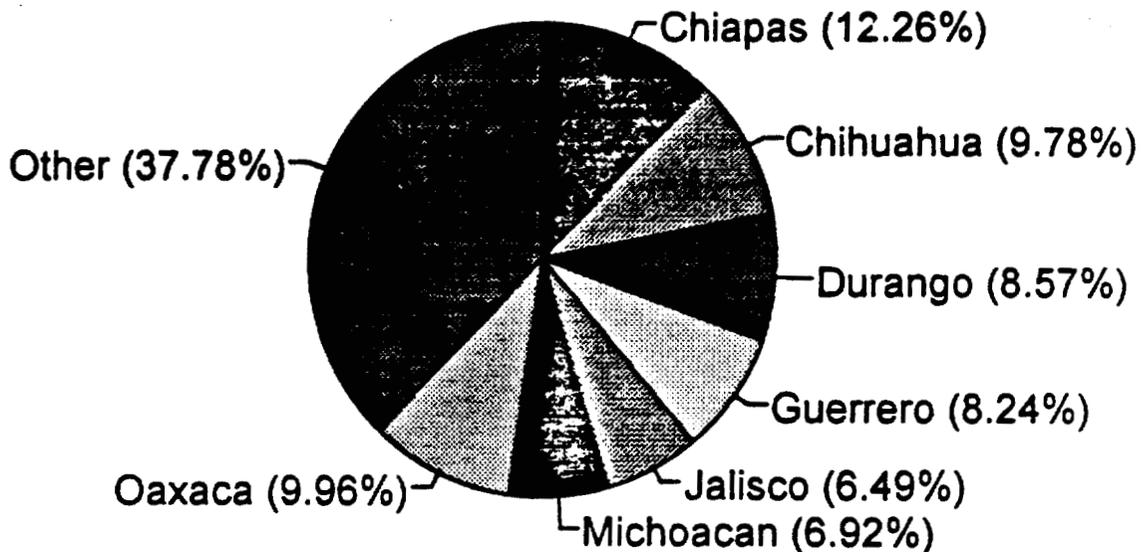


Figure 2 - Source: SARH, 1992

Temperate Coniferous Forests

Mexico's temperate coniferous (mostly pine) and deciduous (oak) forests are located primarily along the Sierra Madre Occidental mountain range which runs North to South in western Mexico.

Temperate coniferous forests represent 34 percent of Mexico's total forest resource base, and contain more than 50 percent of the standing volume of timber. The largest concentration of coniferous forests is found in the northern states of Chihuahua (23.7% of the total) and Durango (20.8%), followed by Guerrero

(6.7%) and Michoacan (6.6%) (Fig. 3). Together, these four states account for almost 58 percent of the coniferous forest area and 56 percent of the standing volume (Fig. 4). The various species of pine dominate this forest type, and account for about 95 percent of the annual harvest. There are 55 different species or sub-species of pine found in Mexico, of which 85 percent are found exclusively in Mexico.

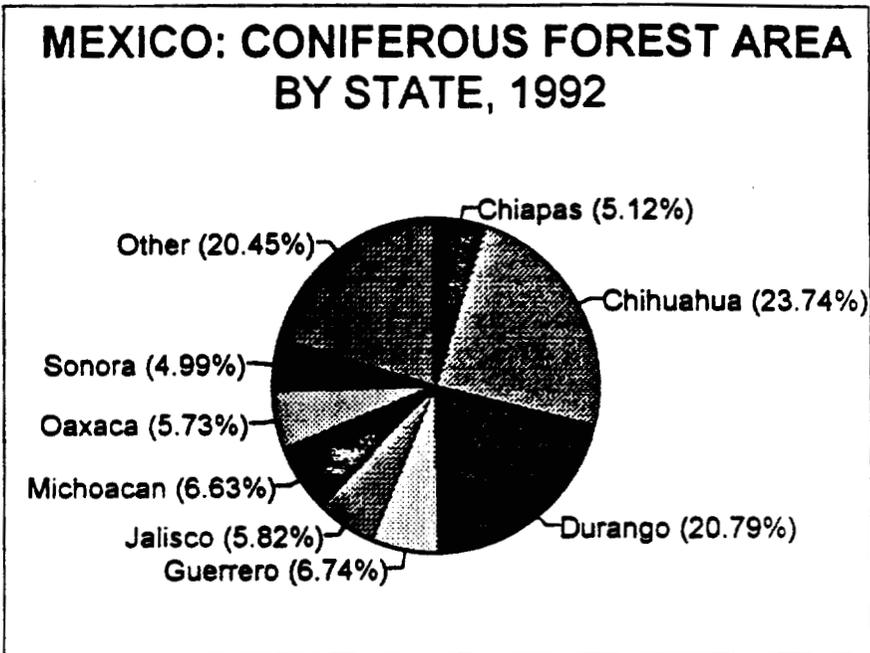


Figure 3 - Source: 1992

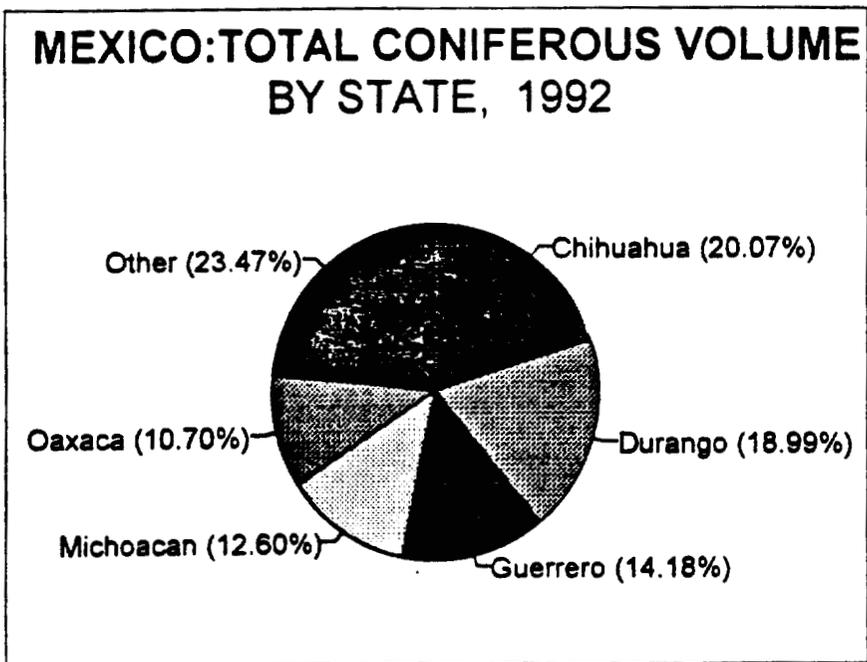


Figure 4 - Source: SARH, 1992

Temperate Deciduous or Hardwood Forests

Temperate deciduous forests cover 17 percent of the total forest area, and contain about 13 percent of the standing timber volume. These forests consist

6

primarily of various species of oak. There are some 138 species or sub-species of oak, 70 percent of which are endemic to Mexico. This type of forest is spread throughout much of Mexico, but the largest areas are primarily in Jalisco (17% of the total area), Chihuahua (11%) and Michoacan (10%). Forty-five percent of the total standing volume of this type of timber is found in these same three states.

Tropical Forests

The current inventory classifies tropical forests as either "altas y medianas" or "bajas". "Altas" are forests whose trees reach a height of 21 meters or more; "medianas" contains trees reaching a height of 10 to 20 meters. In general, these same forests are elsewhere described as just "tropical and subtropical" forests, or "moist" tropical forests, and are those which produce virtually all of the commercial tropical timber. "Bajas", also called "dry" tropical forests, have trees less than 10 meters in height.

The high/medium tropical forests cover 8.7 million hectares, or 18 percent of the total forest base, and contain 26 percent of the standing timber volume. Of this area, only 1.7 million hectares are classified as "altos", or high tropical forests, and 7.0 million hectares are medianas. The states with the largest areas of these moist tropical forests are Campeche (28.3% of the total), Chiapas (18.8%) and Quintana Roo (18.1%) (Fig. 5 shows the area of all tropical forests by state). However, much of this volume is no longer accessible for commercial timber production. For example, although Chiapas contains 34.5 percent of the total standing volume in this forest type, logging is mostly prohibited.

MEXICO: TROPICAL FOREST AREA BY STATE, 1992

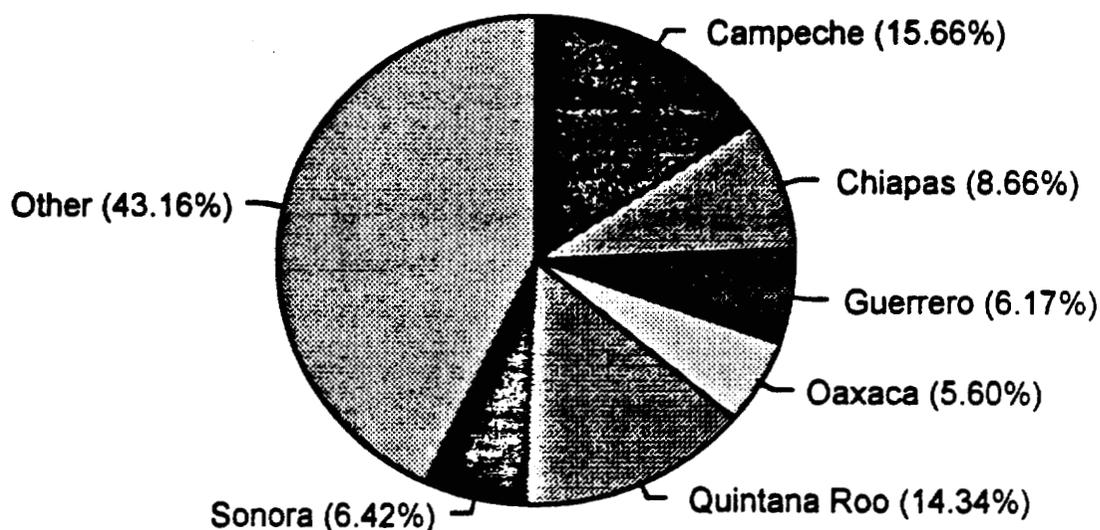


Figure 5 - Source: SARH, 1992

Low tropical forests cover about 31 percent of the total forest base, but contain only 11 percent of the standing volume. These forests are very widespread, but the states' with the largest areas are Quintana Roo (10.4% of the total), Sinaloa (9.8%), and Sonora (9.2%).

Transition forests, or "mesofilos", are found along streams and in canyons in the mountains. These forests represent a very small area of transition between the pine and oak forests and the more moist montane tropical forests. This type of forest is not considered commercial.

Deforestation

Comparisons of this recent inventory with past surveys shows that Mexico's forests have continued to undergo significant deforestation. The 1991 survey using satellite imagery was a different type of survey than had previously been done in Mexico, so it is difficult to make exact comparisons in trying to determine the rate of deforestation. The previous inventory had been done on a regional basis, over a period of almost 25 years, so the comparisons below reflect general trends rather than a comparison of two exact dates. However, SARH has concluded that Mexico's forest resources have been diminishing at a rapid rate.

In general, there has been less deforestation in the temperate forests than in the tropical forests. The deforestation rate has been especially high in the moist tropical forests of southern Mexico. Comparing the 1991 survey with the previous inventory, the total decrease in forest area has been about 7.2 million hectares, or 12.7% (Table 3). However, the moist or "high/medium" tropical forests (defined as areas with the dominant trees greater than 10 meters in height) has lost 23.7 percent of its area compared with previous estimates.

Table 3. Amount of Deforestation in Mexico: Inventory Comparison

Type	1961-1985 Inventory	1991 Inventory	Change	Percent Change

(Million hectares)				
Temperate forest	27.5	25.5	2.0	-7.3%
coniferous	18.7	17.0	1.7	-9.0%
hardwoods	8.8	8.5	0.3	-3.4%
High/medium tropical	11.4	8.7	2.7	-23.7%
Low tropical	17.9	15.4	2.5	-14.0%
Total	56.8	49.6	7.2	-12.7%

Source: SARH, 1992

According to comparative estimates made by the FAO (Food and Agricultural Organization of the United Nations), Mexico's forested area decreased from 55.3 million hectares in 1980 to 51.7 million in 1990, giving an average deforestation rate of about 365,000 hectares per year, or roughly 0.71 %. The FAO forecasts that the rate of deforestation will decrease during the 1990s to 283,000 hectares per year, or a rate of 0.55%. There are reports that the deforestation in 1991 and 1992 was less than 300,000 hectares.

One of the main causes of deforestation has been the slash-and-burn, shifting agriculture practiced by farmers in southern Mexico (Table 4).

Table 4. Principal Causes of Deforestation in Mexico

Type of Forest	Principal Causes	
Temperate Coniferous	Forest Fires	49%
	Grazing	28%
	Illegal cutting	5%
	Farming	16%
Temperate Hardwood	Forest Fires	47%
	Grazing	28%
	Illegal cutting	5%
	Farming	17%
Tropical High/Medium	Grazing/Farming	68%
	Oil production	3%
	Mining	2.5%
	Forest fires	22%
	Logging	2%
Tropical Low	Grazing/Farming	71%
	Logging	21%
	Forest fires	7%

Note: Percentages do not total to 100%

Source: SARH, 1992

In addition to deforestation, the forests of Mexico have been substantially degraded over the years. From a series of several hundred management studies, SARH estimates that 33 percent of the standing timber has been damaged by various causes, including:

Direct human activities (girdling, tapping for resin, etc)	9%
Insects	16%
Fires	27%
Diseases	27%
Wind	6%
Weakness (over mature)	6%
Unknown	9%
 Total	 100%

For example, in 1988 and 1989, more than 500,000 hectares of forest were burned each year. These were unusually bad fire years, and in the pine forest ground fires do not typically kill the dominant trees. However, fires may damage the trees and allow diseases to be introduced.

Reforestation

Reforestation in Mexico began in 1909. Until around 1955, the reforestation efforts were very small scale and were concentrated in the areas around Mexico City and other areas affected by deforestation and environmental degradation. By 1976, there were 110 seedling nurseries in Mexico, producing about 8 million seedlings per year. Official statistics on reforestation, based on the amount of seed produced each year, indicated that 30-60,000 hectares were being reforested per year during the 1980s. However, most of this planting was not done on a commercial basis, and the success rate was very low. For example, a recent World Bank report mentioned one area in which, since 1972, the government had been running a seedling nursery which had a capacity of one million seedlings per year. Yet in the surrounding area, the total extent of forest plantations amounted

to less than 20 hectares.

A recent estimate of the area successfully reforested over the last 30 years totaled less than 500,000 hectares. Thus the area reforested has only amounted to about 6 percent of the area deforested over the last 30 years. The government has increased its planting efforts during the last five years:

Table 5. Area Reforested in Mexico

Year	Area (ha)
1989	36,781
1990	59,040
1991	93,038
1992	100,481
1993	110,863

Source: SARH, 1993

However, most of this planting was done for protection purposes (to stop erosion, protect stream quality, etc):

1992 Reforestation in Mexico - Planting Objective

Protection	58,368 hectares	58%
Commercial	12,315 ha	12%
Agroforestry	13,898 ha	14%
Urban	15,900 ha	16%

One of the largest "debt-for-nature" swap plans will be used to help reforest mountainous areas north of Mexico City, and to preserve plant cover in the Sierra de Guadalupe and Santa Catarina ecological zones. The Inter-American Development Bank is providing the capital for this project, which it is hoped will help clean Mexico City's very polluted air. These forests are not

to be considered commercial plantations, because the trees are not intended for future harvesting.

Commercial Plantations

In fact, an incredibly small area of commercial forest plantations have been established in Mexico, considering the good growing conditions in parts of the country and the proximity to the huge North American wood markets. This has primarily been due to the problem of tenure, on the part of the companies, and the lack of capital on the part of the ejidos.

By far the largest commercial plantations in Mexico are those established by Fabricas de Papel Tuxtepec in Oaxaca in the 1970s. These consist of 9,700 hectares of caribbean pine, planted mainly for pulp production. The growth rates have been reported as 5-6 m³/ha/year, which is much higher than the average growth reported for Mexican forests, but is only about 20-25 percent of the growth rate which could be expected with this same species in Brazil or Argentina. U.S. plantation experts who have visited the forest attribute the relatively slow growth to lack of proper management, especially thinning.

Fibracel, which manufactures fiberboard (hardboard), has announced a joint venture with ejido farmers to establish a 10,000 hectare eucalyptus plantation in the states of San Luis Potosi and Tamaulipas in northeastern Mexico. The plantations, which will be grown on an 8-year cycle, will provide raw material for Fibracel's fiberboard plant in Ciudad de Valles. However, a representative of a U.S. firm which visited the proposed plantation site reported that the soils were not suitable for high-yield plantations.

Simpson Timber Company and Temple-Inland, of the U.S., are close to beginning a project to plant eucalyptus in southeast Mexico. They have recently agreed to purchase property to establish a seedling nursery in Veracruz. They estimate that

growth rates should be about 25 cubic meters per hectares per year to begin with, and that through genetic improvement programs they should be able to double that growth rate over the years.

Grupo Ponderosa has several eucalyptus plantation projects, including an irrigated plantation near the Rio Grande, and two projects near Los Mochis on the Gulf of California. Reportedly, these projects are currently "on hold."

Finally, a very large, ambitious project to plant 300,000 hectares of gmelina and eucalyptus in Tabasco is reportedly set to begin. The group proposing the project is a consortium of Mexican businesses, and the project is evidently tied to a proposed railway and port development project in the town of Paraiso. About 2,000 hectares are scheduled to be planted in 1994.

Growth Rates

Total growth of coniferous species in Mexico is estimated to be about 25 million m³ per year, or an average of only about 1.5 m/ha/year. A World Bank report in 1989 estimated that the Chihuahua/Durango area had an average annual increment of only 1.8 m/ha/year. However, with better management practices, the Bank estimated that the average could be increased to 3.2 m/ha/year. This is still relatively slow compared to other countries; for example, radiata pine in Chile grows at about 20 m/ha/yr. The relatively slow growth in Mexico reflects both the lack of industrial plantations of fast growing species and the lack of intensive management.

Ownership of the forests

An almost universal comment by all authors on the Mexican forest industry is that the forest ownership structure has impeded investment and modernization of the industry, and has been the major factor in declining harvest rates. In Mexico, about 80 percent of the forest belongs to a type of communal ownership, the

ejidos (in reality, the forest belongs to the state, but the ejidos control the forest through a type of perpetual concession). Of the remaining forest, 15 percent are in private hands, and 5 percent belong to the government.

In 1988, CONAFOR reported the ownership of the forests in Durango and Chihuahua, the two most important forest industry states, as follows:

Type of Ownership	Number of entities	Area owned (million ha)	Percent	Average Size (ha)
<u>Durango</u>				
Ejidos	450	6.10	65%	13,560
Communities	142	1.50	16%	10,560
Private	34	1.58	16%	46,470
National	?	0.25	3%	n.a.
 <u>Chihuahua</u>				
Ejidos	268	3.40	67%	12,690
Communities	47	0.30	6%	6,380
Private	1,076	1.30	26%	1,200
National	47	0.05	1%	1,060

Assuming these numbers are correct, it means that the average unit of ownership in Chihuahua is much smaller than in Durango

In 1989, there were more than 6,000 ejidos in Mexico. From these, about 48 percent sold their wood as standing timber to intermediaries, who in turn sold it to sawmills and other processors. Less than 20 percent of the ejidos are vertically integrated to sell logs or finished products.

Under the ejido ownership structure, forest land could only be leased, and only for one year at a time. This restriction greatly discouraged investment in forest management, infrastructure, and processing facilities.

The laws governing ejido tenure system were amended in November, 1991. The Mexican government amended Article 27 of the Mexican Constitution, for the purpose of allowing increased

participation of the private sector on Mexican land. The law eliminates the constitutional prohibition on corporate ownerships of entities engaged in forest and agricultural production, and gives increased protection against expropriation. Forest land may now be bought, sold or leased by both individuals and corporations. Land holdings are still limited - individuals may own up to 800 hectares and corporations with 25 stockholders or more may own as much as 25,000 hectares.

These land reforms may have an important impact in the longer term, but haven't had a big affect yet. Industry is cautious, and often lacks capital for land purchase and infrastructure development. Mexican companies have been looking to form joint venture projects with foreign firms in order to obtain capital for development.

Timber Production

The industrial timber harvest in Mexico has been declining steadily for the last 7 years. In 1987, total industrial wood production was 9.8 million m³. The U.S. Foreign Agricultural Service estimates that the 1993 harvest was only about 6.91 million m³, a 29 percent reduction in volume (Fig. 6).¹ Of this total, 88 percent was coniferous species, 5 percent was temperate hardwoods, and the remainder was tropical species.

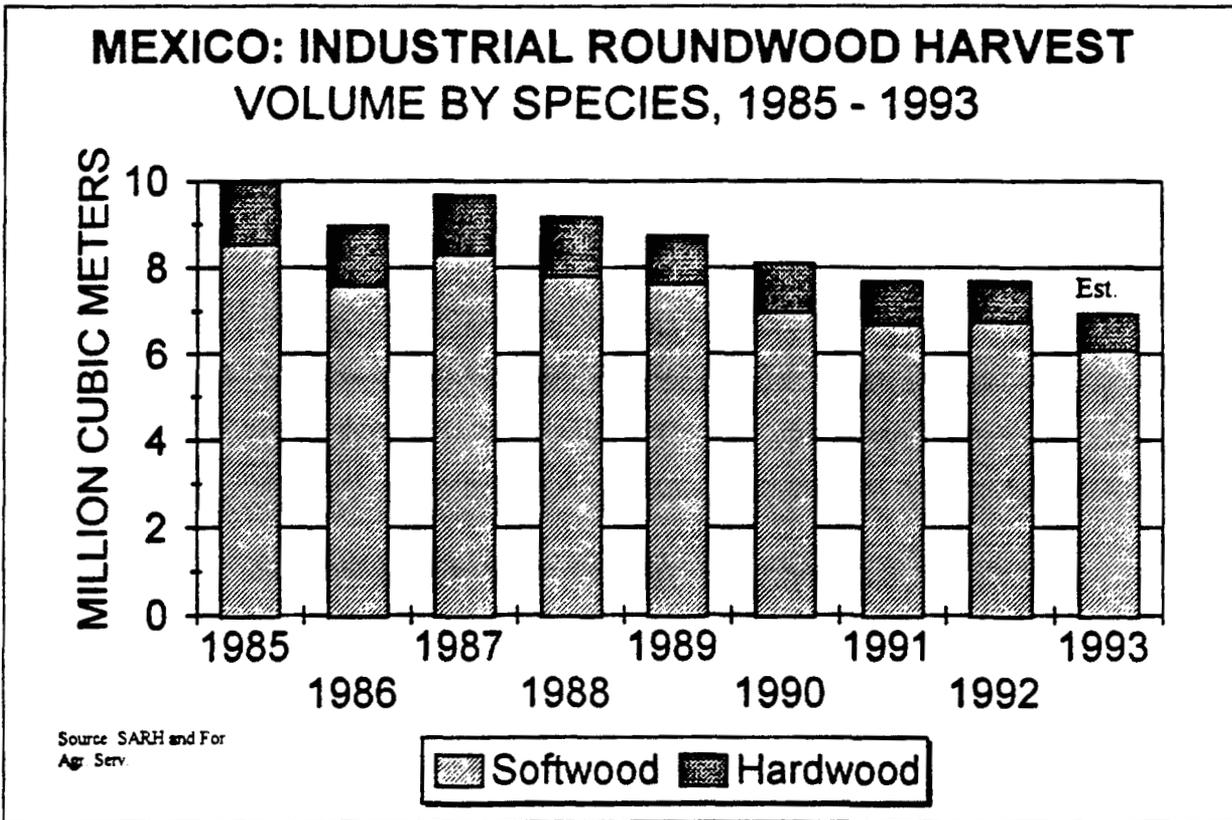


Figure 6

The above volumes are only for the officially licensed industrial roundwood harvest. Informal estimates are that the total industrial harvest may be twice as large as officially

¹ Note that the species breakdown between those statistics reported by SARH and FAS do not correspond exactly, especially in the hardwood category.

69

reported. However, the statistics on lumber production indicate a level of output which might be expected with the official timber harvest volume. Therefore, if it is true that the actual harvest greatly exceeds the reported harvest, then either the lumber production statistics greatly underestimate the true volume of lumber production, or Mexican sawmills are even more inefficient than previously thought. In addition, various reports estimate that the total national fuelwood consumption in Mexico ranges from 10 to 28 million cubic meters per year. A recent World Bank study estimated that if the true industrial timber harvest is double the reported volume (which would make the true volume about 15 million m³), and if harvesting for firewood is about 20 million m³, then the total timber removals are about 35 million m³.

The coniferous timber harvest has declined by more than 2.3 million cubic meters since 1987, a 28 percent decline. Various species of pine account for about 95 percent of the harvest of coniferous species, or about 83-84 percent of the total harvest. Several species of fir and some cypress account for the remaining volume of coniferous species harvested. This decline in coniferous timber supply has had a significant negative impact on the Mexican forest products industry. According to SARH, the official harvest of coniferous timber in 1993 was only about 24 percent of the growth. However, as stated previously, the total harvest is likely much greater than that officially reported, so that the actual harvest is much closer to, and in some locations exceeds, actual growth.

Both temperate and tropical hardwood timber harvests have also officially declined since 1987, although the production of lumber of these species has increased. Pressure from international environmental groups will help to lower the timber harvest in tropical forests. The harvest in temperate hardwood forests will likely continue at about the current level, although hardwood logs and lumber from the U.S. will increasingly be utilized.

Fig. 7 shows the share of the 1992 timber harvest accounted for by each state. Durango and Chihuahua made up almost one-half of the total harvest. Michoacan, Jalisco, and Oaxaca are the next most important timber producers. Note that the reported harvest in these

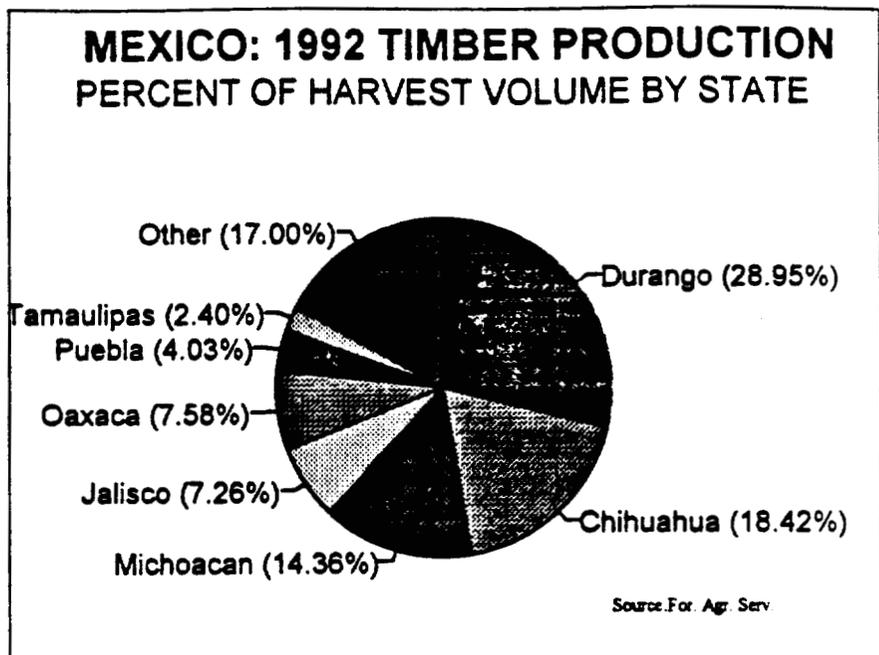
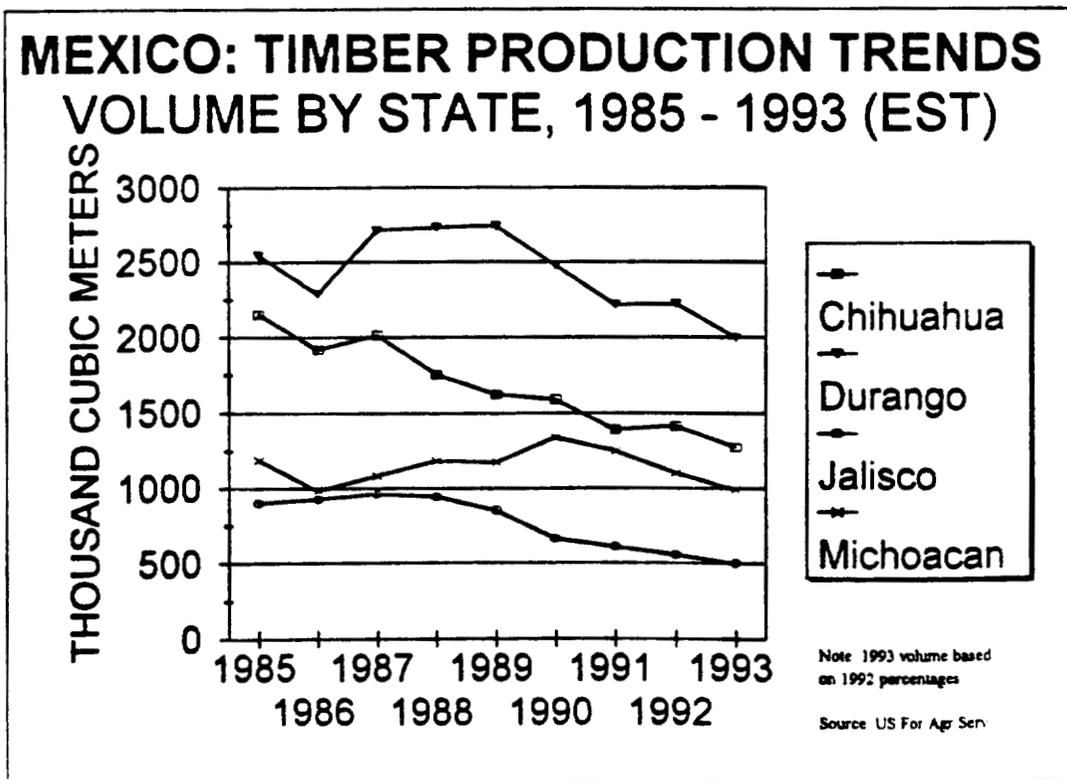


Figure 7

important states has declined sharply since 1987, except in Michoacan (Fig. 8).



69

Mexico's Forest Industry

Sawmills

In a review of the Mexican forest products industry, a recent study by the consulting firm of Deloitte & Touche employed a Mexican firm to interview managers of Mexico's larger sawmills and lumber distribution yards. Despite this in-country effort, they found it extremely difficult to obtain reliable, detailed information on Mexico's industry:

"The industry has a fragmented, regionalized structure which limits the transfer of market information. Although the industry has a relatively well-developed network of industry associations, consistent industry reporting and monitoring practices are absent. As a result, reliable statistical information does not exist in this market. Not only is statistical information scant, but, given the fragmented nature of many of the segments, industry participants have a relatively poor idea of how they are performing relative to the industry. For instance, industry participants have diverging opinions on basic industry benchmarks such as the top forest products companies in Mexico or the growth rate of the industry or of a particular market segment."

In 1991, there were an estimated 1543 sawmills in Mexico (the number shown in Table 6 is smaller, because it includes the number of factories, some of which contain more than one sawmill line). In addition to the sawmills, in 1991 there were 1,144 box plants, making wooden fruit/vegetable containers and other packaging material. Sixty-seven percent of the sawmills in Mexico are located in the states of Durango, Chihuahua, Michoacan, Jalisco, and Oaxaca. According to one recent estimate, these five states account for about 77 percent of the country's lumber production (Table 7).

Table 6. Distribution of Forest Industry Facilities

State	Sawmills	Boxes furniture etc.	Plywood, veneer, sheets	Pulp, paper, chips	Impreg- nation	Non-Timber	Total
AGS							0
BCN						4	4
BCS							0
CAM	21		4			2	27
COAH	11					11	22
COL	3	23					28
CHIS	24		2				26
CHIH	236	64	2	1			303
DF	6	3	2				11
DGO	212	208	11	3	4		438
GTO							0
GRO	48	3	1				52
HGO	20	9	1	2			32
JAL	70	36	2	3			111
MEX	48	6	6	5		1	66
MICH	232	1056	4	7	1	10	1310
MOR							0
NAY	9	22					31
NL	25	4					29
OAX	64	17		1			82
PUE	48	9					57
QRO	6						6
QROO	18	3	2				23
SLP	4		1	1		2	8
SIN	16	30					46
SON	18						18
TAB	6						6
TAMPS	11	1					12
TLAX	11	5			1		17
VER	16	9			1	3	29
YUC	15	1					16
ZAC	9	3					12
Total	1207	1514	38	23	7	33	2822

Table showing National Distribution of Timber Industries, 1992 (SFF, D.G. de Política Forestal)

Lumber Production

Eighty-seven percent of the lumber produced in Mexico in 1992 was softwood, 5 percent was of temperate hardwood species, and 8 percent was of tropical hardwood species. Softwood lumber production in Mexico declined from a recent high of 2.6 million m³ in 1989 to an estimated 2.1 million m³ in 1993 (Table 8).¹ In late 1993, the FAS reported that "Sawmills are currently working at very low production levels of about 30 percent of capacity. Some sawmills have closed down because of capital and roundwood shortages." The decline in production has been attributed to weakness in the furniture sector and problems with log supply.

Despite the fact that the official harvest of hardwood species, both tropical and temperate, has been decreasing in recent years, the reported production of hardwood lumber has increased. For example, temperate hardwood lumber increased from 77,000 m³ in 1987 to 132,000 m³ in 1992; similarly, tropical hardwood lumber increased from 92,000 m³ in 1987 to 212,000 m³ in 1992 (Table 9). This anomaly is likely due to several factors: decreasing use of tropical hardwood logs for plywood, increasing imports of temperate hardwood logs from the U.S., and, most importantly, an under-reporting of the hardwood harvest.

Putting Mexico's lumber production in perspective, in 1991 the country's official lumber output was roughly 1.15 billion board (assuming 2.36 m³ per MBF). That was less than half of the lumber produced in the state of Georgia in the same year, and was only about 5 percent greater than Virginia's lumber production.

¹ Mexico's lumber production statistics correspond a little too closely to the roundwood consumption figures; it is likely that either a) lumber production in Mexico is estimated from the roundwood consumption data (which in turn is just an estimate) or b) the roundwood consumption figure for sawmills is estimated based on lumber production statistics. In either case, most analysts suspect that both the timber harvest and lumber production statistics underestimate the true figures by a wide margin.

Table 7. Mexico's lumber production by state, 1992

State	# of sawmills	Percent of Total Lumber Production
Durango	199	28.7%
Chihuahua	231	18.1%
Michoacan	575	16.2%
Jalisco	70	8.0%
Oaxaca	98	6.2%

Source: CNIF

Table 8. Softwood Lumber Production in Mexico

Year	Production	Imports (thousand cubic meters)	Exports	Consumption	% from U.S.
1982					
1983					
1984	2285	214	6	2493	8.6%
1985	2480	258	15	2723	9.5%
1986	2368	302	310	2360	12.8%
1987	2550	402	582	2370	17.0%
1988	2505	678	225	2958	22.9%
1989	2600	671	140	3131	21.4%
1990	2498	866	124	3240	26.7%
1991	2345	877	27	3195	27.4%
1992	2300	949	26	3223	29.4%
1993	2100	750	26	2824	26.6%

Source: U.S. For. Agr. Serv.

Note: Imports are U.S. export volumes to Mexico
1993 imports estimate based on first 10 months

Table 9. Mexico's Hardwood Lumber production

Year	Temperate Hardwood Production	Imports	Exports	Consumption	%US	Tropical lumber production
(Volume in thousand cubic meters)						
1984	72	39	0	111	35.1%	122
1985	75	37	0	112	33.0%	128
1986	70	45	10	105	42.9%	110
1987	77	74	9	142	52.1%	92
1988	80	111	5	186	59.7%	110
1989	83	109	8	184	59.2%	86
1990	80	84	1	163	51.5%	84
1991	135	105	63	177	59.3%	216
1992	132	127	2	257	49.4%	212
1993	120	122	0	242	50.4%	193

Source: U.S. For. Agr. Serv.

Note: Imports are U.S. export volumes to Mexico
1993 imports estimate based on first 10 months

Lumber Usage in Mexico

Table 10. Uses of Lumber in Mexico, 1992

<u>Use</u>	<u>Softwood</u> %		<u>Hardwood</u> %		<u>Total</u>	<u>%</u>
	(Usage in 1,000 cubic meters)					
Construction/ Joinery	2346	73%	255	46%	2601	69%
Packaging/ Crates	370	11%			370	10%
Furniture	506	16%	294	54%	800	21%
Total	3222	100%	549	100%	3771	100%

Source: World Bank, 1993

The use of softwood in construction is primarily for concrete forming and other temporary uses for structural purposes. U.S.-style timber frame construction for housing is very uncommon. In 1991, there were 273,000 dwellings built in Mexico, of which only 1500 were timber frame construction. Softwood used for joinery in the domestic market is found in shops, restaurants, hotels and in some new housing and renovation work. Softwood is also used in doors, mouldings and millwork, mostly for export.²

More than half of the tropical lumber produced in southern Mexico is used in construction, simply because of the lack of alternatives. The rest is used in the domestic furniture industry. Temperate hardwoods (about 40-45 percent of hardwood lumber consumption in 1992) are used in roughly equal proportions in the furniture and construction/joinery industries.

² It is generally acknowledged that Mexico's statistics on lumber consumption do not reflect all the lumber imported into maquiladora plants and then later exported. Thus the amount of softwood lumber actually consumed for moulding, millwork, and furniture, is much higher than shown here.

Problems Facing the Lumber Industry

A number of recent reports (see bibliography) have discussed the numerous problems facing the Mexican sawmill industry. There is general agreement on the following problems:

1. The majority of sawmills are small, (uneconomical in size), and scattered throughout the mountains in remote locations.
2. The larger sawmills, still small by international standards, are clustered in a few commercial centers, located far from the forest resource.
3. The road system is poor, and combined with the long hauling distance, makes transport costs very high for the raw material.
4. In addition, the poor roads, which experience frequent washouts in winter, make log supply uncertain.
5. Most sawmills are old, with primitive technology. Their inefficiency and high raw material costs make their products uncompetitive by international standards.
6. Most mills do not have chippers, or material handling capability to recover the residual chips and/or hog fuel.
7. There are few dry kilns at the sawmills, and little anti-stain treating capability.
8. The quality of logs available, especially of peeler grades for plywood, has become increasingly worse.
9. There are a wide range of species in Mexico (55 types of pine, more than 130 species of oaks), which makes it difficult to standardize production and grading.

10. In general, there is no uniform, standardized grading system, and much lumber sells without a quality grade at all.

11. At the mills, there is a general lack of production management/quality control.

12. Perhaps most importantly, few mills have a secure timber base; most have to contract for logs on an annual basis with many ejidos and small landowners. This has made the industry very reluctant to invest in more modern equipment, and in many cases has made it impossible for companies to invest in modernization, because banks are generally unwilling to loan to mills without a secure timber supply.

Logging and Transportation costs

One of the other major factors which puts the Mexican forest industry at a severe disadvantage is the much higher cost of transporting logs to the mills. According to one expert, the average distance from the forest to the sawmill in the state of Durango is 250 kilometers, versus 100 kilometers in the U.S. Another source cited hauling distances of up to 1,000 kilometers, and round-trip hauls of 72 hours. As pointed out below, virtually all of the better, larger sawmills are located in production centers such as the cities of Durango, Chihuahua, Uruapan, Morelia, etc., long distances from the forests.

Logging costs are relatively high, because much of the forest is located in steep areas. In addition, the logging roads are in very poor conditions and are generally impassable in some of the winter months. This means not only that travel time is even longer than would be indicated by the distance to the mills, but that log supply is simply unavailable during some months. Uncertainty of supply makes it difficult to supply customers on a regular basis,

and adds to the dis-incentives for industry to invest in more modern facilities.

The cost breakdown for delivered log costs is highly variable in Mexico. One World Bank study found that the average breakdown of costs for roundwood delivered to a sawmill in Durango was: 16% stumpage (to timber owners); 55% harvesting and road transportation; 8 percent technical services, 18% administration; and 3% others.

Sawmill Technology

There are a few relatively large, modern (late-1970's technology) sawmills, but the majority are small, old, inefficient, and often poorly located. Very few lumber or plywood producers own their own forests. This lack of linkage between the forest and industry has hampered development.

Mexican sawmills are generally quite small, with an average installed capacity 8,000 cubic meters per year. A mill producing 10,000-15,000 m³ per year is considered large. For example, a 1989 World Bank study found that in the primary sawmilling states of Chihuahua and Durango, only 15 of the 163 sawmills in Durango had an annual capacity of over 20,000 m³ of log input (less than 10,000 m³ of lumber production). Similarly, in Chihuahua, only 12 of the 197 sawmills had a log input capacity of over 20,000 m³.

In Chihuahua and Durango, about one-half the sawmills are owned by ejidos and communities, while the other half are owned by private firms. The private mills are generally more efficient, and obtain a higher conversion from logs to lumber (about 50%), compared with the ejido mills (40%). However, the private mills are generally located in the urban centers, far from the forest resource.

The level of technology in Mexican sawmills is generally quite low. Few plants have debarking capability, and log infeed is made manually (by hand!) Most sawmills have one band-or circular saw headrigs, with carriage driven by cables and manual squaring feed. Machinery is driven by diesel or electrical motors, even where electric energy supply is available. The machinery is generally 15-30 years old, and second-hand machinery is widely used.

Very few sawmills have their own dry kilns. Most lumber is sawn full sized and air-dried; then it is shipped in rough form, mill run (ungraded) to a distribution yard. The lumber is often kiln-dried and finished at a remanufacturing or furniture plant. According to a World Bank study, planer mills at these distribution centers generally are equipped with drykilns and boilers using waste wood as combustion fuel. Eighty percent of Mexico's lumber production is relatively low quality, of the third and fourth grades, and is primarily used for concrete forming.

Because of poor equipment, sawing is inaccurate and the yield of wood is typically close to 40 percent. At many of the small mills, wood wastes are not utilized because sawmills lack chippers and equipment to handle the residuals. It is typical for small mills to allow local people into their sawmill after hours, to clean up the waste wood for fuel.

The low degree of vertical integration in the industry results in high distribution costs and in an inefficient marketing system. Deloitte & Touche described the Mexican wood products distribution system as "far from a uniform process flow, but rather is a highly regionalized, fragmented system replete with logistical complications and inefficiencies. With the exception of five large distribution operations that successfully import from the United States, most Mexican wood processors are very small businesses with a cultivated set of familiar buyers. The distributor/buyer relationship is often based not on competitive pricing and service,

but built on regional and family ties."

Sawmill cost structure

A recent World Bank study estimated that the cost structure of lumber production in Durango and Chihuahua was approximately:

Roundwood	73 %
Labor	16 %
Energy	2%
Maintenance, etc	4%
Administration	5%
Total	100%

Major Forest Products Companies

The primary lumber producing states are Durango, Chihuahua, Michoacan, Jalisco, and Oaxaca. Based on the number of sawmills relative to lumber production, the average mill size in Michoacan is much smaller than in Chihuahua and Durango. Table 11 lists the major producers in the latter two states, and indicates how concentrated the larger mills are. In Chihuahua, all of the major mills, with one exception, are located either in the town of Chihuahua or in Parral. In Durango, 80 percent of the mills are located between the cities of Durango and Santiago Papiasquiario, with almost all the large producers clustered near the city of Durango. Michoacan has hundreds of small producers scattered through the mountainous state, but almost all of the larger mills are located in the Uruapan-Patzcuaro-Morelia area. Guadalajara is the main commercial center for the sawmill industry in Jalisco. In Oaxaca, the cities of Oaxaca and Puebla are the two most important sawmill centers.

79

Table 11. Major Lumber and Plywood Producers in Chihuahua and Durango

Company	Location	Lumber	Plywood	Particle-board
Chihuahua				
Bosques de Chihuahua	Chihuahua	X	X	
Duraplay de Parral	Parral		X	X
Industrializadora Forestal San Paulino	Chihuahua	X	X	
Maderas Sisoguichic	Chihuahua	X		
Maderas Tutuaca	Chihuahua	X		
Panales Ponderosa	Chihuahua			X
Rachali de Chihuahua	Chihuahua	X		
Sepulveda Manufacturera	Parral	X		
Durango				
Cia. Triplayera de Durango	Durango		X	
Cia. Maderera del Guadiana	Durango	X		
Enchapados Alfa	Durango	X	X	
Fabrica de Muebles Durango	Durango	X	X	
Forestal Bosques de Durango	Durango	X		
Forestal Chapultepec	Durango	X	X	
Forestal Halcon	Durango	X	X	
Grupo Industrial Durango	Durango	X		
Grupo Industrial Guadiana	Durango	X		X
Industrial Pinos Altos	Durango	X		
Industrializadora de Maderas de Dur.	Durango	X		
Maderas Pinelli	Durango	X		
Pino Exporta	Durango	X		
Plywood Ponderosa de Durango	Durango		X	
Productora de Triplay	Durango	X	X	
Triplay Y Maderas del Norte	Durango	X	X	
Triplay Plywood Ponderosa de Durang	Durango		X	

Source: CNIF

Note: These companies have been described as "some of the larger producers in this region"

20

Plywood Industry

The plywood industry in Mexico consists of 35 plants which consume roughly 7-8 percent of the total roundwood harvest, or about 556,000 m³ in 1991. The total production of plywood in Mexico in 1991, about 565 million square feet (on a 3/8") basis, is the production equivalent of 3.5 average-sized mills in the United States.

Plywood production in Mexico has been decreasing steadily since 1982, when 313,000 m³ of softwood plywood were produced (Table 12). Total production of softwood plywood in 1992 was only 157,000 m³, and this was expected to fall to 141,000 m³ in 1993. Most of this production is of ponderosa pine, and is used in the furniture industry. There is increasing demand in Mexico for U.S. softwood plywood for use in concrete forming. Imports of U.S. plywood increased from only 7,000 m³ in 1986 to 181,000 m³ in 1992, and were expected to reach 195,00 m³ in 1993. This level of imports will represent about 58 percent of Mexican consumption of softwood plywood.

Hardwood plywood production has been much less important in Mexico. Temperate hardwood plywood production peaked in 1991 at only 9,000 m³, and declined to an estimated 7,000 m³ in 1993 (Table 13). About 90 percent of temperate hardwood plywood consumption is provided by imports from the U.S. Tropical hardwood plywood production has decreased steadily from 55,000 m³ in 1984 to an estimated 10,000 m³ in 1993. The decline in production has been attributed to pressure to decrease logging in tropical forests in Mexico. In 1992, 41,000 m³ of tropical hardwood plywood were imported from Indonesia to supply the needs of the furniture industry.

Table 12. Mexico's Softwood Plywood Production and Trade

Year	Production	Imports	Exports	Consumption	% from U.S.
	(Volume in thousand cubic meters)				
1982	313	5	2	316	1.6%
1983	286	6	17	275	2.2%
1984	230	20	8	242	8.3%
1985	218	18	0	236	7.6%
1986	218	7	16	209	3.3%
1987	229	11	22	218	5.0%
1988	183	18	8	193	9.3%
1989	148	24	6	166	14.5%
1990	132	60	3	189	31.7%
1991	160	132	2	290	45.5%
1992	157	181	1	337	53.7%
1993	141	195	1	335	58.2%

Source: U.S. Foreign Agricultural Service

Table 13. Mexico's Temperate Hardwood Plywood Production Imports Consumption
(Volume in thousand cubic meters)

Year	Production	Imports	Consumption	% from U.S.
1984	1	4	5	80.0%
1985	1	8	9	88.9%
1986	3	7	10	70.0%
1987	3	16	19	84.2%
1988	2	33	35	94.3%
1989	2	27	29	93.1%
1990	8	43	51	84.3%
1991	9	71	80	88.8%
1992	8	82	90	91.1%
1993	7	67	74	90.5%

Source: U.S. Foreign Agricultural Service

47

Machinery in the plywood plants is typically 15-20 years old, but there has been some investment in equipment in recent years. The cost structure for plywood production has been estimated by the World Bank at:

Roundwood	63%
Resins	4%
Energy	9%
Maintenance, etc	5%
Labor	10%
Administration	9%
Total	100%

Particleboard and other reconstituted panels

Particleboard

There are 9 particleboard plants, three hardboard (fiberboard) plants, and one MDF plant operating in Mexico. These plants are scattered through Mexico to take advantage of residual or waste fiber produced by the nation's sawmills.

Particleboard is by far the leading reconstituted wood panel product, accounting for about 90 percent of total production in Mexico in 1992. The mills have been described as "relatively efficient" by one industry expert. Production was stagnant between 1985 and 1992, at around 400,000 cubic meters per year (Table 14). In 1992, Mexican particleboard plants were operating at 59 percent of capacity. Three particleboard plants closed down in 1993, "temporarily", because of weakness in the furniture industry. Mexican production was expected to drop to only about 325,000 m³.

U.S. exports of particleboard to Mexico increased from 10,000

m³ in 1985 to more than 75,000 m³ in 1992. U.S.-made particleboard had about a 16 percent share of the Mexican market in 1992. In 1993, imports of U.S. particleboard were expected to increase to about 100,000 m³, which, with lower Mexican production, would mean that U.S. imports would account for roughly 24 percent of production. The duty on imports of U.S. particleboard is currently 20 percent, and is to be phased out over a ten year period under NAFTA.

Particleboard in Mexico is used primarily in the furniture industry. In general, Mexican furniture manufacturers believe that U.S. particleboard is superior to that produced in Mexico in terms of internal bond, uniformity of thickness and general quality control. Mexican particleboard has a lower density (30-40 lbs/ft³) than U.S. boards. Mexican particleboard is sold in many thicknesses, ranging from 2mm to 38mm, 0.91, 1.22, and 1.83 m in width, and lengths ranging from 1.83m to 7.32 m.

Exact figures on the consumption of waste wood fiber by Mexico's particleboard plants is unavailable, but data on one of the larger producers is indicative of the industry. Paneles Ponderosa has a large particleboard plant in Chihuahua that exports 30 percent of its production to the U.S. The plant has a capacity of 131,000 m³, of which 60 percent is standard particleboard and 40 percent is melamine laminated board. This plant utilizes much of the waste fines, bark and chips from sawmills belonging to the Ponderosa group. Residual chips provide 70 percent of their raw material needs. In addition, it uses 30 percent roundwood to produce chips. One recent study estimates that the industry average is 25 percent roundwood and 75 percent residual chips.

Industrias Resistol, the largest particleboard producer in Mexico, operates two laminated and particleboard plants (one location), in Michoacan, relatively close to Mexico City. Recently, Industrias Resistol and Paneles Ponderosa, the two

largest particleboard producers in the country, have formed a joint marketing company, Decorlam. Now Paneles Ponderosa covers the export market, while Resistol concentrates on the Mexico City market.

Table 15 lists the existing particleboard plants in Mexico and their rated capacities. The only expansion in recent years has been a new line of 45,000 m³ capacity that Maderas Conglomeradas added at its San Juan Ixhuatepec complex. However, a company in Tijuana is reportedly in the process of setting up a used particleboard plant there to take advantage of the large quantity of wood wastes from the woodworking maquiladora plants.

Hardboard

There are three hardboard plants in Mexico, owned by Maderas Conglomeradas, S.A., Fibrasin, S.A., and Fibracel, S.A. Fibracel's plant, located in Ciudad de Valles in San Luis Potosi, is currently not operating. It reportedly has an annual capacity of 125,000 m³. Hardboard production in Mexico fell from a high of 63,000 m³ in 1987 to only 23,000 m³ in 1989. Since then, production rebounded somewhat, to 44,000 m³ in 1992. Production in 1993 was expected to be about the same. Production has been limited to about one-third of capacity because of a lack of suitable raw material. Hardboard is used in the automotive industry (25%), furniture industry (30%), doors (25%), paneling (10%) and packaging (10%).

As recently as 1991, about 20,000 m³ of Mexican hardboard was exported each year. Currently, Mexico is not exporting hardboard. Imports of U.S. hardboard jumped from 8,000 m³ in 1990 to 20,000 m³ in 1992, which was about 30 percent of the total market. Currently, the duty on imports of hardboard from the U.S. is 15%, but this duty will be phased out over a five year period. Brazil has also supplied about 4-5,000 m³ of hardboard to Mexico each year for the last several years.

Table 14. Mexico's Particleboard Production

	Production	Imports	Exports	Consumption	% from U.S.
	(volume in thousand cubic meters)				
1982	412	12.6	2	422.6	3.0%
1983	335	2.7	72	265.7	1.0%
1984	379	2.4	66	315.4	0.8%
1985	395	10.4	60	345.4	3.0%
1986	403	20.9	111	312.9	6.7%
1987	423	31.6	118	336.6	9.4%
1988	419	29.8	136	312.8	9.5%
1989	414	54.1	70	398.1	13.6%
1990	352	60.6	41	371.6	16.3%
1991	414	55.2	27	442.2	12.5%
1992	405	75.6	0	480.6	15.7%
1993	325	100.0	0	425.0	23.5%

Source: U.S. Foreign Agricultural Service

Table 15. Mexican Particleboard Plant Capacity - 1993

State	Company	City	Annual Capacity	
			MMSF	MCM
Chihuahua	Duraplay de Parral, S.A. de C.V.	Parral	51	90
	Paneles Ponderosa, S.A.	Chihuahua	74	131
Durango	Grupo Guadiana, S.A.	Durango	43	76
	Maderas Moldeadas, S.A. de C.V.	Durango	17	30
Jalisco	Industrias Emman, S.A. de C.V.	Ocotian	17	30
Mexico	Maderas Conglomeradas, SA de C\	San Juan Ixhuatepec	45	80
Michoacan	Industrias, S.A.	Zitacuaro	85	150
Oaxaca	Novapan de Mexico, S.A.	Oaxaca	28	50
Yucatan	Comasa	Colonia	21	37
Total			381	674

Notes: MMSF= million square feet on a 3/4 inch basis
Maderas Conglomeradas includes 1993 expansion

Source: National Particleboard Association

86

Faced with a decreasing supply of raw material and increasing competition from U.S. products, some producers in Mexico are making efforts to modernize and to ensure a more stable supply of raw material. For example, Fibracel is modernizing its Ciudad de Valles hardboard plant, and is in the processing of establishing eucalyptus plantations to provide a more stable supply of raw material.

Medium Density Fibreboard (MDF)

There is only one MDF plant in Mexico, owned by Maderas Conglomeradas in the state of Mexico located in San Juan Ixhuatepec, just north of Mexico City. Although its capacity is 25,000 m³, it has not produced at that level since 1989. In 1990 and 1991, the plant produced only 7-8,000 m³. The company claimed that a shortage of suitable chips in the domestic market prevented a higher operating rate. In the early 1990s, they began importing softwood logs for processing into chips to ensure adequate raw material supplies.

As & Dev. Dir. Rogelio Magaña C.
Finan. Dir. Eduardo Baltazares
Eng. Dir. Mayolo Navarro
Admin. Dir. Ruben Molina
Mill Locations:
 Tuztepec (pulp & paper mill)
Sales offices & sales agents:
 P.P.S.A., Poniente 140, No. 840,
 Mexico, D.F., Tel: 5 67 25 11

NOT PRODUCE PULP
Tuztepec SA, Fabricas de Papel
 Apdo. Postal 50
 68300 Tuztepec, Oax., Mexico
 Phone: 287 50407
Personnel:
Mill Mgr.: Rogelio Ortega
Ass. Mill Mgr.: Silverio Contreras Vidal
Tech. Mgr.: Sergio Moreno Garcia
Purch. Agent: Lina Adame Ortiz
Total Employees at This Location:
 665

Type of Operation: pulp, paper
Pulp Grades & Capacities:
 Total pulp capacity: 174,420 m³/yr
 Pulp available for market: 17,100 m³/yr
Principal categories:
 stone groundwood—51,300 m³/yr
 BSCM—123,120 m³/yr
Raw Material Data:
 Wood deliveries to mill:
 Pulpwood as logs or roundwood:
 376,748 m³/yr
 Pulpwood as chips: 113,024 m³/yr
Pulp Mill Data:
 Chippers: 3
 Type of chip transport: pneumatic
 conveyor & mechanical conveyor
 Conventional grinders: 6
 BMP systems: 5
 TMP systems: 3
Paper & Paperboard Grades & Capacities:
 Paper capacity: 170,000 m³/yr
Principal categories:
 newsprint—170,000 m³/yr
Grades:
 Newsprint

Paper & Paperboard Mill Data:
 Paper Machines: 2
 No. 1, fourdrinier, installed 1958,
 rebuilt 1975, trim width 4.4 m,
 max. speed 580.0 m/min
 No. 2, twin-wire, installed 1984, trim
 width 6.7 m, max. speed 900.0
 m/min
Power Plant, Water & Effluent
Data:
 Power boilers: 3 at 80 steam tons/hr

UNIPAK SA
 Amsterdam 29, Col. Hipódromo
 Condesa, Del Cuauhtémoc
 6170 Mexico, D.F., Mexico
 Phone: 533 60 76
Personnel:
Dir.: M. Gomez Pimienta
Gen. Mgr.: José Gómez Pérez
Mill Locations:
 Cuernavaca, Morelos (paperboard mill)

Unipak SA
 Apdo. Postal 944
 92450 Cuernavaca, Morelos, Mexico
 Phone: 5 01 11, 5 65 20
 Telex: 173357 upakme
Mill Location: San Juan Esq. con
 Atlacomulco s/n Col. Chapultepec
Type of Operation: paperboard

Paper & Paperboard Grades & Capacities:
 Corrugating medium, Linerboard kraft

UNITED SA DE CV, EMPAQUES DE CARTON
 Etzaltan 25-A, Col. Popular Rastro
 15220 Mexico, D.F., Mexico
 Phone: 789 90 88
 Telex: 1762303 eounme
Personnel:
Chmn. of the Board: Luis Gonzalez Diaz
Prod. Mgr.: Marcos Almazan
Sis. Dir.: Jose Caso Perez
Purch. Dir.: Roberto Macias Velazquez
Mill Locations:
 Mexico, D.F. (paperboard mill)

United SA de CV, Empaques de Carton
 Apdo. Postal 2 421
 15220 Mexico, D.F., Mexico
 Phone: 789 90 88
 Telex: 1762303 eounme
Mill Location: Alumino 196, Col.
 Popular Rastro
Personnel:
Mill Mgr.: F. Sanchez Rocha
Plant Supt.: Francisco Sanchez Rocha
Total Employees at This Location:
 670
Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:
 Grades:
 Corrugating medium, Linerboard kraft
Paper & Paperboard Mill Data:
 Paper Machines: 2
 cylinder, trim width 1.3 m, max.
 speed 20.0 m/min
 cylinder, trim width 1.6 m, max.
 speed 30.0 m/min

VERACRUZANA SA DE CV, PAPELERA
 Apdo. Postal 16212
 02760 Mexico, D.F., Mexico
 Phone: 561 18 59
Personnel:
Gen. Dir.: E. Morodo Garcia
Div. Mgr.: Carlos Morodo S.
Adm. Mgr.: Luis Morodo S.
Mill Locations:
 Orizaba, Veracruz (paper mill, converting plant)
 Celulosa de Fibras Mexicanas, SA de
 CV, Apizaco, Tlaxcala (paper mill,
 converting plant)

Celulosa de Fibras Mexicanas, SA de CV
 Apdo. Postal 36
 90300 Apizaco, Tlaxcala, Mexico
 Phone: 241 70222
 Phone: 241 70241
 FAX: 241 71777
Mill Location: Km. A-1 Cam a Col.
 Morelos
 Subsidiary of: **Papelera Veracruzana**
 SA de CV
Personnel:
Mill Mgr.: F. Trespalacios C.
Ass. Mill Mgr.: Alberto Bautista
 Sanchez
Paper Mill Mgr.: Aurelio Hernandez B
Tech. Mgr.: Ofelio Gonzalez Diaz
Chief Eng.: Gonzalo Carmona
Purch. Agent: Silvia Cervantes
Cont. Gral.: Barron R. Jesus

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

XALAPA SA, CELULOSA Y PAPEL DE
 Ownership: **Cerveceria Moctezuma**
 SA
 A.P. 1713, Paseo de la Reforma 136, Col.
 Juárez Del Cuauhtémoc
 06600 Mexico, D.F., Mexico

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
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 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
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Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Veracruzana SA de CV, Papelera
 Poniente 105-108, Col. Librado Rivera
 94380 Orizaba, Veracruz, Mexico
 Phone: 272 52422
Personnel:
Mill Mgr.: V. Gonzalez Iroz
Ass. Mill Mgr.: Rogelio Diaz Votie
Paper Mill Mgr.: Manuel Martinez
Chief Eng.: Juan Martinez
Purch. Agent: Carlos De los Rios
Converting Plant Mgr.: Gilberto Ceron
Total Employees at This Location:
 150
Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
 Paper capacity: 14,000 m³/yr
Principal categories:
 packaging/industrial—14,000 m³/yr
Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 6 (4 conical, 1 disc)
 Paper Machines: 2
 fourdrinier, installed 1955, trim width
 2.0 m, max. speed 160.0 m/min
 No. 2, fourdrinier, installed 1959,
 trim width 2.0 m, max. speed
 160.0 m/min
 Rewinders: 2
Power Plant, Water & Effluent
Data:
 Turbines: 1
 Effluent systems:
 clarifiers, aerators, biological
 treatment

Mill Locations:
 Xalapa, Veracruz (paperboard mill)

Xalapa SA, Celulosa y Papel de
 Apdo. Postal 418
 91000 Xalapa, Veracruz, Mexico
 Phone: 281 7 29 89
Personnel:
Mill Mgr.: Edmundo Velasquez F.
Paper Mill Mgr.: Everado Maldonado
Tech. Mgr.: Luis Kelly Diaz
Adm. Mgr.: Rene Camacho
Total Employees at This Location:
 91
Paper employees: 75
Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:
Principal categories:
 corrugating medium—14,500 m³/yr
Grades:
 Corrugating medium

Paper & Paperboard Mill Data:
 Pulpers: 3
 Refiners: 2 (conical)
 Paper Machines: 1
 No. 1, fourdrinier, installed 1975, trim
 width 2.0 m, max. speed 110.0
 m/min
 Rewinders: 1
 Supercalenders: 1
Power Plant, Water & Effluent
Data:
 Power boilers: 3 at 7 steam tons/hr
 Fuels used: 100% oil
 Purchased electrical power: 143
 MWh/day
 Effluent systems:
 settling ponds

PANAMA
PANAMENA DE PAPEL SA, INDUSTRIA
 Ownership: 50% by Great Southern
 Paper, 50% by Grupo Galindo
 Apdo. 6908
 5 Panama, Panama
 Phone: 68 0944, 68 0555
 FAX: 6

Chief Eng. Conrado Lopez Forment
 Purch. Agent Maria Eugenia Estrada
Total Employees at This Location:
 392

Type of Operation: pulp, paperboard
Pulp Grades & Capacities:
 Total pulp capacity: 33,000 m³/y
Principal categories:
 unbl./semi-bl. softwood kraft—
 33,000 m³/y
 recycled fiber processing—155,000
 m³/y

Pulp Mill Data:
 Chippers: 2
 Type of chip transport: pneumatic
 conveyor

Batch digesters: 3 at 33,000 m³/y
Paper & Paperboard Grades & Capacities:

Principal categories:
 test linerboard—115,000 m³/y
 corrugating medium—33,000 m³/y
 folding boxboard—24,000 m³/y

Grades:
 Boxboard, folding, Chipboard,
 Container board, Corrugating
 medium, Linerboard test

Paper & Paperboard Mill Data:
Paper Machines: 2
 fourdrinier, trim width 5.5 m, max.
 speed 330.0 m/min
 ultriformer, trim width 3.2 m, max.
 speed 180.0 m/min

**Santh Carlos y Papel de Mexico
 SA de CV, Los Reyes Mill**
 Km. 16.5 Carr. Tlalpan
 54090 Los Reyes Acaquilpan, Edo. de
 Mexico, Mexico
 Phone: 565 65 22

Personnel:
 Mill Mgr.: Glendie Osborne
 Asst. Mill Mgr.: Mario Garza
 Chief Eng. Jaime Ruiz
Total Employees at This Location:
 291

Type of Operation: paperboard
Pulp Grades & Capacities:
Principal categories:
 recycled fiber processing—70,500
 m³/y

Paper & Paperboard Grades & Capacities:
Principal categories:
 corrugating medium—22,000 m³/y
 folding boxboard—42,000 m³/y

Grades:
 Boxboard, folding, Chipboard,
 Container board, Corrugating
 medium, Linerboard test, Manila
 board

Paper & Paperboard Mill Data:
Pulpers: 8
Refiners: 7 (5 double disc, 2 conical)
Paper Machines: 2
 No. 1, fourdrinier, trim width 1.6 m,
 max. speed 220.0 m/min
 No. 3, cylinder, trim width 2.1 m,
 max. speed 152.0 m/min, coater

Rewinders: 2
Sheeters: 2
Coating equipment:
 air knife, on machine, installed 1968,
 trim width 2.2 m, max. speed
 152.0 m/min

**Power Plant, Water & Effluent
 Data:**
 Power boilers: 3 at 40 steam tons/hr
 Fuels used: 5% oil, 25% gas

Turbines: 1 at 1.8 MW
 Purchased electrical power: 3.0
 MW/day

SOBANA SA, LA
 Km. 13.5 Carr. Mexico-Laredo
 San Pedro Xalostloc, Estado de Mexico,
 Mexico
 Phone: 569 3005

Sobana SA, La
 Km. 13.5 carr. Mexico-Laredo,
 San Pedro Xalostloc, Estado de Mexico,
 Mexico

Phone: 569 3005
Pulp Grades & Capacities:
 Total pulp capacity: 5,000 m³/y
 Pulp available for market: 5,000 m³/y
Principal categories:
 cotton—5,000 m³/y

Mill Status:
 Mill is closed

**SOLEDAD SA, FABRICA DE PAPEL
 LA**

Aptdo. Postal 8 938
 56400 Los Reyes Acaquilpan, Edo. de
 Mexico, Mexico
 Phone: 585 26 69

Personnel:
 Dir. Gen.: Angel Mier Peral
 Gen. Mgr.: Ampelio Jimenez Ramirez
 Prod. Mgr.: Paulino Mier Mazzoni
 Acct.: Ricardo Gomez Merino
Mill Locations:
 Los Reyes Acaquilpan (paper mill)

Soledad SA, Fabrica de Papel La
 Aptdo. Postal 8 938
 56400 Los Reyes Acaquilpan, Edo. de
 Mexico, Mexico
 Phone: 585 26 69

Mill Location: Km. 20.7 Carr.
 Mexico-Texcoco Col. Los Reyes
 Acaquilpan
Total Employees at This Location:
 80

Type of Operation: paper
Paper & Paperboard Grades & Capacities:
 Paper capacity: 16,500 m³/y
Principal categories:
 wrapping—16,500 m³/y

Paper & Paperboard Mill Data:
Paper Machines: 3
 fourdrinier, trim width 1.8 m, max.
 speed 150.0 m/min
 fourdrinier, trim width 2.5 m, max.
 speed 150.0 m/min
 yankee, trim width 2.4 m, max. speed
 210.0 m/min

SONOCO DE MEXICO, SA DE CV
 Ownership: 100% by Sonoco
 Products Co.

Aptdo. Postal 92 Bis
 06000 Mexico, D.F., Mexico
 Phone: 5 562 62 10
 FAX: 5 393 77 31
 Subsidiary of Sonoco Products Co.,
 USA

Personnel:
 Paper Div. V.P. Fred Samejo
 Converting Div. V.P. Filiberlo Rubio
Mill Locations:
 Manufacturas Gargo SA de CV, López
 Mateos (paperboard mill)
 Santa Clara Mill, Mexico D.F.
 (paperboard mill, converting plant)

Watermarks & Brands:
 Duro, Kraft board, Sonobubo, Spiral
 core, Sonovod, Spiral tube

Manufacturas Gargo SA de CV
 (Zaragoza 15
 52900 Alizapan, Edo. de Mexico, Mexico
 Phone: 5 572 0644
 FAX: 5 822 0146

Personnel:
 Gen. Dir.: Guillermo Cavazos M.
 Mill Mgr.: Carlos Gutiérrez
 Sls. Dir.: Francisco Rentería R.
Total Employees at This Location:
 460

Paper employees: 200
Type of Operation: paperboard,
 converting

Paper & Paperboard Grades & Capacities:
Principal categories:
 folding boxboard—19,000 m³/y

Grades:
 Boxboard, folding
Paper & Paperboard Mill Data:
Paper Machines: 1
 cylinder, trim width 1.5 m, max.
 speed 100.0 m/min

**Sonoco de Mexico, SA CV, Planta
 Santa Clara**

Ownership: 100% by Sonoco
 Products Co.
 Aptdo. Postal 92 Bis
 06000 Mexico, D.F., Mexico
 Phone: 5 569 3288
 FAX: 5 569 0249
Mill Location: Km. 15.5 Via Morelos
 Sta. Clara

Subsidiary of Sonoco Products Co.

Personnel:
 Paper Mill Mgr.: Mariano Escalante
 Tech. Mgr.: Carlos Ceniceros M.
 Chief Eng.: José Guadalupe Hernandez
 Purch. Agent: Natividad Espinosa
 Converting Plant Mgr.: Javier García A.
 Prod. Mgr.: José Gpe. Hernández
Total Employees at This Location:
 420

Paper employees: 55
Type of Operation: paperboard,
 converting

Paper & Paperboard Grades & Capacities:
 Total paper & paperboard capacity:
 22,000 m³/y

Principal categories:
 kraft linerboard

Grades:
 Chipboard, Gray board, Linerboard
 test, Tube board

Paper & Paperboard Mill Data:
Pulpers: 3
Refiners: 4 (2 conical, 2 double disc)
Paper Machines: 1

No. 1, cylinder, installed 1954, trim
 width 1.9 m, max. speed 85.0
 m/min

Rewinders: 3
Sheeters: 1

**Power Plant, Water & Effluent
 Data:**

Power boilers: 2 at 12 steam tons/hr
 Fuels used: 100% gas
 Turbines: 1
 Purchased electrical power: 26.0
 MW/day
 Effluent systems:
 clarifiers

Watermarks & Brands:
 Duro, Kraft paperboard, Sonolubo,
 Paperboard rolls, Sonovoid,
 Paperboard rolls
Expansion Plans:
 Board production: 8,000 m³/y increase,
 \$41,000,000 cost

**SONORA SA, CELULOSA Y
 CORRUGADOS DE**

Obregon y Plaza 5 de Mayo
 85800 Navojoa, Sonora, Mexico
Personnel:
 Gen. Mgr.: R. Rodriguez Coronel
Mill Locations:
 (paperboard mill at this location)

**Sonora SA, Celulosa y
 Corrugados de**

Obregon y Plaza 5 de Mayo
 85800 Navojoa, Sonora, Mexico
Personnel:

Mill Mgr.: Luis Elizondo
Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:

Grades:
 Corrugating medium, Linerboard kraft

TODO PAPEL SA
 Cerrada de Luis G. Urbina s/n, Col. La
 Venta

56530 Ixtapaluca, Edo. de Mexico,
 Mexico
 Phone: 2 04 54
Personnel:
 Pres.: Rafael Sanchez
Mill Locations:
 Ixtapaluca (paper & paperboard mill)

Todo Papel SA
 Cerrada de Luis G. Urbina s/n, Col. La
 Venta

56530 Ixtapaluca, Edo. de Mexico,
 Mexico
 Phone: 2 04 54
Type of Operation: paper,
 paperboard

Paper & Paperboard Grades & Capacities:
Principal categories:
 packaging/industrial—7,600 m³/y

Grades:
 Corrugating medium, Linerboard
 kraft, Manila board, Manila paper
Paper & Paperboard Mill Data:
Paper Machines: 1
 fourdrinier, trim width 1.6 m, max.
 speed 90.0 m/min

**TUXTEPEC SA, FABRICAS DE
 PAPEL**

Ownership: 100% by Govt. of Mexico
 Aptdo. Postal 50
 68300 Tuxtpec, Oaxaca, Mexico
 Phone: 287 5 04 99
 Telex: 18829 la palmé
 FAX: 287 5 04 05

Subsidiary of Productora E
 Importadora De Papel SA, Mexico

Personnel:
 Chmn. of the Board René Villarreal
 Arrambide

Pres.: Gildardo Villalobos García
 Man. Dir.: Rogelio Ortega G.
 V.P. C. P. Hector Guajardo P.
 V.P. Silverio Contreras
 Prod. Mgr.: Sergio Arano L.
 Sls. Dir.: Victor M. Gonzalez E

Mexican Furniture Industry

A recent survey done for the American Hardwood Export Council provides an excellent profile of one of Mexico's major wood using industries. There are approximately 2,000 domestic furniture manufacturers (does not include maquiladora plants) in Mexico today. About 40 percent of these are located in Jalisco, 40 percent in the Mexico City area, and the remainder are mostly concentrated in Tijuana, Aguascalientes, Monterrey, Chihuahua and San Luis Potosi.

The furniture industry has traditionally used domestic pine or tropical species such as mahogany. The domestic lumber supply is viewed as unreliable and of low quality by furniture manufacturers.

The furniture manufacturers are generally small in size. Of the 174 "major" companies interviewed for this AHEC study, 60 percent had fewer than 51 employees. Only 10 percent employed more than 100 workers.

Lumber represented 62 percent of the manufacturers' raw material costs. Sixty-five of the firms interviewed purchased only softwood lumber; of the 109 that purchased both hardwood and softwood, softwood was still dominant, representing 65 percent of the total. While almost all of the imported hardwood lumber purchased by these firms was kiln-dried, only 54 percent of the domestic hardwood lumber was kiln-dried.

The method of purchasing hardwood lumber of domestic species gives an interesting focus on the lumber distribution channels in Mexico. About 22 percent was purchased directly from the primary sawmill, another 38 percent from a secondary mill, 20 percent through a broker or wholesaler, and 14 percent was purchased directly from mills outside of Mexico.

Two of the larger furniture producers who were contacted by

Deloitte & Touche in their analysis of the Mexican wood markets were:

- Grupo Dixy, Sr. Victor Urquiza- a well known furniture manufacturer
- Early American, Sr. Rafael Meza Cancino - one of the largest Mexican furniture manufacturers.

International Trade and Mexico's Forest Industry

Imports of foreign wood products, primarily from the United States, have been taking an increasing share of the Mexican domestic market. Some forecasters expect that with the changes due as a result of NAFTA, imports from the U.S. will accelerate, taking an even greater share of the Mexican market, thus driving Mexican primary forest production even lower than its current level.

Mexico's forest industry had been largely protected from the impacts of foreign competition until the mid-1980s. Prior to 1986 import tariffs on forest products were as high as 40-50 percent. The procedures for importing wood products were complex, and a state-owned monopoly controlled all imports of newsprint. As shown in Table 16, tariffs in 1993, just prior to NAFTA, averaged between 5 and 20 %.

Under NAFTA, duties on most types of lumber and plywood will be phased out over a 10-year period. This relatively slow reduction should allow sufficient time for Mexico's industry to adjust to the lower level of protection.

U.S. Exports

A number of observers have commented that Mexico's trade statistics are not accurate. Because the U.S. supplies about 95 percent of the softwood and temperate hardwood products covered in this section, we have chosen to use U.S. export statistics to Mexico rather than the Mexican import statistics reported by the US Foreign Agricultural Service in their annual reports on Mexico.

Total value of wood products exports to Mexico (not including pulp and paper) have soared in recent years, and Mexico is now the third most important market for U.S. forest products exporters. In 1989, the value of U.S. wood exports to Mexico exceeded \$200 million for the first time (Fig. 9). By 1992, the value had grown

Table 16. Mexican Tariffs on Imports of U.S. Wood Products

HS code	Product	1993 Phase-out Duty Period	
		(Percent)	(years)
4401.21	softwood chips	10	10(Q)
4401.22	hardwood chips	10	5
4403.2	softwood logs	10	10
4403.91/2	hardwood logs	10	5
4407.10.01	planks, boards and beams	15	10(Q)
4407.10.02	sawn pine or fir	10	10(Q)
4407.91.01	sawn oak	15	10(Q)
4408	veneer	15	immediate
4410.1	particleboard	20	10
4411	fiberboard	15	5
4412.19.02	softwood plywood	15	10

Quotas - tariff elimination schedules including (Q) above
allow a certain amount of product into Mexico duty-free:

softwood chips -	66,500 metric tonnes
planks, boards, & beams	9,500 metric tonnes
sawn pine or fir	119,700 metric tonnes
sawn oak	3,325 metric tonnes

Source: Foreign Agricultural Service

to more than \$500 million. Exports to Mexico eased slightly in 1993, and for the first nine months the total value was down 5.1 percent compared to the same period in 1992.

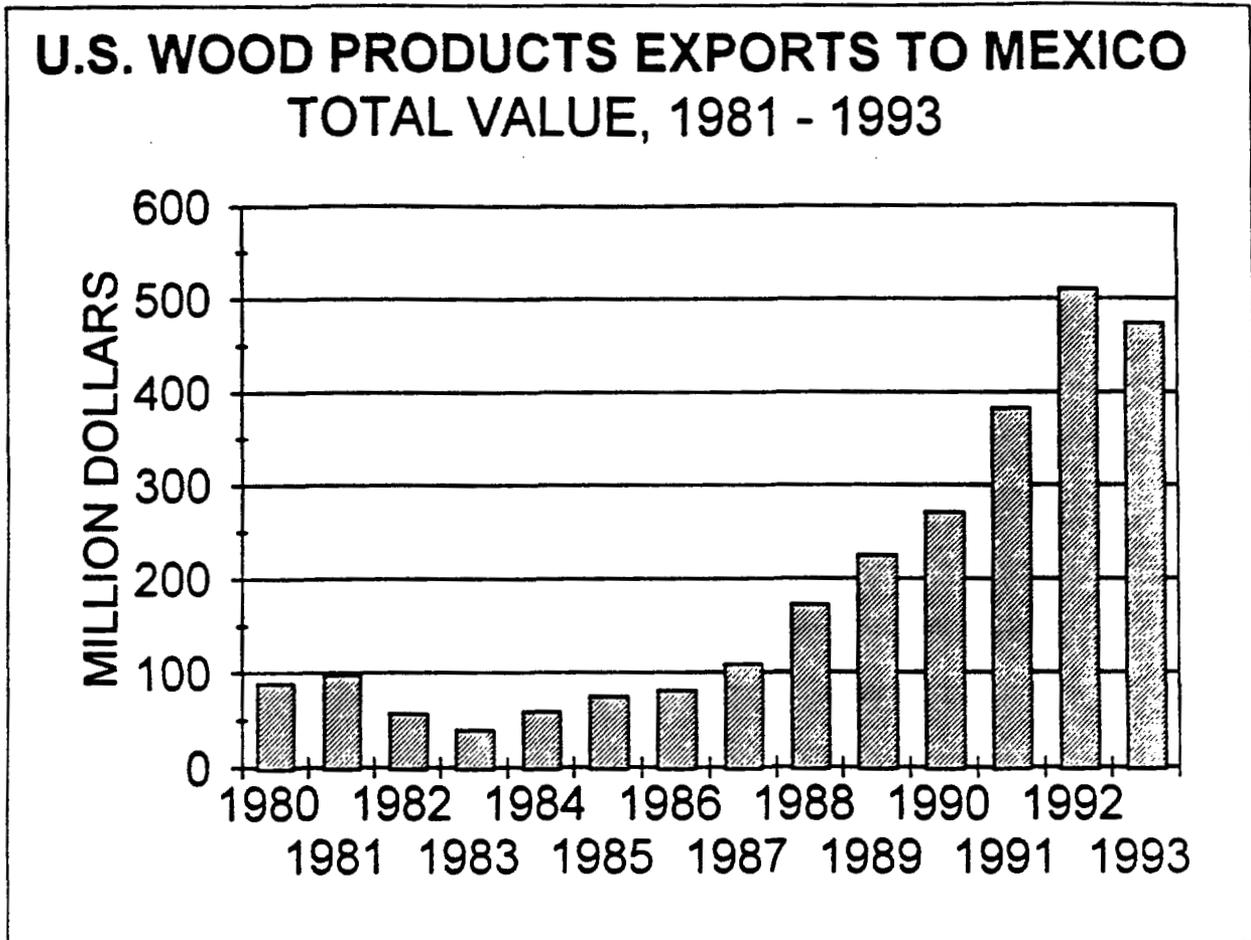


Figure 9 - Source: U.S. Foreign Agricultural Service

Logs

Mexican imports of softwood log from the U.S. were only 24,000 cubic meters in 1992 (Fig. 10). While that was twice the level of 1987 exports, it only represented 0.3% of the total softwood harvest in Mexico. Temperate hardwood log imports are a slightly smaller volume (17,000 m³ in 1992), but represent between 3.5 - 4.5 percent of the total harvest of temperate hardwoods in Mexico. U.S. log exports to Mexico declined sharply in 1993: for the first nine months of the year softwood log exports were down 27.7 percent

94

in volume, and temperate hardwood log exports were down 38.5 percent, compared with 1992.

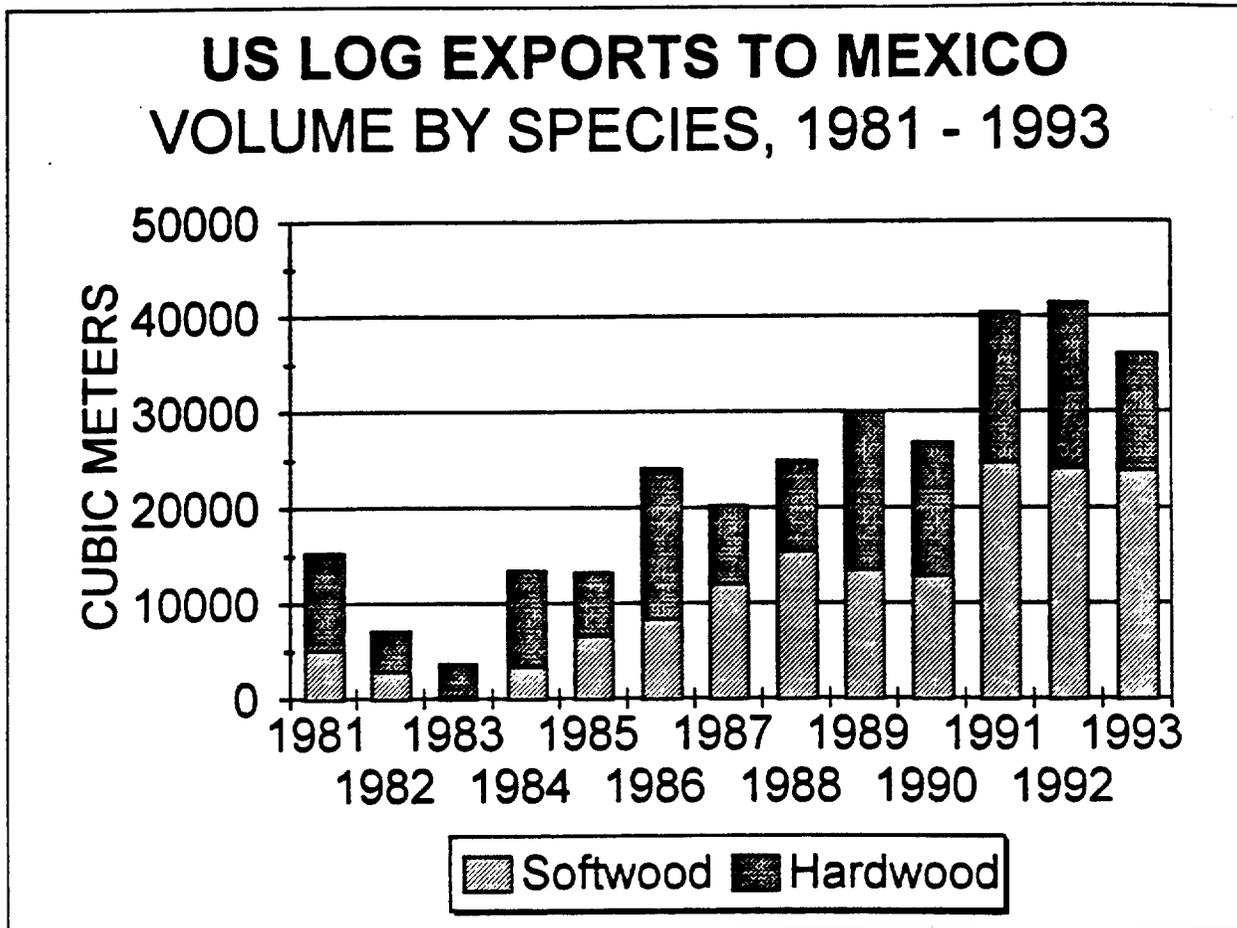


Figure 10

Softwood lumber

The United States supplies almost all of Mexico's softwood lumber imports. Exports from the U.S. to Mexico increased from 214,000 cubic meters in 1984 to 949,000 m³ in 1992, an increase of 344 percent (Fig. 11). Imports of U.S. lumber accounted for roughly 29 percent of Mexico's total consumption of softwood lumber, up from only 9 percent in 1984. However, lumber shipments to Mexico dropped sharply in 1993, and will likely total only

5

around 750,000 m³ for the year. Much higher prices for U.S. lumber and a slowdown in Mexico's economy were the causes cited for the decline in U.S. softwood lumber exports to Mexico.

Softwood lumber exported from the U.S. to Mexico is primarily lower quality. In the Mexican system of grading lumber, the U.S. imports are mostly of the 3rd and 4th grades. In 1991, the Western Wood Products Association analyzed the

U.S. EXPORTS OF SOFTWOOD LUMBER VOLUME TO MEXICO 1984 - 1993

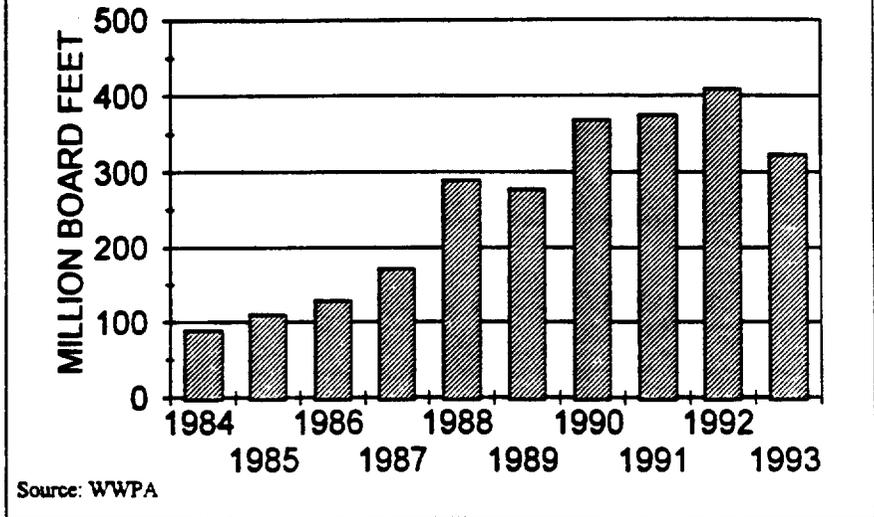


Figure 11

invoices of its member companies for lumber going to Mexico. The grade breakdown of this western lumber exported to Mexico was:

Selects	2.3%
Shop	23.2% (primarily 5/4 #3 Shop and Shop outs)
Commons	22.3% (mostly 5/4 Box and Misc.)
Dimension	47.8% (mostly 2" #2 & Btr dimension)
Timbers	4.4%

Most of the lower quality softwood lumber exported from the U.S. to Mexico goes to maquiladora plants along the border. These in-bond companies process the wood and re-export higher added value products such as moulding to the U.S. market. Maquiladora plants rely almost exclusively on U.S. softwood and hardwood lumber, veneers, and reconstituted panel products. For example, Louisiana

Pacific exports Redwood to Ensenada, in Baja California, where it is converted into fencing and other products (they had intended to barge but are still mostly trucking the lumber).

Hardwood lumber

The U.S. also supplies most of Mexico's temperate hardwood lumber imports. The volume increased from 39,000 m³ in 1984 to 127,000 m³ in 1992, an increase of 226%. Imports declined slightly during most of 1993, and will likely total around 122,000 m³ for the year. Imports from the U.S. account for roughly 50% of Mexico's consumption of temperate hardwood lumber.

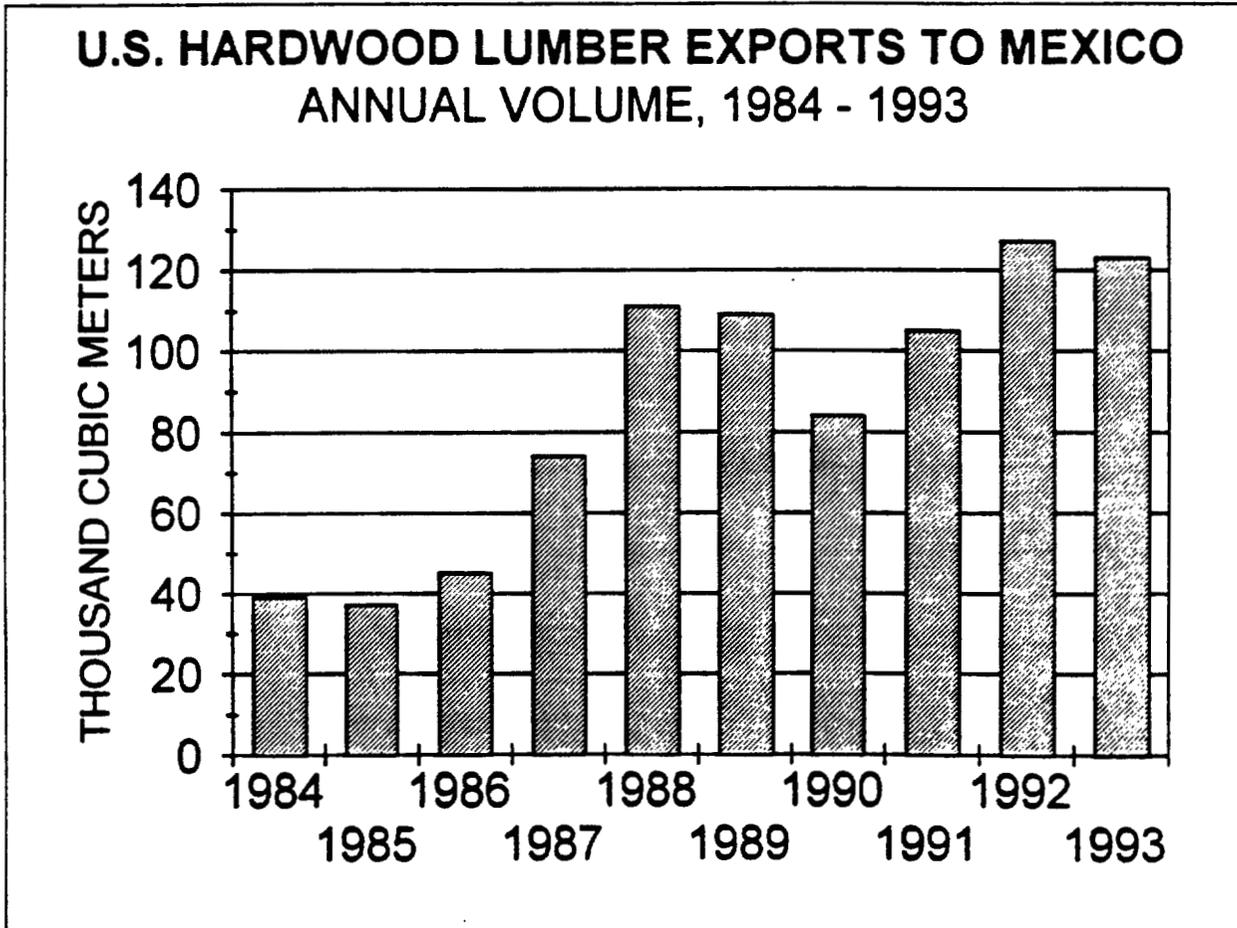


Figure 12

2d

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Plywood

The American Plywood Association has been actively promoting U.S. plywood in Mexico, and their promotional efforts are slowly paying off. U.S. softwood plywood exports to Mexico increased from only 20,000 m³ in 1984 to 181,000 m³ in 1992, and are likely to increase to around 195,000 m³ in 1993 (Fig. 13). The share of U.S. softwood plywood in Mexico's total consumption increased from 8 percent in 1984 to around 55 percent in 1992 and 1993.

Softwood veneer exports from the U.S. to Mexico increased rapidly in recent years, surging from 75,000 square meters (3/8) basis in 1989 to over 365,000 square meters in 1992. However, in 1993 this volume plunged, and will likely total less than 60,000 square meters for the year.

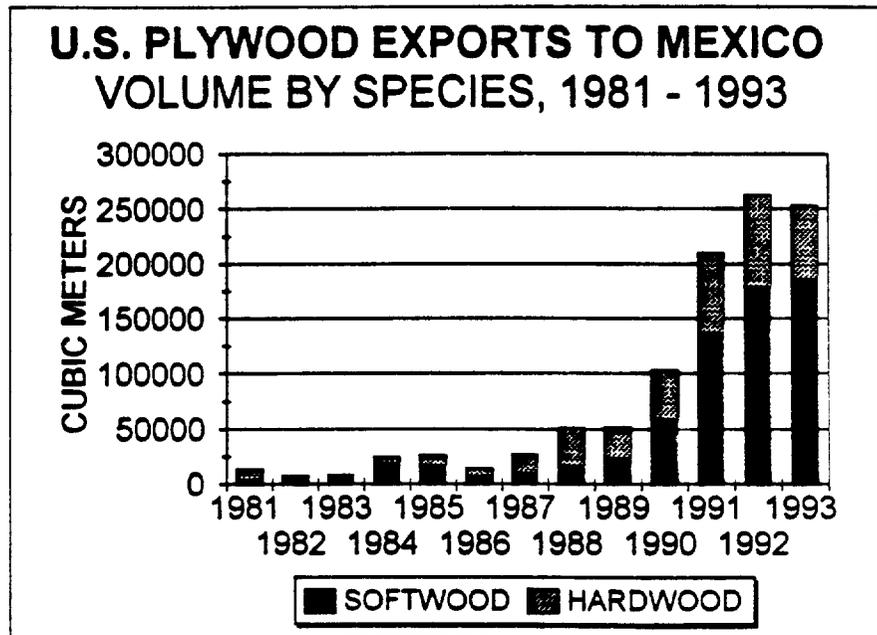


Figure 13

Exports of hardwood plywood from the U.S. to Mexico have also increased, but not as rapidly as softwood plywood. U.S. exports were only 4,000 m³ in 1984, but increased steadily to 82,000 m³ in 1992. Because of a decreased demand for furniture production, hardwood plywood exports to Mexico declined slightly in 1993, to about 67,000 m³. On the other hand, hardwood veneer exports to Mexico, which more than doubled in volume between 1990 and 1992, were up 85 percent for the first nine months of 1993, compared with the previous year.

Wood-based Panels

In addition to lumber and plywood, U.S. exports to Mexico have become increasingly important in other products. For example, U.S. exports of particleboard to Mexico increased from 21,000 m³ in 1986 to more than 75,000 m³ in 1992 (Fig. 14). The volume of "other panels", which includes hardboard, medium density fibreboard, and some others, soared from only 3,000 m³ in 1986 to over 102,000 m³ in 1992.

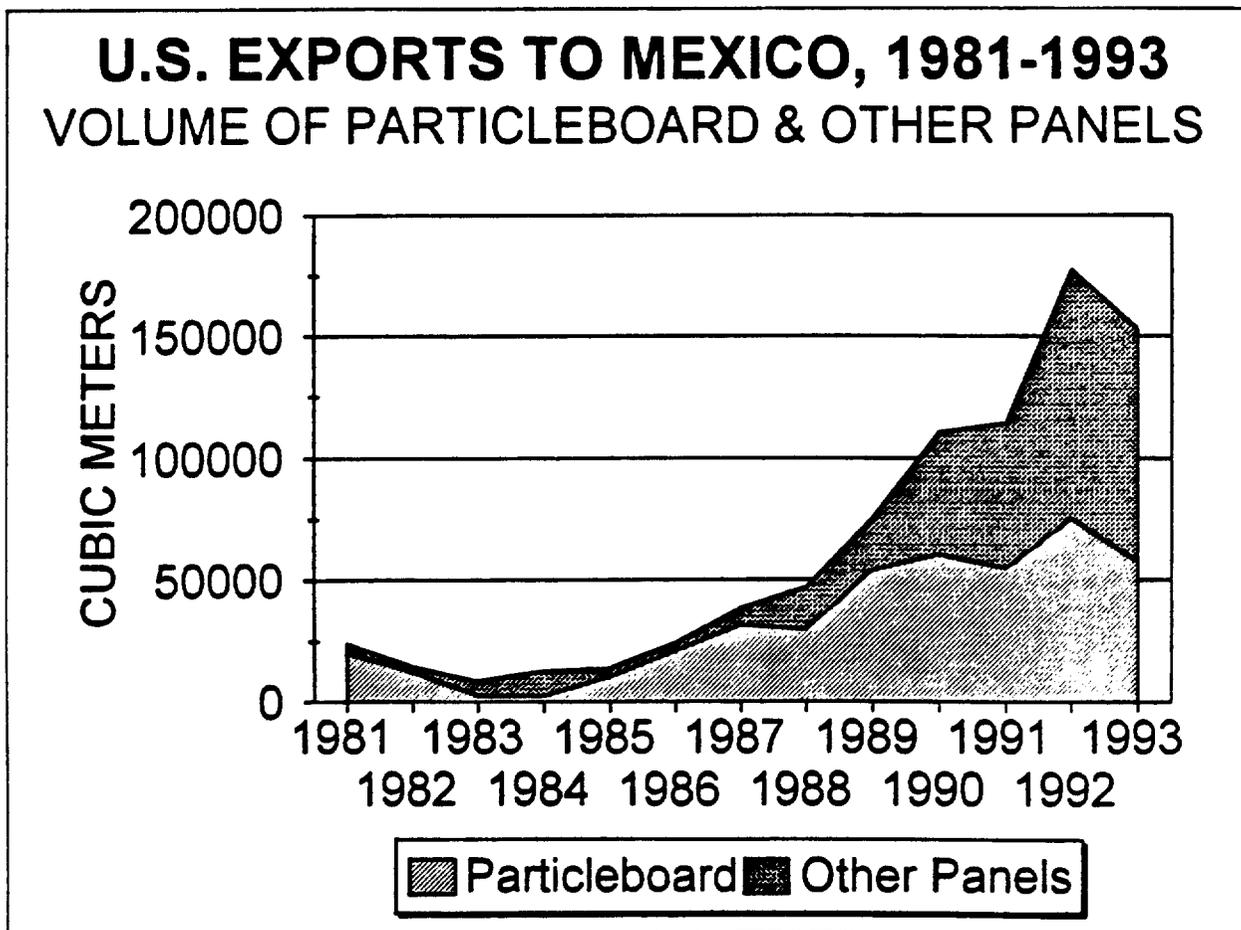


Figure 14

U.S. Imports of Mexican Forest Products

Previous sections of this report have discussed the many challenges facing Mexico's forest products industry. However, U.S. imports of wood products from Mexico have expanded rapidly in recent years, growing from \$90 million in 1985 to over \$291 million in 1992, a 143 percent increase (Fig. 15). Mexico is the third most important source of wood products for the U.S. market, behind only Canada (\$4.5 billion in 1992) and Indonesia (\$399 million). U.S. imports of wood products from Mexico were up 3.8 percent for the first nine months of 1993, compared with the previous year. Much of the wood products which the U.S. imports are from the maquiladora plants along the border, which use primarily raw materials from the U.S.

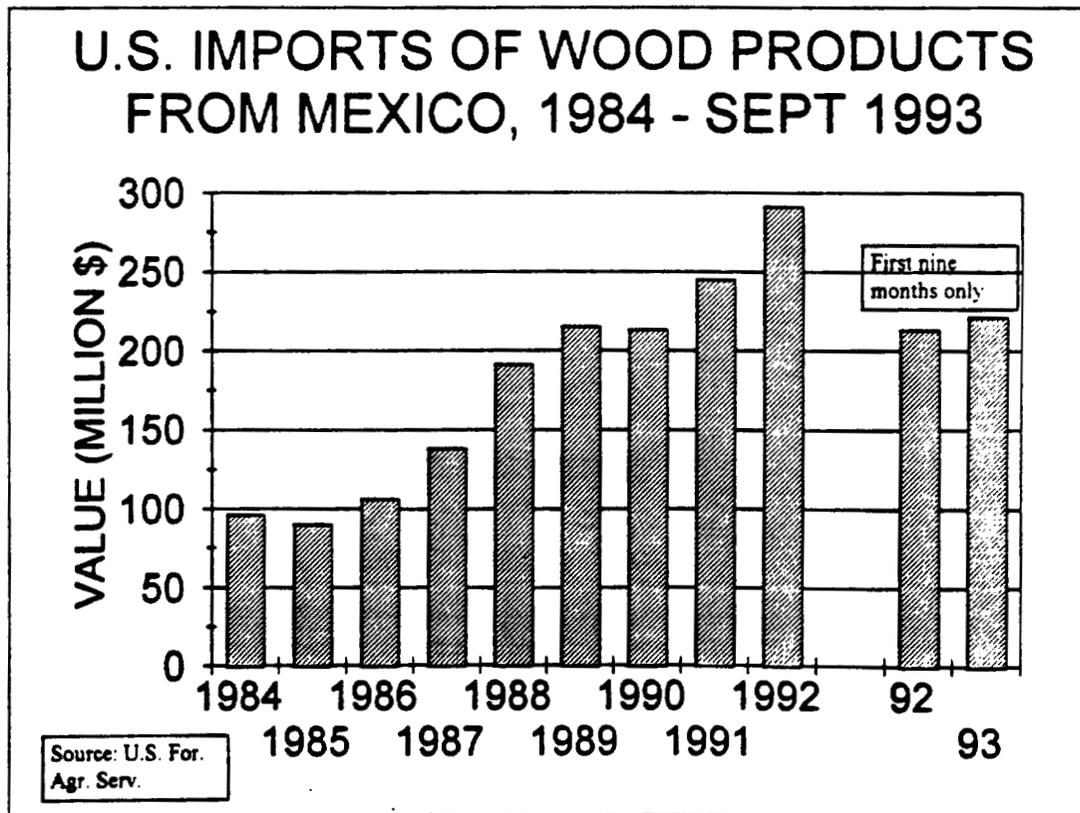


Figure 15

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Maquiladora Plants

There are approximately 200 furniture manufacturers (as of 1991) in the maquiladora industry, of which 78 percent are located in the states of Baja California, Chihuahua and Tamaulipas along the U.S./Mexico border. Although exact statistics on this industry are unavailable, these 200 plants reportedly produce nearly as much product (by value) as the 2,000 domestic furniture manufacturers.

In addition, a number of these maquiladora plants are using U.S. based raw materials to produce moulding and millwork products, picture frames, and other value-added products. Some of these plants are quite large, and even though they are not primary lumber producers, they generate enough wood waste to power cogeneration facilities. For example, the Acevedo Group in Tijuana consumes more than 100 MMBF of lumber per year, and the waste wood generated is trucked to a cogeneration facility in California.

Significance of NAFTA

The maquiladora plants along Mexico's northern border are the most efficient facilities in Mexico for producing furniture, moulding, millwork, doors, and other finished wood products. Currently, these mills are only allowed to sell into Mexico's domestic market if they pay duties of 10-20 percent on the U.S. lumber and plywood used to produce their products. As NAFTA is phased in, these maquiladora plants will be able to sell more and more of their production into the domestic market. Because these mills are so much more efficient than the traditional domestic producers, it will become even more difficult for the traditional primary and secondary wood products producers to compete and remain in business.

A 1991 Mexican study indicated that the impact of NAFTA on Mexico's forest products industry may vary by sector. For example, a price comparison of softwood lumber and particleboard from the

U.S. versus Mexico showed that even with the duty in place, U.S. products in 1991 were still less expensive. The removal of the duty would be expected to affect a relatively small change in price and competitiveness, since the U.S. softwood lumber was already priced lower than its Mexican counterpart. On the other hand, U.S. hardwood lumber was more expensive than Mexican lumber with the import duty in place; therefore removing the duty might be expected to result in a more significant increase in demand for the cheaper U.S. wood.

Other studies, also done in 1991 and 1992, demonstrated repeatedly that Mexican products were price much higher than similar products from the U.S. Another comparative study, done also in 1991, indicated that prices of Mexican lumber were about 300% higher than similar grades of lumber in the U.S. And a 1992 World Bank comparison of U.S. and Mexican products, f.o.b. Mexico City, showed that U.S. lumber was 21 percent less expensive than Mexican lumber, U.S. particleboard was 14 percent less expensive, and U.S. plywood was 20-38 percent less expensive.

A number of observers have noted that Mexico's domestic wood products industry has enjoyed a certain level of protection from international competition. Combined with the relative inefficiencies and higher prices of the Mexican producers, the conventional wisdom has been that NAFTA will be the ruin of the industry in Mexico.

However, many Mexican producers were not opposed to NAFTA, and it is quite likely that NAFTA will not be the devastating influence once thought. Prices for U.S. manufactured forest products have increased considerably since the above comparisons were made, and demand is expected to remain high in the U.S. So Mexican wood products manufacturers don't necessarily face a flood of inexpensive lumber and other products coming in from the U.S. Certainly there will be increased competition, and this will force the

industry in Mexico to become more rationalized and more efficient. But the Mexican companies shouldn't be "forced out of business overnight."

First, there is a shortage of lumber, and to a lesser extent, panel products in the U.S. This has forced prices higher, and most analysts do not expect prices to lower significantly from current levels. Second, the duties under NAFTA are being phased out gradually, most over a ten year period, which should give the Mexican industry adequate time to adjust.¹ Finally, NAFTA is expected to boost economic development in Mexico, which will mean a higher level of construction and infrastructure development, all of which will mean a much greater demand for wood.

¹ The American Forest and Paper Association, on behalf of U.S. wood products producers, has filed a petition to accelerate the tariff reduction schedules.

PULP AND PAPER

Declining Wood Use

The use of virgin wood fibers in the pulp and paper industry in Mexico has been declining since 1987. This decline has been offset with imported wood pulp, which in 1992 represented 52 percent of all wood pulp consumed in the country (chemical and mechanical). The virgin wood pulp produced in Mexico is even less significant when compared to total pulp consumption: it is less than 20 percent of the total.

Many reasons have and will continue to dictate the low usage of Mexican wood fiber for pulp and paper.

- dwindling domestic wood sources.
- the worldwide industry recession which has flooded the market with high quality, low priced, imported pulp.
- a yet unproven government sponsored reforestation program consisting of fast growing eucalyptus and pine.
- continued availability of low cost, high quality pulp from the U.S. and Canada under NAFTA.
- significant pulp production capacity dedicated to secondary and non-wood fibers, although both bagasse and straw will probably decline in use in favor of imported wood pulps.

Pulp production decline

Total pulp production in Mexico peaked in 1985 at 818,000 metric tons. Production decreased slowly, reaching 705,000 mt in 1991, but then plunged 20 percent to only 560,000 tons in 1992. In 1993, pulp production declined even further. Bagasse and straw pulp production has been relatively stable during the last decade; virtually all of the decline in pulp production has been in mechanical or chemical wood pulp (Figure 16).

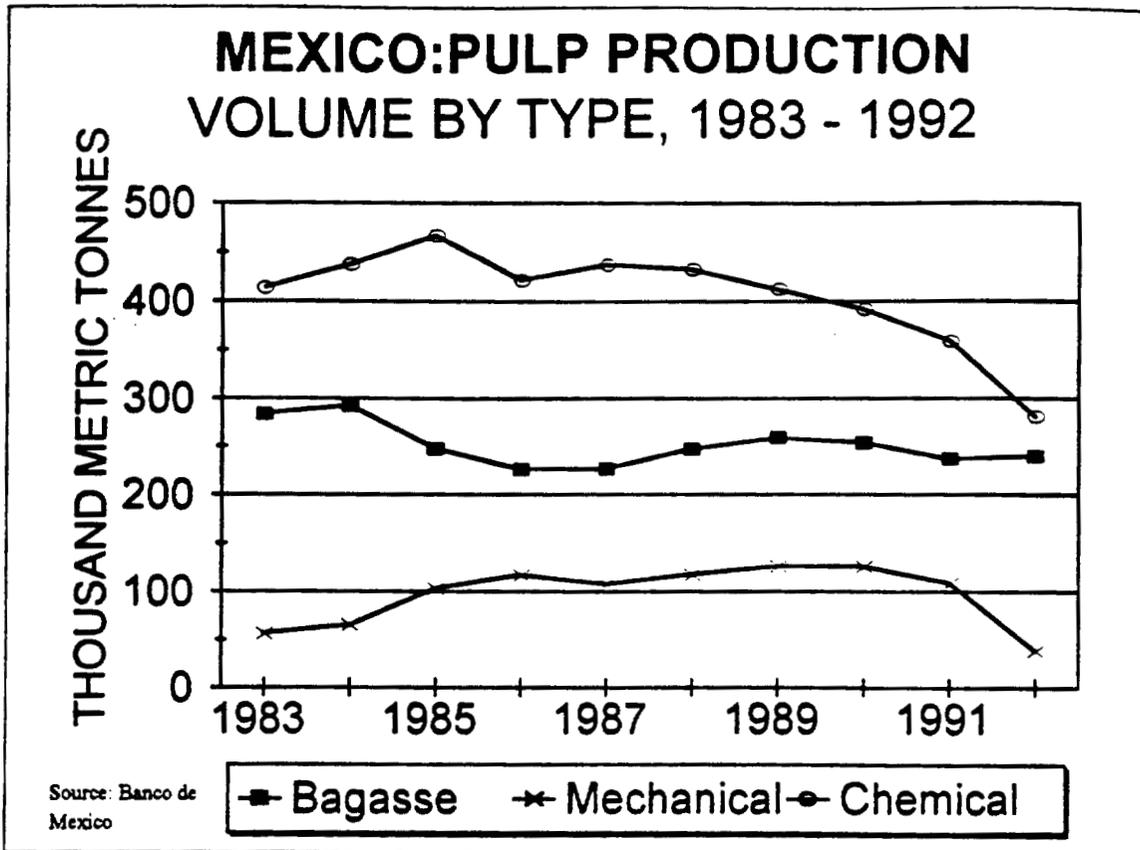


Figure 16

Imported wood pulp has become an important replacement for domestic pulp in Mexico. The total volume of imports peaked in 1987 at 471,000 mt, declined to 304,000 mt in 1989, but then increased steadily to 348,000 mt in 1992 (Fig. 17).

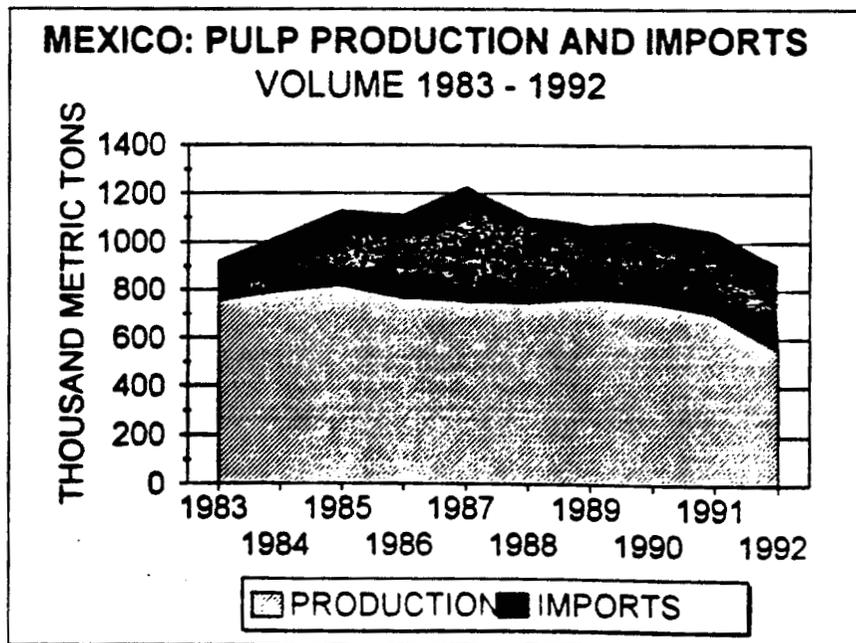


Figure 17- Source: CNICP

of imports has been increasing: imports accounted for about 26 percent of Mexico's pulp consumption in 1983, but supplied about 52 percent of the total in 1992 (Table 17). Most of the imported wood pulp is sourced from the U.S. and Canada.

In an effort to secure a more reliable supply of fiber, Mexican pulp mills have attempted to import woodchips from other countries. Trial shipments of woodchips from Brazil and Chile were mostly unsuccessful, according to the FAS, because of poor port handling and inadequate inland transportation systems. Mexican pulp mills temporarily imported significant quantities of woodchips from the U.S. (110,000 metric tons in 1988 and 138,000 metric tons in 1989) (Fig. 18). After this surge, the volume declined steadily to about 60,000 mt in 1992, and in 1993 essentially no wood chips were exported to Mexico.

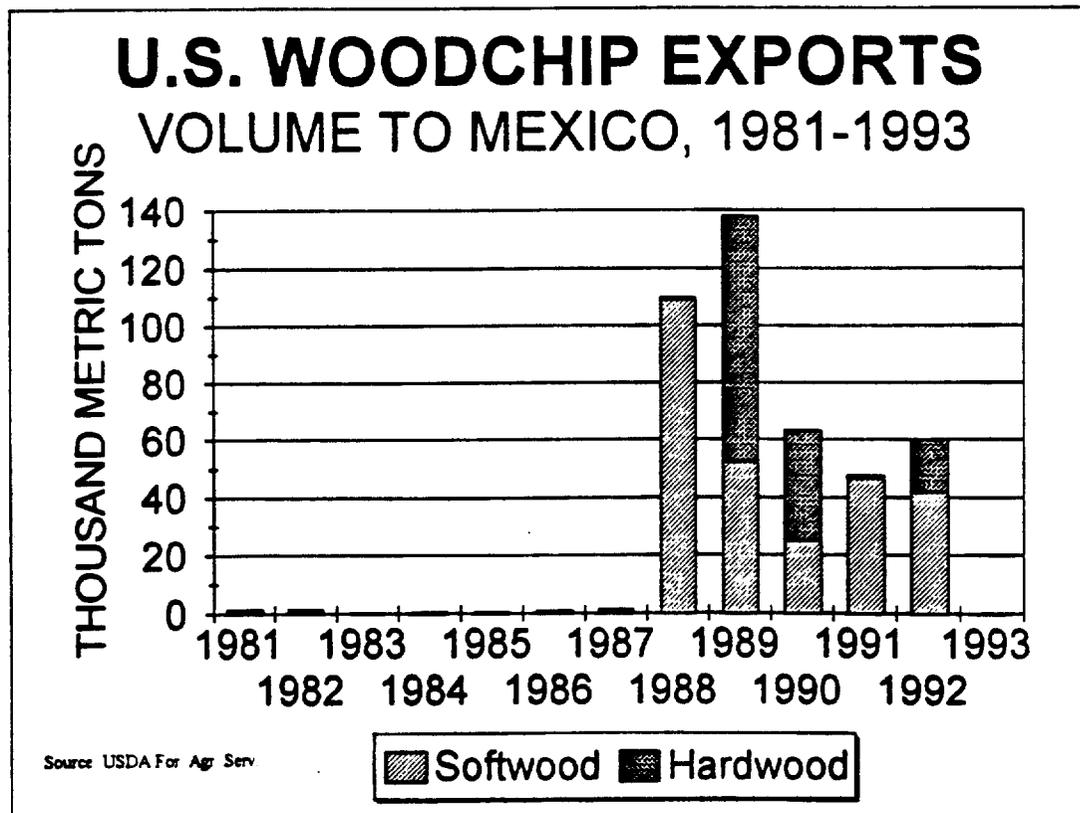


Figure 18

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Table 17. MEXICO'S PULP PRODUCTION AND IMPORTS, 1983-1992								
	Bagasse	Mechanical	Chemical	Total	Export	Total - exports	Imports	% Imports
(Volume in thousand metric tonnes)								
1983	284	56	414	754	0	754	163	25.8%
1984	292	65	438	795	0	795	228	31.2%
1985	248	103	467	818	0	818	311	35.3%
1986	226	117	422	765	0	765	345	39.0%
1987	227	108	438	773	20	753	471	47.2%
1988	247	118	433	798	52	746	356	41.6%
1989	259	126	413	798	31	767	304	37.4%
1990	254	126	392	772	23	749	336	40.4%
1991	237	109	359	705	1	704	341	42.2%
1992	240	39	281	560	0	560	348	52.1%
Source: CNICP, 1993								

In Mexico, companies have been aggressively substituting secondary fiber for virgin pulp. In 1992, reported the journal Paper, total domestic fiber consumption was 3.1 million metric tons. Secondary fiber usage accounted for 73 percent of the total, or 2.3 million metric tons, putting Mexico in the category of one of the top recyclers in the world. Around 45 percent of the recycled fiber is imported, mostly from the U.S. Imports of secondary fibers in Mexico increased from 806,000 mt in 1988 to 1,048,000 mt in 1992.

Current Wood Pulp Production

Only two mills currently produce virgin wood pulp:

- Cia. Industrial de Atenquique in the state of Jalisco, and
- Celulosa y Papel de Michoacan, SA

All of the pulp mills which used wood fiber in the states of Durango and Chihuahua, the primary sawmilling states in Mexico, are currently closed.

Cia. Industrial de Atenquique is a subsidiary of Grupo Industrial Durango, SA de CV. The mill manager is Juan Montufar C., phone 341-50004; fax 341-50178. This is an integrated pulp and paper facility. The pulp mill has a productive capacity of 140,000 metric tons per year of unbleached and semi-bleached kraft pulp. They produce mostly softwood pulp, but also some hardwood pulp. According to the International Pulp and Paper Directory,¹ most of the raw material for this mill is roundwood chipped at the pulp mill (800,000 cubic meters per year), with some residual chips from local sawmills (40,000 cubic meters). Currently, the mill has plans to expand its capacity by about 34,000 metric tons per year.

¹ See Appendix for list of Mexico's pulp and paper facilities.

The CEPAMISA mill (Celulosa y Papel de Michoacan) is located in Cointzio, and is one of the Cia. Industrial de San Cristobal mills. This company is 49 percent owned by Scott Paper Company. The mill manager is Guillermo Tello, phone 451-60050; fax 451-60154. This is also an integrated pulp and paper complex. The pulp mill has a stated capacity of 93,000 metric tons per year, including 61,000 mt of bleached softwood kraft pulp and 32,000 mt of bleached hardwood kraft. The raw material sourcing is split between roundwood chipped at the mill (240,000 cubic meters per year) and residual sawmill chips (240,000 cubic meters). In addition, the mill consumes about 5,000 dry tons of bagasse per year.

Wood used at both Atenquique and Michoacan are mostly debarked in the woods leaving little waste for burning except for the fines from the chipping and screening operations.

A number of other wood consuming pulp mills have been closed in the last several years, including:

- Celulosa de Chihuahua SA, in Anahuac, Chihuahua - capacity of 140,000 metric tons of pulp per year.
- Celulosicos Centauro SA, in the city of Durango - capacity of 63,000 metric tons per year.
- Productora de Papel SA, in San Nicolas de los Garza, N.L. - capacity of 24,000 metric tons per year.
- Fabricas de Papel Tuxtepec SA, in Tuxtepec, Oaxaca - capacity of 174,420 metric tons per year.

In August, 1993, Paper magazine reported a forecast by Carlos Sacal, retiring president of the CNICP, that no "significant" new woodpulp projects are likely to be implemented in Mexico in the next five years.

Information on pulp and paper mills in Mexico was obtained partly from the Camera Nacional de las Industrias de la Celulosa y

del Papel, A.C. (CNICP). President of CNICP is Benito Lasky, address is Privada San Isidro #30, Colonia Reforma Social, Mexico D.F. 11650, Mexico. Phone 42-5-202-8603 or 52-5-202-8483; fax 52-5-202-1349.

Pulpwood markets

As stated, the pulp industry has depended on sawmill residual chips for a only small portion of its raw material requirements, no more than about 10-15 percent. According to Wood Resources International (WRI), wood chips are typically purchased from local sawmills on an FOB mill basis "at prices that closely follow the average cost of delivered roundwood pulpwood". Contracts are negotiated on an annual basis, and because the sawmills on average operate at well below 50 percent of capacity, residual chips are not seen as a reliable source of fiber.

WRI estimated the price of pine roundwood pulpwood in the north central region of the country, with an average transport distance of 300 kilometers. In 1992, this roundwood had a total delivered cost of between US\$42-46 per solid cubic meter. By comparison, coniferous roundwood for pulp was selling at the same time for US\$22-25/ cubic meter in Chile, \$17-31 per in New Zealand, \$27-34 per in the US South, and \$59-61 per in Scandinavia. Since that time, Scandinavia has devalued its currency, making Mexico's wood cost close to the highest in the world.

Percent of delivered cost

Stumpage	11%
cut, skid, load	24%
Transport	42%
Handling	7%
Overhead	16%
Total	100%

Paper Industry

Paper production in Mexico increased slowly during the last five years, growing from 2.58 million metric tons in 1987 to 2.82 million mt in 1992. However, over that same time period paper imports increased from 66,000 mt to almost 850,000 mt in 1992. The share of imports in total paper consumption in Mexico increased from less than 3 percent in 1987 to more than 24 percent in 1992.

The government of Mexico is trying to privatize its state-owned paper companies. Pipsa, or Productora e Importadora de Papel, is one of Latin America's largest newsprint manufacturers. The state-owned corporation has three mills, one using bagasse, one using secondary fiber, and one using woodfiber. The government announced last November its intention to sell all three mills. The bagasse mill (in Veracruz state) and the woodpulp mill (in Oaxaca), have both been shut down.

Although the use of pulp and paper wood residue for cogeneration purposes looks less than pessimistic, there is a noticeable movement to use gas and oil-fueled cogeneration in paper making. The investment in cogeneration by the paper industry is, in part, the result of the government easing its monopolistic control over electrical distribution. With the government allowing these cogeneration projects, the paper industry plans to benefit not only from potential energy cost reduction, but also from improved product quality by eliminating frequent power blackouts and voltage changes.

Manufacturers of cogeneration equipment are almost entirely foreign companies with the exception of a Monterrey based boiler manufacturer called Cerrey. It is also common to do subcontracting of components with Mexican companies. Almost all the control parts are imported at this time.

In short, there will be very little opportunity for wood residue in the pulp and paper industry until a major reforestation program guarantees a long-term supply of virgin wood fiber.

2

Mexican Market for U.S. Wood Working Equipment

According to the U.S. Department of Commerce, the Mexican market for wood working machine tools was US\$ 15.8 million in 1989. In 1990, the total declined to \$13.6 million, but then increased to \$14.3 million in 1991. In 1991, Mexican domestic production supplied around 12 percent of total demand, while imports accounted for 88 percent. In 1990, the U.S. had a 63 percent market share (\$8.2 million), while Italy had an 11.9 percent share, Spain 10.7 percent, and Germany 10.2 percent.

An analysis of the 1993 U.S. export statistics shows that U.S. exports of sawmill machinery and wood working machine tools increased in 1992 to about the same level as in 1989 (Note: Fig. 19 shows only several of the major categories of wood working and sawmill

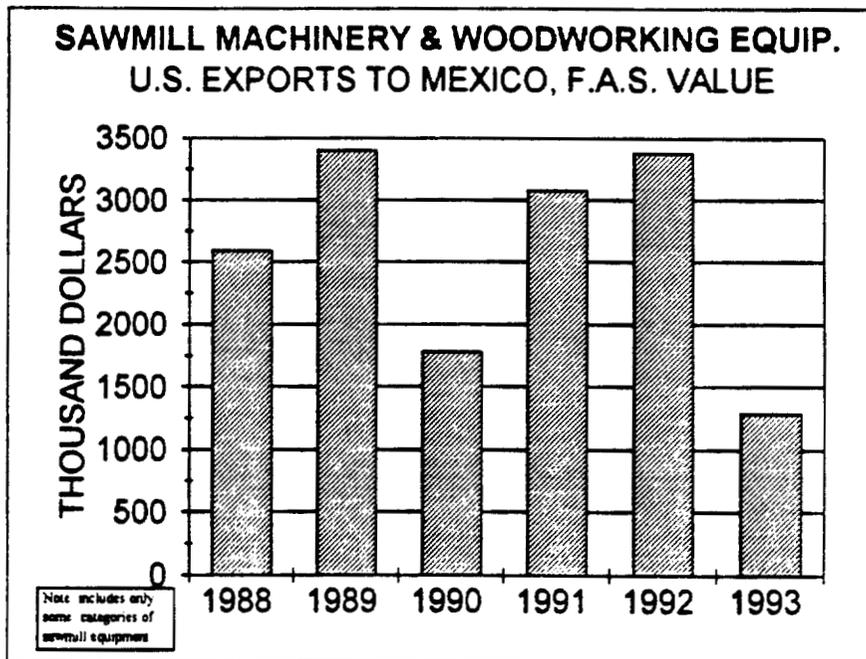


Figure 19

equipment, it is not a compilation of all categories). However, in 1993 U.S. equipment exports plunged to its lowest level in the past six years. This decline can be attributed to a general weakening in the furniture and forest products industry in Mexico in 1993, competition from European manufacturers, and perhaps a drop in purchase in anticipation of lower tariffs on imports from the U.S. once NAFTA was implemented.

Following is a breakdown of imports of U.S. wood working machinery by industrial sector in Mexico:

Sector	Percent of	
	Total sales	Imports
Furniture manufacturers	72%	68%
Sawmills	11%	16%
Plywood plants	7%	4%
Particleboard, other plants	6%	3%
Other related activities	4%	9%

The majority of machinery used in the wood-converting and furniture industry of Mexico is from Italy, Germany, Spain, the U.S. and Brazil. Most of the technology for plywood manufacturing is from the U.S., and German equipment is used in the composite panel industry.

Currently, Mexico is the 7th largest market for exports of U.S. sawmill machinery; however, this represents only 1.5 percent of the total exports, by value.

According to a U.S. Commerce Department study, the Mexican market for wood working equipment is highly receptive to U.S. manufactured equipment:

"This receptivity comes from the fact that U.S. manufacturers share a tradition of high quality for their products. Other factors which favor U.S. manufacturers are the proximity between the United States and Mexico; the prompt response given by U.S. manufacturers to the requests from their customers; the large variety of equipment manufactured in the United States; the capabilities of the equipment; and familiarity with business practices of both countries."

U.S. equipment is principally sold through Mexican representatives. None of the major U.S. manufacturers of wood working machine tools has manufacturing operations in Mexico. Promotion is

typically through participating in trade shows, advertising in specialized magazines; and visiting clients.

Biomass Equipment

As an indication of the market for U.S. manufactured equipment in biomass projects in Mexico, we examined recent statistics on U.S. exports to Mexico of several types of boilers used to produce steam. In contrast to wood working equipment, U.S. exports of boilers and boiler parts have increased rapidly in recent years, and although the trade slowed in 1993, it did not decrease sharply (Fig. 20). U.S. exports of boilers to Mexico increased from only about \$500,000 in 1988 to around \$4 million in 1992, and to \$4.2 million in 1993. U.S. exports of boiler parts to Mexico increased from about \$2 million in 1990 to around \$5 million in 1992 and 1993.

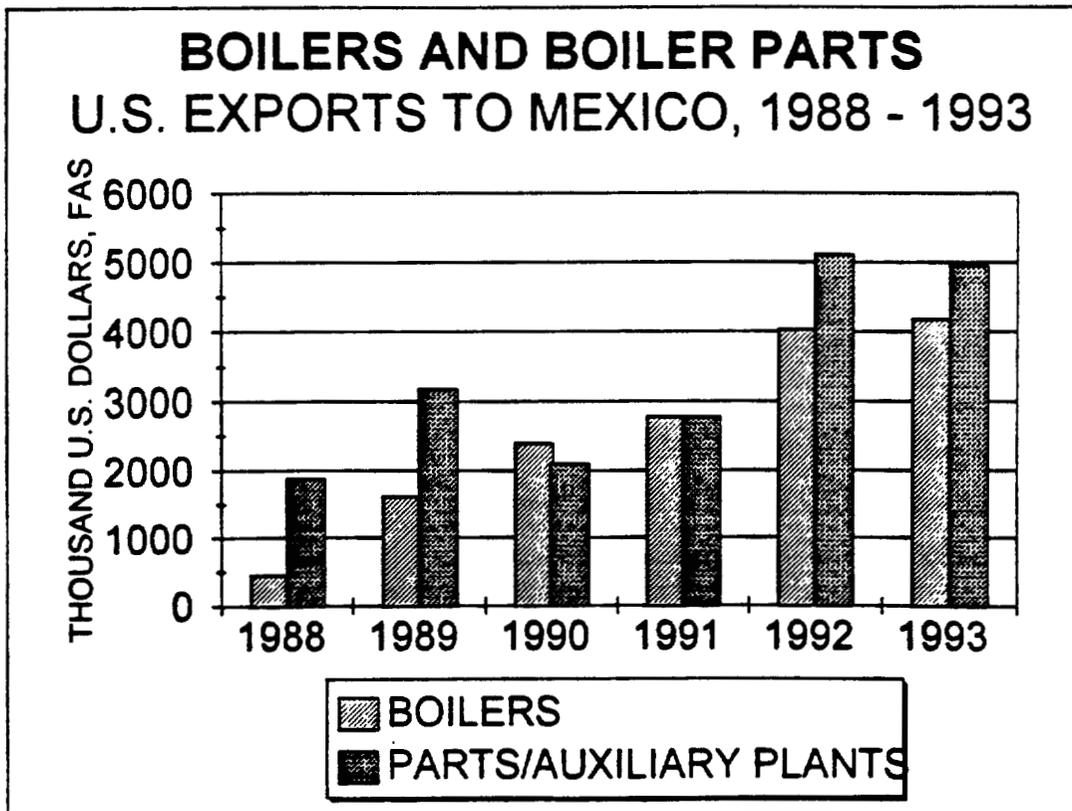


Figure 20

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Wood Residue Availability

No reliable statistics exist on the volume of wood waste in Mexico that is currently available, i.e., not being consumed by a board or pulp producer nor being used for energy production already. In addition, the inherent inaccuracies in Mexico's timber production statistics (reportedly off by as much as 100 percent) and lumber production statistics makes any quantitative analysis of wood residue flows virtually impossible.

However, to illustrate the magnitude of residue availability, it is possible to utilize the statistics that are available to estimate the volume of wood residue that is produced in Mexico from the official industrial timber harvest (Table 18). We have used 1991 data for this example.

Table 18. Mexico: Wood Residue Availability Analysis

The following example uses 1991 data.

	M cubic meters
Fuelwood harvest	10000
Total Industrial Roundwood Harvest	7683
Volume to sawmills and plywood mills	5391
plywood roundwood	368
sawmill roundwood	4848
particleboard roundwood	175
Residue production @ 50%	
plywood	184
sawmill	2424
sub-total	2608
Less chips consumed by pulp mills	433
Less fiber consumed by particleboard	525
Less fiber consumed by hardboard	45
sub-total	1605
Hourly volume @ 8,000 hours per year	
green tonnes	200
dry tonnes	100

The total industrial roundwood harvest in 1991 was 7.683 million cubic meters. Note that this is less than the most conservative estimate of wood unofficially harvested for firewood (10 million m³). Of the industrial wood harvest, about 21 percent was roundwood utilized by pulp mills, 6 percent was firewood, 2 percent was used to produce sleepers (railroad ties) and 1 percent for poles. The remainder, 5.391 million m³, was used to produce lumber, plywood, particleboard and other reconstituted board products. The total wood residue produced by sawmills and plywood mills was just over 2.6 million m³. After subtracting out the residues consumed by pulp mills and for the various board products, there remains about 1.6 million m³.

Assuming an average of 1 green tonne per cubic meter, and 8,000 hours per year, this total residue for Mexico equals about 200 green tonnes per hour, or about 100 dry tonnes per hour.

In Table 19, the focus is on the primary wood processing states of Durango and Chihuahua. Using the above figure of 1.6 million m³ of available wood residues for Mexico, we estimate the

Table 19. Total surplus wood residue in		M cubic meters
Durango		461
Chihuahua		291
Less 30% unrecoverable or currently used		
Durango		322
Chihuahua		203
Available* tons of fiber per hour (8,000 hrs/year)		
	Green tonnes	Dry Tonnes
Durango	40	20
Chihuahua	25	12.5

Note: 1 cubic meter wood = 1 green tonne
2 green tonnes = 1 dry tonne

share in these two states based on their share of lumber production. Assuming the consumption of wood residues by pulp mills and board plants is roughly the same as for Mexico as a whole, Durango would have about 460,000 green tonnes of residues and Chihuahua 290,000 green tonnes per year. If we assume that 30 percent of this "available" residue is unrecoverable or already being utilized, then Durango has about 20 dry tonnes per hour and Chihuahua 12.5 dry tonnes per hour of available wood residues.

Obviously, a substantial amount of further investigation is necessary before a reliable estimate can be made of economically available wood residues in Mexico. Several key points regarding this analysis of wood residues should be emphasized:

1. The amount of wood currently being consumed for fuelwood in Mexico has been estimated at anywhere from 10 up to 28 million m³. Even the lowest estimate, used here, is more than 6 times greater than the total wood residues generated from industrial wood processing.

2. Because of the high cost of wood transport, a substantial volume of wood is left in the forest by loggers, and is never counted as part of the residue stream. These same high transport costs would prevent most of the logging residue from being utilized in regional power plants, but some additional wood, on the margin, could be expected to enter the system. If there is a market for the residues, an increase, albeit slight, in utilization of the timber harvested could be expected.

3. As mentioned previously, many of the small mills lack the ability to recover sawmill residues, either as chips or hog fuel. Realistically, these small mills will not be able to afford the equipment to recover the residues, especially if they are a long distance from the location where the residue would be utilized. Over time, due to competition from U.S. products, a number of these

small mills will likely close, and the production will be consolidated among larger mills. Residues from those facilities will be much more available to any type of energy generating system.

4. The amount of wood consumed by pulp mills in Mexico has declined by about 50 percent, in 1993, from the quantity assumed in this example. Also, we have not estimated the quantity of wood which might be supplied by plantations of fast growing species, either for pulp or a biomass plantations. Since, with very few exceptions, commercial plantations of fast growing species have not yet been established, their utilization is only speculative at this point.

5. Much of Mexico's lumber production is shipped rough to regional distribution centers, some of which goes to planing mills. The additional wood residues, in the form of planer shavings, have not been included in the above example. This represents an additional source of residue.

In addition, most of the wood residues generated by maquiladora plants are not included in the above analysis, and these also represent a sizable source of residues.

6. One likely area to encourage the use of surplus wood residues is in providing energy for dry kilns at sawmills who do not currently have this capability. However, it is uncertain how much the demand for kiln dried lumber will expand in Mexico. Lumber is largely used for construction, but mostly in concrete forming, not in structural applications. Low grade, air dried lumber is perfectly adequate for this use. If more higher value lumber is available, through more kiln-drying, will the market consume it? Is the available timber supply of adequate quality to produce higher value lumber? These and other questions regarding the need for dry kilns should be examined in greater detail.

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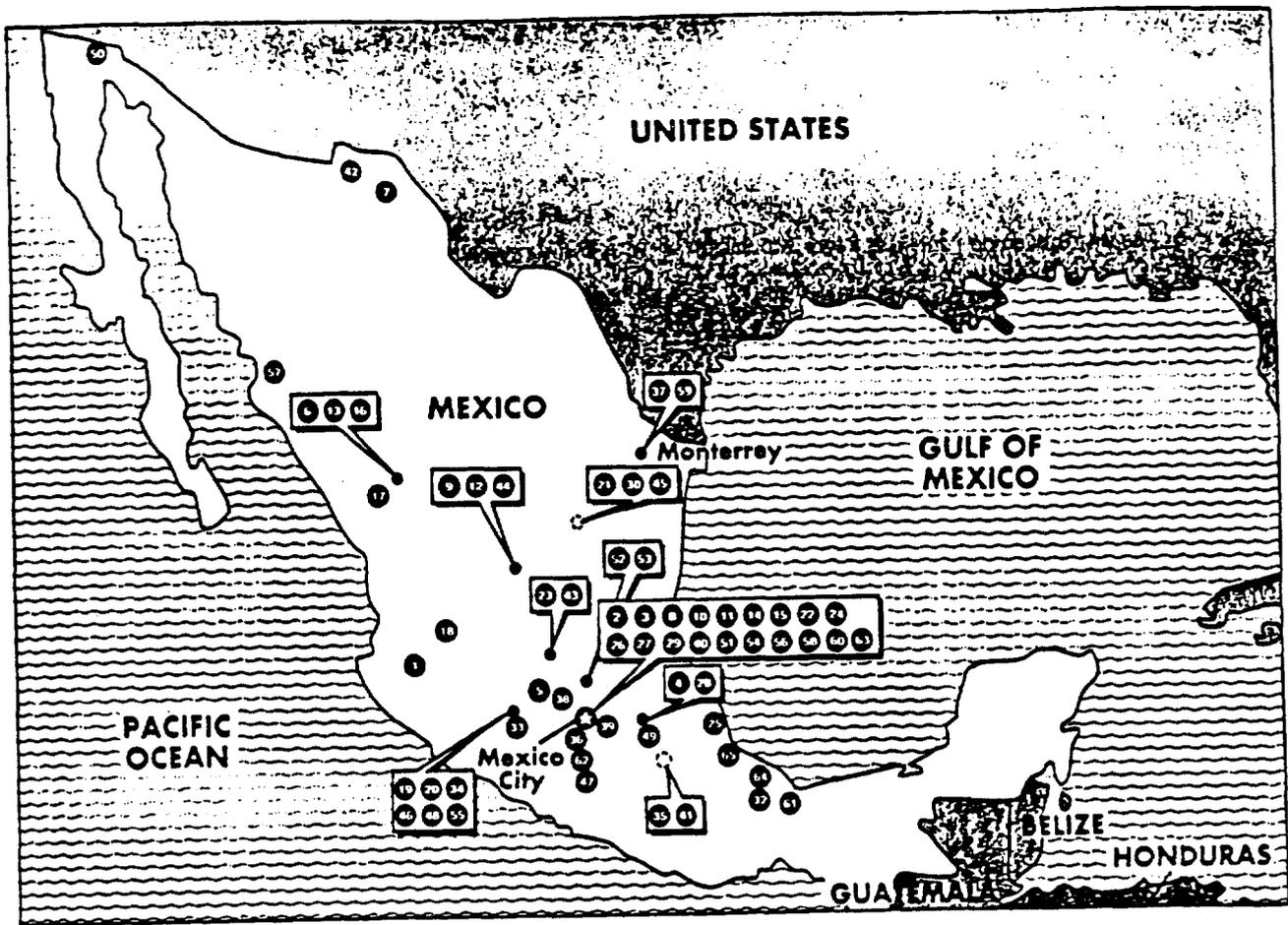
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APPENDIX

DIRECTORY OF MEXICO'S PULP AND PAPER INDUSTRY

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MEXICO

- 1 Atenquique SA, Cia. Industrial de; Atenquique, Jalisco
- 2 Atlas SA, Papelera; Nuocolpan de Juárez
- 3 Bidasoa SA, Manufacturera de Papel; Mexico City, D.F.
- 4 Celulosa de Fibras Mexicanas SA de CV; Apizaco, Tlaxcala
- 5 Celulosa y papel de Michoacan SA; Morelia, Michoacan
- ~~6 Centauro SA, Celulosos, Durango closed~~
- 7 Chihuahua SA de CV, Papelera de, Igual; Chihuahua
- 8 Comercializadora de Papeles Industriales SA de CV, Progreso Industrial; Villa Nicolas Romero, Tlalnepanitla
- ~~9 Copal Mexicana SA de CV, San Luis Potosi closed~~
- 10 Corporacion de Papeles Tecnicos y especiales SA de CV; Tlalnepanitla
- 11 Coyacoacan SA, Fabrica de Papel; Mexico City
- 12 Destinado SA de CV, Productora Nacional de Papel; San Luis Potosi
- ~~13 Durango SA de CV Grupo Industrial, Celulosicos-Centauro, Durango closed~~
- 14 Estrella SA de CV, Cartonajes; Mexico City, D.F.
- 15 Fenix SA, Cia. Papelera El; Mexico City, D.F.
- 16 Grupo Industrial Durango Celulosicos Centauro; Durango
- 17 Guadalajara SA de CV, Empaques Modernos; El Salto Jalisco
- 18 Guadalajara SA, Fabricas de Papel; Guadalajara
- 19 Guadalupe SA de CV, Cartonera; Los Reyes Acaquilpan, La Paz
- 20 Heda SA de CV, Papelera, Los Reyes, La Paz

closed

- 21 Higienicos de Mexico SA de CV; San Nicolás de los Garza, Nuevo León
- 22 Iruña SA de CV, Papelera; Mexico City, D.F.
- 23 Kimberly-Clark de Mexico SA, Bajío Mill, San Juan del Rio
- 24 Kimberly-Clark de Mexico SA, Naucalpan Mill, Naucalpan de Juárez
- 25 Kimberly-Clark de Mexico SA, Orizaba Mill; Escamela, Veracruz
- 26 Kraft SA; Mexico City, D.F.
- ~~27 Loreto y Fabrica de Papel Peñon Pobre SA de CV, Mexico City, D.F. closed~~
- 28 Morelas SA de CV, Papelera de Loreto y Pe SA de CV; Apizaco, Tlaxcal
- 29 Madruño y Cia. SA de CV; Mexico City, D.F.
- 30 Maldonado SA, Cia. Papelera; San Nicolas de los Garza
- 31 Manufacturas Gargo SA de CV; Atizapan
- 32 Mexicana de Papel Periodico SA; Tres Valles
- 33 Mexicana SA de CV, Industrial Papelera; Uruapan
- 34 Mexico SA, Cajas Corrugadas de; Los Reyes, La Paz
- ~~35 Mexico SA, Fabrica de Papel Tlalpizahuac closed~~
- 36 Monterola SA de CV, Papelera; Tepetitlaotoc
- 37 Monterrey SA, Fabrica de Papel; Monterrey
- 38 Nevado SA de CV, Papelera del, San Miguel Mill; Toluca
- 39 Papeles de Calidad San Rafael SA de CV, San Rafael Mill, Chalco, Tlalmanalco
- ~~40 Pila SA, Fabrica de Celuloso El Ayote, Tlalmanalco closed~~
- 41 Poblano SA, Cia., Industrial Papelera; Puebla
- 42 Pondercel SA de CV, Anahuac, Chihuahua

MEXICO (continued)

- 43 Ponderosa SA, Cartones; San Juan del Rio
- 44 Potosi SA de CV, Fabricas de Papel, San Luis Potosi
- 45 Productora de Papel SA; San Nicolás de los Garza
- 46 Rimo SA, Cartonera; Los Reyes Acoquilpan, La Paz
- 47 San Cristóbal SA de CV, Productos; Ecatepec
- 48 San Jose SA, Fabrica de Papel; Los Reyes Acoquilpan
- 49 San Juan SA, Fabrica de Papel; San Martin Texmelucan
- 50 San Francisco SA de CV Fabrica de Papel, Lopez Mateos Mill, Mexicoli
- 51 San Pablo SA de CV, Empaques Modernos; Mexico City, D.F.
- 52 Santa Clara SA de CV, Fabrica de Papel; Santa Clara
- 53 Smurfit Carton y Papel de Mexico SA, Cerro Gordo Mill; Santa Clara
- 54 Smurfit Carton y Papel de Mexico SA de CV, Los Reyes Mill; Los Reyes Ixtacala
- 55 Soledad SA, Fabrica de Papel La; Los Reyes Acoquilpan
- 56 Sonoco de Mexico SA de CV, Planta Santa Clara, Mexico City, D.F.
- 57 Sonora SA, Celulosa y Corrugadas de Obregon y Proza 5 de Mayo; Navajoo
- 58 Todo Papel SA; Ixtapaluca
- 59 Titan SA, Empaques de Carton; Monterrey
- 60 Transformacion de Papel Irbio SA; Mexico City
- 61 Tuxtepec SA, Fabricas de Papel; Tuxtepec
- 62 Unipak SA; Cuernavaca
- 63 United SA de CV, Empaques de Carton; Mexico City D.F.
- 64 Veracruzana SA de CV, Papelero, Orizaba, Veracruz
- 65 Xalapa SA, Celulosa y Papel de; Xalapa, Veracruz

Personnel:

CLOSED

Mill Mgr: Angel D. Hipólito García
 Prod Mgr: Fernando García Rivera
 Wood Procurement Dir.: Gustavo Cardenas

Sis Mgr: Sergio Vadillo Lagos
 Finan Dir: Pedro H. Ramirez S.

Total Employees at This Location:
 545

* Type of Operation: pulp *

Pulp Grades & Capacities:

Total pulp capacity: 63,000 m³/y
 Pulp available for market: 63,000 m³/y

Principal categories:

unbl./semi-bl. softwood kraft—
 63,000 m³/y

Raw Material Data:

Wood deliveries to mill:
 Pulpwood as logs or roundwood
 300,000 m³/y

Pulpwood as chips: 15,000 m³/y

Pulp Mill Data:

Debarking drums: 1

Chippers: 3

Type of chip transport: mechanical
 conveyor

Batch digesters: 5 at 60,000 m³/y

Flash dryers: 1 at 40,000 m³/y

Fourdrinier pulp dryers: 1 at 24,000 m³/y

Recovery boilers: 1 at 204 tons/day dry
 solids

Power Plant, Water & Effluent

Data:

Power boilers: 3 at 80 steam tons/hr

Fuels used: 100% oil

Turbines: 2 at 10.0 MW

Purchased electrical power: .2 MWh/day

Effluent systems:

clarifiers, aerators, settling ponds,
 biological treatment

Expansion Plans:

Pulp production: 75,000 m³/y increase

Paper production: 250,000 m³/y increase

Durango SA DE CV, Grupo Industrial

Centauro, Mexico

Paper & Paperboard Grades & Capacities:

Principal categories:

linerboard

Paper & Paperboard Mill Data:

Paper Machines: 1

twin-crete

Grupo Industrial Durango, **CLOSED**

Celulosicos Centauro

Protasio 50

Durango, Durango, Mexico

Phone: 181 2 34 44

FAX: 181 2 18 69

Mill Location: Km 26 Carretera

Durango, Mexico

Subsidiary of Grupo Industrial

Durango

Division of Papeles Centauro Gpo

Ind Durango

Personnel:

Mill Mgr: Rolf Furrer S

Asst. Mill Mgr: Claudio Zamora R.

Paper Mill Mgr: Rafael Fuentes

Pulp Mill Mgr: Roberto Mateos

Tech Mgr: Armando Dominguez F

Chief Eng: Jaime Luna L

Purch Agent: Jorge Perez

Prod Mgr: Alfonso Castañeda

Fin Mgr: Pedro Ramirez

Wood Supply: Angel Hipólito

Total Employees at This Location:

Pulp employees: 545

Paper employees: 455

*Type of Operation: pulp, paper *

Pulp Grades & Capacities:

Total pulp capacity: 63,000 m³/y

Pulp available for market: 45,000 m³/y

Principal categories:

TMP—150,000 m³/y

unbl./semi-bl. softwood kraft—

63,000 m³/y

Raw Material Data:

Wood deliveries to mill:

Pulpwood as logs or roundwood:
 300,000 m³/y

Pulpwood as chips: 15,000 m³/y

Pulp Mill Data:

Debarking drums: 1

Chippers: 3

CTMP systems: 2

Batch digesters: 6 at 65,700 m³/y

Bleaching systems: 1

Process sequence peroxal (pp) at
 80,000 m³/y

Flash dryers: 2 at 150,000 m³/y

Fourdrinier pulp dryers: 1 at 47,450 m³/y

Evaporator lines: 1

Recovery boilers: 1 at 992 tons/day dry
 solids

Paper & Paperboard Grades & Capacities:

Paper capacity: 270,000 m³/y

Paperboard capacity: 135,000 m³/y

Principal categories:

packaging/industrial—270,000 m³/y

kraft linerboard—750 m³/y

corrugating medium—600 m³/y

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 4 (disc)

Paper Machines: 1

No. 1, fourdrinier, installed 1989, trim
 width 6.8 m, max. speed 750.0
 m/min

Rewinders: 1

Power Plant, Water & Effluent

Data:

Power boilers: 3 at 156 steam tons/hr

Fuels used: 100% oil

Turbines: 2 at 12.5 MW

Purchased electrical power: 9.6

MWh/day

Effluent systems:

clarifiers, aerators, settling ponds,
 biological treatment

ESTRELLA SA DE CV,
 CARTONAJES

Aptdo. Postal 16288

02300 Mexico, D.F., Mexico

Phone: 5 368 00 33

Telex: 1773423

Personnel:

Chm: Amable Carriles Cueto

Mill Locations:

Mexico, D.F. (paperboard mill)

Estrella SA de CV, Carionajet

Aptdo. Postal 16288

02300 Mexico, D.F., Mexico

Phone: 5 368 00 33

Telex: 1773423

Mill Location: Poniente 122, No. 430

Personnel:

Mill Mgr: Adolfo Carriles Koll

Tech Mgr: Salvador Carrasco Nairo

Total Employees at This Location:

496

Type of Operation: paperboard
 Paper & Paperboard Grades &
 Capacities:

Principal categories:

kraft linerboard—10,000 m³/y
 folding boxboard—65,000 m³/y

Grades:

Boxboard, folding, imitation kraft,
 Kraft paper, Linerboard kraft

Paper & Paperboard Mill Data:

Paper Machines: 2

No. 1, cylinder, trim width 180.0 m,

max. speed 100.0 m/min, size

press, coater

No. 2, cylinder, trim width 320.0 m,

max. speed 90.0 m/min, size press

Rewinders: 1

Sheeters: 2

Coating equipment:

air knife, off machine

blade, on machine

Power Plant, Water & Effluent

Data:

Power boilers: 1

Fuels used: 100% gas

Turbines: 2

FENIX SA, CIA. PAPELERA EL

Av. Rio Consulado 375, Col. Arenal

02980 Mexico, D.F., Mexico

Phone: 355 32 11

Telex: 1772363 pedime

Personnel:

Chmn. of the Board: Jose Barroso

Chavez

Pres: Jose Luis Herrera Ortiz

Prod Mgr: Eduardo Valencia

Sis Dir.: Francisco Coellar M.

Purch Dir.: Diego Gonzalez

Mill Locations:

Mexico, D.F. (paper & paperboard mill,
 converting plant)

Fenix SA, Cia. Papelera El

Av. Rio Consulado 375, Col. Arenal

02980 Mexico, D.F., Mexico

Phone: 355 32 11

Telex: 1772363 pedime

Personnel:

Mill Mgr.: J. L. Herrera Ortiz

Asst. Mill Mgr.: Jose Antonio Batres C.

Paper Mill Mgr.: Eduardo Valencia

Total Employees at This Location:

154

Paper employees: 130

Type of Operation: paper,

paperboard, converting

Paper & Paperboard Grades &
 Capacities:

Total paper & paperboard capacity:
 16,500 m³/y

Paper capacity: 11,000 m³/y

Paperboard capacity: 5,500 m³/y

Principal categories:

printing/writing—8,000 m³/y

(total woodfree—8,000 m³/y)

specialty papers—3,000 m³/y

folding boxboard—5,500 m³/y

Paper & Paperboard Mill Data:

Pulpers: 3

Refiners: 7 (conical, double disc)

Paper Machines: 2

cylinder, installed 1940, rebuilt 1984,

trim width 1.5 m, max. speed 40.0

m/min, coater

fourdrinier, installed 1945, rebuilt

1975, trim width 2.0 m, max

speed 228.6 m/min, size press

Rewinders: 2

Sheeters: 1

Superlenders: 1

Power Plant, Water & Effluent
 Data:

Power boilers: 2 at 30 steam tons/hr

Fuels used: 100% oil

Turbines: 1 at 10.5 MW

Purchased electrical power: 22.0

MWh/day

Effluent systems:

clarifiers, aerators

FINES SA, FABRICA DE PAPEL

Aptdo. Postal 74 286, 71 Calle Matz, Col

I. Granjas Esmeralda, Del. Iztapalapa

09810 Mexico, D.F., Mexico

Phone: 581 77 99

Personnel:

Pres: Guillermo Elias

Man. Dir.: Luis Elias

Mill Locations:

Apizaco, Tlaxcala (paper mill)

Finex SA, Fabrica de Papel

Malz 71 Km. 133.6 Carr. Mexico-

Veracruz

90309 Apizaco, Tlaxcala, Mexico

Phone: 581 77 99

Type of Operation: paper

Paper & Paperboard Grades &
 Capacities:

Total paper & paperboard capacity:
 4,500 m³/y

Paper capacity: 4,500 m³/y

Principal categories:

tissue/hygienic—4,500 m³/y

Paper & Paperboard Mill Data:

Paper Machines: 1

lourd./yankee, trim width 2.1 m, max.
 speed 350.0 m/min

GUADALAJARA SA DE CV,
 EMPAQUES MODERNOS DE

Etzallan 25-A, Col. Popular Rastro

15220 Mexico, D.F., Mexico

Phone: 789 90 88

Telex: 1762303 ecurme

Personnel:

Chmn. of the Board: Luis Gonzalez Diez

Prod Mgr.: A. Cruz Linares

Sis. Dir.: Jose Caso Perez

Purch Dir.: Roberto Macias Velazquez

Mill Locations:

El Salto Jalisco (paper & paperboard

mill)

Guadalajara SA de CV, Empaques
 Modernos de

Aptdo. Postal 34

45680 El Salto Jalisco, Mexico

Phone: 35 33 04

Mill Location: Km. 7.3 Carr.

Guadalajara-El Salto Jalisco

Total Employees at This Location:

200

Type of Operation: paper,

paperboard

Paper & Paperboard Grades &
 Capacities:

Total paper & paperboard capacity:

87,500 m³/y

Grades:

Cover paper, Linerboard kraft

Paper & Paperboard Mill Data:

Paper Machines: 1

cylinder, trim width 3.1 m, max

speed 225.0

GUADALAJARA SA, FABRICA DE PAPEL

Pablo Valdez 578 S.L.
44360 Guadalajara, Jalisco, Mexico
Phone: 91 38 17 41 68

Personnel:

Chmn. of the Board: Manuel Arellano Hernandez

Pres.: Alejandro E. Arellano Anaya
Man. Dir.: Mario Gonzalez Torres
Prod. Mgr.: C. Arellano Anaya
Sis. Dir.: Carlos Martin Del Campo A.
Purch. Dir.: Joaquin Salas Gallo
Prod. Mgr.: Antonio Cruz Linares
Mill Locations:
San Sebastianito (paper & paperboard mill, converting plant)

Guadalajara SA, Fabricas de Papel

Pablo Valdez 578 S.L.
44360 Guadalajara, Jalisco, Mexico
Phone: 91 38 17 41 68
Telex: 684272 aldame

Mill Location: Iguala 150, San Sebastianito

Personnel:

Mill Mgr.: A. Arellano Anaya
Asst. Mill Mgr.: Daniel Rios
Paper Mill Mgr.: Ernesto Gonzalez Rato
Tech. Mgr.: Eduardo Ramirez
Chief Eng.: Carlos Enderle
Purch. Agent: Ismael Meneses
Converting Plant Mgr.: Rene Paredes
Adm. Dir.: Mario Gonzalez Torres
Total Employees at This Location: 250

Type of Operation: paper, paperboard, converting

Paper & Paperboard Grades & Capacities:

Paper capacity: 48,000 m²/y
Principal categories:
packaging/industrial—48,000 m²/y
Grades:

Container board, Food wrapping, Gray paper, Kraft board, Kraft paper, Kraft wrapping, Linerboard kraft, Mill board, Shoe board

Paper & Paperboard Mill Data:

Pulpers: 6

Refiners: 7 (disc)

Paper Machines: 3

No. 1, cylinder, installed 1944, trim width 1.1 m, max. speed 60.0 m/min

No. 2, cylinder, installed 1954, trim width 1.4 m, max. speed 80.0 m/min

No. 3, cylinder, installed 1974, rebuilt 1984, trim width 2.4 m, max. speed 120.0 m/min, size press

Rewinders: 2

Sheeters: 2

Power Plant, Water & Effluent Data:

Power boilers: 3
Fuels used: 100% oil
Turbines: 1 at 5.0 MW
Purchased electrical power: 75.0 MW/day

Effluent systems:

clarifiers, aerators, settling ponds, biological treatment

GUADALUPE SA DE CV, CARTONERA

Km 17 Carr. Mexico Puebla

56400 Los Reyes Acaquilpan, Mexico
Phone: 521 91 37

Personnel:

Chmn. of the Board: Felix Ribot Govea
Man. Dir.: Jose M. Ribot Rodriguez
Prod. Mgr.: Manuel Zamora Rosas
Sis. Dir.: Eduardo Varela Rivas
Purch. Dir.: Jesus Dominguez
Mill Locations:
Los Reyes Acaquilpan (paperboard mill)
Cartonera Rimo SA, Los Reyes Acaquilpan (paperboard mill)

Guadalupe SA de CV, Cartonera

Km 17 Carr. Mexico-Puebla
56400 Los Reyes Acaquilpan, La Paz, Edo de Mexico, Mexico
Phone: 521 91 37

Personnel:

Mill Mgr.: Felix Ribot Govea
Asst. Mill Mgr.: Jose M. Ribot Rodriguez
Paper Mill Mgr.: Manuel Zamora Rosas
Tech. Mgr.: Abraham Rivera Ramirez
Chief Eng.: Guillermo Jimenez Miranda
Total Employees at This Location: 125

Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:

Principal categories:

corrugating medium—373 m²/y
folding boxboard—7,979 m²/y
press board—416 m²/y
other—1,232 m²/y

Paper & Paperboard Mill Data:

Pulpers: 3

Refiners: 2 (conical)

Paper Machines: 2

No. 1, cylinder, installed 1962, rebuilt 1981, trim width 1.6 m, max. speed 20.0 m/min, size press, coater

No. 2, cylinder, installed 1966, rebuilt 1979, trim width 1.2 m, max. speed 30.0 m/min

Rewinders: 1

Sheeters: 2

Coating equipment:

blade, on machine, installed 1984, trim width 1.7 m, max. speed 40.0 m/min

Power Plant, Water & Effluent Data:

Power boilers: 2
Fuels used: 100% oil
Effluent systems:
clarifiers, aerators, settling ponds

Rimo SA, Cartonera

Km 22.3 Carr. Mexico-Tezcoco, Col. La Magdalena, Antipac
56440 Los Reyes Acaquilpan, La Paz, Edo de Mexico, Mexico
Phone: 597 517 01

Subsidiary of Cartonera Guadalupe SA de CV

Personnel:

Mill Mgr.: Felix Ribot Govea
Asst. Mill Mgr.: Jose M. Ribot Rodriguez
Paper Mill Mgr.: Felix Ribot Rodriguez
Tech. Mgr.: Adalberto Molina Del Rio
Chief Eng.: Javier Rodriguez Dominguez
Purch. Agent: Cesar Dominguez II
Total Employees at This Location: 32

Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:

Grades:

Art board, Bristol, Castcoated board, Machine-coated board, Manila board
Paper & Paperboard Mill Data:

Pulpers: 1

Refiners: 1 (conical)

Paper Machines: 1

No. 1, cylinder, installed 1984, trim width 2.0 m, max. speed 30.0 m/min, size press, coater

Rewinders: 1

Sheeters: 1

Power Plant, Water & Effluent Data:

Power boilers: 1
Fuels used: 100% oil
Effluent systems:
clarifiers, aerators, settling ponds

HEDA SA DE CV, PAPELERA

Apdo. Postal 638
06000 Mexico, D.F., Mexico
Phone: 528 71 29
Telex: 1775827 com

Personnel:

Pres.: Enrique Dabdoub Gómez
Dir.: Alejandro Smutry Narganes
Supl.: Antonio Becerra
Mill Locations:
Los Reyes, La Paz, Edo de Mexico (paperboard mill)

Heda SA de CV, Papelera

Km 23.5 Carr. Mexico-Tezcoco
56440 Los Reyes, La Paz, Edo de Mexico, Mexico
Phone: 8551300
Phone: 8552977
Telex: 1775827 com

Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:

Grades:

Corrugating medium, Linerboard kraft
Paper & Paperboard Mill Data:
Paper Machines: 1
fourdrinier, trim width 2.3 m, max. speed 140.0 m/min

HOVOMEX SA DE CV

Apdo. Postal 68
Apizaco, Tlaxcala, Mexico
Phone: 241 7 24 66

Personnel:

Chmn. of the Board: Gordon W. Moran
Pres.: Enrique Morodo Garcia
Man. Dir.: Enrique Morodo Santisteban
Prod. Mgr.: Cesar Gonzalez Vazquez
Sis. Dir.: Javier Sada Narro
Purch. Dir.: Salvador De Leon Escanilla
Res. & Dev. Dir.: Angelica Heredia Salcedo

Cont. Jorge Bouyssonnade Bandera

Int. Rel. Dir.: Jose Zaldívar Morales

Mill Locations:
Apizaco (paper mill)

Hovomex SA de CV

Apdo. Postal 68
Apizaco, Tlaxcala, Mexico
Phone: 241 7 24 66

Type of Operation: paper
Paper & Paperboard Grades & Capacities:

Grades:

Creeping paper, Fiberboard Flame retardant paper, Impregnating base Release paper

IRUNA SA DE CV, PAPELERA

Calz. Tulyehualco 5921, Col. V. Del Izapalapa, Apdo. Postal 55433
09880 Mexico, D.F., Mexico
Phone: 656 25 81
Telex: 1764192 lrsame
FAX: 656 44 10

Personnel:

Chmn. of the Board: Ambrosio Arcelus Echeverria
Pres.: Miguel Arcelus Iroz
Man. Dir.: Nilo Fernandez Sofo
Deputy Man. Dir.: José Luis Garcia
Deputy Man. Dir.: Johé María Sahagún Rios
Prod. Mgr.: Evodio Padilla
Sis. Dir.: José María Aranz
Elec. Eng.: Hector Balcazar
Chem. Eng.: Javier Arcelus I
Chem. Eng.: Encarnación Rivera
Mech. And. Eng.: Juan Ramos Silgado
Mill Locations:
Mexico, D.F. (paper & paperboard mill)
Divisions:
Tulyehualco, 5921, C.P. 09880, Tel: 656 25 81

Iruna SA de CV, Papelera

Calz. Tulyehualco 5921, Col. El Vergel, Del Izapalapa, AP/SS 433
09880 Mexico, D.F., Mexico
Phone: 582 60 11
Telex: 1764192 lrsame

Personnel:

Mill Mgr.: Miguel Arcelus Iroz
Asst. Mill Mgr.: Maximiliano Garcia Echeguren
Paper Mill Mgr.: Pedro Alcibia Bibbins
Chief Eng.: Jose Alcibia Martinez
Purch. Agent: Jose Ma. Sahagun Rios
Total Employees at This Location: 205

Paper employees: 170

Type of Operation: paper, paperboard

Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity: 39,000 m²/y

Paper capacity: 17,000 m²/y

Paperboard capacity: 22,000 m²/y

Principal categories:

packaging/industrial—17,000 m²/y
test linerboard—12,000 m²/y
corrugating medium—10,000 m²/y
Grades:

Corrugating medium, Linerboard test

Paper & Paperboard Mill Data:

Pulpers: 9

Refiners: 32 (conical)

Paper Machines: 7

No. 1, fourdrinier, installed 1947, rebuilt 1978, trim width 1.7 m, max. speed 120.0 m/min

No. 2, fourdrinier, installed 1949, rebuilt 1976, trim width 2.0 m, max. speed 120.0 m/min

No. 3, fourdrinier, installed 1953, rebuilt 1966, trim width 2.2 m, max. speed 130.0 m/min

No. 4, fourdrinier, installed 1964, rebuilt 1980, trim width 1.5 m, max. speed 120.0 m/min

No. 5, cylinder, installed 1967, trim width 1.7 m, max. speed 100.0 m/min

No. 6, fourdrinier, installed 1969, trim width 2.0 m, max. speed 130.0 m/min

Pulp Grades & Capacities:

Principal categories:
recycled fiber processing—3,310 m/y

Paper & Paperboard Grades & Capacities:

Paper capacity 6,620 m/y
Principal categories
tissue/hygienic—6,620 m/y

Grades
Crepe tissue, Crepe toweling, Creping tissue, Napkin paper, Tissue, Toweling, Wet strength tissue

Paper & Paperboard Mill Data:

Pulpers: 2
Refiners: 2 (double disc)
Paper Machines: 1
No. 2, Iouid/Yankoe, installed 1970, trim width 2.3 m, max. speed 600.0 m/min

Rewinders: 1

Expansion Plans:

Paper production: 20,000 m/y increase
Summary of expansion plans:
Plans to install deinking plant to supply 20,000 m/y deinked fiber, and a new tissue machine, to increase mill's total production to 20,000 m/y.

MEXICO

ALFA PAPEL Y EMPAQUE

Aptdo. Postal 757
Monterrey, N.L., Mexico
Phone 78 43 12
Personnel:

Dir./N. Zone: Javier Bermea
Dir./Central Zone: Juan Garza
Dir./Western Zone: Raul Garcia M.
Dir. Plan. & Finan.: Mario Paez
Dir. Human Resources: Agustin Ravelo

Mill Locations:

Empaques de Carton Titan SA,
Monterrey, N.L. (paper & paperboard mill, converting plant)

Titan SA, Empaques de Carton

Ownership: 100% by Grupo Industrial Alfa SA
Miguel Barragan 307 Pte., Col. 15 de Mayo

64450 Monterrey, N.L., Mexico
Phone: 788180
Telex: 382585 titame

Personnel:

Mill Mgr.: Jose Angel Santos
Tech. Mgr. Alfredo Amparan
Chief Eng. Ricardo Suarez
Purch. Agent Ramiro Villanueva
Plan. & Finan.: Francisco Porras
V.P. Human Res. Agustin Ravelo
Total Employees at This Location: 2,275

Paper employees 388

Type of Operation: paper, paperboard, converting

Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity 280,000 m/y

Paper capacity 90,000 m/y
Paperboard capacity 190,000 m/y

Principal categories

packaging/industrial—90,000 m/y
kraft linerboard—134,000 m/y
corrugating medium—66,000 m/y

Grades

Corrugating medium, Linerboard kraft

Paper & Paperboard Mill Data:

Pulpers: 4
Refiners: 8 (6 disc, 2 conical)
Paper Machines: 3

No. 1, cylinder, installed 1970, trim width 1.9 m, max. speed 100.0 m/min

No. 2, cylinder, installed 1979, trim width 1.9 m, max. speed 150.0 m/min

No. 3, fourdrinier, installed 1962, trim width 1.9 m, max. speed 330.0 m/min

ANAYA SA, ADOLFO

Canal de Garay s/n, Ex. Honda San Nicolas Tolemi, Del Tlapalapa 09850 Mexico, D.F., Mexico
Phone 6 70 23 11

Mill Locations:

Mexico, D.F. (pulp mill, paper & paperboard mill)

Comments: capacity under 5,000 m/y

ATLAS SA, PAPELERA

25 Av. 16 de Septiembre, Col. El Prieto 53370 Nuacalpan de Juárez, Edo. de Mexico, Mexico
Phone 576 59 00

Personnel:

Pres.: Cippiano Santisteban Aja
Cont.: Moises Uribe Elizalde
Sis. Mgr.: Peter P. Petersen Schick
Proj. & Eng. Mgr.: Miguel A. Santisteban Espinosa

Ind. Rel. Mgr.: Alfredo Fermin Ceron

Mill Locations:

Nuacalpan de Juárez (paper & paperboard mill)

Atlas SA, Papelera

25 Av. 16 de Septiembre, Col. El Prieto 53370 Nuacalpan de Juárez, Edo. de Mexico, Mexico
Phone 576 59 00

Subsidiary of Smurfit Carton y Papel de Mexico

Type of Operation: paper, paperboard

Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity: 38,000 m/y

Grades

Bank and bond paper, Corrugating medium, Linerboard kraft

Paper & Paperboard Mill Data:

Paper Machines: 2

cylinder, trim width 2.0 m, max. speed 100.0 m/min
fourdrinier, trim width 2.6 m, max. speed 250.0 m/min

BIDASOA SA, MANUFACTURERA DE PAPEL

122 Av. Hidalgo, Col. Barrio de Santa Catarina Del Arcapotalco 02250 Mexico, D.F., Mexico
Phone 382 69 70

Personnel:

Gen. Mgr.: Esteban Larragain Clavé
Sis. Mgr.: Esteban Larragain González
Adm. Mgr.: José Ramón González
Adm. Mgr.: Valentin Castillo Anluano

Mill Locations:

Mexico, D.F. (paper & paperboard mill)

Bidasoa SA, Manufacturera de Papel

122 Av. Hidalgo, Col. Barrio de Santa Catarina Del Arcapotalco 02250 Mexico, D.F., Mexico
Phone 382 69 70

Type of Operation: paper, paperboard

Paper & Paperboard Grades & Capacities:

Paper capacity 14,400 m/y
Principal categories
packaging/industrial—14,400 m/y

Paper & Paperboard Mill Data:

Paper Machines: 3
cylinder, trim width 1.3 m, max. speed 25.0 m/min
cylinder, trim width 1.7 m, max. speed 42.0 m/min
fourdrinier, trim width 2.2 m, max. speed 200.0 m/min

CENTAURO, INDUSTRIAS

Km. 26, Carr. Durango 3400 Durango, Mexico
Phone 181 23444
Phone 181 28835

CHIHUAHUA SA DE CV, CELULOSA DE

Ave. Universidad 1507 31240 Chihuahua, Chih., Mexico
Phone: 14 131518
Telex: 349895 cehcme
FAX: 14 133784

Personnel:

Chmn. of the Board: Eloy S. Vallina
Pres.: Juan F. San Vicente La Villa
Sis. Dir.: Porfirio Villalobos
Purch. Dir.: Alfonso Tena Ruiz
Res. & Dev. Dir.: Luis Camacho

Griensen

Adm. Dir.: Rafael Ordoñez

Mill Locations:

Anahuac (pulp mill)

Chihuahua SA, Celulosa de, Anahuac Mill

Aptdo. Postal 26 31600 Anahuac, Chih., Mexico
Phone 14 126650

Telex: 349815 cehcme

Personnel:

Pulp Mill Mgr.: Oscar Villareal Y.
Tech. Mgr.: Adolpho Quiroz Cruz
Chief Eng.: Enrique Marquez Terrazas
Purch. Agent: Luis R. Flores R.
Proj. Mgr.: Jaime Gutierrez B.

Total Employees at This Location:

900

Pulp employees 760

***Type of Operation: pulp ***

Pulp Grades & Capacities:

Total pulp capacity 140,000 m/y
Pulp available for market 140,000 m/y

Principal categories:

ubl./semi-bl. softwood kraft—140,000 m/y

Pulp Mill Data:

Chippers: 2
Type of chip transport: mechanical conveyor

Batch digesters: 6 at 155,000 m/y

Bleaching systems: 2

Process sequence: CEHM at 66,800 m/y, CEHM at 73,200 m/y

Fourdrinier pulp dryers: 2 at 140,000 m/y

Evaporator lines: 2

Recovery boilers: 2 at 748 tons/day dry solids

Paper & Paperboard Mill Data:

Paper Machines: 1

No. 1, installed 1990

Power Plant, Water & Effluent Data:

Power boilers: 4 at 110 steam tons/hr

Fuels used: 5% oil, 95% gas

Turbines: 4 at 18.0 MW

Effluent systems

settling ponds

Expansion Plans:

Summary of expansion plans:
Expanding production of bleached kraft pulp 15% at a cost of \$5,000,000.

CHIHUAHUA SA, PAPELERA DE

Aptdo. Postal 570 31000 Chihuahua, Chih., Mexico
Phone 14 157378
Phone 14 167878

Telex: 349629, 349852

FAX: 14 156770

Personnel:

Chmn. of the Board: Carlos Maldonado Elizondo

Pres.: Agustin Anaya Garza

Prod. Mgr.: Francisco Rivas

Sis. Dir.: Javier Luna Quintero

Purch. Dir.: Carlos Grave

Res. & Dev. Dir.: Oscar Vazquez Rojas

Gen. Mgr.: Norberto Valverde

Plan. & Cont. Dir.: Jesus Manuel Garcia

Cont.: Jorge Mendoza Guzman

Budget Dir.: Nicanor Ibarra

Systems Mgr.: Luis Fourzan

Operation Dir.: Oscar Castillo Hinojosa

Mill Locations:

Chihuahua (paper mill)

Sales offices & sales agents:

Papelera de Chihuahua Warehouse,

Tenayuca No. 37, Tenayuca

Tlalnepantla, Edo. de Mexico,

Mexico, Tel. 5 391 68 65

Chihuahua SA de CV, Papelera de, Igual

Aptdo. Postal 570 31350 Chihuahua, Chih., Mexico
Phone 14 167878

Telex: 349852

FAX: 14 156770

Personnel:

Division of Consorcio Papelero

Mexicano, SA de CV

Personnel:

Mill Mgr.: Norberto Valverde

Asst. Mill Mgr.: Jesus Manuel Gonzalez

Tech. Mgr.: Juan Duran M.

Purch. Agent: Carlos Grave

Converting Plant Mgr.: Francisco Rivas

Human Resource: Pedro Roacho

Gerente De Costas: Francisco Javier Ruiz

Gen. Dir.: Agustin Anaya

Operational Dir.: Oscar Castillo

Total Employees at This Location:

500

Type of Operation: paper

Raw Material Data:

Clay and filler consumption

Filler clays

Paper & Paperboard Grades & Capacities:

Paper capacity 110,000 m/y

Principal categories

printing/writing—22,000 m/y

107

(coated woodcontaining)
packaging/industrial—88,000 m³/y
Grades:

Bag paper, Bank and bond paper,
Book paper, Bristol, Business form
paper, Carbonless copy base paper,
Check paper, Cover paper, Cup stock,
Deed paper, Document paper,
Envelope paper, Extensible paper,
Greaseproof paper, Grease resistant
paper, Kraft paper, Kraft sack, Kraft
wrapping, Loan paper, Lottery paper,
Manifold paper, Manila paper, NCR
paper, Photocopy base paper, Playing
card, Printing paper (uncoated),
Printing paper—litho, Printing
paper—offset, Security paper,
Tagboard, Ticketboard, Ticket paper,
Wet strength paper, Writings,
Xerographic papers

Paper & Paperboard Mill Data:

Pulpers: 6

Refiners: 11 (10 disc, 1 conical)

Paper Machines: 2

No. 1, fourdrinier, installed 1972,
rebuilt 1984, trim width 2.1 m,
max. speed 320.0 m/min, size
press

No. 2, fourdrinier, installed 1980,
rebuilt 1989, trim width 4.0 m,
max. speed 600.0 m/min

Rewinders: 3

Sheeters: 1

Power Plant, Water & Effluent

Data:

Power boilers: 5 at 65 steam tons/hr
Fuels used: 63% oil, 17% gas
Purchased electrical power: 215.0
MWh/day

Effluent systems:

clarifiers, settling ponds

Expansion Plans:

\$200,000,000 cost

COPAL MEXICANA SA DE CV

Homero 1433 8th Fl, Col Polanco
Chapultepec, Del Miguel Hidalgo
11560 Mexico, D.F., Mexico
Phone: 395 59 99
Telex: 1772228 compme

Personnel:

Gen. Dir.: Pablo Aldrett Cruz

Sis. Mgr.: Antonio J. Zárate Gómez

Mill Locations:

San Luis Potosí, S.L.P. (paper &
paperboard mill)

Copal Mexicana SA de CV

Eje 114 s/n, Col Zona Industrial
78090 San Luis Potosí, S.L.P., Mexico
Phone: 4 40 48, 4 42 05
Telex: 13895 mapame

Personnel:

Mill Mgr.: J. Davila Sanchez

Total Employees at This Location:
138

Type of Operation: paper,
paperboard

Paper & Paperboard Grades &

Capacities:

Principal categories:
folding boxboard—40,000 m³/y
Grades:

Coating base board

Paper & Paperboard Mill Data:

Pulpers: 3

Refiners: 4 (2 conical, 2 double disc)

Rewinders: 2

Power Plant, Water & Effluent

Data:

Power boilers: 2 at 1,400 steam tons/hr
Effluent systems:
clarifiers, aerators

Expansion Plans:

Board production: 54,000 m³/y increase

COYOACAN SA, FABRICA DE PAPEL

Fernandez Leal 62, Col Concepcion,
Del Coyoacan
04020 Mexico, D.F., Mexico
Phone: 549 95 00

Personnel:

Chmn. of the Board: José Manuel
Cuevas

Sis. Dir.: José Luis Iglesias

Purch. Dir.: Ramon Ortiz Mier

Mill Locations:

Mexico, D.F. (paper & paperboard mill)

Coyoacan SA, Fabrica de Papel

Fernandez Leal 62, Col Concepcion,
Del Coyoacan
04020 Mexico, D.F., Mexico
Phone: 549 95 00

Personnel:

Mill Mgr.: Antonio Velarde

Paper Mill Mgr.: Ramon Ortiz Mier

Tech. Mgr.: Jorge Garcia

Gen. Cont.: Bernardino Salgado Rivera

Total Employees at This Location:
300

Type of Operation: paper,
paperboard

Paper & Paperboard Grades &

Capacities:

Total paper & paperboard capacity:
11,000 m³/y

Paper capacity: 10,000 m³/y

Paperboard capacity: 1,000 m³/y

Principal categories:

printing/writing—6,000 m³/y

bond—4,000 m³/y

cardboard—1,000 m³/y

Grades:

Bank and bond paper, Bristol,
Manifold paper, Printing paper—
offset

Paper & Paperboard Mill Data:

Paper Machines: 3

fourdrinier, trim width 1.4 m, max
speed 125.0 m/min

fourdrinier, trim width 1.9 m, max
speed 190.0 m/min

fourdrinier, trim width 2.8 m, max
speed 108.0 m/min

DESTINTADO SA DE CV, PRODUCTORA NACIONAL DE PAPEL (PRONAPADE),

Mexico

Personnel:

Man. Dir.: Victor Manuel Padilla

Admin. Mgr.: Carlos Muñoz

Mill Locations:

San Luis Potosí, S.L.P. (paper mill)

Destintado SA de CV, Productora

Nacional de Papel

Ownership: 51% by PIPSA (Mexican
Government), 49% by Garden
State Media General

Km/58 Carr. S.L. Potosí a S. Felipe

Gto., Villa de Reyes

79580 San Luis Potosí, S.L.P., Mexico

Phone: 2 00 91

FAX: 2 00 75

Personnel:

Mill Mgr.: Adolfo Bultron Flores

Asst. Mill Mgr.: Oscar Leyva Gordon

Paper Mill Mgr.: Jesus Cebrían Ramos

Pulp Mill Mgr.: José Luis Sanchez

Tech. Mgr.: Gustavo Mancinas Zaldivar

Chief Eng.: Higinio Flores Castro

Purch. Agent: Cesar H. Modetzuma

Finan. Mgr.: Jose Cosials De La Hiedaga

Total Employees at This Location:

850

Pulp employees: 119

Paper employees: 70

Type of Operation: paper

Pulp Grades & Capacities:

Total pulp capacity: 153,000 m³/y

Principal categories:

deinked pulp—153,000 m³/y

Raw Material Data:

Clay and filler consumption:

Talc

Pulp Mill Data:

Bleaching systems: 2

Process sequence: Sodium at 76,650

m³/y, Hydrodisulfite at 76,650 m³/y

Paper & Paperboard Grades &

Capacities:

Paper capacity: 135,000 m³/y

Principal categories:

newsprint—135,000 m³/y

Paper & Paperboard Mill Data:

Paper Machines: 2

No. 1, top-wire, installed 1976,

rebuilt 1987, trim width 6.1 m,
max. speed 1700.0 m/min

No. 2, top-wire, installed 1982,

rebuilt 1987, trim width 5.5 m,
max. speed 1800.0 m/min

Rewinders: 2

Power Plant, Water & Effluent

Data:

Power boilers: 3 at 300 steam tons/hr

Fuels used: 100% oil

Turbines: 1 at 4 MW

Purchased electrical power: 200.0

MWh/day

Effluent systems:

clarifiers, aerators

Expansion Plans:

Paper production: 30,000 m³/y increase,

\$35,000,000 cost

DURANGO SA DE CV, GRUPO INDUSTRIAL

Potasio 200, Ciudad Industrial

Durango, Durango, Mexico

Phone: 181 21697

Personnel:

Pres.: Miguel Rincon

Man. Dir.: José Antonio Rincon

Finan. Dir.: Mayela R. Velasco

Plan. Dir.: Armondo Domínguez

Mexico City Official: Sergio Vadillo

Mill Locations:

Celulosico Centauro SA, Durango (pulp

mill)

Cia. Industrial de Atenquique SA de CV,

Atenquique (pulp, paper &

paperboard mill)

Industrias Centauro SA de CV, Durango

(pulp mill)

— OPERATING —

Atenquique SA, Cia. Industrial de

Domicilio Conocido

49820 Atenquique, Jalisco, Mexico

Phone: 341 50004

FAX: 341 50178

Subsidiary of Grupo Industrial

Durango SA de CV

Personnel:

Mill Mgr.: Juan Montolui C.

Paper Mill Mgr.: C. Madrigal C.

Pulp Mill Mgr.: Carlos Najari V.

Tech. Mgr.: José T. Peregrina

Purch. Agent: Saul Vargas M.

Dir.: Jorge Ortega S.V.

Total Employees at This Location:

1,850

Pulp employees: 700

Paper employees: 650

Type of Operation: pulp, paper,
paperboard

Pulp Grades & Capacities:

Total pulp capacity: 140,000 m³/y

Principal categories:

unbl./semi-bl. softwood kraft—

120,000 m³/y

unbl./semi-bl. hardwood kraft—

20,000 m³/y

Raw Material Data:

Wood deliveries to mill:

Pulpwood as logs or roundwood:

800,000 m³/y

Pulpwood as chips: 40,000 m³/y

Pulp Mill Data:

Debarking drums: 1

Chippers: 4

Type of chip transport: mechanical

conveyor

Batch digesters: 5 at 150,000 m³/y

Evaporator lines: 2

Recovery boilers: 3 at 400 tons/day dry

solids

Paper & Paperboard Grades &

Capacities:

Total paper & paperboard capacity:

135,000 m³/y

Paper capacity: 85,000 m³/y

Paperboard capacity: 50,000 m³/y

Principal categories:

packaging/industrial—85,000 m³/y

kraft linerboard—50,000 m³/y

Grades:

Kraft board, Kraft paper, Kraft sack

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 9 (conical, double disc)

Paper Machines: 2

No. 1, fourdrinier, installed 1946,

rebuilt 1968, trim width 3.1 m,
max. speed 1100.0 m/min, size

press

No. 2, fourdrinier, installed 1969,

rebuilt 1988, trim width 4.2 m,
max. speed 1800.0 m/min, size

press

Rewinders: 2

Supercalenders: 2

Power Plant, Water & Effluent

Data:

Power boilers: 3 at 130 steam tons/hr

Fuels used: 95% oil, 5% bark

Turbines: 4 at 18.5 MW

Effluent systems:

clarifiers, aerators

Expansion Plans:

Pulp production: 33,920 m³/y increase

Paper production: 32,000 m³/y increase

Centauro SA, Celulosicos

Apido Postal 50

34000 Durango, Dgo., Mexico

Phone: 181 2 34 44

Telex: 66318 alceme

Mill Location: Km. 26 Carr. Durango

Mexico

Subsidiary of Grupo Industrial

Durango

No. 7, yankee, rebuilt 1972, trim width 1.6 m, max. speed 150.0 m/min

Rewinders 2

Sheeters 3

Power Plant, Water & Effluent

Data:

Power boilers 5 at 45 steam tons/hr

Fuels used 100% oil

Effluent systems

clarifiers, aerators, settling ponds

KIMBERLY-CLARK DE MEXICO SA DE CV

Ownership: 57% by Mexican Public, 43% by Kimberly-Clark Corp., USA

Jose Luis Lagrange 103-3er piso

11510 Mexico, D.F., Mexico

Phone: 52 3950155

Phone: 52 3959777

Telex: 1774544 komame

FAX: 52 5571413

Personnel:

Chmn. of the Board: Claudio X. Gonzalez

Man. Dir.: Arnoldo J. Cepeda

Sis. Dir.: Jorge Babatz

Purch. Dir.: Hector Pilego

Res. & Dev. Dir.: Bernardo Servin

Oper. & Strategic Planning: Jesus

Gonzalez

Ind. Rel. Dir.: Jose Antonio Mondragon

Cont. & Analysis Mgr.: José Luis

Ind. Prod. Dir.: Alfonso Estrada Bery

Mill Locations:

Bajío Mill, San Juan del Rio (paper mill, converting plant)

Naucaipan Mill, Naucaipan de Juarez

(paper mill, converting plant)

Orizaba Mill, Escamela, Veracruz (pulp

& paper mill, converting plant)

Kimberly-Clark de Mexico SA de CV, Bajío Mill

Aptdo. Postal 77

76600 San Juan del Rio, Queretaro,

Mexico

Phone: 467 21946

Telex: 121481 komb

FAX: 467 21946

Mill Location: Libramiento a

Tequisquiapan, Km. 0.5

Personnel:

Mill Mgr.: Xavier Chazaro

Paper Mill Mgr.: Enrique Barreto

Tech. Mgr.: Gerardo Camacho

Chief Eng.: Humberto Ramirez

Purch. Agent: Eduardo Martinez

Converting Plant Mgr.: Jesus Mavil

Cost & Acct. Mgr.: Jorge Diaz

Tissue Mill Mgr.: Laurentino Rodriguez

Conv. Plant Mgr.: Vicente Garcia

Paper Tech. Mgr.: Francisco Sanchez

Oper. Mgr.: Gabriel Lance

Ind. Rel. Mgr.: Jesus Oregon

Total Employees at This Location:

1,060

Type of Operation: paper, converting

Paper & Paperboard Grades & Capacities:

Paper capacity 199,000 m/y

Principal categories:

printing/writing

(total woodcontaining—113,600

m/y)

tissue/hygienic—85,400 m/y

Grades:

Book paper, Label paper,

Mimeograph paper, Photocopy base

paper, Printing paper—gravure,

Printing paper—litho

paper—offset

Paper & Paperboard Mill Data:

Pulpers 6

Retiners 6 (double disc)

Paper Machines 3

twin wire installed 1982, trim width

4.8 m, max. speed 1000.0 m/min

size press

yankee, installed 1981, trim width 5.3

m, max. speed 1800.0 m/min

yankee, installed 1984, trim width 5.3

m, max. speed 1800.0 m/min

Rewinders 6

Sheeters 2

Power Plant, Water & Effluent

Data:

Power boilers 3 at 125 steam tons/hr

Fuels used 90% oil, 10% gas

Purchased electrical power 450.0

MWh/day

Effluent systems

clarifiers, aerators

Kimberly-Clark de Mexico SA de CV, Naucaipan Mill

9 Av. Uno

53370 Naucaipan de Juarez, Edo. de

Mexico, Mexico

Phone: 576 10 22

FAX: 358 90 87

Personnel:

Mill Mgr.: Isidro Zamarripa

Chief Eng.: Jaiver Escamilla

Prod. Mgr.: Lucio Perez

Cost & Acct. Mgr.: Jaime Gonzalez

Ind. Rel. Mgr.: Jesus Gaimas

Total Employees at This Location:

980

Type of Operation: paper, converting

Paper & Paperboard Grades & Capacities:

Paper capacity 32,000 m/y

Principal categories:

printing/writing—15,000 m/y

(total woodfree—15,000 m/y)

tissue/hygienic—12,000 m/y

cigarette paper—5,000 m/y

Grades:

Airmail paper, Banknote paper, Bank

and bond paper, Book paper, Bristol,

Business form paper, Cellulose

wadding, Check paper, Cigarette

paper, Continuous stationery,

Creping tissue, Document paper,

Duplex (machine) board, Embossed

paper, Ledger, Manifold paper,

Mimeograph paper, Photocopy base

paper, Printing paper—gravure,

Printing paper—litho, Printing

paper—offset, Tissue, Watermarked

paper, Wet strength paper

Paper & Paperboard Mill Data:

Pulpers 3

Paper Machines 3

No. 1, fourdrinier, installed 1953,

rebuilt 1961, trim width 2.4 m,

max. speed 230.0 m/min, size

press

No. 2, yankee, installed 1956, trim

width 3.1 m, max. speed 750.0

m/min

No. 3, fourdrinier, installed 1963, trim

width 3.1 m, max. speed 150.0

m/min

Kimberly-Clark de Mexico SA de CV, Orizaba Mill

Aptdo. Postal 15

Escamela, Veracruz, Mexico

Phone: 272 41855

Telex: 15415 komome

FAX: 272 41793

Mill Location: 1 Av. San Juan,

Escamela, Tlaxcoquillan Veracruz

Personnel:

Mill Mgr.: Armando Saco Espinoza

Pulp Mill Mgr.: Ramon Barrientos

Tech. Mgr.: Homero Galindo

Chief Eng.: Luis Baldaras

Purch. Agent: Mauricio Camareno

Converting Plant Mgr.: Camilo Gomez

Ind. Rel. Mgr.: Mariano Moran

Admin. Mgr.: Luis Bernal Capeda

Cost & Acct. Mgr.: Samuel Solis

Total Employees at This Location:

2,100

Type of Operation: pulp, paper,

converting

Pulp Grades & Capacities:

Total pulp capacity 112,000 m/y

Pulp available for market 5,000 m/y

Principal categories:

bagasse—112,000 m/y

Raw Material Data:

Non wood fiber consumption:

bagasse—210,000 dry tons/yr

Pulp Mill Data:

Continuous digesters 2 at 400 m/y

Bleaching systems 2

Process sequence: CEN at 140 m/y;

CEN at 200 m/y

Flash dryers: 2 at 70,000 m/y

Evaporator lines: 3

Recovery boilers 1 at 320 tons/day dry

solids

Paper & Paperboard Grades & Capacities:

Paper capacity 166,000 m/y

Principal categories:

printing/writing—86,000 m/y

(total woodfree—86,000 m/y, coated

woodfree—32,000 m/y)

Grades:

Art paper, Book paper, Bristol,

Catalog paper, Cellulose wadding,

Coating base paper, Cup stock,

Embossing paper, Envelope paper,

Label paper, Magazine paper,

Manifold paper, Manila paper,

Opaque paper, Poster paper, Printing

paper—litho, Printing paper—offset,

Ticket paper, Wallpaper base, Wet

strength paper

Paper & Paperboard Mill Data:

Pulpers 4

Retiners 4 (conical, disc)

Paper Machines 5

No. 4, fourdrinier, installed 1968, trim

width 3.1 m, max. speed 460.0

m/min, size press, coater

No. 5, yankee, trim width 4.2 m, max.

speed 1000.0 m/min

No. 6, yankee, trim width 4.2 m, max.

speed 1200.0 m/min

No. 7, fourdrinier, installed 1976, trim

width 3.9 m, max. speed 600.0

m/min, size press

No. 8, yankee, installed 1979, trim

width 4.4 m, max. speed 1700.0

m/min

Sheeters 3

Supercalenders 1

Coating equipment

blade installed 1969, trim width 3.1

m, max. speed 500.0 m/min, cap

35.5(m) m/y

Power Plant, Water & Effluent

Data:

Power boilers 6 at 300 steam tons/hr

fuels used 100% gas

Purchased electrical power 575.0

MWh/day

Effluent systems

clarifiers, aerators

KRAFT SA

Aptdo. Postal 639, Rio Danube 51, Col.

Cua uitemoc, Del Cuauhtemoc

06500 Mexico, D.F., Mexico

Phone: 533 05 80

Telex: 1775827 comme

Personnel:

Pres.: Enrique Dabdoub Gómez

Paper Div. Dir.: Alejandro Smutny

Marganes

Cont.: Daniel Frías Lemus

Prod. Mgr.: Arturo Garcia Solis

Mill Locations:

Mexico, D.F. (paperboard mill)

Kraft SA

Pelicanos No. 79, Col. Granjas

Modernas, Del Gustavo A. Madero

07460 Mexico, D.F., Mexico

Phone: 577 07 11

Total Employees at This Location:

100

Type of Operation: paperboard

Paper & Paperboard Grades & Capacities:

Grades:

Corrugating medium, Linerboard kraft

Paper & Paperboard Mill Data:

Pulpers 2 (double disc)

Paper Machines 1

No. 1, fourdrinier, installed 1953,

rebuilt 1970, trim width 2.3 m,

max. speed 170.0 m/min

LORETO Y PENÁ POBRÉ SA, FABRICAS DE PAPEL

Aptdo. Postal 20379, Cal/Altamir 46,

Paper & Paperboard Grades & Capacities:

Paper capacity: 25,000 mt/y

Principal categories:

printing/writing
(total woodfree)

Grades:

Bookbinding paper, Book paper, Colored paper (uncoated), Cup stock, Deed paper, Envelope paper, Gift wrapping paper, Laminating papers, Laminating papers—decorative, Lightweight printings (uncoated), Liquid packaging board, Magazine paper, Masking paper, Mimeograph paper, Newsprint, Newsprint improved, Offset news, Photocopy base paper, Photocopy paper—A4 cut size, Printing paper (uncoated), Printing paper—gravure, Printing paper—litho, Printing paper—offset, Security paper, Supercalendered paper (SC) offset, Ticketboard, Wallpaper base, Warming paper, Wet strength paper

Paper & Paperboard Mill Data:

Pulpers: 6

Refiners: 12 (conical, disc)

Paper Machines: 6

fourdrinier, trim width 2.1 m, max. speed 150.0 m/min

fourdrinier, trim width 2.2 m, max. speed 135.0 m/min

fourdrinier, trim width 2.3 m, max. speed 350.0 m/min

fourdrinier, trim width 3.0 m, max. speed 350.0 m/min

fourdrinier, trim width 3.2 m, max. speed 300.0 m/min

yankee, trim width 2.0 m

Refiners: 6

Sheeters: 3

Supercalenders: 2

Morelos SA de CV, Papelera de Loro y Peña SA de CV

Apdo. Postal 96

90300 Apizaco, Tlaxcala, Mexico

Phone: 241 72500

FAX: 241 72510

Mill Location: Km. 115.5 Carr. Los Reyes-Zacatepec Dist. de Cuauhtémoc

Subsidiary of: *Fabricas de Papel Loro y Peña Pobre SA*

Personnel:

Mill Mgr.: Victor Guevara Hernandez

Asst. Mill Mgr.: Ignacio Martinez

Paper Mill Mgr.: Victor Tinajero

Purch. Agent: Alejandro César

Converting Plant Mgr.: Victor Guevara

Total Employees at This Location: 450

Paper employees: 131

Type of Operation: paper, converting

Paper & Paperboard Grades & Capacities:

Paper capacity: 100,000 mt/y

Grades:

Envelope paper, Magazine paper, Napkin paper, Supercalendered paper (SC) offset

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 2 (double disc)

Paper Machines: 2

No. 1, installed 1978, trim width 2.2 m, max. speed 800.0 m/min, size press

No. 2, installed 1982, trim width 2.2 m, max. speed 1400.0 m/min, size press, coater

Rewinders: 3

Sheeters: 3

Power Plant, Water & Effluent Data:

Power boilers: 1 at 100 steam tons/hr

Turbines: 2

Purchased electrical power: 51.0 MWh/day

Effluent systems:

clarifiers, aerators, settling ponds,

biological treatment

Watermarks & Brands:

Lypps, Hygienic paper

Expansion Plans:

Paper production: 110,000 mt/y

Increase, \$1,500,000 cost

LOZAR SA, Papeles

Apdo. Postal 21 102

04000 Mexico, D.F., Mexico

Phone: 597 200 22

Personnel:

Chmn. of the Board: Humberto Ramos

Espinosa

Man. Dir.: Humberto Ramos Arias

Prod. Mgr.: Victor Ramos Arias

Mill Locations:

Idapalapa, Edo. de Mexico (paper & paperboard mill)

Lozar SA, Papeles

Zaragoza 38, Col. La Venta

56530 Idapalapa, Edo. de Mexico,

México

Personnel:

Mill Mgr.: H. Ramos Espinosa

Asst. Mill Mgr.: Humberto Ramos Arias

Tech. Mgr.: Victor Manuel Ramos Arias

Chief Eng.: Jose Luis Hernández

Total Employees at This Location: 53

Type of Operation: paper,

paperboard

Paper & Paperboard Grades & Capacities:

Paper capacity: 6,000 mt/y

Principal categories:

printing/writing—4,800 mt/y

—1,200 mt/y

Grades:

Envelope paper, Manila board

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 3 (2 conical, 1 double disc)

Paper Machines: 1

No. 1, fourdrinier, installed 1978, trim

width 1.5 m, max. speed 60.0

m/min

Rewinders: 1

Sheeters: 1

Supercalenders: 1

Power Plant, Water & Effluent Data:

Power boilers: 1

Fuels used: 97% oil, 3% other

Effluent systems:

MADRUENO Y CIA. SA DE CV

Apdo. Postal 21-819

04000 Mexico, D.F., Mexico

Phone: 597 200 11

Telex: 1760568 macome

FAX: 597 200 14

Personnel:

Chmn. of the Board: Gilberto Madrueno

G

Man. Dir.: Gabriel Madrueno R.

Deputy Man. Dir.: Carlos Tracous S.

Prod. Mgr.: Dellino Flores F.

Sis. Dir.: Jose Antonio Castillon R.

Purch. Dir.: Carmen Ruiz A.

Gen. Acc't.: Mario Sevilla Z.

Mill Locations:

Idapalapa (paper mill converting plant)

Madrueno y Cia. SA de CV

Apdo. Postal 21-819

04000 Mexico, D.F., Mexico

Phone: 597 20011

Telex: 1760568 maco

FAX: 20014

Mill Location: Km. 30.5 Carr. Federal

Mexico-PuebladIdapalapa

Personnel:

Mill Mgr.: Arturo Madrueno R.

Paper Mill Mgr.: Jesse Reid Mason

Chief Eng.: Erick Skoglund O.

Total Employees at This Location: 290

Paper employees: 201

Type of Operation: paper, converting

Paper & Paperboard Grades & Capacities:

Paper capacity: 15,750 mt/y

Principal categories:

printing/writing

total woodfree—8,750 mt/y

light wrappings, OTC—7,000 mt/y

Grades:

Asphalt board, Business form paper,

Carbonizing base paper, Cash

register paper, Copier paper, Crepe

paper, Cup stock, Embossing paper,

Envelope paper, Gift wrapping paper,

Kraft wrapping, Liquid packaging

board, Machine accounting paper,

Machine glazed paper, Manila paper,

Napkin paper, Pattern paper,

Photocopy base paper, Photocopy

paper—A4 cut size, Poster paper,

Silk paper, Thin printing papers

(uncoated), Ticket paper, Vacuum

cleaner dust bag paper, Warming

paper, Waxed paper, Waxing base,

Wet strength paper, Writings

Paper & Paperboard Mill Data:

Pulpers: 4

Refiners: 10 (conical, double disc)

Paper Machines: 3

No. 1, yankee, installed 1964, trim

width 2.5 m, max. speed 250.0

m/min

No. 2, fourdrinier, installed 1968, trim

width 1.8 m, max. speed 300.0

m/min, size press coater

No. 3, yankee, installed 1975, trim

width 1.6 m, max. speed 300.0

m/min

Rewinders: 4

Sheeters: 2

Power Plant, Water & Effluent Data:

Power boilers: 1 at 220 steam tons/hr

Fuels used: 100% oil

Turbines: 1 at 3.5 MW

Effluent systems:

clarifiers aerators

Madrueno y Cia. SA de CV

Carretera Fed. Mexico-Puebla Km. A30.5

56530 Idapalapa CP, Mexico

Phone: 200 11

MALDONADO SA, CIA. PAPELERA

Comie No. 44, Col. Arzures, Del. Miguel

Hidalgo

11590 Mexico, D.F., Mexico

Phone: 250 78 00

Personnel:

Chmn. of the Board: Humberto

Maldonado

Gen. Dir.: Mario Gonzalez O.

Adm. Mgr.: Guillermo Charles L.

Sis. Mgr.: Bernardo Morán L.

Ind. Rel. Mgr.: Jorge L. Flores P.

Cont.: Valentín Benavides M.

Treas.: Carlos F. Garcia

Mail. Mgr.: Jesus Tamez

Mill Locations:

Monterrey, N.L. (paper mill)

Maldonado SA, Cia. Papelera

Apdo. Postal 1428

San Nicolás de los Garza, N.L., Mexico

Phone: 52 15 50

Telex: 382708 cpamame

Mill Location: Av. Nogalar Norte 280,

Col. Cuauhtémoc, Monterrey

Personnel:

Mill Mgr.: Juan Gonzalez O.

Total Employees at This Location: 700

Type of Operation: paper

Paper & Paperboard Grades & Capacities:

Paper capacity: 89,500 mt/y

Grades:

Glassine, Kraft paper, Printing

paper—litho

Paper & Paperboard Mill Data:

Paper Machines: 4

fourdrinier, trim width 2.0 m, max.

speed 280.0 m/min

fourdrinier, trim width 2.1 m, max.

speed 160.0 m/min

fourdrinier, trim width 3.0 m, max.

speed 265.0 m/min

fourdrinier, trim width 3.5 m, max.

speed 500.0 m/min

Expansion Plans:

Paper production: 35,000 mt/y increase

Summary of expansion plans:

Planning the start up of a 25,000

mt/y PM. Rebuilding PM 3.

MEXICANA DE PAPEL PERIODICO SA

Pontleule 140 No. 840

5672511 Vallejo, Mexico D.F., Mexico

Telex: 1772961 mepdme

Personnel:

Pres: Jose Vazquez

Finan. Dir.: Noel Sanchez

Gen. Cont.: Jose Arturo Vazquez

Sales Dir.: Ricardo Benavides Segovia

Mill Locations:

Tres Valles (pulp & paper mill)

Mexicana de Papel Periodico SA

Apdo. Postal 8

95300 Tres Valles, Veracruz, Mexico

Phone: 5 00 66

Mill Location: Km. 66.5 Carr. La

Tinaja Cd. Aleman

Personnel:

Mill Mgr.: Martinez Sibaja

Type of Operation: pulp, paper

Pulp Grades & Capacities:

Total pulp capacity: 55,250 mt/y

Paper & Paperboard Grades & Capacities:

Paper capacity: 100,000 m²/y
Principal categories:
newsprint—100,000 m²/y
Grades:

Book paper, Newsprint
Paper & Paperboard Mill Data:
Paper Machines: 1
twin-wire, trim width 6.3 m, max. speed 800.0 m/min

MEXICANA SA DE CV, INDUSTRIAL PAPELERA

Apto. Postal 193
60050 Uruapan, Michoacan, Mexico
Phone: 452 3 17 22
Telex: 19843
Personnel:
Chmn. of the Board: Carlos Maldonado Elizondo
Pres.: Agustin Anaya Garza
Prod. Mgr.: Jeronimo Villalobos
Sls. Dir.: Javier Luna O.
Res. & Dev. Dir.: Oscar Vazquez
Mill Locations:
Uruapan (paper mill, converting plant)

Mexicana SA de CV, Industrial Papelera

Apto. Postal 193
60050 Uruapan, Michoacan, Mexico
Phone: 452 3 16 15
Telex: 19843
Personnel:
Tech. Mgr.: Camillo Rangel
Purch. Agent: Jesus Sardain
Maint. Mgr.: Guillermo Zamora
Human Resource Mgr.: Ignacio Moya
Cont.: Jose Luis Arevalo
Mill Mgr.: Oscar Castillo Hinojosa
Total Employees at This Location:
290

Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
Paper capacity: 32,000 m²/y
Grades:

Bag paper, Bank and bond paper, Bristol, Business form paper, Carbonless copy base paper, Check paper, Cover paper, Cup stock, Envelope paper, Greaseproof paper, Kraft paper, Kraft sack, Kraft wrapping, Ledger, Manifold paper, Manila paper, Photocopy base paper, Printing paper—litho, Printing paper—offset, Tagboard, Wet strength paper

Paper & Paperboard Mill Data:

Pulpers: 2
Refiners: 4
Paper Machines: 1
No. 1, fourdrinier, installed 1976, trim width 3.0 m, max. speed 400.0 m/min, size press

Rewinders: 1
Sheeters: 2
Power Plant, Water & Effluent Data:

Fuels used: 100% other
Purchased electrical power: 82.0 MWh/day
Effluent systems:
settling ponds

MEXICO SA, CAJAS CORRUGADAS DE

Apto. Postal 639, 51 Rio Danubio, Col Cuauhtemoc, Del Cuauhtemoc

06500 Mexico D.F. Mexico
Phone: 533 05 80
Telex: 1775R27 comme
Personnel:
Pres.: Enrique Dahdoub Gomez
Paper Div. Dir.: Alejandro Smutny Narganes
Cont.: Daniel Filas Lemus
Mill Locations:
Papelera Texcoco, Los Reyes, La Paz, Edo. de Mexico (paperboard mill, converting plant)

Mexico SA, Cajas Corrugadas de, Papelera Texcoco

Km. 23.5 Carr. Mexico-Texcoco, La Magdalena Allipac
56440 Los Reyes, La Paz, Edo. de Mexico, Mexico
Phone: 585 00 33
Telex: 1775827 comme
Personnel:
Prod. Mgr. (Div.): Liborio Dector
Type of Operation: paperboard, converting

Paper & Paperboard Grades & Capacities:

Principal categories:
kraft linerboard—30,200 m²/y
Paper & Paperboard Mill Data:
Paper Machines: 1
cylinder, trim width 2.5 m, max. speed 124.0 m/min

MEXICO SA, FABRICA DE PAPEL

Km. 24 Carr. Federal Mexico-Puebla
56560 Tlalpizahuac, Edo. de Mexico, Mexico
Phone: 585 24 55
Personnel:
Man. Dir.: José Manuel Cuevas
Prod. Mgr.: Anastasio Martinez
Sls. Dir.: Jose Luis Iglesias
Purch. Dir.: Ramon Ortiz Mier
Mill Locations:
Tlalpizahuac (paper mill)

Mexico SA, Fabrica de Papel

Km. 24 Carr. Federal Mexico-Puebla
56560 Tlalpizahuac, Edo. de Mexico, Mexico
Phone: 585 24 55
Type of Operation: paper
Paper & Paperboard Grades & Capacities:
Paper capacity: 58,500 m²/y
Principal categories:
printing/writing—58,500 m²/y
Paper & Paperboard Mill Data:
Paper Machines: 3

No. 4, fourdrinier, trim width 3.1 m, max. speed 140.0 m/min
No. 5, fourdrinier, trim width 2.9 m, max. speed 140.0 m/min
No. 6, fourdrinier, trim width 4.1 m, max. speed 454.0 m/min

MONTEROLA SA DE CV, PAPELERA

Prolongacion Xocaltenco s/n
Tepellaortoc, Edo. de Mexico, Mexico
Phone: 595 4 1448
Mill Locations:
Tepellaortoc (paper mill & converting plant)

Monterola SA de CV, Papelera
Prolongacion Xocaltenco s/n
Tepellaortoc, Edo. de Mexico, Mexico

Phone: 595 4 1448
Total Employees at This Location:
265

Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity:
24,000 m²/y
Paper capacity: 12,000 m²/y
Paperboard capacity: 12,000 m²/y
Principal categories:
tissue/hygienic—12,000 m²/y
corrugating medium—12,000 m²/y
Paper & Paperboard Mill Data:
Paper Machines: 2
No. 1, Yankee
No. 2, fourdrinier

MONTERREY SA, FABRICA DE PAPEL

Apto. Postal 228
64010 Monterrey, N.L., Mexico
Phone: 54 59 87
Subsidiary of: Smurfit Carton y Papel de Mexico

Personnel:

Prod. Mgr.: V. Rivero Gonzalez
Purch. Dir.: Mario A. Nuncio Reyna
Res. & Dev. Dir.: Antonio Ferrara Fernandez
Mill Locations:
Monterrey (paper & paperboard mill)

Monterrey SA, Fabrica de Papel

Carlos Salazar Ote. 1821, Apto. Postal 228
64010 Monterrey, N.L., Mexico
Phone: 54 59 85
Personnel:
Chief Eng.: V. Rivero Gonzalez
Pers. Mgr.: Alfonso Cardenas
Tech. Mgr.: Antonio Ferrara Fernandez
Total Employees at This Location:
150

Type of Operation: paper, paperboard

Pulp Grades & Capacities:
Principal categories:
recycled fiber processing—20,000 m²/y

Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity:
18,000 m²/y
Principal categories:
packaging/industrial—18,000 m²/y
Grades:
Corrugating medium, Kraft paper, Linerboard kraft

Paper & Paperboard Mill Data:

Pulpers: 1
Refiners: 2 (double disc)
Paper Machines: 1
No. 4, fourdrinier, installed 1968, rebuilt 1980, trim width 1.9 m, max. speed 190.0 m/min
Rewinders: 1

Power Plant, Water & Effluent Data:

Fuels used: 100% gas
Purchased electrical power: 25.0 MWh/day

NACIONALES SA DE CV, CELULOSAS Y FIBRAS

Apto. Post. 2 421, Etzatlán 25-A, Col Ras Tr. Del Venust/Carranza
15270 Mexico D.F., Mexico
Phone: 789 90 88

Personnel:

Pres.: Luis González Diez
Cont.: Sergio Ruy Diaz López
Mill Locations:
Sanlago Cuautlalpan, Edo. de Mexico (pulp mill)

NEVADO SA DE CV, PAPELERA DEL

Apto. Postal 171
50000 Toluca, Edo. de Mexico, Mexico
Phone: 721 8 00 20
Phone: 721 8 00 21
Telex: 1764192 Irsame
FAX: 5 656 4410

Personnel:

Chmn. of the Board: Miguel Arcelus
Pres.: Javier Arcelus
Prod. Mgr.: José Ramos
Sls. Dir.: José-María Aranz
Purch. Dir.: José-María Sahagun
Mill Locations:
Toluca (paper & paperboard mill)
San Miguel, San Miguel Almoloyan (paper & paperboard mill)

Nevado SA de CV, Papelera del, San Miguel

Apto. Postal 171
50000 Toluca, Edo. de Mexico, Mexico
Phone: 721 8 00 20
Phone: 721 8 00 21
Telex: 1764192 Irsame
Mill Location: Km. 16 Carr. Toluca-Zitacuaro San Miguel Almoloyan, 50900 Mexico

Personnel:

Mill Mgr.: Javier Arcelus
Asst. Mill Mgr.: Manuel Nieva
Paper Mill Mgr.: Jose Ramos
Purch. Agent: Felix Ramirez
Total Employees at This Location:
346

Paper employees: 346
Type of Operation: paper, paperboard

Paper & Paperboard Grades & Capacities:

Total paper & paperboard capacity:
57,640 m²/y
Paper capacity: 5,956 m²/y
Paperboard capacity: 51,684 m²/y
Principal categories:
packaging/industrial—4,534 m²/y
other—1,422 m²/y
kraft linerboard—35,896 m²/y
corrugating medium—13,087 m²/y
other—2,701 m²/y

Grades:

Butcher's wrap, Cardboard, Coil winding paper, Colored paper (uncoated), Container board, Corrugating medium, Dry gummed paper, Ecological paper, Envelope paper, Gasket paper, Gray board, Gumming paper, Imitation kraft, Kraft board, Kraft paper, Kraft wrapping, Kraftliner, Linerboard kraft, Machine accounting paper, Machine glazed paper, Manila paper, Mill board, Millwrapper, Packings, Paraffin paper, Parchment, Recycled paper, Sealings, Tube board, Tube paper, Vacuum cleaner dust bag paper, Waxed paper, Waxing base

Paper & Paperboard Mill Data:

Pulpers: 6
Refiners: 12 (conical, double disc)
Paper Machines: 3

No. 1, cylinder, installed 1980, rebuilt 1991, trim width 2.0 m, max. speed 100.0 m/min, size press
No. 2, yankee, installed 1981, trim width 2.0 m, max. speed 400.0 m/min
No. 3, fourdrinier, installed 1982, rebuilt 1990, trim width 3.3 m, max. speed 235.0 m/min

Rewinders: 3

Sheeters: 1

Power Plant, Water & Effluent

Data:

Power boilers: 4 at 48 steam tons/hr

Fuels used: 100% oil

Purchased electrical power: 115.0

MWh/day

Effluent systems:

clarifiers, settling ponds

PILAR SA, FABRICA DE CELULOSA EL

Km. 24.6 Carr. Federal Mexico-Puebla 56560 Ayotla, Tlaxcala, Edo. de Mexico

Phone: 91597 40251

Personnel:

Prod. Mgr.: R. Flores Martinez

Sls. Dir.: Jose Luis Iglesias

Purch. Dir.: Jose M. Martinez Martinez

Mill Locations:

Ayotla (pulp mill)

Pilar SA, Fabrica de Celulosa El

Km. 24.6 Carr. Federal Mexico-Puebla 56560 Ayotla, Tlaxcala, Edo. de Mexico, Mexico

Phone: 518 35 64

Telex: 1777444 tapame

Type of Operation: pulp

Pulp Grades & Capacities:

Total pulp capacity: 50,000 m³/y

Principal categories:

bagasse—50,000 m³/y

POBLANA SA, CIA. INDUSTRIAL PAPELERA

11 Sur No. 3102, 72420 Puebla, Pue., Mexico

Phone: 91 22 430511

Telex: 91 22 376017

Personnel:

Chmn. of the Board: Gustavo Rugerio

Tirado

Man. Dir.: Gustavo Rugerio Gutierrez

Res. & Dev. Dir.: Javier Parra Larios

Gen. Dir.: Gustavo Rugerio Tirado

Cont.: Maria Luisa Calixto Martinez

Mill Locations:

Puebla, Pue. (paperboard mill)

Poblana SA, Cia. Industrial

Papelera

11 Sur No 3102, Col. Chulavista

72420 Puebla, Pue., Mexico

Phone: 91 22 430619

FAX: 376017

Personnel:

Mill Mgr.: Gustavo Rugerio Gutierrez

Asst. Mill Mgr.: Javier Parra Larios

Tech. Mgr.: Alfonso Rugerio Tirado

Chief Eng.: Roberto Corea Torres

Purch. Agent: Alfonso Rugerio G

Plant Supl.: Leopoldo Blázquez Toquero

Prod. Chief: Francisco Castillo Apalencu

Eng.: Roberto Corea Torres

Dir. Apolinar Rosales

Dir. Lino Espinosa M

Total Employees at This Location:

120

Type of Operation: paperboard

Raw Material Data:

Non-wood fiber consumption:

secondary fibers — dry tons/yr

Paper & Paperboard Grades & Capacities:

Capacity Range: Under 10,000 m³/y

Principal categories:

corrugating medium—5,000 m³/y

Grades:

Container board, Corrugating

medium, Machine glazed board, Mill

board, Packings, Tube board

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 5 (conical)

Paper Machines: 2

No. 1, cylinder, installed 1949, rebuilt

1965, trim width 1.5 m, max.

speed 90.0 m/min

No. 2, fourdrinier, installed 1972,

rebuilt 1974, trim width 3.1 m,

max. speed 200.0 m/min, size

press

Power Plant, Water & Effluent

Data:

Power boilers: 6 at 1 steam tons/hr

Fuels used: 100% oil

Effluent systems:

settling ponds

Expansion Plans:

Board production: 90,000 m³/y increase,

\$6,200,000 cost

Summary of expansion plans:

Installation of new line of production,

yielding 100 m³/day, and

rehabilitation of present production

units that produce 150 m³/day.

PONDEROSA SA, CARTONES

Ownership: 80% by Ponderosa

Industrial SA, 20% by IFC

Aptdo. Postal 76

San Juan del Rio, Queretaro, Mexico

Phone: 467 211 93

Telex: 121455 papome

FAX: 467 212 86

Subsidiary of Ponderosa Industrial,

Mexico

Personnel:

Chmn. of the Board: Eloy S. Vallina

Pres.: Alfredo Schultz

Man. Dir.: Manuel Niño de Rivera

Prod. Mgr.: Angel Perez Gama

Sls. Dir.: Antonio Avendaño

Purch. Dir.: Roberto Rodriguez

Res. & Dev. Dir.: Antonio Rodriguez

Mill Locations:

San Juan del Rio, Queretaro (paperboard

mill)

Divisions:

Ponderosa Corp., 2838 Wood Side,

Dallas, TX 75204, USA

Serpasa, San Isidro Tecpan Esq

Tezosomol Col., Azc. Mexico D.F.

Ponderosa SA, Cartones

Aptdo. Postal 76

76800 San Juan del Rio, Queretaro,

Mexico

Phone: 467 21168

Telex: 12806 papome

FAX: 467 21286

Mill Location: Km. 4.5 Carr. a

Tequisquiapan

Subsidiary of Grupo Chihuahua

Division of Ponderosa Industrial SA

de CV

Personnel:

Mill Mgr.: M. Niño de Rivera

Tech. Mgr.: J. Antonio Rodriguez D.

Chief Eng.: Eugenio Demeneghi Z.

Purch. Agent: Roberto Rodriguez O.

Oper. Mgr.: Angel Perez Gamas

Adm. Mgr.: Jesus Mingarez

Bus. Mgr.: Antonio Avendaño

Cust. Serv. Mgr.: Roberto Caballero

Total Employees at This Location:

412

Type of Operation: paperboard

Raw Material Data:

Clay and filler consumption:

Coating clays, filler clays, calcium

carbonate

Paper & Paperboard Grades & Capacities:

Principal categories:

lolding boxboard

Grades:

Bottle wrapping, Boxboard, lolding,

Castcoated board, Container board,

Duplex (machine) board, Greaseproof

paper, Machine-coated board, Manila

board, Match board, Mill board,

Tickboard, Wet strength board

Paper & Paperboard Mill Data:

Pulpers: 4

Refiners: 8 (double disc)

Paper Machines: 1

No. 1, multi-wire, installed 1978, trim

width 3.3 m, max. speed 350.0

m/min

Sheeters: 4

Power Plant, Water & Effluent

Data:

Power boilers: 1

Fuels used: 100% gas

Effluent systems:

settling ponds

Expansion Plans:

Board production: 36,000 m³/y increase,

\$30,000,000 cost

POTOSI SA DE CV, FABRICAS DE PAPEL

Lago Zirahuen 69

11320 Mexico, D.F., Mexico

Phone: 5 396 1500

Phone: 5 396 0999

Telex: 176024 lppo me

Personnel:

Chmn. of the Board: Jorge Muniain

Alcalde

Pres.: Francisco X. Zermeño

Sls. Dir.: Salvador Navarro Z.

Sls. Dir.: Gerardo Zermeño P.

Mill Locations:

San Luis Potosi (paper mill & converting

plant)

Potosi SA de CV, Fabricas de

Papel

Aptdo. F-1239

7809 San Luis Potosi, Mexico

Phone: 481 251 16

Phone: 481 2 4370

Telex: 13637 lppo me

Mill Location: Eje 120 s/n, Zona

Industrial

Personnel:

Mill Mgr.: F. Galvez Aldana

Paper Mill Mgr.: Alberto Rodriguez S

Purch. Agent: José Herrera Lasso

Constr.: Victor Bancourt

Inv. Rel. Mgr.: Maria Socorro Zuniga

Total Employees at This Location:

436

Pulp employees: 350

Type of Operation: paper, converting

Paper & Paperboard Grades & Capacities:

Paper capacity: 12,000 m³/y

Principal categories:

issue/hygienic—12,000 m³/y

Paper & Paperboard Mill Data:

Paper Machines: 1

No. 1, yankee, trim width 3.2 m, max.

speed 600.0 m/min

Expansion Plans:

Paper production: 20,000 m³/y increase,

\$10,000,000 cost

Summary of expansion plans:

A second issue machine was added.

PRODUCTORA DE PAPEL SA

Ownership: 6% by Empaques de

Carlton Titan

Aptdo. Postal 443

66490 San Nicolás de los Garza, N.L.,

Mexico

Phone: 83 53 2020

Telex: 383202 ppsame

FAX: 83 53 6431

Personnel:

Chmn. of the Board: Ricardo Garza

Elizondo

Pres.: Melesio Vigna Martinez

Prod. Mgr.: José Luis Benavente Garcia

Sls. Dir.: Elias Alvarez Garcia

Purch. Dir.: Sergio Vazquez Castillo

Mainl. Supl.: Julian Reyes Salazar

Prod. Supl.: Teófilo A. Fernandez

Tech. Supl.: Agustín Corona

Mill Locations:

San Nicolás de los Garza, N.L. (pulp

mill)

Productora de Papel SA

Ownership: 94% by Familia Garza

Elizondo, 6% by Empaques de

Carlton Titan

Aptdo. Postal 443

66490 San Nicolás de los Garza, N.L.,

Mexico

Phone: 83 53 20 20

Telex: 383202 ppsame

FAX: 83 53 64 31

Mill Location: Km. 7 F.F.C.C. a

Malamoros, San Nicolás de los

Garza

Personnel:

Mill Mgr.: Melesio Vigna

Paper Mill Mgr.: José L. Benavente

Tech. Mgr.: Teófilo Fernández

Chief Eng.: Julian Reyes

Purch. Agent: Sergio Vazquez

Total Employees at This Location:

490

Type of Operation: pulp, paper

Pulp Grades & Capacities:

Total pulp capacity: 24,000 m³/y

Principal categories:

soda—24,000 m³/y

Pulp Mill Data:

Continuous digesters: 1 at 24,000 m³/y

Paper & Paperboard Grades & Capacities:

Principal categories:

Paper capacity: 90,000 m³/y

Paperboard capacity: 90,000 m³/y

Principal categories:

packaging/industrial

test linerboard—9,000 m³/y

corrugating medium—81,000 m³/y

Grades

Bag paper, Corrugating medium, Kraft paper, Linerboard kraft, Vacuum cleaner dust bag paper

Paper & Paperboard Mill Data:

Pulpers: 4

Refiners: 12 (double disc)

Paper Machines: 3

- No. 1, fourdrinier, installed 1952, rebuilt 1966, trim width 2.0 m, max. speed 200.0 m/min
- No. 2, fourdrinier, installed 1952, rebuilt 1967, trim width 2.0 m, max. speed 200.0 m/min
- No. 3, fourdrinier, installed 1966, rebuilt 1969, trim width 3.3 m, max. speed 200.0 m/min

Rewinders: 3

Power Plant, Water & Effluent Data:

Power boilers: 3 at 70 steam tons/hr
 Fuels used: 100% oil
 Turbines: 2 at 30.0 MW
 Purchased electrical power: 38.0 MWh/day

Effluent systems: settling ponds

Expansion Plans:

Paper production: 20,000 m³/y increase, \$4,000,000 cost

* **Comments:** pulp mill closed *

PRODUCTORA RACIONAL DE PAPEL PERIODICO DESTINADO SA

Domicilio Conocido, Villa de Reyes, Ejido de San Miguel 79580, Mexico
 Phone: 481 20091

SAN CRISTOBAL SA, CIA. INDUSTRIAL DE

Ownership: 51% by Grupo San Cristobal, 49% by Scott Paper Co. M. M. Contreras 133

Mexico, D.F., Mexico

Phone: 906 568 44 66

Personnel:

Chmn. of the Board: Juan Elek

Pres.: Luis Rebollar

Man. Dir., Prod. San Cristobal: C. Graham Booth

Res. & Dev. Dir.: Jorge Sanchez Ramos

Bus. Dir., Paper: Javier Rancano

Ind. Rel. Dir.: Sigfrido Miranda

Finan. Dir.: Chase Brooke

Mill Locations:

San Martin Texmelucan (paper mill, converting plant)

CEPAMISA—Celulosa y Papel de Michoacan SA, Morelia (pulp & paper mill)

Cia. de las Fabricas de Papel de San Rafael y Anexas SA, San Rafael Mill, Chalco (pulp & paper mill)

Commercializadora de papeles

Industriales SA de CV (paper mill, converting plant)

Productos San Cristobal SA de CV, Ecatepec (pulp & paper mill, converting plant)

OPERATIVAS

Celulosa y Papel de Michoacan SA, CEPAMISA

Apto. Postal 85 B

58000 Morelia Michoacan Mexico

Phone: 451 60050

Telex: 69838

FAX: 451 60050 451 60154

Mill Location: Coahuila, Michoacan
 Subsidiary of Grupo Crisoba
 Division of Papeles Planos

Personnel:

Mill Mgr.: Guillermo Tello

Asst. Mill Mgr.: Eduardo Sanchez P.

Paper Mill Mgr.: Hermilo Oliveros

Pulp Mill Mgr.: German Castillo

Tech. Mgr.: Luis Fernandez

Chief Eng.: Manuel Gamino

Purch. Agent: Juan M. Alvarez

Prod. Mgr.: Luis Fernandez

Forestry Mgr.: F. Rodriguez R.

Maint. Supt.: Manuel Gamino M.

Total Employees at This Location: 580

Pulp employees: 180

Paper employees: 110

* **Type of Operation:** pulp, paper *

Pulp Grades & Capacities:

Total pulp capacity: 93,000 m³/y

Principal categories:

bl softwood kraft—61,000 m³/y

bl hardwood kraft—32,000 m³/y

Raw Material Data:

Wood deliveries to mill:

Pulpwood as logs or roundwood: 240,000 m³/y

Pulpwood as chips: 240,000 m³/y

Non-wood fiber consumption:

bagasse—5,000 dry tons/yr

Clay and filler consumption:

Filler clays

Pulp Mill Data:

Debarking drums: 1

Chippers: 2

Type of chip transport: pneumatic

conveyor & mechanical conveyor

Continuous digesters: 1 at 1,080 m³/y

Bleaching systems: 1

Process sequence: CEPD at 93,000 m³/y

Fourdrinier pulp dryers: 1 at 70,000 m³/y

Evaporator lines: 1

Recovery boilers: 1 at 540 tons/day dry solids

Paper & Paperboard Grades & Capacities:

Paper capacity: 52,400 m³/y

Principal categories:

printing/writing

Grades:

Bookbinding paper, Book paper,

Computer tape paper, Copier paper,

Machine accounting paper,

Photocopy base paper, Photocopy

paper—A4 cut size, Printing paper

(uncoated), Surface-treated offset

paper (STP), Writings

Paper & Paperboard Mill Data:

Pulpers: 3

Refiners: 5 (double disc)

Paper Machines: 1

No. 21, twin-wire, installed 1981, trim

width 4.5 m, max. speed 600.0

m/min, size press

Rewinders: 2

Power Plant, Water & Effluent Data:

Power boilers: 2 at 100 steam tons/hr

Fuels used: 100% oil

Turbines: 2 at 7.0 MW

Purchased electrical power: 155.0

MWh/day

Effluent systems:

clarifiers, aerators, settling ponds,

biological treatment

San Cristobal SA de CV, Productos

Prolongacion/Calz. de la Vega No. 220, Col. Jajajala, San Cristobal 05509 Ecatepec, Edo. de Mexico, Mexico

Phone: 787 19 99

Division of Cia. Industrial de San Cristobal SA

Personnel:

Mill Mgr.: James Lang

Prod. Mgr.: Luis Fernandez

Type of Operation: pulp, paper, converting

Pulp Grades & Capacities:

Total pulp capacity: 51,100 m³/y

Principal categories:

bagasse—51,100 m³/y

Paper & Paperboard Grades & Capacities:

Paper capacity: 136,000 m³/y

Principal categories:

lissue/hygienic—136,000 m³/y

Paper & Paperboard Mill Data:

Paper Machines: 7

twin-wire, trim width 5.4 m, max.

speed 1600.0 m/min

yankee, trim width 2.0 m, max. speed

100.0 m/min

yankee, trim width 3.1 m, max. speed

760.0 m/min

yankee, trim width 3.2 m, max. speed

1000.0 m/min

yankee, trim width 3.2 m, max. speed

1250.0 m/min

yankee, trim width 3.3 m, max. speed

1500.0 m/min

yankee, trim width 5.4 m, max. speed

1500.0 m/min

San Juan SA, Fabrica de Papel

Apto. Postal 32 74129 San Martin Texmelucan, Puebla, Mexico

Phone: 248 4 17 42

Mill Location: Domicilio Conocido-Moyotzingo

Division of Cia. Industrial de San Cristobal SA

Personnel:

Mill Mgr.: Armando Yafez

Tech. Mgr.: Francisco Gonzalez

Chief Eng.: Jaime Boza A.

Purch. Agent: Jesus Limon Enriquez

Total Employees at This Location: 180

Type of Operation: paper, converting

Raw Material Data:

Non-wood fiber consumption:

bagasse—15,000 dry tons/yr

Paper & Paperboard Grades & Capacities:

Paper capacity: 25,300 m³/y

Principal categories:

printing/writing—25,300 m³/y

Paper & Paperboard Mill Data:

Pulpers: 2

Refiners: 3 (1 double disc, 2 conical)

Paper Machines: 1

No. 51, fourdrinier, installed 1968,

rebuilt 1981, trim width 3.1 m,

max. speed 350.0 m/min, size

press

Rewinders: 1

Sheeters: 1

Power Plant, Water & Effluent Data:

Power boilers: 1 at 13 steam tons/hr

Fuels used: 100% gas

Purchased electrical power: 55.0 MWh/day

Effluent systems:

clarifiers, aerators, settling ponds, biological treatment

SAN FRANCISCO SA DE CV, FABRICA DE PAPEL

Km. 5.5 Blvd. L. Mateos s/n, Col. Centro Industrial Margar. A. P. 3881 21360 Mexicali, BC, Mexico
 Phone: 656 618341
 Telex: 569788

Personnel:

Gen. Dir.: M. A. Garcia Franco

Commercial Dir.: Rodolfo Valdez

Gutiérrez

Adm. Mgr.: Rubén González Marín

Oper. Mgr.: Francisco Wong

Acci.: César Cossío Burqueño

Ind. Rel. Mgr.: Luis Saucedo Montaño

Mill Locations:

Mexicali, BC (paper mill)

San Francisco SA de CV, Fabrica de Papel, López Mateos Mill

Ownership: 51% by Garcia Franco Group, 49% by James River Corp.

Km. 5.5 Blvd. L. Mateos s/n, Col. Centro Industrial Margar

21360 Mexicali, Baja California, Mexico

Phone: 65 61 83 41-44

Telex: 569788 fpsame

FAX: 619 357 0525

Personnel:

Mill Mgr.: M. A. Garcia Franco

Paper Mill Mgr.: J. Francisco Wong L.

Tech. Mgr.: Fernando De La Torre

Converting Plant Mgr.: Eliseo Muñoz M.

Admin. Mgr.: Ruben Gonzalez M.

Sts. Mgr.: Javier Pastana F.

Ind. Rel. Mgr.: Alfredo Yasoharaj

Total Employees at This Location: 360

Type of Operation: paper, converting

Raw Material Data:

Non-wood fiber consumption:

waste paper—15,500 dry tons/yr

Paper & Paperboard Grades & Capacities:

Paper capacity: 12,600 m³/y

Principal categories:

lissue/hygienic—12,600 m³/y

Paper & Paperboard Mill Data:

Paper Machines: 1

No. 1, fourdrinier, rebuilt 1983, trim

width 2.3 m, max. speed 900.0

m/min

Rewinders: 4

Power Plant, Water & Effluent Data:

Power boilers: 1 at 20 steam tons/hr

Fuels used: 100% oil

Purchased electrical power: 50.0

MWh/day

Effluent systems:

clarifiers, aerators, settling ponds

Expansion Plans:

Paper production: 15,000 m³/y increase,

\$3,000,000 cost

SAN JOSE SA, FABRICA DE PAPEL

Apto. Postal 1000, Col. Centro, Del

Cauahutémoc

06000 Mexico D.F., Mexico

Telex: 1760034 garmex

Personnel:

Pres.: Tomas Garcia Candas

BEST AVAILABLE COPY

Mill Locations:
Los Reyes Acaquilpan, Edo. de Mexico
(pulp & paper mill)

San José SA, Fabrica de Papel
Km. 20.5 Carr. Mexico-Texcoco
56400 Los Reyes Acaquilpan, Edo. de
Mexico, Mexico
Phone: 510 32 70
Phone: 597 50243

Personnel:
Mill Mgr.: Pedro Garcia Candas
Type of Operation: pulp, paper
Pulp Grades & Capacities:
Total pulp capacity: 3,750 m³/y
Principal categories:
cotton—3,750 m³/y
Paper & Paperboard Grades & Capacities:
Paper capacity: 9,000 m³/y
Principal categories:
printing/writing—9,000 m³/y
Grades:

Ledger, Printing paper—filho,
Printing paper—offset
Paper & Paperboard Mill Data:
Paper Machines: 2
fourdrinier, trim width 1.9 m, max.
speed 115.0 m/min
fourdrinier, trim width 1.9 m, max.
speed 350.0 m/min

SAN PABLO SA DE CV, EMPAQUES MODERNOS
Aptdo. Postal 16 130, Del. Azcapotzalco
02000 Mexico, D.F., Mexico
Phone: 394 18 00

Personnel:
Gen. Mgr.: Pablo González Díez
Cont.: José Antonio Reynoso C.
Sis. Mgr.: Alberto Swain Torres
Acc.: Ramón Romero Camberos
Mill Locations:
Tlalnepanitla, Edo. de Mexico
(paperboard mill, converting plant)

San Pablo SA de CV, Empaques Modernos
Aptdo. Postal 16 130, Del. Azcapotzalco
02000 Mexico, D.F., Mexico
Phone: 394 18 00
Mill Location: San Pablo Xalpa,
Tlalnepanitla

Personnel:
Box Plant Supt.: Ismael Segoviano
Camarena
Total Employees at This Location:
800

Type of Operation: paperboard,
converting
Paper & Paperboard Grades & Capacities:
Grades:
Corrugating medium, Linerboard kraft
Paper & Paperboard Mill Data:
Paper Machines: 3
cylinder, trim width 2.1 m, max.
speed 120.0 m/min
fourdrinier, trim width 4.1 m, max.
speed 215.0 m/min
fourdrinier, trim width 4.6 m, max.
speed 365.0 m/min

SAN RAFAEL Y ANEXAS SA DE CV, CIA. DE LAS FABRICAS DE PAPEL
Av. Chapultepec 405, Col. Juárez
06400 Mexico, D.F., Mexico
Phone: 5 207 2076

FAX: 5 207 9260
Subsidiary of Cia. Industrial de San
Cristobal SA

Personnel:
Dply. Man. Dir.: Arturo Fuentes
Prod. Mgr.: Arturo Tena
Purch. Dir.: Fernando Carvajal Torre
Prod. Mgr.: Francisco Gonzalez
Div. Cont. Dir./Treas.: Juan Carlos
Zaragoza Bocado
Comm. Dir.: Joaquín González Leal
Dir.: Genaro Ruiz De Chavez Argote
Tech. & Dev. Dir.: Federico Flores
Gomez
Dir. Finan./Int. Relations: Mario Quirroz
Vazquez

Mill Locations:
Planta Progreso Industrial, Villa Nicotas
Romero, Edo. De Mex. (paper mill)
Planta San Rafael, San Rafael,
Tlalmanalco, Edo. De Mex. (pulp &
paper mill)

San Rafael y Anexas SA, Cia. de las Fabricas de Papel de Progreso Industrial
Aptdo. Postal 100
54030 Villa Nicotas Romero,
Tlalnepanitla, Edo. de Mexico
Phone: 822 02 65
Division of Cia. Industrial de San
Cristobal SA

Personnel:
Mill Mgr.: Daniel Rodriguez J.
Asst. Mill Mgr.: Arturo Tena G.
Tech. Mgr.: Aurelio Arias M.
Adm. Supt.: Armando Valdez G.
Supt. Oper. Serv.: Jaime Martinez
Supt. Ind. Rel.: Marco A. Martinez L.
Prof. Supt.: Alberto Aviles M.
Total Employees at This Location:
885

Type of Operation: paper, converting
Paper & Paperboard Grades & Capacities:
Paper capacity: 47,800 m³/y
Principal categories:
printing/writing—35,500 m³/y
(total woodfree—35,500 m³/y; coated
woodfree—17,750 m³/y)
tissue/hygienic—12,300 m³/y

Paper & Paperboard Mill Data:
Pulpers: 3
Refiners: 3 (double disc)
Paper Machines: 4
No. 1, fourdrinier, installed 1907,
rebuilt 1980, trim width 2.2 m,
max. speed 80.0 m/min, size press
No. 2, fourdrinier, installed 1947,
rebuilt 1973, trim width 2.3 m,
max. speed 180.0 m/min, size
press
No. 3, fourdrinier, installed 1964, trim
width 2.3 m, max. speed 270.0
m/min, size press, coater
No. 4, yankee, installed 1973, trim
width 2.6 m, max. speed 750.0
m/min
Rewinders: 5
Sheeters: 2
Supercalenders: 1
Coaling equipment:
steel blade, installed 1964, trim width
2.3 m, max. speed 300.0 m/min,
cap. 17,750 m³/y

Power Plant, Water & Effluent Data:
Power boilers: 4 at 48 steam tons/hr
Fuels used: 100% oil

Turbines: 1
Purchased electrical power: 107.0
MWh/day
Effluent systems:
settling ponds
NOT PRODUCING PULP
San Rafael y Anexas SA, Cia. de las Fabricas de Papel de, San Rafael Mill
56700 Chalco, Tlalmanalco, Edo. de M.
Mexico
Phone: 7 52 41
Division of Cia. Industrial de San
Cristobal SA

Personnel:
Mill Mgr.: Clemente Vesquez
Prod. Mgr.: Hermilio Oliveros
Paper Mill Supt.: Jose Rodriguez
Tech. Supt.: Carlos Cabral
Asst. Mill Mgr.: Altonso Homma K.
Chief Eng.: Angel Perez
Total Employees at This Location:
1,054

Paper employees: 459
Type of Operation: pulp, paper
Pulp Grades & Capacities:
Total pulp capacity: 40,000 m³/y
Principal categories:
bl. softwood kraft—32,000 m³/y
unbl./semi-bl. softwood kraft—8,000
m³/y

Raw Material Data:
Wood deliveries to mill:
Pulpwood as logs or roundwood:
2,200 m³/y
Non-wood fiber consumption:
bagasse—10,000 dry tons/y
Pulp Mill Data:
Chippers: 1
Type of chip transport: pneumatic
conveyor
Batch digesters: 6
Bleaching systems: 2
Process sequence: CE/MHH at
21,000 m³/y; CE/MHH at 11,000
m³/y

Evaporator lines: 2
Recovery boilers: 2 at 195 tons/day dry
solids

Paper & Paperboard Grades & Capacities:
Paper capacity: 74,000 m³/y
Principal categories:
printing/writing—53,700 m³/y
packaging/industrial—12,500 m³/y
other—7,800 m³/y

Paper & Paperboard Mill Data:
Pulpers: 5
Paper Machines: 4
No. 11, fourdrinier, installed 1959,
trim width 2.9 m, max. speed
280.0 m/min
No. 12, fourdrinier, installed 1967,
trim width 3.0 m, max. speed
320.0 m/min, size press
No. 13, twin-wire, installed 1973, trim
width 3.0 m, max. speed 450.0
m/min, size press
No. 14, fourdrinier, installed 1929,
trim width 3.1 m, max. speed
225.0 m/min, size press

Rewinders: 6
Sheeters: 4
Supercalenders: 1
Coaling equipment:
trailing blade, off machine, trim width
3.1 m, max. speed 488.0 m/min,
cap. 25,000 m³/y

Power Plant, Water & Effluent Data:
Power boilers: 5 at 208 steam tons/hr
Fuels used: 100% oil
Turbines: 2 at 8.0 MW
Purchased electrical power: 120.0
MWh/day

SANTA CLARA SA DE CV, FABRICA DE PAPEL
Aptdo. Postal 75
55540 Santa Clara, Edo. de Mexico,
Mexico
Phone: 569 02 66
Personnel:
Chmn. of the Board: A. Carriles Cueto
Man. Dir.: Adolfo Carriles Koll
Deputy Man. Dir.: Jose Luis Cruz
Fuentes
Mill Locations:
Santa Clara (paperboard mill)

Santa Clara SA de CV, Fabrica de Papel
Aptdo. Postal 75
55540 Santa Clara, Edo. de Mexico,
Mexico
Phone: 569 02 66
Mill Location: Km. 17.5 Carr.
Mexico-Laredo
Personnel:
Mill Mgr.: A. Carriles Koll
Total Employees at This Location:
76

Type of Operation: paperboard
Paper & Paperboard Grades & Capacities:
Principal categories:
kraft linerboard—20,000 m³/y
corrugating medium—8,000 m³/y
Grades:
Corrugating medium, Kraft board,
Kraft wrapping, Linerboard kraft
Paper & Paperboard Mill Data:
Paper Machines: 1
No. 1, fourdrinier, trim width 2.0 m,
max. speed 205.0 m/min, size
press

SMURFIT CARTON Y PAPEL DE MEXICO

Jaime Balmes 11-D, Col. Los Morales
Polanco
11510 Mexico, D.F., Mexico
Phone: 5 3 95 50 22
Telex: 1772707

Personnel:
Pres. R. G. Marshall
V.P. Plan. & Eng.: J. Arbitman
V.P. Mills: José Zorrilla
V.P. Converting: S. Rico
V.P. Finan.: C. Sacal
Purch. Dir.: S. Villa

Mill Locations:
Cerro Gordo Mill, Santa Clara, Edo. de
Mexico (pulp & paperboard mill)
Los Reyes Mill, Los Reyes Ixtacala, Edo.
de Mexico (paperboard mill)

NOT PRODUCING PULP
Smurfit Carton Y Papel de Mexico SA, Cerro Gordo Mill
Km. 15.5 Carr. Santa Clara
55540 Santa Clara, Edo. de Mexico,
Mexico
Phone: 569 25 11
Personnel:
Mill Mgr.: Keith M. Samuel
Asst. Mill Mgr.: Alejandro Ruiz
Tech. Mgr.: Mario Garza

**A TRADE GUIDE FOR
BIOMASS ENERGY PROJECTS
IN MEXICO**

Prepared by

Latin American Trade Council of Oregon
One World Trade Center
121 S.W. Salmon, Suite 1100
Portland, OR 97204

for

National Wood Energy Association
122 C Street NW
Washington, DC 20001

and

Winrock International Institute for Agricultural Development
1611 N. Kent Street
Suite 600
Arlington, VA 22209

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135

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A Trade Guide for Biomass Energy Projects in Mexico

This document was prepared by the Latin American Trade Council of Oregon for the Winrock International Renewable Energy and the Environment Program and the National Wood Energy Association. References, companies or agencies cited were discovered while reviewing the potential of wood residues for energy production in Mexico.

A. Overview

B. Potential Biomass Projects in Mexico

C. Events, Trade Shows

D. Key Contacts, Organizations, Publications

Energy Agencies

Forestry and Related Industries

US Wood Products Organizations Marketing in Mexico

Business Organizations

Resources, newsletters, fax

A. Overview

The demand for electrical power in Mexico has expanded at an average rate of 6 percent for the last ten years. At the same time the demand for wood, paper and biomass products has increased, biomass residues have increased, and the supply of timber has decreased. The potential for energy from biomass, as described in the accompanying review, is limited to current processing centers for wood, sugar or paper, where wood or bagasse residues are concentrated near industrial or urban consumers or to wood future plantation based projects.

The Mexican market for electric power generating equipment was estimated at US\$470 million in 1991, growing at an estimated average annual rate of 9.5%. An important development in this market is the formation of independent energy generators. Formerly, power generation and distribution was controlled by the Comission Federal de Electricidad, (CFE, Federal Electricity Commission). Since May 1991, the Mexican government has encouraged independent power generation. Development of power generation in the wood and paper sectors depends on the concentration of the resource, and it's proximity to demand and energy prices. With natural gas or oil available in Mexico margins for solid fuels are narrow at the present time.

Local production of equipment and materials used in the electrical sector is well integrated and has developed greatly over the past twenty years. Major global firms have plants that manufacture in Mexico and along with domestic companies supply more than 70 percent of the market demand. Domestic sales accounted for US\$345 million or 74 percent of the market in 1991.

Imports of electric power generation equipment were US \$125 million in 1991, approximately 27 percent of the total market. Imports are estimated to increase at an average annual growth rate of 7.2 percent between 1992 and 1995. Under the General Agreement on Tariffs and Trade (GATT) and NAFTA Mexico has progressively liberalized its import regulations.

The small and widely dispersed wood products industry in Mexico has depended on equipment from the US and Europe for harvesting, handling and processing. Industrialized portions of these industries can be reached through industry and state associations. Forest residues constitute a large energy resource in most of rural Mexico: the volume of wood harvested for domestic fuel is estimated to be equal to the total roundwood harvest for other uses. Residue handling equipment only exists in more developed areas. There is very little industrial chipping for paper or fuel in Mexico except for operations that supply wood based board plants. The handling and transportation infrastructure is undeveloped compared with the US or Europe.

Biomass energy projects in Mexico are likely to grow out of existing wood and chemical industries.

B. Identifying Potential Biomass Energy Projects in Mexico

The review of the Mexican forest industry identified some concentrations of industrial waste from furniture, wood panel and wood processing industries and the potential for future plantation derived residues. Energy production from wood residues might reach 200 MW. Residues from sugar production and municipal waste are needed to substantially increase the potential. The review also identified some circumstances that need to be resolved such as timber ownership and biomass power plant ownership and operation.

Concentrations of residues from 5-20 MW were identified in the principal wood production areas of Durango and Chihuahua. Studies of site specific circumstances must be made to confirm the potential to integrate cogeneration with the existing use of residues for steam or power. Many of the wood based board plants use hot oil systems for presses and drying while some use steam.

For a wood project to be economic it may have to be supplemented by residues that are subsidized for their disposal. While many plant residues are already used for domestic fuel in Mexico, some possibilities are urban wood residues, bagasse from sugar mills, tops and leaves, or maquiladora processing wastes. There are no independent power producers as we know them using these fuels to generate power Mexico.

The owners of biomass projects are likely to be large industries or financial consortiums. Some owners or investors may be wood processing industries, associations of timber owners, urban or industrial waste producers or producers of concentrated agricultural wastes such as bagasse from sugar production. In current market conditions financial incentives or environmental pressures are probably needed to justify a biomass power project.

With government encouragement of power generation for in plant use or cogeneration the following groups can be expected to be interested in developing a biomass power project:

- o Large private financial or industrial groups (chemical or manufacturing industry). These are typical owners and developers of projects of the scale (US\$ 4 million to \$40 million) that may be required for a power plant.
- o New independent power producers in joint ventures. The new circumstances and investment requirements may create new partners.
- o Government or private projects for environmental control or waste management. Industrial or urban construction residues that do not find their way into domestic fuel may be driven by current environmental regulation or incentives for their use.

- o **Forest or wood processing industries at the US border, in cities or villages. Disposal pressures or economics create a resource for power generation.**
- o **Rural industries, landowners or associations for remote power generation. Power is poorly distributed outside major cities. Biomass is concentrated where distribution is poor. Small scale (1 -10 MW) plants may be possible where sufficient residues or plantation resources can be collected.**

General Information Sources for Energy and Biomass.

Sources of information about Mexican projects can be found in US and international trade magazines in the power, pulp and paper and wood products industries.

Potential investor groups and industrial consortiums can be found in Latin American and Mexican financial publications.

Projects for cogeneration or independent power generation must be cleared through the government agencies SEMIP... and its cogeneration subsidiary CONAE.

Projects for forest plantations or harvesting require permits from the Forestry Department (SARH) which has an energy specialist. Permits must be approved both at the State and Federal level. Cutting or reforestation permits require an environmental assessment by a registered forester and must be approved by the environmental agency SEDESOL.

Since the forest and wood processing industries in Mexico are relatively small involving a relatively small number of professionals and financial groups, industry chambers and associations are useful sources.

Faced by high costs and competition from the US and Canada because of NAFTA the industry is going through a restructuring for survival. Several groups have sought joint venture partners from the US through the Mexican Investment Board (MIB), the national export bank (BANCOMEXT), and Mexican or US consultants.

Decisions making has decentralized in the recent presidential term and more development initiatives are undertaken at the State or provincial level. State export promotion and development organizations and private chambers of commerce are helpful to US companies.

There are many excellent guides for doing business in Mexico that apply to all industries and many State agencies also offer assistance. Several US states have representatives or representative offices in Mexico.

C. Principal Events, Trade Shows

Representatives of Mexican power and wood industries typically attend major equipment shows for each industry in the US and Canada depending on their needs. Some are listed below. There are no regular wood industry equipment events in Mexico. There are also trade shows that are promoted at regular intervals by the US Department of Commerce at sites in Mexico City, Guadalajara, and Monterrey. Special conferences and trade shows are also arranged by the US Agency for International Development in cooperation with Winrock International and others.

Annual meetings of Mexican wood industries are important but are not accompanied by equipment exhibitions. Contact the individual associations meeting times and locations.

Energy and Power Generation:

Expo Papel Latin America '94. June 1-3, 1994. Pulp and Paper Exhibition and Conference for Latin America. , Mexico City. E.J. Krause de Mexico, S.A. de C.V. Rio Marne No. 6, Col. Cuauhtemoc, Tel (525) 592-3257 Fax (525) 592-6613 Attn: Joseph Flynn.

Renewable Energy in the Americas '94 June 26-July 1, 1994

IEEE-ASME Joint Power Conference. October 1-6, 1994. Phoenix, Arizona
(713) 945-7783.

TAPPI Steam and Power Committee. Annual Meeting Technical Association of the Pulp and Paper Industry. February 1995. 15 Technology Parkway S., Norcross GA 30092.

Expo Energy '95. June 1995. Mexico City.

Forestry and Wood Products:

ANAFATA Annual Meeting. Association of Board Producers. Mexico, Asociacion Nacional de Fabricantes de Tableros de Madera, A.C. Lic. Armando Santiago, Director. Call for dates.

June 26-29, 1994; Forest Products Society 48th Annual Meeting, Holiday Inn by the Bay, Portland, ME.

March 1995. Wood Technology Clinic & Show. Portland, Oregon 600 Harrison Street, San Francisco, CA.

June 25-28, 1995: Forest Products Society 49th Annual Meeting, Red Lion Lloyd Center, Portland, OR.

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Expo Energy '95 June 1995.

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Fax: (51) 181-24 435
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Fax: (52-5) 658-3556
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DATE: January 28, 1994

TO: Jorge Landa, Energy Advisor, USAID/Mexico

FROM: Brad Hollomon

SUBJECT: CO2 Impacts of Biomass Project

First, I apologize for my delay in responding to your question about the potential CO2 reduction that might result from the biomass project. My time has not been entirely my own this week, and I hope the information is still useful to you.

One of the project's objectives is to ascertain the magnitude of the potential for biomass contribution to Mexico's energy supplies, so we will not really know the answer to your question until the first stage of the project is finished. On the other hand, I have tried to define the universe of which the potential represents a part in order to give some idea of what might be accomplished in terms of CO2 reductions due to cogeneration in the sugar and sawmill industries.

According to Cámara de Industria Forestal statistics, the sawmill industry produces lumber from 5,509,000 cubic metres of logs annually. Of this amount, generally 55% ends up as sawdust and offcuts, at least in other countries. Assuming these wastes are not used in other ways, they represent approximately 1,500,000 Tonnes of fuel (bone-dry weight basis) at a typical specific gravity of 0.5. Given

the wood's heating value and a plausible heat rate for small biomass generation systems of 5 kCal/kWh, a dry ton of wood can be converted to about 0.9 MWh, so the entire waste wood resource is equivalent to 1,350,000 MWh per year.

Turning to sugar, the industry processes about 35,000,000 Tonnes of cane per year. Of this, roughly 30%, or 10,500,000 Tonnes, becomes bagasse, with 50% moisture. Our experience is that although mills will vary, they can be reconfigured to export somewhere in the vicinity of 0.16 MWh per Tonne of bagasse, so the total potential output of the industry is 1,680,000 MWh per year.

The combined contribution, then, in appropriate round figures is approximately 3,000,000 MWh per year generated from wastes that represent no new CO₂ additions to the atmosphere, since they will be burned or decompose anyway. You may already have assumptions about carbon consumption for the conventional power generation that would be reduced in response to new renewable sources.

If you do not have standard assumptions, coal yields approximately 9,000 kCal per Tonne of carbon contained in it. (Heating value per ton of coal varies considerably, as does carbon content, but the caloric value expressed in terms of the carbon contained in the coal is somewhat more nearly constant.) Central station coal plants are somewhat more efficient than biomass ones would be, at perhaps 3.5 kCal per kWh, so a MWh worth of utility carbon emissions, based on coal-fired generation, would be 0.4 Tonnes. On this basis the 3 million MWh would amount to 1,200,000 Tonnes of carbon annually (expressed as weight of carbon, not CO₂).

If the alternative is distillate oil in diesel engines, the corresponding figures are 12,500 kCal per Tonne of carbon content in the fuel oil, and the engines are more efficient, at perhaps 2.5 kCal per kWh. This leads to carbon emissions of 0.2 Tonnes of carbon per MWh, or 600,000 Tonnes per year corresponding to the annual 3 million MWh saved.

An additional benefit arises out of the present consumption of oil by the sugar industry, since this could be eliminated with appropriate efficiency measures that the study will address. The Asociación de Técnicos Azucareros estimates that the industry now burns between 22 and 23 litres of bunker fuel oil, on average, per Tonne of cane processed. This amounts to about 800 million litres per year. At 0.8 kg of carbon per litre, the carbon emission reduction would be 640,000 Tonnes

Obviously, this range of 1.2 million to 1.8 million Tonnes of annual carbon reduction represents a rough upper limit, and the study will provide estimates of what fraction of this amount is realistically achievable. However, I hope this provides at least an idea of the general magnitude of the project's potential benefits for AID's purposes.

While I think of it, it would be useful to know if AID or Mexican authorities have standard assumptions regarding the carbon emission reductions associated with saved electric energy. We should try to be consistent with these assumptions, if they have been established, as we proceed with our work.

A handwritten signature in black ink, appearing to be 'Brod', is centered on the page.