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Sixth Session
Bogota, Colombia
29 August 1955

# PULP AND PAPER PROSPECTS IN LATIN AMERICA

NOTE BY THE SECRETARIAT

Since June 1951, the date when the fourth session of the Commission, meeting at Mexico City, adopted resolution 10 (IV) (E/CN.12/278), the ECLA Secretariat has been devoting special attention to the problems of the pulp and paper industry in Latin America. This resolution recommended that the Economic Commission for Latin America and the Food and Agriculture Organization of the United Nations should study the possibilities of regional development for this important branch of industry. The results of the research then undertaken were published in a joint report of the two organizations, 1/ which the secretariat presented to the fifth session of the Commission held at Rio de Janeiro in April 1953.

Discussion of this report at the fifth session led to resolution 58 (V) (E/CN.12/343) wherein the following recommendations were made to the Executive Secretary:

"1. Continue, in conjunction with the United Nations Food and Agriculture Organization and with the collaboration of the Technical Assistance Administration and other specialized agencies interested in the subject, the research begun in the preliminary study, by means of economic studies similar to those on iron and steel, so as to determine:

(a) The possibility of utilizing Latin-American resources on a rational and permanent basis for the development of the pulp and paper industry, with special emphasis on the technique of using tropical and sub-tropical woods;

(b) The possibility of establishing other forestry industries integrated with the pulp and paper industry, that may lead to better utilization of the forests and help to reduce the cost of pulp and paper;

1/ Document E/CN.12/294, which appeared in printed form early in 1954. (See Possibilities for the Development of the Pulp and Paper Industry in Latin America, United Nations publication, Sales N°: 1953.II.G.2.)

/(c) The possibility

(c) The possibility of finding domestic or foreign markets for pulp, paper and the products of the related integrated industries; and

(d) The possibility of utilizing, in the development of the pulp and paper industry, bagasse and other industrial or agricultural by-products;

2. In conjunction with the United Nations Food and Agriculture Organization and the Technical Assistance Administration, and in accordance with the said resolution 10 (IV) (E/CN.12/278), convene a meeting of experts to examine the results of the research work recommended above and, in general, to consider the economic and technical aspects of the pulp and paper industry; and

Recommends that member Governments collaborate to the fullest extent in connexion with the development of these studies and with the meeting of experts".

To fulfill the mandate of the Commission, the secretariat, in close collaboration with FAO and with the help of the Technical Assistance Administration, undertook the following tasks. After field research, particularly carried out at Amapá in Brazil and Yucatán in Mexico, where pilot projects for the possible establishment of pulp and paper mills using tropical woods were completed, the ECLA/FAO Working Group met at Santiago, in April 1954, to prepare the proposed Meeting of Experts. In addition to organizing this meeting, the Group was responsible for the drafting of the technical studies which ECLA and FAO were to present to the meeting and the compilation and revision of the documents received from the experts of different countries who were going to take part in the meeting.

The Latin American Meeting of Experts met in the City of Buenos Aires, through the generous hospitality and good offices of the Government of Argentina. The meeting lasted from 19 October until 2 November 1954. The Joint ECLA/FAO Group, which constituted the secretariat of the meeting, presented 10 studies and they were discussed by the meeting, as well as

/the 63 documents

the 63 documents received from experts in the industry. One hundred and eighty-six technical experts were present at the meeting, of whom 154 came from the following Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay, Peru, Surinam, Uruguay and Venezuela. The 32 other experts were citizens of Australia, Canada, the Federal Republic of Germany, Finland, France, Italy, Norway, Sweden, the United Kingdom and the United States.

The agenda discussed (which contains a list of the reports furnished at the meeting), the summary of the discussions and the conclusions which were reached, as well as the technical studies which were approved by the different committees established to examine each item on the agenda, are all included in the Report of the Latin American Meeting of Experts on the Pulp and Paper Industry (E/CN.12/361, FAO/ETAP N° 462, ST/TAA/SER.C/19). This report was adopted by the experts at the last plenary session of the meeting.

The report was submitted by ECLA and FAO to the Nineteenth Session of the Economic and Social Council, held at New York, in May 1955. The Council, by resolution (XIX)/15, in addition to taking note of the document with satisfaction, agreed to transmit it "...to the States Members of the United Nations and to the specialized agencies for their study and guidance in connexion with requests for technical and financial assistance and programmes for the development of pulp and paper resources..."

Once the work of the meeting was over, the ECLA secretariat - still maintaining the closest contact and collaboration with FAO - immediately undertook the final revision of the documentation, so that it could be published as soon as possible. The large amount of the material which constituted the documentation of the meeting required several months work to condense, and could only be completed in July 1955. The volume, to be published jointly by ECLA and FAO, is now ready for printing in both Spanish and English editions. It will be entitled Pulp and Paper Prospects in Latin America. It is divided into two main parts. The first represents a revised version of the report of the Meeting of Experts, while the second provides, in some cases the complete text and

/in others

in others a summary or condensed version, of the technical studies presented by the secretariat and by the experts. The volume closes with two appendices which give a list of the experts at the meeting and the speeches made at the inaugural session and, secondly, a detailed list of the authors and titles of the work presented.

Because it was impossible to submit the final and complete text of the Pulp and Paper Prospects in Latin America (E/CN.12/361/Add.1, FAO/ETAP N° 462/Add.1, ST/TAA//SER.C/19/Add.1), the secretariat considers it opportune that this report on the present situation should be accompanied by the Report of the Meeting (see appendix 1), as well as summarized versions of the technical studies presented to the meeting (appendix II).

# Appendix I

## REPORT OF THE LATIN AMERICAN MEETING OF EXPERTS ON THE PULP AND PAPER INDUSTRY

Buenos Aires, 19 October - 2 November 1954

E/CN.12/361
FAO/ETAP N° 462
ST/TAA//SER. C/19

(NOTE: To save time, the text of this Appendix maintains the previous symbol, indicated above, and page numbers of the original document.)

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/Locational factors

/Newsprint

## INTRODUCTION

1. The Latin American Meeting of Experts on the Pulp and Paper Industry, held in Buenos Aires in 1954, stems from the joint action of a number of international agencies which, in the years following World War II, have become increasingly concerned with the problems of securing an adequate supply and a fair distribution of pulp and paper.

2. The events which have led up to this meeting may be summarized as follows:

a) April 1949 - a preparatory conference on world pulp problems was convened in Montreal by FAO;

b) June 1951 - a resolution was adopted at the fourth session of ECLA inviting FAO and ECLA to explore the possibilities for development of the pulp and paper industry in Latin America. This resolution led to the preparation of a report by both organizations, presented at the fifth session of ECLA in 1953 and subsequently printed;[1/]

c) September 1951 - a resolution was adopted by the Economic and Social Council requesting the Director General of FAO to advise member governments on the long-term programme required to provide all countries with adequate pulp and paper supplies to meet their increasing needs;[2/]

d) December 1952 - a consultation of leading specialists from the world's pulp and paper industry was held at FAO Headquarters in Rome to determine the technical and economic possibilities for manufacturing pulp and paper from the various kinds of raw material available;[3/]

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1/ See report Possibilities for the Development of the Pulp and Paper Industry in Latin America, (E/CN.12/294/Rev.2) U.N. Sales No. 1953.II.G.2.New York.

2/ See report World Pulp and Paper Resources and Prospects, (21943 New York, September 1954).

3/ See report Raw Materials for more Paper, (FAO Forestry and Forest Products Study No. 6, Rome)

/e) The period

e) The period 1952-53 - FAO short-term survey teams visited 24 countries to explore, with competent local authorities, to what extent raw materials and other production factors would permit an expansion of pulp and paper production;

f) April 1953 - on the grounds of the report mentioned under point (b), a resolution was adopted at the fifth session of ECLA recommending that ECLA and FAO together with UNTAA organize a meeting of experts from the pulp and paper industry to examine the over-all question of pulp and paper production and consumption in Latin America.

3. The report which follows is divided into four parts. Part I describes the composition of the Meeting and those attending it, together with the way in which the work was organized; it includes the agenda adopted, with particulars of the various papers submitted to the Meeting by the Secretariat and by the experts from different countries. Part II provides a summary of the discussions and lists the general conclusions reached. Part III gives the complete version of the different committee reports as approved - in some cases after amendment - in plenary meetings. Part IV brings together in one chapter the various recommendations made by the Meeting in the reports which it adopted and in the course of plenary discussions.

/Part I

# Part I

## A. COMPOSITION, ATTENDANCE AND ORGANIZATION OF THE WORK

### 1. Opening and closing sessions

4. The inaugural session of the Latin American Meeting of Experts on the Pulp and Paper Industry took place in the Aula Magna "Eva Perón" of the Faculty of Law and Social Sciences of the University of Buenos Aires, at Buenos Aires, Argentina, on 19 October 1954. The Minister of Agriculture and Livestock of Argentina, Mr. Carlos A. Hogan, pronounced the opening address in the name of H.E. the President of the Republic, General Juan D. Perón.(see Appendix II). During the course of this session, speeches were made by Dr. Raúl Prebisch, Executive Secretary of the Economic Commission for Latin America and representative of the Secretary-General of the United Nations and of the Director-General of the Technical Assistance Administration, and by Mr. Egon Glesinger, Deputy Director of the Forestry Division of the Food and Agriculture Organization of the United Nations and representative of the Director-General of FAO and of the Executive Secretary of the Economic Commission for Europe (see Appendices III and IV).

5. The Meeting adopted the report of its work at the last plenary session which took place on 2 November 1954. On the same day, at the closing session held in the Aula Magna "Eva Perón", Mr. Carlos A. Hogan, Minister of Agriculture and Livestock of the Republic of Argentina, gave the official address in the name of General Juan D. Perón, President of the Republic. Speeches were also made by Messrs. J. Alfred Hall, Director of the Forest Products Laboratory of the United States Department of Agriculture and Rapporteur of the Meeting; Silvio Gagliardi, Vice-President and Manager of Celulosa Argentina, S.A., in the name of the Latin American experts who attended the Meeting; E.W. Tinker, Director of the American Paper and Pulp Association, in the name of the North American experts; Julius Grant, Director of the Pulp and Paper Research Company (Great Britain) and representative of the British Paper and Board Makers Association, in the name of the European experts, and Pierre Terver, Chief Technical Assistance Officer, Forestry Division of FAO, representing all the international sponsoring organizations.

/2. Composition and

## 2. Composition and attendance

6. The Latin American Meeting of Experts on the Pulp and Paper Industry was attended by 154 experts from the following Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Paraguay, Peru, Surinam, Uruguay and Venezuela. Thirty-two experts from Australia, Canada, the Federal Republic of Germany, Finland, France, Italy, Norway, Sweden, the United Kingdom and the United States of America were also present. The complete list of participants and of the representatives of the various international organizations present may be found in Appendix I to this report.

## 3. Organization of the work of the Meeting

### a) Organization of the work

7. At its first plenary session, the Meeting elected Mr. Carlos A. Hogan, Minister of Agriculture and Livestock of the Republic of Argentina, as Chairman.

8. The work of the Meeting was directed by the following Secretariat:

Directors:

Carlos Quintana, Director for the Economic Commission for Latin America (ECLA) and the United Nations Technical Assistance Administration (TAA)

Arne Sundelin, Director for the Food and Agriculture Organization of the United Nations (FAO)

Secretary-General of the Meeting:

Tomás Fortunato Desimone, of the Ministry of Foreign Affairs and Worship of the Republic of Argentina

Co-ordinators:

Pierre Terver, for FAO

Alfonso Santa Cruz, for ECLA and TAA

Special Advisers:

Jack Westoby, FAO/ECE

Gerald Welsh

/Mr. J. Alfred Hall

9. Mr. J. Alfred Hall, Director of the Forest Products Laboratory, Forest Service of the United States Department of Agriculture, was appointed Rapporteur.

b) Discussion Leaders

10. In order to direct the discussion on the different items on the agenda, the following discussion leaders were appointed:

Carlos Benko (Brazil) for Item II on the agenda: Pulp and paper consumption, production and trade in Latin America

W.O. Hisey (United States) for Item III on the agenda: Economic aspects of pulp and paper manufacture from Latin American tropical and sub-tropical hardwoods

Lucas A. Tortorelli (Argentina) for Item IV on the agenda: Aspects of pulp and paper manufacture based on other Latin American forest resources

Joseph E. Atchison (United States) for Item V on the agenda: Economics of pulp and paper manufacture from sugar cane bagasse

Hans W. Giertz (Sweden) for Item VI on the agenda: Presentation of papers on selected technical matters

Silvio Gagliardi (Argentina) for Item VII on the agenda: Review of the development prospects for pulp and paper industries in selected Latin American countries

Stacy May (United States) for Item VIII on the agenda: Financing of Latin American pulp and paper development

Percy R. Sandwell (Canada) for Item IX on the agenda: Newsprint

Gardner H. Chidester (United States) for the final plenary meetings in which the texts of the committee and working group reports were discussed and approved.

c) Drafting Committees

11. Drafting committees were formed for each item on the agenda (for titles see the preceding paragraph 10), and the Meeting appointed the following experts to them:

Item II : C. Benko, Discussion Leader; P. Asenjo, O.A. D'Adamo, J.C. Leone, A. Picasso Oyague, R. Remolina and F. Urencio.

/ Item III:

Item III : W.C. Hisey, Discussion Leader; G.H. Chidester, H.K. Collinge, J. Di Filippo, H.W. Giertz, S. May, J. Lichon, L. Rys and P.R. Sandwell.

Item IV : L.A. Tortorelli, Discussion Leader; P. Asenjo, L. Golfari, L. Huguet, I.A. de Hulster, R.B. Jeffreys, A.G. Ragonese, L. Rys, A.N. Sampaio and E. Valente.

Item V : J.E. Atchison, Discussion Leader; T.M. Cook, D.S. Cusi, J. Di Filippo, E.C. Lathrop, L. Morganti, H. Niethammer, W.J. Nolan and G. Pomilio.

Item VI : (No drafting committee was formed, since the Meeting simply examined the various papers submitted for its consideration without taking any decisions on the subject.)

Item VII : S. Cagliardi, Discussion Leader; P. Asenjo, J. von Bergen, L. Escobar, J.C. Leone, R. Rencolina, F. Urencio and F.H. Vogel.

Item VIII: S. May, Discussion Leader; O.A. D'Adamo, T.M. Cook, D.S. Cusi, J.C. Leone, C.D. McCoy, W.H. Morell, E.W. Tinker and M. Vieud.

Item IX : P.R. Sandwell, Discussion Leader; P. Asenjo, G.H. Chidester, H.K. Collinge, J. Di Filippo, J. Guerra, H. Niethammer and K. Zappert.

12. Apart from the drafting committees, two working groups were formed to examine special subjects which the Meeting considered to be of particular interest. One of these dealt with the specific subject of eucalypts, and its conclusions (which are nevertheless given separately) were grouped with those of Item IV relating to other forest resources for pulp and paper; the other dealt with the problem of technical assistance, research and training, and one of the Meeting's recommendations emerged from it (see Part IV of this report). The working group on eucalypts consisted of the following experts: R.B. Jeffreys (Australia), Discussion Leader; N. Battenberg, G.H. Chidester, J. Di Filippo, J. Grant and J.C. Leone. The other group was composed of the following: H.K. Collinge (Canada), Discussion Leader; J. von Bergen, E. Gagliardi, H.W. Giertz, J.A. Hall, J.C. Leone and H. Thielen.

13. The reports of the above committees and of the working groups on eucalypts may be found, as indicated earlier, exactly as adopted after discussion by the plenary meetings, in Part III of this report.

/ B. AGENDA

B. Agenda

14. The Meeting adopted the following agenda:

I. INAUGURAL SESSION

II. PULP AND PAPER CONSUMPTION, PRODUCTION AND TRADE IN LATIN AMERICA

Document symbol
ST/ECLA/CONF.3/L. 2.0 Secretariat paper: Pulp and paper consumption, production and trade in Latin America

2.1 Paper for printing and writing: tentative forecasts of demand in 1955, 1960 and 1965

by the Intelligence Unit of The Economist, London, at the request of UNESCO

2.2 Consumption trends in wrapping, packing and industrial papers and paperboard

by Louis T. Stevenson, Tucker, Anthony & Co. (USA)

2.4 World trends in consumption of newsprint, other printing paper and writing paper

by the staff of UNESCO

III. ECONOMIC ASPECTS OF PULP AND PAPER MANUFACTURE FROM LATIN AMERICAN TROPICAL AND SUB-TROPICAL HARDWOODS

Document symbol
ST/ECLA/CONF.3/L. 3.0 Secretariat papers: Economic aspects of pulp and paper manufacture from Latin American tropical and sub-tropical hardwoods

3.01 Latin American tropical and sub-tropical hardwoods as a source of pulp and paper

3.02 Amapa - Yucatan. A study of hypothetical pulp and paper mills based on tropical mixed woods. Part I, Part II and Part III

3.03 Mill size, integration, location. A study of investment and production costs in hypothetical pulp and paper mills

/3.04 Forestry

3.04 Forestry aspects in the planning of pulp and paper mills in tropical regions

3.1 Influence of mill size and integration upon investment and cost

by A.B. Karlstads Mekaniska Werkstad (Sweden)

3.2 Surveying of locational factors for the installation of pulp and paper industries in tropical regions

by the Centre de Recherches et d'Etudes pour l'Industrie de la Cellulose et du Papier (France)

3.3 Forest inventories in tropical regions

by Dennis Heinsdijk of the Surinam Forest Department, member of the FAO Mission to Brazil, assisted by K.P. Macgrath

3.4 Preliminary projects for pulp mills and their service facilities in tropical regions

by the Centre de Recherches et d'Etudes pour l'Industrie de la Cellulose et du Papier (France)

3.5 Wood extraction and transportation in tropical regions

by Pierre Allouard, Centre Technique Forestier Tropical (France)

3.6 Economic availability of pulpwood from Latin American sub-tropical forests

by Orlando A. D'Adamo, Director, Bosques Ordenados, S.A. (Argentina)

3.7 Pulpwood from Peruvian cetico (Cecropia)

by the Banco de Fomento Agropecuario del Perú

/ 3.8 Pulping

3.8 Pulping of Latin American woods

by G.H. Chidester, Chief, Division of Pulp and Paper, and E.R. Schafer, Chemical Engineer, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Madison (USA)

3.9 The technique of pulping mixtures of tropical woods

by the Régie Industrielle de la Cellulose Coloniale du Ministère de la France d'Outre-Mer

3.10 Preliminary results of the pulping of some Brazilian tropical and sub-tropical hardwoods

by L. Rys, A. Boenisch, W. Overbeck and A. Schwarz, Industrias Klabin do Paraná de Celulose, S.A. (Brazil)

3.11 The pulping of Peruvian cetico for the manufacture of newsprint

by Batineyret (Batignolles-Chatillon and Ateliers Neyret Beylier) (both from France)1/

3.12 Economics of newsprint production

by P.R. Sandwell, President, Sandwell & Co. Ltd. (Canada)

3.13 The use, in newsprint, of bleached cold soda pulps from certain mixtures of Latin American hardwoods

by G.H. Chidester, Chief, Division of Pulp and Paper, and K.J. Brown, Chemical Engineer, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Madison (USA)

3.14 Economic aspects of integrating pulp and paper industries with other forest industries

by J.A. Hall, Director, Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, Madison (USA)

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1/ This paper, together with 3.12 and 3.13, was discussed under Item IX of the agenda, which dealt specifically with newsprint and its problems.

/ 3.15 The Amazon

3.15 The Amazon region and the paper industry

by A. de Miranda Bastos, from the Government of the Federal Territory of Amapa, and the Superintendencia da Valorizaçao Economica da Amazonia (Brazil)

IV. ASPECTS OF PULP AND PAPER MANUFACTURE BASED ON OTHER LATIN AMERICAN FOREST RESOURCES

Document symbol
ST/ECLA/CONF.3/L.4.0 Secretariat paper: Other Latin American forest resources as sources of raw materials for pulp and paper

4.2 Mexican experience with coniferous plantations for pulp and paper

by Hans Lenz, Director of Fábricas de Papel de Loreto y Peña Pobre (Mexico)

4.3 Pulpwood from saliaceous species of the Parana Delta

by Enrique G. Valente, Bosques Ordenados, S.A. (Argentina)

4.4 The cultivation of eucalypts in the State of Sao Paulo

by Armando Navarro Sampaio, Chief of the Forestry Service, Paulista Railroad Company (Brazil)

4.5 Pulpwood from plantations of exotic conifers in the Parana Delta

by Lamberto Golfari, Servicio Forestal, Celulosa Argentina, S.A. (Argentina)

4.6 Forestry measures undertaken by the Argentine Government in order to increase pulp and paper production

by the Administración Nacional de Bosques, Ministerio de Agricultura y Ganadería de la Nación (Argentina)

/4.8 Production

4.8 Production of chemical pulp and groundwood from willow, poplar and poplar-willow

by Celulosa Argentina, S.A. (Argentina)

4.9 Pulp and paper making from eucalypts in Australia

by R.B. Jeffreys, Technical Director, Australian Paper Manufacturers Ltd. (Australia)

## V. ECONOMICS OF PULP AND PAPER MANUFACTURE FROM SUGAR CANE BAGASSE

Document symbol
ST/ECLA/CONF.3/L.5.0 Secretariat paper: Bagasse for pulp and paper

with special assistance from the Banco de Fomento Agrícola e Industrial de Cuba

5.1 Bagasse pulping with particular reference to the mechano-chemical process

by E.C. Lathrop, Head, Agricultural Residues Section, and S.I. Aronovsky, Northern Utilization Research Branch, U.S. Department of Agriculture, Peoria (USA)

5.2 Economic and other factors to be considered in the use of sugar cane bagasse as a raw material for pulp and paper manufacture

by E.C. Lathrop, Head, Agricultural Residues Section, Northern Utilization Research Branch, U.S. Department of Agriculture, Peoria (USA)

5.3 Saving of bagasse for paper making: thermal considerations

jointly by the Cellulose Development Corporation and John Thompson Water Tube Boilers Ltd. and several sugar producers and sugar equipment manufacturers (England)

5.4 Saving of bagasse by improved boiler house operations

by G. Ranwez, Mellor Goodwin, S.A. (Argentina)

/5.5 Preservation

5.5 Preservation, handling and storing of bagasse

by A. Watson Chapman, Research Department, The Celotex Corporation (USA)

5.6 Factors influencing the selection of processes and equipment for bagasse pulp manufacture

by Joseph Atchison, Vice-President, Parsons & Whittemore Inc. (USA)

5.7 Experience in industrial bagasse pulping

by the Cellulose Development Corporation (England)

5.8 Industrial experience in bagasse pulp manufacture in Argentina

by the Research Laboratory, Celulosa Argentina, S.A. (Argentina)

5.9 Industrial experience in bagasse pulp and paper manufacture in Paramonga

by José Correa S., W.R. Grace y Cía. (Peru)

5.10 Twenty-five years of Argentine industrial experience in the pulping of straw and cane

by Juan Di Filippo, Celulosa Argentina, S.A. (Argentina)

5.12 Industrial experience in bagasse pulp manufacture in Piracicaba

by Lino Morganti, Refinadora Paulista, S.A. (Brazil)

5.13 The alkaline pulping of bagasse for high strength papers and dissolving pulp

by William J. Nolan, Pulp and Paper Laboratory, University of Florida (USA)

/5.14 Research into

5.14 Research into the use of Trithrinax campestris (palma, palmera, caranday) leaves as raw material for paper

by Walter Ginzel of the Dirección General de Industrias de Córdoba (Argentina)

5.15 Development prospects of the pulp industry for special papers in the Province of Córdoba, based on the palmtrees of the area

by S. Llorens, J. Muhana and W. Ginzel of the Dirección General de Industrias de Córdoba (Argentina)

VI PRESENTATION OF PAPERS ON SELECTED TECHNICAL MATTERS

Document symbol
ST/ECLA/CONF.3/L. 6.1 Modern trends in layout and design of pulp and paper mills

by A.M. Hurter, Stadler, Hurter & Co. (Canada)

6.2 Water supply and waste effluent disposal as factors in locating pulp and paper mills

by Julius Grant, Director, Pulp and Paper Research Co.Ltd. (England)

6.3 The relationship between the morphological characteristics of the fibres from tropical woods and the quality of the pulp and paper obtained from them

by the Régie Industrielle de la Cellulose Coloniale du Ministère de la France d'Outre-Mer

6.5 A new process for bleaching pulp from tropical woods

by the Régie Industrielle de la Cellulose Coloniale du Ministère de la France d'Outre-Mer

6.6 Low cost supply of sulphur dioxide for South America

by C.J. Wall, The Dorr Company (USA)

/ 6.7 Economics

6.7 Economics of waste liquor recovery and burning in the sulphate and sulphite processes

by Gustaf Edling, Vice President, Swedish Steam Users Association (Sweden)

6.8 Economic aspects of power and steam production in the paper industry

by G. Ranwez, Mellor Goodwin, S.A. (Argentina)

6.9 The Aschaffenburger process for manufacturing bagasse pulp for newsprint

by Rudolf Schepp, Chief Chemist, Aschaffenburger Zellstoffwerke, A.G. (Germany)1/

6.10 Defibrator continuous semi-chemical pulping process

by A.B. Defibrator, Stockholm (Sweden)

6.11 Modern pulp-screening equipment and operations

by Karl Lindgren, Chief Engineer, A.B. Ekströms Maskinaffär, Stockholm, (Sweden)

6.12 The modern paper-making machine applied to the utilization of short-fibred raw materials

by Ralph C. Heys, Managing Director, Millspaugh Ltd. (England)

6.13 Improved quality and production from existing paper-making equipment

by Frank T. Peterson, Vice President, The Black-Clawson Co. Inc. (USA)

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1/ This paper was discussed by the Meeting under Item IX of the agenda.

## VII. REVIEW OF THE DEVELOPMENT PROSPECTS FOR PULP AND PAPER INDUSTRIES IN SELECTED LATIN AMERICAN COUNTRIES

Document symbol
ST/ECLA/CONF.3/L.

7.2 Development prospects for the Brazilian pulp and paper industry

by José Carlos Leone, Banco Nacional do Desenvolvimento Economico (Brazil)

7.3 Development prospects for pulp and paper in Colombia

by Manuel Archila M., Instituto de Fomento Industrial (Colombia)

7.4 Development prospects for the Chilean pulp and paper industry

by the Corporación de Fomento de la Producción (Chile)

7.5 Development prospects for the Mexican pulp and paper industry

by Nacional Financiera, S.A. (Mexico)

7.6 Development prospects for pulp and paper in Venezuela

by the Corporación Venezolana de Fomento (Venezuela)

7.7 Abstracts from The Forest and Forest Industry Situation in Central Amaerica, a report of the FAO Forestry Mission for the ECLA Programme of Economic Co-operation of the Central American Isthmus, referring to the possibilities of establishing pulp and paper industries in: El Salvador, Guatemala, Honduras and Nicaragua

7.8 Development prospects for pulp and paper in Uruguay

by the Asociación de Fabricantes de Papel de la Unión Industrial Uruguaya (Uruguay)

/ VIII. FINANCING

## VIII. FINANCING OF LATIN AMERICAN PULP AND PAPER DEVELOPMENT

Document symbol
ST/ECLA/CONF.3/L. 8.0 Secretariat paper: Financing pulp and paper development in Latin America

in co-operation with the Economic Commission for Europe

8.1 Basic principles for financing new pulp and paper projects

by Karl Landegger, President, Parsons & Whittemore Inc. (USA)

8.2 Prospects for investing capital in the Argentine paper industry

by the Confederación Nacional Económica (Argentina)

8.4 Financing pulp and paper companies in the United States. A commercial banker's point of view

by A. Newell Rumpf, Vice-President, Harris Trust and Savings Bank, Chicago (USA)

## IX. SPECIAL ITEM ON NEWSPRINT 1/

9.0 Secretariat paper: The newsprint problem

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1/ Apart from Secretariat paper 9.0, documents 3.11, 3.12 and 3.13, included under Item III, and 6.9, included under Item VI, were examined by the Meeting under this item.

# PART II

## RESUME OF THE MEETING: ITS AIM, DELIBERATIONS AND CONCLUSIONS

### The aim

15. This Meeting was a continuation of the programme of the United Nations and its agencies aimed at expanding world production of pulp and paper to meet existing shortages and prospective needs. Some years ago it became clear that there would be an eventual limit to production based on temperate zone forests and that the vast forest wealth of the tropics - together with subsidiary and abundant fibrous crops - offered the most probable source from which could be derived the vast quantities of fibre required.

16. At FAO Headquarters in Rome, in 1952, a consultation of specialists in the pulp and paper field explored the problem from two principal points of view: a) the technical suitability of tropical woods and other non-traditional resources as raw materials for pulp and paper; and b) the prospective costs of manufacturing pulp and paper from this kind of raw material.

17. That meeting concluded that processes were available for the technically successful manufacture of pulp and paper products from tropical woods; and that there was reason to believe that such operations might prove economically feasible. It further analysed and set forth the problems that ought to be examined and solved before large-scale development was undertaken.

This present Meeting devoted itself to an examination of those and other problems in the region of Latin America and under the special conditions to be found there. Briefly, those problems are as follows:

a) What is the present and probable future demand for pulp and paper in Latin America, in the region as a whole and in individual countries;

b) By what processes, from what sources and at what costs are present requirements being met;

/c) What are

c) What are the probabilities that, considering all fibre resources available for pulp and paper, future requirements can be satisfied by Latin American resources alone or in combination with necessary and available imports;

d) What are the capabilities of known technical processes, their costs and probable results when applied to Latin American woods and fibre crops to produce the necessary kinds and qualities of paper to meet Latin American needs;

e) What are the areas that require co-ordinated technical research in forestry and technology to realize a development programme;

f) What are the economic, political and social obstacles to the expansion of existing industry and the creation of new industry to meet present and future needs;

g) What are the criteria by which new projects should be evaluated;

h) What sources of financing are available for developing pulp and paper industries.

## The deliberations

19. The deliberations of the meeting are summarized below in the order inwhich the items appeared on the agenda.

### Consumption, production and trade

20. It is conservatively estimated that consumption of pulp and paper will approximately double by 1965, reaching nearly 3 million tons as compared to about 1.5 millions per annum in the period 1948-52. If economic developments are generally favourable this figure may be considerably exceeded. These estimates represent in no way the maximum levels of consumption capable of being realized if adequate supplies of pulp and paper should become available, for historical data show clearly the relation between abundant availability of paper and its increasing rate of consumption.

/21. These

21. These increased requirements are not likely to be met by imports from Europe or North America, nor can they be met by Latin American projects under construction, or in the planning stage. The regional capacity for pulp and paper production must rise steeply over the next few years in order to meet clearly foreseen requirements.

22. Two particular aspects require special attention: a) the production of mechanical pulps or pulps capable of replacing mechanical pulp for newsprint, and b) Kraft pulp or combinations of pulps for high strength wrapping paper.

Tropical and sub-tropical hardwoods

23. The very magnitude of the basic resources in tropical and sub-tropical woods quite rightly offers a major challenge to industry. But the obvious abundance of the resource and the small degree of current exploitation raise three different kinds of problems:

a) Those pertaining to the estimate of the resource, its composition and capacity for continuous replenishment, and its probable future evolution under the impact of exploitation; these are problems of resource management.

b) Since these forests yield wood not hitherto well known to pulp and paper technology, the adaptation of known processes to them in both conventional and unconventional ways requires an appraisal of costs, technical results, and capacity to satisfy the requirements for different kinds and qualities of paper; these are largely problems of pulp and paper technology.

c) The fact that certain possible sites are in undeveloped regions, where industrial, social and transport facilities either do not exist or are but meagrely developed, raises important economic problems.

24. From the sylvicultural point of view, the guiding principle is the perpetual maintenance of an adequate and satisfactory supply of material to the contemplated industry. In spite of lack of accurate knowledge as to the way these forests react to the harvest, an optimistic view of

/their long-term

their long-term behaviour is expressed. This view is based upon the known facts of tropical sylviculture, the vigour and growth capacity of the forests, and the apparent need for the present of attainable management and conservation plans.

25. Such plans must be based upon original inventory, perpetual inventories that take account of the dynamic effects of the harvest, and such modifications in forest practice as will arise from increased experience. This has been the history of the opening up of all new forest types; there is no reason to expect that tropical experience will be different. For example, results in certain areas of Peru indicate that Cecropia grows well in clearings and in reasonably pure stands. If this holds good in further practice, it will afford an excellent example of stand improvement through harvesting, with the new forest better adapted to the requirements of pulp and paper.

26. In some areas, opening the forest for exploitation will involve considerable expense. Where veneer woods or saw timbers constitute important components of the stands, attention should be given to proper utilization of such timbers, so that potential high values may be realized and extraction costs, road building and other development costs distributed. Further, proper integration of other forms of utilization with pulp and paper may often make feasible an otherwise impossible project.

27. The selection of the process for pulping mixed tropical woods must be based upon versatility in application to a multiplicity of species, and on the need to adapt the resultant pulp to the products desired. In general, the sulphate process, because of its ability to pulp a great variety of broadleaved species and because of its tolerance to bark and extractives is agreed to be the most adaptable to tropical woods. Considerable investigation has amply shown the flexibility of the sulphate method when applied to quite heterogeneous mixtures of tropical woods.

28. In some cases, wood sorting will be needed, e.g., to eliminate species of high silica content or otherwise unsuitable for processing.

/29. In the

29. In the production of pulp that can be substituted for groundwood in newsprint or other products, the conventional groundwood process can be applied successfully to certain species, providing those species occur in ample quantity. However, conventional production of mechanical pulp from mixed tropical species does not appear feasible.

30. Certain other processes, notably the neutral sulphite semi-chemical process and the more recently developed cold soda process, seem to offer the possibility of meeting Latin America's needs for a type of pulp suitable for the manufacture of newsprint; appropriately blended these pulps may be used in a wide range of other papers too. The capital investments and plant sizes, especially in the case of the cold soda process, need not be large.

31. With regard to plant location of pulp and paper projects in Latin America, problems will be confronted that do not arise in highly industrialized regions. Capital requirements for developments necessary to the installation in under-developed areas may be high but may, on the other hand, be compensated by the lower cost of certain other items. The entrepreneur will seek to balance advantages and disadvantages offered by various sites and will concentrate his attention on that site which offers the optimum combination of suitable locational factors.

32. When projects are contemplated in a region where basic community services are entirely lacking, but where - for economic and social reasons - governments wish to encourage industrial development, it is possible that methods can be worked out between private capital and government authorities that will provide for government financing of so-called "settlement" facilities. Unless such policies are adopted, the attention of private capital will necessarily be drawn towards projects located in developed areas near urban consumption centres.

33. It is considered unlikely that pulps from tropical broadleaved woods will make any substantial contribution to the world market for many years to come, but they may be of great significance in the satisfaction of Latin American requirements. Broadly speaking, this applies especially where proper integration can be achieved with those areas capable of producing long-fibred pulps. In the regional market, prospects are

/good for

good for both bleached and unbleached pulps from tropical broadleaved woods and especially for papers made therefrom.

34. It is impossible to generalize concerning minimum economic size for mills proposed in Latin America. However, in general capital costs will be heavier if sites in undeveloped regions are compared with those in industrial areas; but certain other costs, such as those for pulpwood and wages, will tend to be lower.

35. The Meeting concluded that available data demonstrated the possibility of converting tropical woods into satisfactory paper at competitive prices in national or regional markets, provided the site is correctly chosen.

Other forest resources

36. Although the tropical and sub-tropical forests of Latin America loom large as eventual potentialities, the region is by no means devoid of other important forest resources. These comprise considerable broadleaved and coniferous temperate forests, as well as large existing plantations in both categories.

37. General factors governing forest practices and the utilization of natural temperate broadleaved forests are akin to those applying to similar forests elsewhere. Once a decision has been reached, on a basis of economic and land classification studies, to devote land to permanent broadleaved forest, the harvest must be depended upon to bring the forest to good composition and acceptable yield. Existing pulping methods can serve well to effect this process and make possible profitable utilization of present stands to improve future crops.

38. In both broadleaved forests and natural coniferous stands, the general problems of protection from fire and over-grazing are of great importance.

39. Natural regeneration of existing forests must sometimes be supplemented by planting, and, in such cases, opportunity may be afforded to improve composition and yield through choice of species or even transformation of a natural broadleaved stand to more profitable conifers.

/ 40. Extention

40. Extension of the natural coniferous forests in South America and Mexico by plantation methods, based upon adequate research, appears to warrant special attention.

41. As for plantations, they attract pulp and paper manufacturers because of the convenience with which the yield can be adapted to the requirements of processes and products. Also, since plantations can often be developed in proximity to industrial areas, many problems arising in more remote locations are avoided.

42. In general there are two principal instances where plantations are recommended: a) when they constitute the best form of land utilization. Numerous examples are found in north eastern Argentina and in Brazil with their plantations of Parana pine and eucalypts; b) when they represent profitable use of currently unprofitable forest sites, whether of unforested land or land covered with woodland of little or no economic value. Examples are the plantations of Pinus radiata in Chile and the plantations in the Parana Delta.

43. There is a large and important field for research in planting in Latin America to ensure reafforestation of a great deal of deforested or poorly forested land, and to create new forests. Careful testing of exotic species and selection of superior strains of native species offer fields for extensive co-operation between the various research institutions. An extension of present arrangements for exchange of seeds and information is needed.

44. Particular attention should be given to the relationships between spacing, growth rate and wood properties in order to achieve optimum yields and utilization opportunities.

45. The Regional Forestry Office of FAO is in an excellent position to function as collecting and distributing agency for pertinent information. The Meeting suggested the desirability of amplifying that Office's facilities to accomplish these ends.

Eucalypts

46. Extensive plantations of eucalypts, based on many years of careful

/experimentation, especially

experimentation, especially in Brazil, offer encouraging prospects as a source of material for a permanent pulp and paper industry.

47. With regard to processes, the sulphate, semi-chemical, soda and the new cold soda process as well, all seem to be applicable to numerous species of eucalypts for the production of a wide variety of papers, ranging from fine bonds to newsprint. In the case of groundwood, Australian and Latin American experience indicates that mechanical pulps from plantation eucalypts are likely to be of poor qualtity and their use for newsprint limited to low percentages in blends.

48. More intensive research on and experiments with the eucalypts should produce results of considerable value to Latin America, especially if advantage is taken of the very extensive work already carried out in Africa and Australia.

Bagasse

49. Latin America produces annually about 26 million tons of wet bagasse, or more than enough for 4 million tons of pulp. However, only 1 to 1 1/2 per cent of this quantity is actually being pulped in nine existing mills. In general, increased supplies of bagasse for pulping are dependent entirely upon changes or improvements in sugar mill procedures. Chief among these is the replacement of bagasse - used as fuel in the sugar mills - by oil or, in some countries, by coal or natural gas.

50. The capital costs involved in substituting oil for bagasse are not at all high, the major cost element in the substitution being that of the fuel itself. Generally, where the substitution has been made, one ton of oil has replaced about 6 tons of wet bagasse.

51. Existing mills pulping bagasse offer a wealth of experience in the practical baling, storage and handling of bagasse to permit continuous pulping operations in spite of the generally short duration of the sugar campaign.

52. Separation of the pith from the fibre in bagasse has been found

/ generally advantageous

generally advantageous in pulping; the pith can be profitably marketed for various uses.

53. As for pulping processes applicable to bagasse, all the standard processes seem to be satisfactory, except the acid sulphite method.

54. Some important grades of paper are being made from furnishes consisting of bagasse pulp alone. However, it is believed that the major contribution of this important raw material will be as a blending pulp. Mixed with other pulps, bagasse pulp can impart improved properties to the blend.

55. While there seems to be no doubt that bagasse will make a significant contribution to an expansion of Latin American pulp and paper production in the long term, its possibilities in the short term are limited by the fact that alternative fuel is used to release substantial amounts.

Development prospects

56. Most Latin American countries give a prominent place in their plans for industrialization to the development of adequate productive capacity for paper. They clearly recognize the social and economic value to them of a creative industry based on a renewable resource, and the capacity of pulp and paper to generate new and allied industries.

57. Analysis of the plans offered by the different countries serves to emphasize the attention being given to the various types and grades of commercial papers, and the inadequacy of the plans for the production of newsprint. This is not due to any lack of recognition of the importance of newsprint, but because economic considerations, and, in some cases, government policy, have caused plans to be directed toward grades other than newsprint.

58. Raw material supply differences and specific economic circumstances may be expected to give rise to a tendency toward specialization within countries as regards types of pulp and particular grades of paper. In some cases domestic markets will be too small to absorb the output of large and specialized mills; hence it would be desirable to facilitate

/the development

the development of intra-regional markets in pulp and paper.

59. The need for international co-ordination of developments is clear, and it is hoped that international organizations will find it possible to study this field and render assistance in those problems that cannot be solved by individual governments or private enterprise.

Newsprint

60. If proposals for increasing newsprint production in Latin America are considered inadequate, this is not due to lack of interest. All countries, without exception, are intensely interested in expanding or beginning newsprint production for well known and impelling reasons.

61. Latin American newsprint production today is based mainly on traditional fibres using more or less conventional methods. This production will expand, but many Latin American countries lack traditional fibres.

62. Processes available today give promise for the production of newsprint from tropical woods in combination with long-fibred pulps. Technical results indicate the possibility, for example, of substituting semi-chemical pulps from broadleaved species for groundwood, possibly reducing the furnish of long-fibred coniferous pulp, and thus leading to the production of satisfactory newsprint of unconventional composition. Technically, the newsprint problem may be solved along these lines.

63. Attention is called to the economic implications of promoting newsprint production in Latin America. In only very few cases can newsprint mills operate, even in the domestic market, if exposed to the unhampered competition of foreign newsprint. Governments wishing to ensure domestic supplies of newsprint must take cognizance of the economic disadvantages under which such a new industry may have to operate.

64. Newsprint mills are generally specialized and represent large investments and large production. Thus the need for intra-regional arrangements to facilitate the expansion of this key industry in Latin America for the betterment of the region is again apparent.

/ Financing

Financing

65. The need for expansion of pulp and paper production in Latin America is real and urgent. Raw material from forest and field exists in sufficient quantity and, with good management, in perpetual supply. The will to encourage expansion exists on the part of interested governments. The technology is sufficiently advanced to warrant optimistic expectations of success. There remains the important problem of mobilizing the necessary capital to finance this development.

66. The amount of new investment estimated to be required per year to achieve a reasonable standard of paper production by 1965 is between 50 and 90 million dollars. These figures need not be regarded as unattainable. The annual foreign exchange requirements would amount to about half of 1 per cent of the region's annual foreign exchange earnings. Furthermore, the reduction in requirements for foreign currency for imported paper will, in many cases, exceed in a couple of years the amount of foreign exchange needed to establish the industry.

67. However, capital - whether public or private, local or foreign - will only become available for projects which succeed in satisfying strict criteria.

68. Two recent proposals may, if they come to fruition, provide private undertakings in less developed areas with a more direct access to international lending facilities. The utilization of either would meet the recognized need for some institution able to channel international loans to private undertakings.

69. If private foreign capital is to participate in Latin American pulp and paper expansion through direct investment, it must be satisfied concerning the soundness of the project as a business risk; that general conditions in the project area are such that the enterprise can operate successfully for a reasonable period; and that no difficulties will arise in remitting earnings and in eventually repatriating capital.

70. The most important source of financing will be domestic capital, and though joint enterprises uniting domestic and foreign capital may

/become of

become of increasing importance, it must be recognized that no significant expansion of the Latin American pulp and paper industry can take place unless domestic capital is willing to set the pace.

71. It is desirable that the attention of the Latin American governments be drawn to the necessity for a) according priority to the pulp and paper industry in establishing development plans; and b) mobilizing domestic capital and facilitating the movement of international capital in order to realize this expansion.

Technical assistance, research and training

72. Throughout the Meeting, repeated emphasis was given to the need for more research in sylviculture, planting and forest products technology. Likewise the need for trained men was emphasized, especially to facilitate pulp and paper expansion.

73. There was agreement on the desirability of ensuring regional co-operation in the programming of national and individual research, educational and training activities. For reasons of economy and efficiency, such co-ordination is deemed highly desirable.

74. It was the belief of the Meeting that the proposed establishment of a Latin American Research and Forestry Training Institute represents a satisfactory solution of this problem. Therefore, the Meeting urged governments of Latin American countries, as well as the international and bilateral organizations concerned, to implement the recommendation of the fourth session of the FAO Latin American Forestry Commission (Buenos Aires, 1952) as soon and as fully as possible.

75. It is urgent that early and adequate attention be given to the creation of central research and training facilities in the field of pulp and paper, forestry and forest products. In developing such a central institute, it is strongly recommended that the closest co-operation be maintained with existing facilities for teaching engineering and applied sciences.

76. To co-ordinate these proposals, and to afford a serviceable channel for technical assistance, the Meeting recommended that a group of experts

/ be placed

be placed in Latin America in the near future under the Technical Assistance Programme. This group should include one or more specialists on industrial problems, and one or more on technical and economic aspects of the pulp and paper industry.

## General conclusions

77. The foregoing all leads to the general conclusions enumerated below:

1. Latin America needs somewhere between 1.5 and 2 million tons of additional pulp and paper supplies a year by 1965.

2. Most - in fact nearly all - of this increase must come from new Latin American production.

3. There must be a steep increase in the rate of completion of new production projects in order to meet the requirements.

4. Raw material supplies in wood and other fibres are adequate for all foreseen needs.

5. Established processes and new processes, operating along unconventional but proven lines, can adequately accomplish the technological task.

6. Unconventional fibres, bagasse, straw, grasses, etc. will play an important part in long-range pulp and paper supplies.

7. Excellent opportunities for increased industry based on planted forests already exist and may be expected to increase.

8. Development of new production enterprises in undeveloped regions should carry governmental co-operation to cover "settlement" costs.

9. The important item of increased newsprint production from Latin American materials poses special problems of large investments and inter-Latin American co-operation.

10. The technical task of newsprint production can be solved by a combination of conventional and unconventional processes and materials.

11. Capital investments required by the whole programme are not so large as to be forbidding. The total is very small in comparison with the current rate of total investment in

/Latin America

Latin America.

12. Foreign exchange required will be quickly compensated by reductions in import requirements.

13. Combinations of foreign and domestic capital will be most favourable for development, but the lead must be taken by domestic capital.

14. Project proposals, whether for banking or private capital, must be sound business risks and so presented.

15. Government policies should take cognizance of the need to encourage new industry.

16. Governmental policies should move in the direction of encouraging inter-Latin American trade in pulp and paper in order to ensure adequate supplies for all countries and the most rational use of the region's resources.

17. Provision should be made for greatly increased research looking towards management of the resources, utilization and training of personnel.

18. International co-operation, with participation of international agencies, is the most economic and satisfactory means of completing and fulfilling existing national and private efforts in this field.

/Part III

# Part III

## SECTIONAL REPORTS

### Pulp and paper consumption, production and trade in Latin America 1/

78. Latin America today consumes about 1 1/2 million tons of paper and board, including about 400,000 tons of newsprint.

79. An appraisal of the prospects for developing pulp and paper industries in Latin America calls for an assessment of the future level of demand, an appreciation of the possibilities of procuring pulp and paper supplies from other regions, and an estimate of the extent to which projects currently under construction, or expected to be completed in the near future, are capable of satisfying expected future needs.

80. Estimates of future requirements must take as their starting point current consumption, or effective demand. Today, in many Latin American countries, effective demand falls short of real demand. Countries where exchange restrictions limit consumption would of course consume more if restrictions were removed. And the removal of particular deficiencies in local supply, e.g., in mechanical pulp or newsprint, would undoubtedly lead to increased consumption in the countries concerned. Thus, any estimate of future consumption based on current effective demand could prove too low if, in fact, local production expanded sufficiently or if free import became more general.

81. The estimates of future consumption contained in Secretariat paper 2.0 were arrived at by making use of the high correlation which exists between per capita income and per capita consumption of paper. Three categories of paper were studied separately: newsprint, other printing and writing paper, and all other paper and board. In each case it was established that income elasticity was higher at lower income levels; in other words, while a given increase in per capita income was followed by a more than proportionate increase in paper consumption; this increase was greater for lower income countries than for high income countries. The income elasticities were applied to estimated demographic trends, making two separate sets of assumptions

1/ Item II on the Agenda.

/concerning the

concerning the annual rise in per capita income that may be expected in Latin American countries during the coming years. The first set of assumptions were based on the expectation that only a minimum rate of economic growth would be realized; the second corresponded to a more favourable (though not the maximum possible) rate of economic growth.

82. Since the starting point was average effective demand in the years 1948-52, the resultant estimates do not represent either forecasts of future consumption or estimates of the full potential demand that could be realized; they simply represent the levels of consumption that would be attained if consumption were to rise in accordance with the income elasticities determined from present data.

83. The Meeting endorsed the procedure followed in arriving at estimates of future demand, and experts from Brazil, Chile, Colombia, Cuba, Mexico, Peru and Venezuela confirmed that the figures contained in the Secretariat paper corresponded fairly well to the results of individual studies carried out in their own countries. The representative of UNESCO stated that further confirmation of the global estimates was found in the independent study which UNESCO had commissioned from the Intelligence Unit of the Economist, London.

84. Attention was drawn to the contrast between paper consumption in urban and in rural areas, and to the rise in consumption that would accompany the very rapid increase in urbanization that was taking place in many Latin American countries today. It was suggested that studies of the percentage of income devoted to paper consumption at different income levels be undertaken in each country; it was believed that such studies would serve to confirm the Secretariat's findings.

85. Given only minimum economic growth, the Secretariat estimated that Latin American consumption would rise by 1965 to 4.7 million tons, including nearly 800,000 tons of newsprint; if economic development were favourable, consumption would rise to 5.8 million tons, including just under 1 million tons of newsprint.

86. While approving the orders of magnitude indicated by these global

/figures, various

figures, various experts commented in detail on certain of the figures appertaining to individual countries and recommended that their comments be appended to the published version of the Secretariat paper.

87. The trend of demand in Europe makes it unlikely that there will be any substantial increase of export availabilities in that region. So high are the levels of production and consumption in North America that uneven development in the former or variations in the latter will make available for export fluctuating amounts which may, from time to time, be substantial.

88. In the past, various factors, including the problem of foreign exchange, have limited Latin America's capacity to import. Though some experts believed that conditions have changed and will possibly improve even more in the future, most considered that these factors would continue to set a limit to imports.

89. The Secretariat paper contains details of existing plans for expanding the region's pulp and paper capacity in the next decade. Even if all are realized, however, it is evident that they will be insufficient to ensure that the region's future needs are satisfied. It was pointed out, nevertheless, that mills now under construction in Chile provide for an expansion of capacity beyond the requirements of the national market: thus a small exportable surplus may become available there and if further plans materialize this exportable surplus will grow. This would help to offset the rising deficit in other parts of the region.

90. The Meeting agreed on the following conclusions:

1. By 1965 the region's paper needs will have approximately doubled as compared with 1948-52. Given favourable economic development, the region's paper needs would be considerably higher.

2. Many projects for expanding the region's capacity are under construction, at the planning stage, or being studied. Even if all were realized, they would not satisfy the expected increase in demand.

3. Unless capacity rises much faster than is at present contemplated, only a steep increase in pulp and paper imports will permit the region's paper needs to be fully met.

/4. There is

4. There is little likelihood that the region will be able to import on the scale required, or that quantities of this order will be available in the traditional producing centres for export to Latin America, especially as needs are rising faster than capacity in other regions of the world which today look to Europe and North America for supplies.

5. Every effort should therefore be made to step up the rate at which new capacity is being developed, both by pressing forward those projects already under study which prove practicable and by exploring further possibilities.

6. Two problems especially call for an urgent solution: firstly, the development of sources of cheap mechanical pulp, or pulps capable of replacing mechanical pulp, for the manufacture of newsprint; secondly, the development of kraft pulp production, particularly for high strength wrapping papers.

91. The meeting was of the opinion that the need for a detailed consideration of the measures which can be taken to accelerate the expansion of pulp and paper capacity in Latin America clearly emerged from even a cautious assessment of the region's future needs. It was emphasized that the estimates in no way represented the maximum levels of consumption which were capable of being realized. Historical data show clearly that consumption levels are largely determined by the extent to which adequate supplies of pulp are available at reasonable cost from either domestic or foreign sources. Even higher levels of consumption than are at present foreseen could be reached were domestic supplies to become available in sufficient quantities.

92. On the other hand, a failure to realize an adequate expansion in the region's pulp and paper capacity would inevitably mean that low standards of paper consumption would act as a drag on the region's educational, cultural and economic progress.

/Economic aspects

## Economic aspects of pulp and paper manufacture from Latin American Tropical and Sub-Tropical Hardwoods 1/

### Forestry aspects

93. When considering the tropical forest as a source of raw materials for the pulp and paper industry, the forestry expert is faced with two different categories of problems, according to whether there is contemplated a short-term supply, based on the existing state of the forest stands, or a long-term supply, taking into account the evolution of these stands following repeated cuttings and various sylvicultural interventions.

94. To be able to inform industrial interests on each of these aspects, the forester has to carry out a series of studies. First come what may be termed static studies, giving a clear picture of the present condition of the forest area; these data are provided by different kinds of inventories. Next must be undertaken dynamic studies of the forest stands; these will be carried out on the basis of trials and experiments which should aim at providing, as quickly as possible, a knowledge of how the stands will evolve under different kinds of treatment. From the results of these studies and trials conclusions can be drawn which will permit a definition of the sylvicultural methods that should be envisaged in each case, and the establishment of a forest management (and utilization) plan. This plan should be made on the basis of most adequate forest practices, defining such operations as may be necessary to assure a permanent raw material supply, having regard to conservation and the improvement of the forest capital.

95. A continuing inventory will provide increasingly precise information regarding available forest areas, the volume of standing timber per hectare and the composition of this volume by diameter classes and species, and will be of value both in selecting a satisfactory working site and in defining details in the forest management plan for a short-term working period.

96. In tropical as well as in temperate zones, aerial photography can quickly and economically provide indispensable information upon topography, forest area and the distribution of the different forest types; its efficacy in the tropical and sub-tropical zones is limited by the density and inter-mixture of

1/ Item III on the Agenda.

/crown foliage.

crown foliage. Essential data upon volume, species and their individual distribution cannot in most cases be directly determined from the photographs.

97. Aerial photography must be followed up and completed by ground surveys of two kinds: rapid surveys, to interpret aerial photographs, and precise studies of the stand based upon careful systematic sampling.

98. It has been established that in general, inventories are more precise the greater the number of sample plots examined within the forest, but since the cost of these operations is proportional to the intensity of the sampling, the forest expert, in agreement with the industrial interests, should fix an economic limit to such studies. The limit fixed will have to take into account the tolerance of the pulping process contemplated to variations in wood mixtures. If there are great differences within the forest stand, this may require modification of the pulping process; these variations must therefore be known in advance.

99. Very little information exists at present concerning the long-term evolution of tropical forest stands following intense and repeated cuttings such as those which must be envisaged when supplying a pulp mill.

100. Studies of the consequences of the traditional practice of shifting cultivation can doubtless provide some clues since this practice has brought about changes in the forests comparable to those which would follow repeated fellings in short-term cycles for pulping.

101. The harm done by shifting cultivation and grazing is much greater than that resulting from repeated cutting for forest products, since destruction of the forests by fire despoils and denudes the forest soil. Nevertheless, it has been shown that this form of agriculture offers no real danger if carried out under proper conditions, and if certain well-known precautions are adopted.

102. Thus exploitation to supply the pulp and paper industry may be regarded in the long term with a certain optimism, providing the necessary measures are taken to avoid soil depletion, especially to be feared in tropical forests.

103. As regards sylvicultural practices for preserving or improving the make-up and value of a forest, no general rule can be established, since natural, economic and social conditions vary so much from one place to another.

/One can

One can only consider, in each case, the appropriate methods determined by special studies of local conditions and by experience gained on the spot. These studies and investigations, however, must be based upon certain main principles:

1. It is necessary to be assured that the source of supply is permanent; in the case of tropical areas this means the setting up of management and soil conservation plans.

2. Efforts must be made to transform the heterogeneous forests into a composition of greater economic value from the standpoint of the requirements of the pulp and paper industry, for example, as regards wood size, quality and homogeneity.

3. Because it is important to obtain raw material at the lowest possible cost, the aim will be to obtain the maximum output of best quality material, easy to extract. At the same time the sylvicultural practices adopted to achieve this aim must be carried out as economically as possible. It is clear that in most cases the most economical form of intervention will be the exploitation operations themselves.

104. The studies undertaken in the Amazon area of Peru concerning the natural stands of cetico (Cecropia spp.) and their possible utilization by the paper industry were considered to be of importance.

105. The excellent technical properties of cetico wood, which can be processed mechanically or chemically to provide pulps suitable for various uses, and the fact that these trees grow in homogeneous stands in clearings of the tropical zone, indicate good possibilities for the pulp and paper industry. Nevertheless, it is difficult, in the light of present knowledge concerning their regeneration and propagation, to reach any definite conclusion for tropical areas in general. Sylvicultural studies should therefore be undertaken.

106. The Amazon area of Peru, in view of its special natural conditions, represents an exceptional case which, according to information given during this meeting, allows a regular supply of cetico wood for an industrial unit under contemplation. Consequently the meeting regards with great interest the contemplated project in this region, and believes that this project will provide valuable information which will contribute to the study of the problem of utilizing Cecropia species in other parts of Latin America.

107. The need is great for systematic and continuous research in all fields of tropical and sub-tropical sylviculture and forest utilization, and results

/obtained throughout

obtained throughout the world should be made known through the efforts of international organizations interested in forestry and through bilateral arrangements.

108. Consequently, the forestry profession is awaiting with interest the results of the Fourth World Congress on Sylviculture, which will meet shortly in Dehra Dun (India) and which is to pay special attention to the problem of tropical forests. It is expected that a great number of Latin American foresters will be helped by the recommendations of this Congress, or by their active participation in it.

Wood extraction

109. It is believed that pulp mills in general should have under their control sufficient forest area to guarantee their own supplies even in those regions where it may be possible to purchase the mill requirements locally. In such a case, the paper industry need not necessarily produce the whole of its supply, but it will be in a position to avert a possible interruption of its operations due to lack of wood or excessive wood prices.

110. The extraction of raw materials in large tonnages from concentrated areas depends primarily upon the planning and establishment of adequate transportation facilities. Although water is still the most economical means of transport, roads will be of greater importance in tropical forests because many tropical species will not float. Barging, however, may prove economical in some cases.

111. It will be necessary, on account of heavy rainfall, to give particular care to the construction of primary roads, that is to say, of permanent roads carrying the whole or the major part of traffic.

112. The climatic conditions which complicate road transport, at least during part of the year, also complicate the harvesting and storage of pulpwood. A possible solution to the problem of assuring an uninterrupted wood supply may be achieved by selecting, in the management plan, an area as near as possible to the mill and on readily accessible terrain, to be reserved for extraction during the most unfavourable season. It has been mentioned that when conditions are particularly difficult, the use of insecticides and fungicides might represent a solution to storage problems.

/113. Since in

113. Since in general not all the timber drawn from the forests will be destined for pulp and paper manufacture, the first selection can be made by marking commercially valuable species before felling, in particular for saw logs and veneer logs. Subsequently, it would be possible after felling to segregate wood for the pulp mill into a limited number of categories in accordance with hardness and colour characteristics, in particular sorting out those unsuitable for pulping. The categories segregated will naturally vary according to the pulping process contemplated. It is not believed that this simple segregation after felling will present any serious difficulties.

114. In the case of pulp industries located at a distance from industrially developed centres, special attention should be paid to the kind and quantity of basic equipment, maintenance shops, and stocks of spare parts.

115. Finally, with reference to the over-all forestry or utilization problems, it is hoped that FAO may be able to compile and publish pertinent information available from all reliable sources. The establishment of a Latin American Research Centre would render a valuable contribution towards the development of the pulp and paper industry on this continent. Any effort in this direction would be of great advantage to the governments concerned as well as to industry.

Pulping processes and paper qualities

116. It has been established that, because of its great tolerance to bark and extractives and a wide variety of wood properties, the most suitable standard method for producing chemical pulp from mixed species is the sulphate or sulphur-soda process. This has the further advantage of being able to produce stronger and more varied pulps than other commercial processes now known.

117. The pulping conditions for mixed tropical species do not differ essentially from the normal conditions employed for chemical pulping of temperate broad-leaved species, except for a possible adjustment of details for certain single species or groups of species with very high or low density. Two-stage or counter-current alkaline pulping of certain raw materials such as bamboo and eucalypts has shown that technical improvements in pulp quality may be obtained, and this method may be worth considering also for mixed tropical species.

/118. Laboratory and

118. Laboratory and pilot scale investigations carried out in France, the United States, Brazil and Mexico, show clearly that it is possible to cook heterogeneous mixtures of tropical woods successfully by the sulphate process. These results are also confirmed by tests carried out on mixed woods from Amapá and Yucatán, the locations of the hypothetical mills studied in the Secretariat papers. Industrial experience in the mill in Abidjan, West Africa, working on mixed tropical woods, amply confirm the laboratory tests.

119. Although pulps produced from mixtures of tropical woods possess good paper-making characteristics, improved qualities may perhaps be obtained by segregating the woods into groups or eliminating certain species prior to cooking and subsequently blending the pulps obtained. The decision for or against segregation in any given case will depend on a variety of technical and economic factors.

120. Among tropical timbers, species may be encountereed with high silica content or other peculiarities of chemical composition which may give rise to difficulties in processing. These difficulties may appear in the recovery of the black liquor, bleaching or other phases of the process. Experience in pulping numerous broad-leaved species, however, suggests that such difficulties may be overcome by known techniques.

121. In most cases tropical woods may be expected to be barked by hand, principally because this method is inexpensive when labour rates are low and makes the use of complicated equipment unnecessary. Mechanized barking should be studied; it may present difficulties with certain groups of species. The debarking of standing trees by chemical treatment is a promising recent development on temperate zone species and may prove suitable for accessible forest areas.

122. Experience in North America suggests that temperate hardwoods may be successfully processed without barking, making use of modern screening equipment and centrifugal pulp cleaners. There is reason to believe that this method would give satisfactory results on some mixtures of tropical woods. The pulping of unbarked wood may involve heavier chemical consumption in digestion.

123. With the

123. With the possible exception of certain species with unusual properties, it has been found that the bleaching of mixed tropical wood pulps does not present any special problem - the ordinary multi-stage operation commonly used today for sulphate pulps gives satisfactory results although brightness stability may require special consideration.

124. There is sufficient practical experience to demonstrate that bleached pulps made from many mixtures of tropical woods may be used without admixture of long-fibred pulps for the manufacture of printing, writing and a variety of fine papers in commercial operation. Laboratory and limited industrial experience suggest that from these pulps, without adding long-fibred pulps, an even wider range of papers may be produced, including those wrapping papers for uses in which the highest requirements of strength are not considered essential. Since the fibre properties of the mixed tropical woods have been found to be equal, and in the case of certain groups of species superior, to those of temperate zone hardwoods and eucalypts in common use, it seems clear that pulps from tropical wood mixtures can also be used for the production of even the highest strength grades (e.g. wrapping and sack papers, kraft-liner), providing they are blended with quantities of long-fibred (coniferous) pulps; in some cases these quantities may be relatively modest.

125. When a mill is contemplated in a tropical region it will normally be conceived as a wholly or partly integrated project. Tropical hardwood pulp is not likely to be of great significance in the world market, but may be significant in developing "area integration" of pulp and paper manufacture. Indeed, it is unlikely that unbleached pulp from tropical hardwoods could compete successfully on the world market with unbleached long-fibred pulp, although special grades of purified or bleached pulp may well find a place. In the regional market, however, the prospects are better for both bleached and unbleached pulp, but especially for papers made therefrom.

126. Insofar as chemical pulp may be considered to be too expensive for the furnish of some varieties of paper, some processes which are of limited applicability with respect to raw materials or product properties may make it possible to produce cheaper pulp for special purposes. Preliminary investigations show them to be sufficiently promising, at least for some single species and groups of species, to warrant further study.

/127. Most of

127. Most of the tropical species, pulped by the processes described below, give pulp of low colour, which may require brightening or partial bleaching before it can be used in printing papers of even the lowest grade.

128. Groundwood pulp is of major importance in newsprint manufacture and of some lesser importance in a wide range of other paper products. The conventional groundwood process can be applied to certain tropical and sub-tropical species, notably some cecropia species and other low density woods frequently occurring in second-growth forests. However, the production of mechanical pulp from mixed tropical species by the conventional grinding process does not appear feasible at present. The applicability of the chemi-groundwood process to mixtures of tropical woods has not been proved, although it may well be of use on selected species or for selected purposes.

129. Some processes offer the possibility of producing groundwood type pulps from mixed, as well as from individual species, e.g. disk-refining processes with pre-treatment of the wood by steam or chemicals. For example, a cold caustic treatment followed by disk-refining has yielded promising results for the production of newsprint type groundwood. Because newsprint is one of Latin America's particular needs, it would seem that closer investigation of this and any other process capable of yielding newsprint type groundwoods from mixed tropical species is desirable.

130. The neutral sulphite semi-chemical processes have proved to be of particular interest for converting broad-leaved species from temperate zones. These processes are adaptable to most temperate hardwoods and to some tropical species. Mill construction costs are somewhat lower than those of chemical pulp mills and relatively small units are being operated economically in developed countries. Although the rapid expansion of the various semi-chemical processes is based largely on the use of pulp for corrugating medium, unbleached neutral sulphite pulp is now being used for newsprint; bleached neutral sulphite semi-chemical pulp is being employed for glassine and, in blends with other pulps, also for writing and printing papers.

131. Potential uses for semi-chemical pulps from tropical woods, in appropriate blends, may be considerably broader. Further exploration of the economic possibilities for adapting the semi-chemical processes to tropical species for specific products such as liner and corrugating board may well be considered.

/In fact

In fact one such operation is already working satisfactorily in Latin America. Generally, such operations would be limited largely to integrated production units.

Locational factors and site selection

132. The general principles of location for the pulp and paper industry are no different from those for industry generally. No site will ever prove ideal from the standpoint of all the locational factors which have to be taken into account - raw material, power, fuel, chemicals, labour, transport, markets, etc. The entrepreneur will seek to balance the advantages and disadvantages offered by various sites under each of these headings, and will concentrate his attention on that site which offers the optimum combination of locational factors.

133. A new pulp and paper project in an undeveloped area will not necessarily require more investment in the mill proper than would a similar project in an industrialized region; it may even require less. The higher freight on the machinery and the higher erection costs may be offset by the fact that certain buildings can be of lighter construction or may be dispensed with altogether in tropical sites; careful international purchasing of machinery may also lead to savings.

134. Capital requirements for those elements of the project other than investment in the mill proper may however be very high in undeveloped areas, and for two main reasons. Firstly, a mill in a remote area will have to be planned to be self-sufficient in many respects; it will probably have to provide its own power, it may have to develop its own sources of chemicals (e.g. to install an electrolytic plant for the manufacture of chlorine and caustic soda from salt), it may even have to develop its own mines for fuel supply. Secondly, besides ensuring the elementary needs of the production process, it will have to provide certain basic community services (transport, non-industrial power, communications, education, health, etc.) which, as a general rule, will exist already in an industrialized area; this need gives rise to what may be termed "settlement" costs.

135. It would be a mistake to assume that all tropical forests present the same problems. The establishment of a mill in the deep forest calls for very

/much higher

much higher total investment than the establishment of one in an area where certain facilities (and especially transport) already exist. But there are tropical forest areas which have already been partly developed in this sense. Certain "settlement" costs will inevitably be incurred in any tropical mill project, but in a remote site these may be so high as to render any project prohibitive.

136. These considerations serve to underline the paramount importance of exercising every possible care in selecting a site for a new pulp and paper project. Site selection in any country, for any industry, is important; it is important in Latin America for pulp projects based on any one of the region's many resources. The impact of "settlement" costs on most of Latin America's tropical forests makes imperative an especially intensive investigation of the locational factors involved when the establishment of a pulp and paper mill based on tropical woods is under study.

137. If projects are to be contemplated in a region where basic community services are totally lacking, and it is nevertheless believed that such industrial development ought to be undertaken for economic and social reasons, it is desirable that some way be found of financing such facilities other than by charging them as capital costs on the paper operation. Otherwise it is unlikely that private enterprise will undertake the risks involved. One solution to this problem is suggested by the practice adopted in certain countries where provision has been made for public authorities to furnish "settlement" facilities where the development of industrial enterprises has been judged to be in the national interest.

138. The relative influence of various locational factors will change in the course of time, and it is necessary to distinguish the short-term and the long-term view. If a new project in an undeveloped area has to bear the entire burden of "settlement" costs, there will be a tendency for private capital to prefer projects which are located near the urban consumption centres.

139. There are today in Latin America examples of mills located in urban areas which have been forced to close down as local raw material resources became depleted. At the same time, those paper mills originally established near market centres to operate on imported pulp are steadily being forced, as

/a result

a result of the trend to large-scale production in the standard paper grades, to concentrate either on speciality production or on low grade products based on waste paper.

140. A long-term view would take into account the fact that in an undeveloped area the burden of "settlement" capital declines after an initial period, while the differences in costs determined by environment will tend to diminish.

141. Today the pulp and paper industry in Latin America has the advantage of being in its preliminary stage; every effort should therefore be made to ensure that any units established are suitably located and of economic size.

142. In particular, it is of the greatest importance that the principle of permanent raw material supply be maintained. Some areas of tropical forest may be found to contain only species which are eminently and economically suitable for pulp and paper manufacture. More usually, in tropical areas, the forest will contain species possessing qualities which may have most value when used as saw logs or veneer logs. In such cases the utilization of the forest so as to yield the maximum value should be aimed at from the beginning. In any event area integration of all forest products industries so as to yield the maximum economic value and proper diversity of production should be aimed at as an ultimate objective.

Costs and economic size

143. In general, capital costs for mills in undeveloped regions will tend to be heavier than for mills of the same size in industrialized areas, as will also chemical costs in most cases, while pulpwood costs, wages, and sometimes also fuel costs, will tend to be lower. The balance will vary according to the site chosen.

144. The problem of the minimum economic size of a mill to be located in an undeveloped area, however, is by no means a simple one. If the product is destined for the national market, it will enjoy certain economic and commercial advantages which flow from its proximity to that market. Such countervailing factors may partly or wholly offset the relatively heavy incidence of capital charges; these tend to diminish more steeply in undeveloped areas as mill size increases. Nevertheless, the danger of establishing units which are too small

/to be

to be of economic size is a real one, to be guarded against.

145. There is a considerable difference between paper converting costs in a non-integrated paper mill and in an integrated paper mill section, especially for small units. Therefore the establishment of a new pulp mill in an undeveloped area should, if possible, be integrated with a paper section to convert at least part of its production.

146. The experts' conclusions, reached after an exchange of experiences, were facilitated by the Secretariat studies of hypothetical mills in Amapá and Yucatán, studies which had been initiated in order to throw light on the problem of erecting mills in tropical areas, and in particular to study the effect of location on investment and cost. The meeting considered that the Secretariat documents represented a valuable contribution to the study of the problem of establishing pulp mills in the tropics and commended the use of prepared comparative estimates in meetings of this kind; it considered the procedure adopted therein to arrive at figures of production and investment costs valid for the purposes of exposition. After discussion, the experts considered that, on balance, the estimates probably erred on the side of caution (e.g. in the low proportion assumed of species pulpable and in the forest yield) and thus tended to understate probable earnings.

147. As regards the two particular locations studied, the Secretariat papers contained preliminary figures which indicated that the Yucatán project held distinct promise, especially as more favourable sites within the area appear to exist. The Amapá project seemed less attractive, but information brought forward in the discussion of the Secretariat papers indicated that further investigations might reveal production costs lower than the estimates contained therein.

148. While the experts did not have sufficient time and information to arrive at definite conclusions regarding these two Secretariat examples, they concluded that the Secretariat data further demonstrated that the possibility exists, providing the site is correctly chosen, of converting tropical woods into satisfactory paper at competitive prices in national or regional markets.

149. While studies similar to those presented on Amapá and Yucatán would always be necessary for arriving at a preliminary judgment in considering new

/projects, such

projects, such studies can never dispense with the need for more comprehensive and detailed investigations. Moreover, it was pointed out that there might well be other sites in Latin America, and not necessarily in the areas studied, which might prove to be more favourable.

150. Any mill project in an undeveloped area, especially if it is based on a non-traditional raw material, needs not only careful analysis of all cost factors, but also technical investigations which may involve considerable expense. This capital outlay is imperative especially in the case of new processes or processing techniques. Technical assistance by international agencies might offer some help in connexion with the essential preliminary investigations.

151. Informed and objective advice in the preliminary stages of planning can be decisive in ensuring the viability of the final project; it can ensure that unsound schemes are discarded at an early stage and, as concerns those projects which are eventually realized, it can, by indicating the most economic combination of machines to be employed, reduce initial investment cost and hence the consequent burden of capital charges.

152. The meeting underlined the note of caution which is expressly stated in the Secretariat papers.

153. Because a large-scale pulp and paper mill calls for a very heavy investment, the need to safeguard against possible failures makes a cautious - even extremely conservative - view advisable when considering projects in undeveloped areas.

/Aspects of

## Aspects of pulp and paper manufacture based on other Latin American forest resources 1/

154. Apart from its vast tropical and sub-tropical forests, Latin America possesses further substantial raw material resources in the coniferous and broad-leaved forests which grow in temperate or cold climatic zones.

155. In addition, the region possesses important reserves in the extensive forest plantations of native and exotic species, both coniferous and broad-leaved, which have been established in many countries.

156. The success obtained from these plantations in some areas and with certain species, allows the statement to be made that Latin America has an enormous potential output of raw materials for the pulp and paper industry.

157. The meeting has paid particular attention to two aspects of this problem; in the first place, to the technical aspects (exploitation of natural forests, plantation techniques, transformation processes) and secondly, and even more important, to the place each resource should occupy within the framework of forestry policy and within that of the general policy for developing pulp and paper production in this region.

### Plantations

158. For the manufacturer, there is no doubt that raw materials from plantations have, in the main, advantages over those extracted from natural forests. The technical facilities in the management and exploitation of these plantations, the uniformity of the supply and of the mill product, as well as the normally high quality of the output, are all arguments in favour of artificial methods. However, the problem is rather more complicated than it first appears, since other important factors relating to natural and economic conditions, must also be taken into consideration before arriving at a conclusion.

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1/ Item IV on the Agenda.

/159. In Latin

159. In Latin America, the exact locations where plantations are to be established in relation to natural forests, should, as noted above, be defined on the basis of the two criteria linked with forestry practice and with the policy for paper production.

160. First of all, in each area being studied, it is necessary to define the place which regulated natural forests and artificial plantations should occupy within the general planning of soil utilization. Such planning must take into account locational conditions (nature and utility of soils, topography, etc.), economic factors (yield according to the different types of soil exploitation and marketing of products) as well as social factors (maximum use of rural and urban manpower).

161. Forests, of whatever class, must take advantage of, or have to be created on, soils possessing forestry qualities. The term "qualities" is used in its widest sense; it means not only on soils that, for climatic or protective reasons, should be wooded, but also where rational exploitation - already existent or artificially created - represents the best and most economic among the various types of soil exploitation possible in the area.

162. It is evident that in naturally wooded regions, if climatic and protective reasons should be of importance, the maintenance of natural forests is to be recommended. It is also understood that, very frequently, and notwithstanding protective requirements, the exploitation of such forests may be undertaken if the necessary precautions have been taken to ensure perpetual use of these forests and of the protection they afford. Rules for extraction should thus be based upon a carefully prepared plan for regulation.

163. When studying the best type of soil exploitation for natural stands and even more so for a colonized zone, it is advisable, in the first place, to compare, on a long-term basis, the income from the exploitation of the natural stands as against that accruing from agricultural or pastoral activities established after clear cutting. Later it will be essential to determine whether the plantation of certain species might - in the case of suitable soils - compete favourably on such soils, not only with regulated natural forests, but also with certain forms of agriculture which are believed to be profitable.

/164. Considering this

164. Considering this aspect of the problem only, it may be said that plantation can be recommended in two main cases: a) when it constitutes the best form of soil utilization, as is frequently the case in north-eastern Argentina and in the south of Brazil with the plantations of Araucaria angustifolia and eucalypt; b) when it represents the only remunerative activity, whether in non-wooded areas or in those covered by woods with no economic value at all. This is true of Pinus radiata plantations in Chile and in particular of the Paraná delta for the plantation of salicaceous and some pine species.

165. A further aspect to be studied is the importance which should be given to plantations and their nature when it is necessary to meet certain special requirements of the transforming industry. In this case it is no longer a question of producing large quantities of raw materials without definite specifications; it is necessary to extract a type of wood with certain characteristics and capable of producing pulp to meet specific needs which pulps from other available resources cannot meet.

166. No general solution can be provided to this aspect of the problem, since it deals with species and requirements which vary from one area to another, according to the natural possibilities of each and the markets to be supplied.

167. The meeting gave particular attention to this technical aspect of the problem and has recommended action for the international organizations concerned.

Natural forests

168. Once the place which natural stands should occupy in the economy of an area has been determined, it remains to establish how such forests should be managed to ensure their conservation and to allow them to provide the raw materials required by pulp mills. In the case of natural stands it is not always possible to limit the research to sustained yield, since at the start the quality is often rather poor. As occurs in the case of tropical and sub-tropical forests, progressive improvement in the nature of the stands will have to be attempted to ensure long-term production which will better both quality and quantity.

169. This is a matter of forestry management and often of treatment. As regards the aim of producing pulpwood, the chief objective of the forester

/should be

should be to discover or to continue regeneration which is as regular as possible in time and space.

170. If the forester adopts natural regeneration, which is often uncertain and irregular, he must help and protect the process (such is the case of the coniferous forests in Mexico especially). Fire is generally a scourge, but in certain cases, however, prudently directed and limited, it can be of use. In Latin America, grazing in the forests must almost always be severely regulated. The rotation of extraction must be carefully studied, taking into account not only the main factor of the yield, but also the technical and legal protective needs, as well as the most suitable size of the pulpwood for the paper industry.

171. Allowing for either the destructive factors which at once eliminate natural regeneration or the composition of the stands which hinder or prevent such regeneration, the forester must often adopt more active measures and sometimes introduce artificial regeneration. This type of regeneration may be effected with the same species found in the primitive stand or - according to individual cases and requirements - with other species. It leads to the progressive transformation of a natural forest with no economic value into a rich artificial forest. Interesting results of such methods, used in the Paraná delta, have been submitted to the meeting.

Considerations relating to pulping

172. It was recognized that well-established techniques already exist for the manufacture of pulp and paper from coniferous and salicaceous species and that the subject of pulping broad-leaved species generally, was similar to that dealt with in another section of the report. However, a rather special problem arose in the case of producing pulp and paper from eucalypts and a second section on current experience in this field is given. (See Paragraphs 177 to 195.)

Conclusions

173. To encourage the development of forest plantations on a rational basis and in the interests of Latin America's pulp and paper industry - without overlooking the large plantations now being made - the meeting recommends the

/organizations concerned

organizations concerned to take the following steps:

1. To study on a systematic basis, at the various experimental forestry stations in Latin America, the possibilities of introducing those exotic species which grow rapidly and are of interest to the pulp and paper industry.

2. To carry out systematic and comparative research at the same experimental stations into the different conditions for establishing and treating forest plantations based on native or exotic species which have already been, or could be, introduced.

3. To study at qualified laboratories the products of the plantations. Such studies would deal with the suitability of the wood for conversion into pulp and, above all, the quality of the pulps thus obtained. Not only wood specimens should be studied, but also each species individually according to its conditions of growth and the plantation methods for treatment. It would be particularly desirable to gather data on the relations between the rate of growth and the value in paper of the end-product for each of the existing species.

174. The combined results of these studies, as well as similar research undertaken elsewhere in the world into the same characteristics, should be collected by the Regional Forestry Office of FAO, analysed and distributed to the governments and organizations concerned.

175. The Meeting suggests that the Regional Forestry Office, which has already undertaken work of this nature, should be given greater facilities to allow it to arrange either the exchange or free distribution of seed samples of forest species for the purpose of experiment and trial plantings.

176. Finally, the Meeting also recommends that FAO should urge that governments grant all possible facilities for public services and private enterprise to obtain - by purchase or exchange - seeds for the enlargement of this work. As regards the temperate natural forests of Latin America, the meeting in general feels that their use is economically feasible as a means of meeting the requirements of the paper industry, although in some cases delicate problems exist, which should be the object of attention by specialists and governments.

/Pulp and paper

## Pulp and paper manufacture from eucalypts[1/]

### General

177. The adaptability and rapid growth of many species of eucalypts in Latin America indicate that the many plantations established, especially in Brazil, should provide a plentiful and cheap supply of raw material for the manufacture of pulp and paper. Sufficient knowledge has been accumulated to dispel any doubts as to the wisdom of setting up an industry based wholly or mainly on the supply of pulpwwod from the plantations.

### Processes and species used

a) For mechanical pulp

178. In Australia mechanical pulp is made only from E. regnans, gigantea and obliqua, all of which need to be over 200 years old. Australian and Latin American experience indicates that mechanical pulps from plantation eucalypts are likely to be of poor quality and their use for newsprint should be limited to low percentages, the exact amount depending upon the quality of the pulp with which it is to be blended.

b) For semi-chemical pulps

179. Semi-chemical pulps have been made from eucalypts in Australia on a laboratory and very limited semi-commercial scale. Results indicated that these pulps could be used as the greater part of the furnish in the manufacture of corrugating paper and perhaps also for liner board. Bleached semi-chemical pulps from eucalypts resemble pulps of this kind made from other sub-tropical or temperate broad-leaved woods and should find similar usages.

180. In Australia a low-grade pulp has been produced semi-commercially by cooking the chips with lime at a pressure of 90 lbs. per square inch, followed by treatment in a disk refiner. This pulp, however, can only be used as part of the furnish in the manufacture of low-grade boards. Nevertheless it offers possibilities when such products are produced away from sources of waste paper, when capital costs have to be kept low and when land is available over which the effluent may be spread with advantage.

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1/ Report of the special working group appointed to study this subject within Item IV.

/181. Experimental

181. Experimental work at the United States Forest Products Laboratory, Madison, has shown that the cold soda process has distinct possibilities for producing pulp from Latin American eucalypts that might be considered for the manufacture of newsprint. Further work needs to be undertaken, however, before any definite statement can be made regarding the use of this process for this purpose.

c) For chemical pulps

182. For the production of chemical pulps for paper and board the sulphate process appears to be the most suitable. Besides possesing other advantages, pulps made by this process can be used for a wider variety of papers than is feasible with pulps using the soda or sulphite methods.

183. The species used in Australia in the manufacture of chemical pulps are E. regnans, gigantea, obliqua, sieberiana, eugenioides, capitellata, radiata, viminalis, goniocalyx and small quantities of eight or more other species. In Latin America the species available for chemical pulping appear to be maidly E. saligna, E. grandis and E. globulus, and these have proved satisfactory in this region. E. saligna and E. grandis are also used successfully in South Africa.

184. In Australia a bleaching process has been developed which enables dark-coloured sulphate pulps made from old eucalypt timber to be bleached to 85 brightness with little loss in strength. Experience in Latin America indicates that similar results may be obtained when bleaching sulphate pulps from very young eucalypt timber by using conventional bleaching methods.

185. This is no reason why a modified process should not be employed. Latin American experience indicates that about 10 per cent of sulphur, based on the amount of caustic soda used, is required in order to obtain pulps comparable to those produced with the sulphate process. Although the modified soda method - compared with the sulphate process - offers a certain degree of flexibility, the availability and cost of the raw materials, i.e. sulphur on the one hand and sodium sulphate on the other, would probably determine individual choice.

186. In both Australia and Latin America two-stage cooking has produced lighter-coloured and more easily bleached pulps than single-stage cooking.

/187. Difficulties

187. Difficulties experienced in Australia in recovering the chemicals from spent liquors produced in the manufacture of pulp from certain old and slowly-grown eucalypts have not been encountered in pulping operations with Latin American eucalypts.

d) For dissolving grade

188. In the manufacture of dissolving pulps the sulphite process has some advantages when young clean eucalypts of even quality are available. The process is being used successfully in several countries.

189. In Australia where young clean wood is not available, experimental work has been concerned with the sulphate process. Pulps prepared on a semi-commercial scale have given satisfactory results when tested overseas. These pulps were made from E. regnans, but as this timber is not available in sufficient quantities other species are being tried. Semi-commercial tests indicate that satisfactory pulps can be made from these species provided the timber is of even quality. This even quality stipulation is a pre-requisite for any process involving the manufacture of dissolving grade pulps. The method employed in Australia consists of pre-hydrolysis followed by a normal sulphate cook.

190. The possibility of producing at the same mill a wide range of pulps including ordinary grades for papers and boards, semi-chemical pulps and also dissolving pulps should focus attention on the sulphate process as the logical method to adopt. However, the possibility of producing sodium bisulphite pulp and also sulphate pulp in the same mill, with a combined chemical recovery process, should not be overlooked.

Uses of eucalypt pulps

191. Experience in Australia has proved that bleached soda pulps from eucalypts can be used to provide up to 100 per cent of the furnish in the manufacture of high-grade writing and printing papers. Experience in Latin America has shown that bleached sulphate pulps from eucalypts can be similarly used. In Australia and Latin America up to 60 per cent of unbleached eucalypts sulphate pulps are used in the manufacture of wrapping and certain types of bag paper, and up to 30 per cent in the manufacture of multiwall bag paper. Up to 80 per cent of eucalypt sulphate pulp has

/been used

been used in the furnish for kraft liner boards and up to 50 per cent in the liner furnish for lined board. The following table is provided in order to set down the above data in summary form:

| Product | Type of pulp | Percentage |
|---|---|---|
| Fine writings and printings | Bleached | 90 - 100 |
| Wrapping and bag papers, excluding multi-wall bag kraft | Unbleached | 60 |
| Multi-wall bag kraft | Unbleached | 30 |
| Kraft liner boards | Unbleached | Up to 80 |
| Liner of boards | Bleached and Unbleached | 50 |
| Newsprint | (See text) | |

192. Apart from their present use in the above grades of papers and boards, eucalypt pulps have been employed in the manufacture of body paper for parchmentizing, light weight fruit wrap and as a major part of the furnish in high-grade toilet tissue.

Conclusions

193. In Australia approximately 100,000 tons per annum of eucalypt pulp is being successfully used in the manufacture of fine writings and printings, wrapping and bag papers, liner boards, etc. Experience in Australia, Latin America and South Africa indicates that the young plantation eucalypts of Latin America should be at least the equal, and perhaps even superior to the mature eucalypts used in Australia.

194. Thus the plantation eucalypts of Latin America appear to be a valuable source of raw material for chemical pulp manufacture.

195. The outlook for the production of mechanical pulp is not so encouraging. In Australia over 50,000 tons of eucalypt groundwood pulp are being employed in the manufacture of newsprint, but timber of the type and age used for this purpose in Australia is not available in Latin America. The production, therefore, of newsprint from eucalypts currently found in Latin America would appear to depend upon the development of some other low-cost process such as the cold soda process.

/Economics of

## Economics of pulp and paper manufacture from sugar cane bagasse[1]

### General availability of bagasse

196. Every ton of raw sugar produced in sugar cane[2] milling operations gives rise to the production of approximately one ton of bone dry bagasse. In Latin America the average yearly production of fresh bagasse (containing 50 per cent moisture) amounts to approximately 26 million tons. This quantity would be sufficient to produce a minimum of 4 million tons of pulp annually or enough to meet the region's current paper requirements three times over if it were all available for paper-making. Bagasse is, however, at present the main source of fuel in the sugar mills themselves, as it is available on the spot in a quantity sufficient to meet requirements. Consequently, without fuel substitutions, only a small part of the huge quantity of bagasse in the region can be regarded as potentially available for the manufacture of pulp and paper. While most of the paper mills are too small to supply enough bagasse to feed a pulp mill of economic size, it may pay to procure bagasse from several sugar mills in the same region. Currently, only between 300 and 400 thousand tons of fresh bagasse per annum, i.e., 1 to 1 1/2 per cent of the total quantity produced, are converted into pulp by the nine existing mills using bagasse in this region.

197. The general question of availability and cost of bagasse as a raw material for paper-making is intimately bound up with sugar cane milling operations. Individual sugar mill installations differ from country to country, within the same country and even within the same district, as to kinds of end-products which they make and regarding the quantity of steam they require. A survey of six Latin American countries[3] showed

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1/ Item V on the Agenda.

2/ From one ton of sugar cane there may be produced approximately:

| | |
|---|---|
| sugar | 110 kg. |
| alcohol | 10-12 litres |
| bagasse (bone dry) | 110 kg. |
| paper pulp | 37-55 kg. |
| pith | 27-33 kg. |

3/ Argentina, Brazil, Cuba, Mexico, Peru and Venezuela.

/that local

that local conditions, both as to bagasse availability and all of the other factors involved in establishing a bagasse pulp mill project, vary so widely that on-the-spot studies and surveys are quite indispensable.

Releasing bagasse for pulp

198. There are two principal methods by which additional quantities of bagasse may be released for pulp production. These are (1) by improved thermal efficiency in the sugar mill and (2) by using an alternative fuel.

199. With regard to improving thermal efficiency in sugar cane milling operations, the various methods - in order of importance - by which this may be achieved are as follows:

a) Improvements in steam generation and combustion efficiency;
b) Reduction in heat losses;
c) Improvements in process steam utilization;
d) More efficient mechanical utilization of steam.

200. It should be emphasized that it is primarily in the first three methods mentioned that effective economies must be made if more bagasse is to be released. By these methods a considerable measure of success can be achieved at comparatively low cost. In contrast, the capital requirements for improving efficiency in the mechanical utilization of steam are rather high and this method can make but a negligible contribution toward fuel saving, i.e. saving bagasse.

201. The amount of bagasse which may be released by means of better thermal efficiency will differ according to the type of operations being carried out in the sugar mill. Thus:

1. In cases where raw sugar mills are integrated with either a refinery or an alcohol distillery, or both, the possibilities of releasing bagasse are extremely small.
2. Relatively modern sugar mills producing only brown or raw sugar may, by taking care in the production and utilization of steam, release up to 20 or 30 per cent of the bagasse produced.
3. Sugar mills that produce only direct alcohol by fermentation may, without large investments in improving their regular equipment, liberate up to 40 or 50 per cent of the total bagasse produced.

/202. In the case

202. In the case of releasing bagasse by utilizing a substitute fuel, the only practicable fuel alternative in Latin America will usually be oil. However, in some countries the use of natural gas, coal, or wood may be taken into consideration.

203. The use of an alternative fuel will free all of the bagasse produced. Contrary to popular belief, in most cases the investment costs involved in converting to operation on a substitute fuel are not high. In any event, amortization of these conversion costs does not represent an important element in the total cost of the fresh bagasse at the sugar mill. The major element is the cost of the substitute fuel itself.

204. In sugar mills where fuel oil has been substituted for bagasse, the general experience has been that 1 ton of fuel oil will replace approximately 6 tons of fresh run-of-the-mill bagasse containing 50 per cent moisture. Conversion to fuel oil opens up the possibility of greatly improving the output of the boiler plant as a whole, considerably reduces fuel handling costs, simplifies control, and increases capacity.

Baling and storage

205. In the different sugar producing countries of Latin America, the cane grinding season ranges from 75 to 225 days or more per annum. Since a pulp and paper mill must operate on a year round basis, it follows that a stock of bagasse must be made to enable production to be maintained at the level required. Unless the grinding season extends throughout the year, and there are few, if any, areas where it does, this means that a considerable portion of the material has to be baled. It is this factor, along with considerations of ease of handling, storage and transport, which largely accounts for the fact that common practice in bagasse pulping is to bale all of the material as it comes from the sugar mill and store it against demand.

206. There is a considerable amount of experience as to the proper procedures which should be followed and the most suitable types of equipment which can be used for baling. Average experience is that fibre losses incurred under proper storage conditions amount to about 10 per cent, due to deterioration. If the bagasse is not stored properly the

/deterioration loss

deterioration loss may amount to as much as 30 per cent or even more. In the main, but depending upon local conditions, a large size of bale and a high baling rate are important in order to make the best use of the capital invested in baling station equipment.

Pith separation

207. Bagasse contains a large amount - which may be as much as 30 per cent - of parenchymatous substance or pith. Its physical structure is quite different from that of bagasse fibre, and it is attacked in quite a different manner by the chemicals used in pulping. Most authorities maintain that optimum results in machine operation, product quality and low chemical cost per ton of pulp produced, will only be achieved by using bagasse fibre from which the maximum amount of pith has been removed. Several methods of partial or complete pith separation have been developed.

208. Pith is a product which has many uses. It may, of course, be used as fuel in the mill boiler installation its calorific value being only slightly less than that of whole bagasse. However, it has more profitable applications in the preparation of feed materials and as an absorbent for nitro-glycerin in the manufacture of dynamite. It might also serve as a raw material for the manufacture of furfural, as a filter medium, etc.

Bagasse pulping processes

209. The characteristics of bagasse fibre are such that it may easily be pulped by any one of the commercially known pulping methods; the acid sulphite processes are not recommended. The selection of any particular process for a given mill location depends on a great number of inter-related factors which require careful, on-the-spot investigation.

210. Important progress has been made in the past few years in bagasse pulping and, since there has been successsful commercial operation of pulp mills using this raw material, it can be safely stated that there are no technical difficulties which stand in the way of full utilization of bagasse fibre as a source of pulp.

/Properties and

Properties and uses of bagasse pulps

211. The quality and character of pulps from bagasse and their conversion into paper are well understood. Many industrial examples prove that bagasse pulps may be used to advantage in a great variety of paper products ranging from wallboard to the finest grades of tissue. Fine pulps from bagasse will improve sheet formation and have a relatively high tensile and bursting strength. Folding resistance is good. In general, tearing resistance is less than that of coniferous pulp. Due to their special character, bagasse pulps can be refined with very low power consumption, and if handled properly they may be regarded as rather free-draining pulps. They blend easily not only with all grades of groundwood and chemical pulps made from wood but also with inert fillers as well.

212. In the case of fine bleached papers, the addition of bagasse pulp often improves the quality and gives the paper certain characteristics which cannot be obtained with wood pulp alone. It has been shown that when unbleached bagasse pulp is added in proper proportions to pulps of the Kraft type, papers of extremely high strength can be made. Shipping containers manufactured from bagasse have exceptional properties. Corrugating medium from bagasse excels in crush resistance. For liner-boards, bagasse pulps can be mixed in substantial proportions with unbleached sulphate pulps from wood.

213. It has been established that a newsprint-type paper can be produced from bagasse pulp. However, it is still an open question whether it can be manufactured commercially to compete both in price and in quality with the standard article which is universally accepted by the trade at the present time.

General conclusions

214. The meeting reached the following conclusions:

1. Successful industrial experience shows that bagasse may be used to great advantage as a source of raw material in meeting future requirements of pulp and paper in Latin America.

/2. At present

2. At present, there are well know processes in commercial operation which produce satisfactory pulps without technical difficulties. The choice of process depends upon many factors, including those of a local nature, and careful study is to be recommended in each case.

3. Although some grades of paper can be made from a furnish consisting of bagasse pulp alone, it is believed that a major contribution which this raw material will make as a source of pulp in Latin America will be as a blending pulp in admixture with pulps from other fibrous raw materials.

4. For pulp mills with a daily capacity of 20 tons, the quantity of whole fresh bagasse (50 per cent moist) which needs to be made available annually may be reckoned at approximately 36 thousand tons in the case of bleached grades and about 24 thousand tons for coarse board-type pulps. Respective requirements for 50 ton daily capacity pulp mills would be of the order of 90 thousand tons and 60 thousand tons per annum. These are conservative estimates.

5. Since bagasse is today used as fuel in the sugar mills, the freeing of additional quantities of this raw material for pulping will require either the introduction of measures for economizing fuel in the sugar mills or the substitution of an alternative fuel for bagasse.

6. The first course can liberate substantial quantities of bagasse, but the actual amount freed will depend on the type of operation undertaken at the sugar mill, and on the degree of thermal efficiency already achieved. Even in the most promising cases the savings are not likely to exceed 20 to 30 per cent of the bagasse produced. On the other hand, the measures that need to be adopted are not unduly expensive and are capable of being applied singly or in concert.

7. The most profitable operation will result when full utilization is made both of the fibre and pith for purposes for which each fraction is particularly suited.

8. From the standpoint of bagasse availability, it is clear that the limitations imposed by the regular use of bagasse as fuel in sugar milling operations - either by the creation of surpluses (through improved utilization of steam) or by substitution of another fuel - lead to the conclusion that the contribution which this raw material can make to the region's pulp and paper industry will, on a short-term basis, be limited as to volume.

9. On a long-term basis, there is no doubt that bagasse, because of a variety of favourable economic factors, will have an important part to play in the increased expansion which will

/be required

be required. Its role has an obvious significance in those cane-producing countries where supplies of other fibrous raw materials are lacking.

10. In relation to other non-forest sources of raw material for pulp and paper available in Latin America, sugar-cane bagasse, being a by-product of an established industry, appears to offer good possibilities for immediate increases in production.

## Presentation of papers on selected technical matters[1]

215. At the sessions devoted to this item, the various papers presented to the meeting as background documents were discussed. (See Part I of this report.)

1/ Item VI on the Agenda

/Review of

## Review of the development prospects for pulp and paper industries in selected Latin American countries 1/

216. In the sessions for this item on the agenda, studies which had been presented on prospects for the development of the paper industry in Argentina, Brazil, Chile, Colombia, Mexico, Uruguay, and Venezuela were discussed. During the debates, through statements made by certain participants, data also became available on Bolivia, Paraguay, and Peru. Thus the information discussed during the sessions related to almost 90 per cent of the region's paper consumption. Summaries of these studies and statements follow below, while in the background material detailed information is given on the pulp and paper situation not only in the above-mentioned countries, but also in certain others not referred to during the sessions. Although each country was considered individually, discussion of this item led to conclusions of a regional nature which are given at the end of this section of the report.

### Argentina

217. Current paper and board consumption amounts to 400,000 tons, distributed as follows: 90,000 tons for newsprint and magazine paper, 260,000 tons for sundry papers and 50,000 tons for board.

218. A steady increase in paper and board consumption is foreseen, but this will depend chiefly upon an increase in domestic production, since it is estimated that the foreign exchange available for importing these products will not rise much above the present level.

219. It is estimated that by 1960, paper and board consumption may reach 600,000 tons, distributed as follows: 200,000 tons of newsprint and paper for magazines and 400,000 tons of sundry paper and boards.

220. Average production of chemical and mechanical pulp at present and over the short term is as follows: 75,000 tons of chemical pulps; 40,000 tons of mechanical pulps, and 20,000 tons of semi-chemical pulp, or a total of 135,000 tons. The projects submitted suggest that this tonnage may rise to 250,000 tons by 1960.

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1/ Item VII on the Agenda.

/221. The

221. The following raw material sources will be used: wheat straw, sudan grass, black sorghum, picanilla cane, bamboo, castilla cane, sugar-cane bagasse, salicaceous species such as willow and poplar, the American pine and Araucaria angustifolia.

Bolivia

222. In Bolivia, the current annual consumption of paper and board amounts to approximately 2,200 tons and that of newsprint to 3,500 tons. The actual requirements of various types of paper and board are about 5,000 tons annually and there is a great scarcity of paper of all types since imports are restricted due to lack of foreign exchange.

223. There is one mill for board existing in Bolivia which mainly utilizes "paja brava" (a type of straw) as a raw material and the annual output of which amounts to 750 tons.

224. Extensive tropical and sub-tropical forests grow in Bolivia and there is a project to establish in the near future a mill to produce 5,000 tons annually of bleached chemical pulp and paper from sub-tropical woods.

Brazil

225. Brazil at present consumes some 146,000 tons of newsprint and 250,000 tons of other paper and board. Paper imports, excluding newsprint, stood at 6,000 tons in 1953, or 2.7 per cent of aggregate consumption. In the same year imports of newsprint amounted to 105,000 tons representing 70 per cent of the domestic demand. According to estimates for the 1965 consumption of newsprint, Brazil must raise productive capacity by 195,000 tons. As regards other grades of paper, excluding newsprint, an increase of around 178,000 tons may be expected by 1965.

226. Currently pulp consumption stands at approximately 170,000 tons, of which domestic output only meets 30 per cent, imports in the form of raw materials provide 58 per cent, and the remainder represents pulp contained in imported paper. The required increase in installed capacity will need to reach 265,000 tons in 1965, to satisfy the aggregate demand of the domestic market.

/227. Lack of

227. Lack of foreign exchange and inflation are the chief economic factors which have retarded the development of Brazil's pulp and paper industry. However, it is hoped that recent changes in foreign exchange policy will offer domestic and foreign companies better prospects for investment in this branch of industry.

228. A comparison of statistical data on apparent present and future production and consumption shows that the immediate and most pressing need is an increase in pulp and newsprint production. As regards other grades of paper, existing output satisfies almost all consumption requirements.

229. In Brazil there are four main sources of fibrous raw materials for the pulp and paper industry: 1) virgin forests of Araucaria angustifolia, and plantations of the same species, in the States of Paraná, Santa Catarina and Rio Grande do Sul; 2) plantations of eucalypts, mainly in Sao Paulo; 3) sugar-cane bagasse in the States of Pernambuco, Alagoas, Rio de Janeiro and Sao Paulo; and 4) tropical woods growing in the north of the country.

230. When account is taken of specific conditions of site, power, economic size of mill and other technical and economic factors, it is evident that only the first two sources of supply can be considered for an immediate expansion of pulp and paper production. However, bagasse and tropical woods undoubtedly constitute very important resources, provided that the specific problems mentioned earlier can be successfully solved.

Chile

231. To date little progress has been made in the development of Chile's pulp and paper industry, although it meets a greater proportion of domestic requirements than do its counterparts in most of the other Latin American countries. During the last five years, 57 per cent of the newsprint and 15 per cent of all other paper and board, as well as 85 per cent of the chemical pulp and 10 per cent of the mechanical pulp used in production, had to be imported. These imports amounted annually to 13,700 tons of newsprint, 3,400 tons of other papers and board, 26,700 tons of different types of chemical pulp and 1,400 tons of mechanical pulp.

/232. On the

232. On the other hand, if future demand is calculated on the basis of satisfying market requirements, it may be estimated that by 1960 41,000 tons of newsprint and 78,400 tons of other papers and boards will be needed, while requirements by 1965 will reach 48,200 tons and 98,700 tons respectively. The corresponding pulp requirements for these two years will be 100,300 tons (45,300 tons of mechanical pulp) and 122,700 tons (53,200 tons of mechanical pulp), respectively.

233. However, Chile is in an excellent position to meet all its present and future pulp and paper requirements; it may even provide an exportable surplus eventually. The country not only has abundant fibrous resources - six million hectares of natural broad-leaved temperate forests and extensive plantations of Pinus radiata - but also substantial supplies of other raw materials and the necessary facilities for the development of the pulp and paper industry.

234. According to the results of tests, the natural forests in the south of Chile contain many species that are suitable for pulping. The Pinus radiata plantations have been developed during the last 25 years, especially in a 200 thousand hectare zone in the Central Southern area, about 300 kilometres in length by 70 kilometres wide. The annual growth rate per hectare of these plantations amounts to about 20 cubic metres of barked wood. In addition to the fact that no special problems are involved in the mechanical or chemical pulping of such wood, these figures give an indication of the enormous potential production of these plantations: they should furnish 200,000 tons of pulp by 1960.

235. Industrialization programmes provide for an ever-increasing utilization of the available wood - particularly Pinus radiata. Two mills are at present under construction, whose joint annual production will amount to 44,000 tons of newsprint and 47,000 tons of sulphate pulp.

Colombia

236. The growing domestic consumption of paper is covered by the production of one mill alone, Cartón de Colombia S.A., which utilizes imported pulps, bagasse and waste paper. Current output each year amounts to 12,000 tons of wrapping and writing paper and a further 12,000 of board. There are plans to raise production to 36,000 tons annually in order to meet the demand for kraft.

/237. Newsprint

237. Newsprint consumption stood at 19,060 tons in 1950 and the probable demand for 1954 is estimated at 30,000 tons.

238. Tropical woods, bagasse and rice straw are possible sources of raw material.

239. The Instituto de Fomento Industrial is at present well advanced in a detailed and systematic study of the forests in the central valley of the Magdalena river for the purpose of establishing a pulp and paper mill there. The realization of this project will depend upon the technical and economic possibilities.

240. Annual output of dry bagasse stands at 170,000 tons which are all used as fuel. Nevertheless the sugar area of the Cauca valley also contains coal deposits and it should also be noted that there is a year-round harvest in this area.

241. Rice straw, in view of the high rice production and the proximity of this crop area to the large consumption centres, may be considered as a possible source of raw material for the paper industry.

Mexico

242. There are more than 30 paper and board mills in Mexico. Six of them manufacture a total of more than 18,000 tons of unbleached mechanical pulp annually, and four produce unbleached chemical (mostly kraft) and semi-chemical pulp.

243. At present these mills manufacture kraft and semi-kraft papers and board, printing and writing papers, toilet paper and certain specialities. Aggregate production for 1953 exceeded 136,000 tons.

244. Mills producing unbleached pulp (two with the sulphate and one with the sulphite process; one with the semi-chemical and another with the modified mechano-chemical process) today supply more than half (about 100,000 tons) of the current domestic demand.

245. Sources of raw material suitable for industrial conversion are plentiful. Coniferous forests (mostly pines), sub-tropical forests, sugar-cane bagasse - to mention only the principal resources available - could supply present and

/future demand

future demand for pulp for conversion into paper and other products.

246. The country's industrialization permits an adequate supply of other indispensable materials for the pulp and paper industry, such as sulphur, salt, sodium sulphate, lime, kaolin, alum and oil.

247. Encouragement given by private and State enterprise to electric power generation, improvements in transport facilities and the expansion of the national road network, all aid the progress of industrial integration.

248. The enlargement of existing installations, together with the operation of those mills whose construction is almost complete (Celulosa de Chihuahua, S.A. in Chihuahua State, and El Pilar in Mexico State) will make available most of the pulp required by the Mexican paper industry, as well as all the pulp required for the manufacture of synthetic fibres.

249. Mexico does not manufacture newsprint, and imports stand at approximately 70,000 tons per year. To enable some of this domestic deficit to be met by local production, a mill for the manufacture of 36,800 tons of mechanical pulp is to be installed in the near future. This, together with the necessary chemical pulp - of domestic or foreign origin - will make it possible to supply 50 per cent of the present newsprint consumption and 46 per cent of the estimated requirements for 1960.

250. The remaining deficit will be covered by the progress of projects in the blueprint stage. Such developments will, however, depend on improvements in the communications system, the electrification of the country, a growth of domestic savings and the securing of foreign credits.

Paraguay

251. Recognition of the importance of its forest resources to the national economy has led the Government of Paraguay to take particular interest in the possibilities for pulp and paper development. It has requested the technical assistance of bilateral and international organizations to prepare a plan for the rational development of integrated forest industries including pulp and paper manufacture, agriculture and stock resettlement.

252. Eastern Paraguay has vast raw material resources, with its 7 million hectares of almost virgin sub-tropical broad-leaved forest. This area, according

/to field

to field surveys on the upper Paraná, gives an average yield of 100 cubic metres per hectare from 100 different species. Of these 100 species, laboratory studies have determined that as many as 83 can be pulped together in any proportion to produce an adequate commercial pulp of uniform character.

253. The Paraguayan stretches of the upper Paraná river offer very substantial hydro-electric possibilities as well as a combination of other important factors including abundant raw materials, excellent agricultural possibilities, a favourable living environment, and available access to one of the principal river communication systems of South America.

254. There are some unfavourable economic factors which have limited industrial development in the past, such as the very reduced population in the forest zone, the lack of skilled labour, scarcity of domestic capital, and unbalanced foreign exchange, but the Government today is deeply interested in overcoming these adverse factors by positive action to welcome both domestic and foreign investment.

255. Apart from their pulp and paper possibilities, these great forest resources, due to their location near the population centres of Latin America, may well have great economic significance in the future.

Peru

256. Peru currently consumes 42,500 tons of paper, of which 14,500, including all newsprint, are imported. If these figures are compared with those presented in the Secretariat documents - which refer to the 1948-52 average - an outstanding upswing of 33 per cent is apparent. This increase is mainly due to the freedom of trade and of the exchange system since 1950. Output of wrapping, writing and printing paper, as well as board, is principally based on sugar-cane bagasse and a small proportion of imported pulp. The requirements for these grades of paper and board are fully covered, while a small surplus of around 2,000 tons annually has been exported to Bolivia, Colombia, and Ecuador. Through expansions to the existing mills - especially that of Paramonga - a production of 41,000 tons is planned for 1960, which will meet about 66 per cent of the demand foreseen for that year.

/257. Domestic

257. Domestic sources furnish 22,500 tons of the raw materials (pulp from bagasse and waste paper) required by the industry. The pulp deficit of 5,500 tons is purchased abroad. For 1960, an annual pulp consumption of 41,000 tons is anticipated, of which 7,000 will be imported and the remainder produced by the domestic industry, with its projected enlargements in capacity.

258. The above data show that the only important supply problem is that of newsprint. In order to solve it, the Banco de Fomento Agropecuario del Perú plans to use the great resources in the Amazon area of the cetico (Cecropia spp.) tree, which is a suitable tropical species for mechanical pulp production by common processes. It is also possible that Peru may manufacture newsprint from sugar-cane bagasse since more than 600,000 tons of this raw material are available each year.

259. Once the technical problems presented by one or other of these two fibre sources have been overcome the final solution will depend solely upon economic factors. The establishment of a newsprint mill based either on cetico or bagasse can be undertaken by private enterprise on the basis of free competition with imported newsprint from the traditional supply centres.

260. Rice straw represents an additional source of pulp which has not yet been studied. Production of this cereal is concentrated at three valleys in the northern zone of the Peruvian coastal provinces and it is thus thought that the straw could be easily gathered, reaching a total of 400,000 tons annually.

Uruguay

261. Estimated paper consumption in Uruguay during 1954 stands at an annual 55,000 tons, of which only 28,000 are produced in the country. The 20,500 tons of newsprint required are all imported. On the basis of a population of 2.5 million inhabitants, the annual per capita consumption amounts to 8.2 kilogrammes of newsprint and 13.8 kilogrammes of all other grades of paper.

262. Current production of paper other than newsprint amounts to approximately 50,000 tons, leaving a surplus of 22,000 tons annually in relation to consumption. To balance consumption and demand for all grades of papers, the following solutions are proposed.

/a) To complete

a) To complete additional installations for the production of some paper and board which is at present imported (glassine, cigarette paper, bristol board for cards used in accounting, etc.). It is hoped that capacity to manufacture these products will rise by 5,000 tons annually, whereby imports could be limited to 1,000-1,500 tons.

b) To promote, through agreements with other governments, exports of some paper grades which may be of interest to other countries (especially the neighbouring ones), with a view to satisfying their immediate needs, at least until their own capacity is enlarged. It is impossible to foresee the tonnages that could be exported, since these mostly depend upon the relative exchange agreements.

c) To produce domestically at least one third of the present newsprint consumption. This will be the easiest problem to solve, provided that economic and financial arrangements can be made between the government, publishing concerns and paper manufacturers. This solution would also encourage domestic production of mechanical pulp, which is the most important raw material for newsprint manufacture.

263. Estimates of demand for 1960 give a total of 67,000 tons annually, of which 27,000 correspond to newsprint and the remaining 40,000 to other grades of paper and to board. Thus if, by that year, it were possible to manufacture domestically part of the newsprint, the mills' production capacities would entirely cover domestic requirements.

264. No less than 10,730 tons of chemical pulp and 2,458 of mechanical pulp were imported in 1953. In addition, 3,800 tons of straw pulp were produced locally by the soda-chlorine process. One of the paper manufacturing firms has recently begun to operate a large mill for dark-coloured mechanical pulp, which is particularly suitable for wrapping paper and cardboard containers.

265. Fibrous raw material resources are very limited and the small size of the market does not allow units of economic size to be installed which could produce the different types of pulp required. It would therefore be more advantageous for the country to enter into an inter-Latin American co-operation plan and take part in the development of neighbouring countries' projects by investing capital in exchange for the guarantee, on the part of these countries, to allow duty-free exports of pulp to Uruguay. As regards mechanical pulp, however, an

/effort could

effort could be made to enlarge capacity with a view to supplying some of the raw material needed for newsprint manufacture.

266. The large poplar and eucalypt plantations which were established during the last few years will easily cover the needs of a new mechanical pulp plant with a capacity of 8,000 tons per year. Output would suffice to meet the annual newsprint demand and to replace imports of this pulp.

Venezuela

267. A strong currency and the dollar availability in Venezuela have led to the following characteristics of paper and board production and consumption up to 1953: a) unrestricted imports of finished products, but also of machinery and equipment for industrial plants; b) availability and hence free consumption of the best types of imported paper and board: c) little incentive to investigate and develop the utilization of domestic raw materials.

268. As a result, until 1953, Venezuela produced only 15 per cent of the paper and board consumed, and only imported pulps and waste paper were employed for this purpose.

269. The recent establishment and accelerated development of industries requiring containers for their products (paper bags for cement, sugar, etc. and cardboard boxes), followed by the development of the two main industries manufacturing these containers, has caused the necessary change in market conditions that will encourage the expansion of paper and board mills in the country.

270. In fact, statistics for the last four years indicate that per capita consumption increased to 13 kilogrammes, quadrupling to a point where it reached a total figure of 68,000 tons per year.

271. As a result of these new conditions, there is now both the incentive and justification for establishing industries with sufficient capacity to permit economic production, utilizing the natural raw material resources existing in the country.

272. Official bodies (Ministry of Development and Corporación Venezolana de Fomento) have also contributed, both from a technical and economic viewpoint,

/to promote

to promote the planned industries and, at the same time, to attain one of their objectives, i.e., a reduction in the value of imports.

273. The paper industry is at present centred in the Fábrica Nacional de Papel at Maracay, the Fábrica de Cajas de Cartón (ISSA) in Caracas and another small mill which was installed at the beginning of 1954 at Guacara near Valencia for the manufacture of toilet paper.

274. Another mill is at present being installed in Maracay for the production of cardboard boxes. In April 1954 another company was formed, with an initial capital of 25 million bolívares (7,500,000 U.S. dollars) which plans to produce an annual 30,000 tons of unbleached papers, kraft, semi-kraft, wrapping and other grades. This company is now finishing its studies and intends to raise its capacity by stages, and also to expand its field of activity in the future to include newsprint. It plans to make the greatest possible use of domestic raw materials.

Conclusions

275. From the statements by experts from various countries, the general conclusion can be drawn that all the nations of Latin America are showing great interest in the development of their paper industries and are making substantial efforts to achieve that end. There is a general tendency to create or expand productive capacity to meet the growing needs for pulp and paper.

276. In the past, emphasis was primarily placed upon the construction of paper mills; the current tendency is to balance the industry by developing pulp mills.

277. Most Latin American countries give the development of productive capacity for paper a prominent place in their list of priorities for industrial development. In doing so, they are not only concerned with creating permanent sources of paper supply, but also do not overlook other basic advantages. Among the latter are the benefits to be drawn from utilizing abundant natural resources, diversifying their economies, and developing along parallel lines other important industries, such as the manufacture of the chemicals required for pulp production.

/278. No less

278. No less important is the fact that pulp industries, owing to the substantial investment required and to the need for a regular supply of raw materials, in themselves constitute a guarantee that the forests will be protected and exploited rationally, as well as an incentive for the creation of new resources by means of plantations.

279. As regards the transformation of these raw materials into pulp and paper, the general conclusion of the meeting was that, although no technological problems exist for the manufacture of chemical pulp, the economic production of mechanical pulp based on tropical or sub-tropical resources still requires more research. The outstanding exception is the case of the cetico in Peru which has proved to be an excellent raw material for the production of mechanical pulp by conventional processes.

280. It is apparent, from the prospects offered by individual countries, that existing plans to meet the demand for newsprint are inadequate, although in every case the importance which should be given to this type of development is fully appreciated. Apart from technological difficulties, problems of another order - principally of economics and of government policy - have caused current projects to be directed more towards other grades than towards newsprint. The suggestions of participants nevertheless indicate that it is urgent to reconcile the need for developing newsprint output to economize in foreign exchange and to supplement industrialization with that of a permanent source of newsprint and at sufficiently low prices to encourage cultural progress in these countries. It is of great importance that governments should make every effort to accomplish this aim by encouraging the establishment of newsprint mills.

281. The difficulties of financing are a serious obstacle to the development of the paper industry. The general conclusions regarding this matter are given elsewhere in this report.

282. Since the characteristics of the raw material vary from one country to another, it is logical to expect that the development of the paper industry in each country will tend towards specialization as regards the types of pulp and even the specific grades of paper. On the other hand, the domestic market for

/paper products

paper products in the majority of countries is too small to absorb the output of large-scale mills specializing in specific types of pulp and in a limited number of paper grades. Considering these two conditions jointly, the conclusion may be reached that it is both necessary and desirable to encourage a complementation of markets on a regional basis.

283. The Meeting was in agreement that an effort should be made to ensure that in the development of Latin America's paper industry the region should be considered as a whole. It was thought that the present meeting was the first important step to achieve this object, and the hope was expressed of increased international co-operation in the future to obtain balanced industrial development.

284. In the discussion it was also stressed that all development projects should be submitted to a careful examination in order to evaluate their economic and technical characteristics as accurately as possible, as well as their real contribution to the general economic development of the country concerned.

285. When the experts discussed the problems encountered in carrying out present pulp and paper projects, emphasis was placed on the necessity for obtaining technical assistance from international organizations in order to study certain problems which could not be tackled by private enterprise or by individual governments alone and also to co-ordinate national efforts to solve these problems. It was also pointed out that a need existed for technical advice on specific problems arising from development projects, and it was thought that this should be provided by both forestry and industrial experts who had studied the industrial development of Latin America as a whole and who had also had experience in other countries outside the region.

286. This aspect of the discussions was referred to the special committee charged with drafting concrete proposals on technical assistance, research and training. (See Part IV.)

/Newsprint[1]/

## Newsprint 1/

287. An assessment of the prospective balance ten years hence between Latin American requirements and regional production makes it clear that newsprint presents a special problem. Latin American countries, without exception, are intensely interested in expanding, or initiating, domestic production of what is judged to be an essential raw material. Having experienced shortages in the past for various reasons, each country is anxious to achieve some measure of security of supply. Secondly, in many Latin American countries today newsprint consumption falls below the levels which may be considered appropriate to the stage of political, economic and cultural development which has been reached, simply because the countries concerned are unable to devote to the purchase of newsprint the amounts of foreign exchange they would like; for the region as a whole, the capacity to import is likely to be limited in the future also.

288. If Latin American countries had unlimited foreign exchange available with which to purchase imported newsprint, the problem would present itself in a different light. Under those conditions, the traditional producing centres, Canada and, to a lesser extent, Scandinavia, would have the incentive, as they undoubtedly have the resources, to expand productive capacity to a point where any conceivable rise in Latin American demand, during the next decade or so, could be met.

289. Newsprint production is one of the most specialized paper-making processes, governed by strict product specifications and low margins of profit. The economics of the process favour the installation of relatively large mills.

290. It is evident that, at the present time, newsprint production in Latin America is unlikely to be realized from most of the region's fibrous resources at costs which will permit prices to compare favourably on the world market with those of, e.g., Canadian newsprint - certainly in normal times.

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1/ Item IX on the Agenda.

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291. Thus, it may be recognized that, if Latin American countries are resolved to expand newsprint production - and plainly there are many valid reasons why they should - the problems that confront many of them are more economic than technical.

292. Newsprint is today being made from groundwood pulp and up to 20 per cent of coniferous wood chemical pulp, either unbleached sulphite or semi-bleached sulphate.

293. The Meeting heard statements summarizing experience in Latin America to date relating to the production of mechanical pulp for newsprint: it is made from salicaceous species in Argentina, from Araucaria angustifolia in Brazil, from Pinus radiata in Chile. These resources are of considerable magnitude and they are the basis for the current expansion of Latin American newsprint production. The region's potentialities, however, are by no means limited to the resources at present exploited.

294. Development work devoted to the problem of finding raw materials to take the place of conventional spruce groundwood, and thus broaden the raw material basis of newsprint manufacture has proceeded along four separate lines.

295. The technical problem of producing newsprint from pines, especially those with a high resin content, may be considered solved. This makes technically possible the use of natural stands of conifers in Mexico and Central America, and of existing coniferous plantations in Argentina.

296. The Meeting stressed the desirability of exchanging experience and conducting research on plantation conifers to ascertain which species and varieties, suitable for newsprint production, could be successfully grown under the varied conditions met with in the region.

297. The production of groundwood from temperate broad-leaved species by the conventional grinding process has increased rapidly in Europe and the United States. In Latin America the main broad-leaved species suitable for conventional grinding are the plantation willow and poplars of the Paraná Delta, the Cecropia species, and, to a lesser degree, the eucalypt plantations.

298. The willows and poplars present few difficulties. In spite of the fact that in Australia Eucalyptus regnans from 200 to 300 years old is used to

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produce a satisfactory newsprint, it is doubtful whether the short-fibred eucalypts of Latin America can ever serve as the basis for large-scale production of newsprint by conventional means. The Cecropia species are found locally in homogeneous stands in the region, and those species, as well as certain other low density species, arise frequently as second growth in the tropical rain forests. Not all these species are likely to prove suitable for newsprint, but promising tests have been carried out on Peruvian cetico and further investigation may bring to light similar species, possibly even more suitable for newsprint production.

299. Various processes have been developed for producing groundwood type pulps from higher density broad-leaved species, the general principle being to carry out a steam or chemical pre-treatment to soften the wood before conventional grinding, thus minimizing fibre destruction in the grinding process. The application of such processes, e.g. the chemigroundwood process to mixtures of tropical wood species, is likely to give rise to technical difficulties, though it is conceivable that pulps could be produced capable of reducing the amount of chemical pulp required for the manufacture of newsprint.

300. Recently, several processes have been developed for producing groundwood type pulps making use of non-conventional equipment, e.g. by fiberizing in disk mills or refiners after softening the chips by a steam or chemical pre-treatment. One of these, the cold caustic soda process, is simple to operate, should not require heavy capital investment, gives high yields, good strength properties; for some species the pulp will be dark in colour and require bleaching. It might offer possibilities for the future production of newsprint from mixed tropical woods.

301. The production of the chemical pulp of the newsprint furnish does not present the same problem as the production of the groundwood. It can be manufactured as semi-bleached sulphate from different pine species or by the sulphite process from, for example, Araucaria, as is the case in Brazil and Argentina. It was stated during the meeting that part of the chemical pulp can also be provided by broad-leaved chemical pulp or by bagasse pulp.

302. The production of newsprint from bagasse has long been technically possible, but so far no one has succeeded in making, at a competitive price, an acceptable newsprint capable of being run on high speed machines. A recent

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development (the use of a pre-hydrolysis process followed by a neutral sulphite semi-chemical cook) may provide the possibility of successful economic operations in certain countries.

303. The technical progress of recent years has multiplied the processes which can be considered for newsprint manufacture and has potentially widened the range of raw material from which newsprint can be made.

304. The diversity of the raw materials which can now be used for newsprint manufacture calls for a new approach to the problem; no longer is it possible to think rigidly in terms of fixed proportions of conventional pulps. Those countries which lack the traditional materials, and yet feel impelled to develop an indigenous newsprint industry, will undoubtedly find a solution by examining the various possible blends of the different pulps which can be produced from their native resources; some Latin American countries have already found a solution along these lines. At the same time, it should be recognized that the region's existing resources, and the possibilities of adding to those resources, have by no means been fully explored, particularly if the complementary resources of neighbouring countries are taken into account.

305. The Meeting concurred with the suggestion that Latin American countries should, by encouraging experiment, facilitating seed exchange, and pooling experience - particularly in regard to the planting of tropical and sub-tropical conifers - assist each other to discover those species which acclimatize best in their particular countries.

306. The economic implications of developing newsprint production must not, however, be overlooked. Few newsprint mills in Latin America, existing or potential, can operate with commercial success, even in the domestic market, if exposed to the unhampered competition of foreign newsprint in the markets they serve. Hence economic policies in Latin American countries in relation to newsprint differ widely. Some countries, regarding newsprint as an essential raw material, facilitate newsprint imports by low tariffs and preferential exchange rates. And among those countries which do produce newsprint themselves, some take steps to afford the domestic industry some protection (by tariffs on newsprint or facilities for pulp imports), while

/others take

others take the view that the domestic product should be capable of holding its own with the imported product.

307. The Meeting recognized that the initiation or expansion of newsprint production in Latin America was desirable, for reasons both cultural and economic. In certain countries the resources are such that newsprint can be produced profitably. In others it will be difficult to produce newsprint to sell competitively without substantial protection.

308. It emphasized that a price has to be paid if a country decides to embark on high-cost production. Whether that price is worth paying is a matter for decision by each individual country concerned. The wider economic implications of such a course should be carefully examined before a decision is taken.

/ Financing Latin

## Financing Latin American pulp and paper development[1/]

309. A rapid rise in Latin America's paper needs is envisaged during the coming decade. If these needs are to be satisfied, considerable investment will be required. Since, however, the pulp and paper industry is not the only industry, or branch of economic activity, in urgent need of development in the region, it is pertinent to ask what degree of priority should be accorded investment in this field.

310. The meeting considered that the pulp and paper industry had several claims for special consideration. Firstly adequate levels of paper consumption form an essential part of reasonable living standards; economic advancement, rising welfare, educational and cultural progress, all call for more paper. Secondly, a new pulp and paper mill may, in two years or in certain cases even less, furnish a quantity of paper for which the foreign currency requirements, were that paper to be imported, could exceed even the amount of foreign exchange generally needed to establish the mill; in other words, pulp and paper investment based on local raw materials has a high import saving value. Thirdly, an expansion in the domestic paper supply permits the development of new, valuable, employment-generating, paper converting industries. Fourthly, by investing in pulp and paper the region will be able to mobilize a variety of important indigenous resources, including non-wood fibres such as bagasse and straw. Fifthly, investment in this field will make possible the development of a range of industries utilizing the co-products and by-products of the paper industry, notably the chemical industry. Finally, pulp and paper investment can facilitate the establishment of other forest industries; in fact, only an industrial development of this kind can assure the economic utilization of the great potential resource of Latin American forests.

311. There is therefore a compelling case for encouraging the development of the pulp and paper industry in Latin America. Ample fibrous resources are available in the region as a whole to sustain this development, even if traditional paper-making fibres only are taken into account, and proven

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1/ Item VIII on the Agenda.

/techniques are

techniques are available today which make possible also the conversion of the region's vast reserves of non-traditional fibres. Thus the over-all supply of usable raw materials presents no problem.

312. More difficult, however, is the problem of securing the necessary capital to finance this development. It is estimated that even if only minimum economic growth is realized, an annual investment of about 50 million dollars will be required to assure, without incurring an increased burden of imports, a reasonable standard of paper consumption by 1965. If a more favourable economic development takes place, then about 90 million dollars would need to be invested annually. Since the foreign exchange expenditure generally represents about half the cost of pulp and paper projects in Latin America, such exchange requirements may be reckoned at between 25 and 45 million dollars a year.

313. Large as these figures are, they need not be regarded as unattainable. A 90-million dollar a year investment corresponds to only 1 1/2 per cent of average total Latin American annual investment during the postwar period. Annual foreign exchange requirements of 45 million dollars correspond to little more than half of 1 per cent of the region's annual foreign exchange earnings. Because the Latin American economy is dynamic, showing one of the highest economic growth rates in the world, the targets indicated cannot be regarded as unrealistic.

314. It is not enough, however, to urge upon the industrialized nations their obligations to provide the capital for this kind of expansion in less developed countries. Nor is it enough to list the steps which the less developed countries should take to create a climate favourable for investment. Both these considerations are of genuine importance, but they have been outlined with such particularity on so many occasions, and are now so well--documented, that the meeting did not consider that an elaboration of these themes would form the most fruitful basis of discussion.

315. A more practical starting point is to consider what sources of capital are available and what kind of questions will have to be answered before capital, be it public or private, local or foreign, directs itself into the pulp and paper field.

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316. As to the sources of capital, domestic capital may be either private or public, the latter including financing by development banks and various quasi-public institutions as well as by governments and central banks. Frequently there will be enterprises financed from both sources, and the relative frequency of public, private and semi-private enterprises will depend very much on the economic and political background and conditions in the country concerned.

317. If there is any increased momentum of the present movement in a number of Latin American countries towards establishing facilities through which securities in industrial enterprises can be sold widely to the public, the task of mobilizing domestic private funds will be greatly facilitated.

318. Foreign assistance to all the types of companies mentioned may be forthcoming from a variety of sources. This may take the form of loans or be limited to an exchange financing service. Apart from the International Bank itself, which generally concerns itself with development loans, almost all of the equipment-producing countries have agencies that provide credit facilities to cover the sales abroad of their national enterprises.

319. Foreign investment capital, risk capital in the form of direct investments, may participate in several ways. The enterprise may be totally owned by foreign capital, or foreign capital may unite with domestically raised capital in a joint enterprise. In the past, foreign direct investors have favoured joint enterprises where the domestic capital has been raised privately.

320. One of the first questions raised is whether or not there is a sufficient market to warrant the establishment of a new pulp and paper project. Two of the Latin American republics have a population of less than a million, while ten others have populations of under three and a half millions. Investors, before deciding upon an operation in the small countries of Latin America, would no doubt wish to be satisfied that market possibilities, including export prospects, were sufficiently promising to warrant any new development.

321. An illustration of the kind of points on which investors will need assurance is afforded by the criteria which the International Bank adopted

/in arriving

in arriving at its decision to make available a 20-million dollar loan to Chile for the only Latin American pulp and paper project that has so far received financial assistance from an international lending agency. These were:

a) to require a first class presentation and justification of the project, with clear and detailed specifications set forth in cost terms; this presentation, naturally, would be prepared by thoroughly competent persons or agencies specialized in this work, and having experience in the pulp and paper field;

b) evidence of the value to the country's economy, utilizing domestic natural resources and leading to an improvement in the foreign exchange situation, both through import savings and ultimate export earnings;

c) conviction that the management available was competent and experienced;

d) evidence of ample raw material resources, and of a plan for managing them on a sustained yield basis;

e) studies of the local market, including its prospective growth, demonstrating that it was capable of absorbing a sizable proportion of the mill's output;

f) a cost analysis indicating that production would be at competitive prices in the markets contemplated;

g) the margin in the estimates presented was sufficiently large so that, even were domestic demand and foreign market sales to fall short, by a considerable percentage, of the levels estimated, the enterprise was judged to be able to repay its loans and at the same time show a good profit;

h) evidence of specific offers of sufficient domestic equity capital;

i) the Bank was influenced by the fact that the repayment guarantee offered by the Corporación de Fomento was forthcoming without requiring an active vote in the directorship of the company concerned.

322. These are not necessarily the criteria which the Bank would adopt in similar cases; nor can it be assumed that satisfaction on all these points would assure a favourable reception of a request for a loan in any future case. But it is certain that any form of capital contemplating pulp and paper investment would need assurances on most of these points,

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and perhaps on several others. These criteria can thus serve as a general guide to sponsors of other development projects who seek capital. There will obviously be less reason for emphasis on the ability to compete in international markets in the case of a project whose entire output could be absorbed by the national market. The assurance needed in such a case would be that the product could compete successfully with those of other projects that might be established within the country concerned, or, under reasonable protection, with imported products at the price at which they could be sold within the area.

323. The limited part which the International Bank has played in Latin American pulp and paper development springs from the constitution and mode of operation of the Bank itself. The Bank, for the expansion of its loanable funds, is dependent upon its ability to market its own securities. Because its constitutional requirements call for a governmental guarantee, it has considered itself precluded from financing projects of the type generally conducted by private enterprise in those cases where the nature of the governmental guarantee tended to compromise the initiative of private management.

324. Two recent proposals for the establishment of internationla investment agencies, however, might go a long way towards filling the gap which undoubtedly exists. The first is the proposed creation of an International Finance Corporation, to be sponsored by the International Bank, which will be empowered to make equity investments and/or loans to private undertakings, both in industry and agriculture, in the less developed areas without government guarantees. The second is the proposal to be submitted to the Río Conference by the group of Latin American economists convened recently on the invitation of ECLA. The idea underlying this latter proposal was that and Inter-American Development Fund would make loans to public or private financial agencies, which in turn would lend to private enterprises, in accordance with conditions previously establishd between the banks in each country and the Fund. There is a plain need for some institution able to provide to private undertakings a more direct access to international lending facilities than is at present available.

325. Since for pulp and paper plants the investment in machinery normally

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amounts to about one half of the total investment required, the establishment of a plant requires a quite large foreign exchange investment. Insofar as any parts of this equipment can be procured locally - and in a number of Latin American countries some facilities for producing certain parts of the equipment seem to exist - the possibilities of local procurement should receive careful consideration in order to reduce the amount of foreign exchange required. Up to the present time the most important foreign source of financing Latin American pulp and paper development has consisted of medium-term credits offered by machinery-supplying countries; this source of credit may be expected to continue and grow in importance. In recent years exporters have competed for markets partly on the basis of the credit facilities they have been able to offer; the present tendency is for differences in the credit facilities offered by the various exporting countries to diminish. This will permit purchasing countries, upon the basis of the price and suitability of the equipment itself, to exercise a wider range of choice in effecting their purchases. Of course, unless or until general convertibility of currencies is established, the availability of a particular foreign exchange will remain a major determinant of choice.

326. The meeting next turned to a consideration of the possibilities of private foreign capital participating through direct investment in Latin American pulp and paper expansion. It was emphasized that this capital, if it is to be attracted, must be satisfied that the project it is considering is completely sound as a business risk; it must also be satisfied that the general conditions obtaining in the area in which the project is to be located are such that the enterprise can be expected to operate successfully, and that difficulties will not arise in remitting earnings and in eventually repatriating capital. Foreign capital will generally be attracted to an area that offers better prospects than it is able to obtain elsewhere.

327. Since direct foreign investment will normally imply an active voice in the management and control of a company it will bring with it a fund of experience in management and technology. Another major advantage of this form of financing over loans is that, as an equity investment, it shares the risks of the enterprise; it can make no claim for return in

/either local

either local currency or foreign exchange unless the venture is successful.

328. While it is conceivable that there may be projects which are entirely foreign-financed, there is an increasing and desirable trend toward establishing joint enterprises. Indeed unless local capital makes a substantial contribution, foreign capital may be disinclined to participate in the venture. No significant expansion of the Latin American pulp and paper Industry is likely to take place unless domestic capital is willing to set the pace.

329. A thorough examination and prospectus of the project will be a requirement of all investors, domestic or foreign. Every aspect of future operations and commercial prospects must be covered by complete technical and economic studies. The completion of these investigations generally takes at least a year, and the time required may run into several years if intensive studies are needed to establish the adequacy of the raw materials supply. The group intending to operate the project must be prepared to finance the heavy expenses involved in these essential preliminary investigations. It is the responsibility of the owners or prospective owners and operators of the project to bring the results of such technical and economic reports to the attention of the finanacing agencies in the form they usually require for financing consideration. If the investigations have been sufficiently comprehensive and lead to satisfactory conclusions, and, so far as foreign investors are concerned, they are also satisfied on the more general grounds mentioned above, it should be possible to procure the necessary capital.

330. The Meeting heard with interest and appreciation a statement on behalf of the American Paper and Pulp Association offering the services of that Association and its members to any groups in the Latin American industry wishing to avail themselves of those services in carrying forward their development programmes. It is anticipated that similar co-operation will be forthcoming from the pulp and paper industries of other countries.

331. For various reasons the main flow of investment capital for all purposes into Latin America since the war has been from the United States; this flow has averaged, nett, about 250,000 million dollars annually during

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the last 8 years. Statements by European experts indicated that the limitations which postwar circumstances had imposed on the flow of investment funds abroad were steadily being removed. It can be assumed that European capital will be ready, available and willing to help in Latin American expansion. It must be emphasized, however, that the interest expressed in the region will only lead to direct investment in the pulp and paper industry in Latin America to the extent that new projects succeed in satisfying the rigorous criteria earlier outlined.

332. The Meeting did not believe that an expansion of pulp and paper capacity in Latin America threatened the interests of the traditional exporting countries. It believed rather that the region's great consumption potential would require continued imports alongside a rapid development of indigenous production. It expressed satisfaction with the efforts of United Nations organizations, in particular of those bodies which had sponsored this conference, to encourage, by undertaking studies and carrying out surveys under the expanded technical assistance programme, the development of the pulp and paper industry in Latin America.

333. The Meeting agreed on the following conclusions:

1. An expansion of the pulp and paper industry in Latin America is vitally necessary. There is every indication that well-placed investment in this field will prove profitable.

   For a variety of reasons, this industry is one in which joint investment of domestic and foreign capital offers advantages over what can be achieved by either operating alone.

2. To ensure this needed industrial development it is necessary to stimulate the flow of domestic capital in a measure which will at least cover locally-incurred investment costs, working capital requirements and the requisite down-payment on foreign equipment. There is a similar need to encourage a flow of foreign capital to finance the purchase of equipment and the contracting for those technical services that must come from abroad.

3. Various forms of financing this development exist, including long-term loans by international financing agencies, medium--term credits for machinery purchases and direct investment by both local and foreign capital. Projects must be carefully drawn up to establish that they are sound business risks and that the climate for investment in the intended area is favourable.

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4. It is considered that the attention of Latin American governments should be drawn to the special part which pulp and paper industries can play in general economic and cultural development and therefore the desirability of: a) according priority to these industries in establishing development plans; b) ensuring that these plans are carefully drawn and documented to set forth the order of feasibility of potential projects in terms of their respective prospects for fulfilling, in the most effective and economic manner, the needs of Latin America as a whole and its several Republics; c) mobilizing domestic capital and facilitating the movement of international capital in order to realize this expansion.

5. Because an adequate and sustained raw material supply is basic to the industrial development contemplated, the Meeting considered that Latin American governments should take steps to establish or improve credit terms for afforestation as well as for industrialization.

6. Certain developments would involve "settlement" costs so high as to inhibit private investment if charged as capital costs on the paper operations. The Meeting considered that in those cases where developments of this kind are deemed to be in the national interest public authorities should provide basic community services.

7. The Meeting expressed the hope that the conclusions of this meeting would be made known to those banks and financial institutions likely to be interested, so that the attention of those concerned in countries outside Latin America be drawn to the desirability of taking all the necessary measures to: a) facilitate the financing of equipment sales; b) facilitate the export of private capital.

## Part IV

## SUMMARY OF RECOMMENDATIONS

334. The Meeting, through its various committees and its plenary meetings, approved the recommendations which are brought together below and classified according to the agenda item under which they were made. These recommendations, which were implicit in the texts of Part III of this report, are transcribed literally in the following paragraphs, with the additional recommendation on technical assistance, research and training which was put forward by the special working group nominated by the Meeting for that purpose.

### Tropical forests

335. The need is great for systematic and continuous research in all fields of tropical and sub-tropical sylviculture and forest utilization, and results obtained throughout the world should be made known through the efforts of international organizations interested in forestry and through bilateral arrangements. With reference to the over-all forestry or utilization problems, it is hoped that FAO may be able to compile and publish pertinent information available from all reliable sources. The establishment of a Latin American research centre would render a valuable contribution towards the development of the pulp and paper industry on this continent. Any effort in this direction would be of great advantage to the governments concerned as well as to industry.

336. Any mill project in an undeveloped area, especially if it is based on a non-traditional raw material, needs not only careful analysis of all cost factors, but also technical investigations which may involve considerable expense. This capital outlay is imperative especially in the case of new processes or processing techniques. Technical assistance by international agencies might offer some help in connexion with the essential preliminary investigations.

/Other forest resources

Other forest resources

337. To encourage the development of forest plantations on a rational basis and in the interests of Latin America's pulp and paper industry - without overlooking the large plantations now being made - the Meeting recommends the organizations concerned to take the following steps:

1. To study on a systematic basis at the various experimental forestry stations in Latin America the possibilities of introducing those exotic species which grow rapidly and are of interest to the pulp and paper industry.

2. To carry out systematic and comparative research at the same experimental stations into the different conditions for establishing and treating forest plantations based on native or exotic species which have already been, or could be, introduced.

3. To study at qualified laboratories the products of the plantations. Such studies would deal with the suitability of the wood for conversion into pulp and, above all, the quality of the pulps thus obtained. Not only wood specimens should be studied, but also each species individually according to its conditions of growth and the plantation methods for treatment. It would be particularly desirable to gather data on the relations between the rate of growth and the value in paper of the end-product for each of the existing species.

338. The combined results of these studies, as well as similar research undertaken elsewhere in the world into the same characteristics, should be collected by the Regional Forestry Office of FAO, analysed and distributed to the governments and organizations concerned.

339. The Meeting suggests that the Regional Forestry Office, which has already undertaken work of this nature, should be given greater facilities to allow it to arrange either the exchange of the free distribution of seed samples of forest species for the purpose of experiment and trial plantings.

340. Finally, the Meeting also recommends that FAO urge governments to grant all possible facilities for public services and private enterprise to obtain seeds - by purchase or exchange - for the enlargement of this work. As regards the temperate natural forests of Latin America, the meeting in general feels that their use is economically feasible as a means of meeting the

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requirements of the paper industry, although in some cases delicate problems exist, which should be the object of attention by specialists and governments.

Development prospects

341. It is apparent, from the prospects offered by individual countries, that existing plans to meet the demand for newsprint are inadequate, although in every case the importance which should be given to this type of development is fully appreciated. Apart from technological difficulties, problems of another order - principally of economics and of government policy - have caused current projects to be directed more towards other grades than towards newsprint. The suggestions of participants nevertheless indicate that it is urgent to reconcile the need for developing newsprint output to economize in foreign exchange and to supplement industrialization with that of a permanent source of newsprint and at sufficiently low prices to encourage cultural progress in these countries. It is of great importance that governments should make every effort to accomplish this aim by encouraging the establishment of newsprint mills.

342. Since the characteristics of the raw material vary from one country to another, it is logical to expect that the development of the paper industry in each country will tend towards specialization as regards the types of pulp and even the specific grades of paper. On the other hand, the domestic market for paper products in the majority of countries is too small to absorb the output of large-scale mills specializing in specific types of pulp and in a limited number of paper grades. Considering these two conditions jointly, the conclusion may be reached that it is both necessary and desirable to encourage a complementation of markets on a regional basis.

343. In the discussion it was also stressed that all development projects should be submitted to a careful examination in order to evaluate their economic and technical characteristics as accurately as possible, as well as their real contribution to the general economic development of the country concerned.

Financing

344. It is considered that the attention of Latin American governments should

/be drawn

be drawn to the special part which pulp and paper industries can play in general economic and cultural development and therefore the desirability of: a) according priority to these industries in establishing development plans; b) assuring that these plans are carefully drawn and documented to set forth the order of feasibility of potential projects in terms of their respective prospects for fulfilling, in the most effective and economic manner, the needs of Latin America as a whole and its several Republics; c) mobilizing domestic capital and facilitating the movement of international capital in order to realize this expansion.

345. Because an adequate and sustained raw material supply is basic to the industrial development contemplated, the Meeting considered that Latin American governments should take steps to establish or improve credit terms for afforestation as well as for industrialization.

346. Certain developments would involve "settlement" costs so high as to inhibit private investment if charged as capital costs on the paper operation. The meeting considered that in those cases where developments of this kind are deemed to be in the national interest public authorities should provide basic community services.

347. The Meeting expressed the hope that the conclusions of this meeting would be made known to those banks and financial institutions likely to be interested, so that the attention of those concerned in countries outside Latin America be drawn to the desirability of taking all the necessary measures to: a) facilitate the financing of equipment sales; b) facilitate the export of private capital.

## Technical assistance, research and training 1/

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348. The creation and development of new pulp and paper production along sound technical and economic lines requires a volume of advice and direct technical assistance in Latin American countries that cannot yet be adequately obtained from existing agencies or local sources. In fact this is broadly true in all the fields of forest management and forest products technology.

1/ Recommendation prepared by a special working group composed of the following experts: H.K. Collinge (Canada), Discussion Leader; E. Gagliardi; H. Giertz; J.A. Hall; J.C. Leone; H.Thielen; J. von Bergen.

/349. The deliberations

349. The deliberations of the Meeting clearly demonstrated that advice was actively desired by many individuals contemplating the development of pulp and paper facilities in Latin America and by representatives of the governments of the Latin American Republics. It has also become clear that a serious shortage of technically trained personnel for supervisory and managerial positions has hampered the progress of existing industries and undoubtedly will hamper the establishment of new industries. It is believed that steps should be taken to overcome this shortage and to ensure that it is not continued far into the future.

350. Discussions in the Meeting brought out the economic desirability of ensuring regional co-operation and programming of individual and national research and training activities; it appears that for reasons of economy, co-ordination of this kind is necessary. It is thought to be feasible and technically desirable. It was strongly felt that, at the regional level, it is necessary to ensure concentrated co-ordinated effort, especially in connexion with research and personnel training.

II

351. During the numerous discussions, it became apparent that knowledge concerning the rational production of the various Latin American raw materials, their possibilities and technical conditions for transformation, was in many cases inadequate. It was concluded that sylvicultural and technological research should be continued and intensified. The value to each country of preparing and implementing a national research programme was noted. Nevertheless, some of this research can easily be carried out on a regional basis by one agency working for the mutual interest. This possibility becomes a real need when it is a matter of long and costly research, requiring the use of specialized equipment and the services of highly qualified experts.

352. Most important, in order to avoid duplication and even useless efforts, it is desirable that national and regional research should be co-ordinated and that each of the countries or organizations concerned should be kept informed of the results of such research and of the work carried out elsewhere in the same field.

/353. Having been

353. Having been informed of the proposed establishment of a Latin American Research and Forest Training Institute and of the activities and studies undertaken by FAO to implement this project, the Meeting urges the governments of Latin American countries concerned, as well as the international organizations, bilateral aid programmes and public or private agencies likely to take part in such a project, to implement the recommendation formally adopted at the Fourth Session of the FAO Latin American Forestry Commission (Buenos Aires, 1952), as soon and as fully as possible.

354. The Meeting strongly endorses the findings of the Buenos Aires conference of 1952 and in particular urges that early and adequate attention be given to the creation of research facilities for investigation in the field of pulp and paper production, as well as in related fields of practical forestry and of forest production.

355. The Meeting strongly recommends that, as part of and in association with the Latin American Research and Forest Training Institute, adequate facilities be provided for the training of supervisory and technological personnel not only in the fields of pulp and paper technology, but also in all important allied fields of forest products technology. The Meeting urges that, in developing a central institution of this kind, the closest co-operation be maintained with existing facilities in Latin America for the teaching of engineering and applied sciences.

356. It is also recommended that such an institution endeavour to establish co-operative arrangements with similar institutions throughout the world. It is further emphasized that this institution should attempt to supplement and not to replace those methods of training, based on fellowships, scholarships and direct technical experience, in other parts of the world. It should be prepared to assist in the extension of advanced training of this kind.

III

357. The Meeting draws the attention of those responsible for the various technical assistance programmes to the importance which should be given, within the general framework of the region's economic development, to the

/problems outlined

problems outlined above. The Meeting advises governments to call as much as possible upon such assistance, especially during the initial stages of preparing specific development plans. It also recommends most strongly that governments, in formulating their requests, take into consideration the special needs of existing enterprises and groups considering new projects.

IV

358. The Meeting considers that, in order to co-ordinate all these proposals, it will be necessary, within the near future and for an adequate period, to place a group of experts at the disposal of the Latin American countries.

359. In the initial stage this group should include one or more experts on industrial problems and one or more specialists on the economic aspects of the pulp and paper industry.

360. The Meeting believes that such facilities should be provided through the expanded technical assistance programme of the United Nations, which, within the framework of a joint regional plan embracing ECLA, FAO and TAA for stimulating the development of pulp and paper production in Latin America, would appoint the experts and would provide them with the required working facilities.

361. The Meeting consequently recommends that governments take all possible steps towards this aim in conjunction with the international organizations concerned.

362. It proposes in particular that governments should make every effort, in the meetings and councils of the United Nations and its specialized agencies, especially the Economic and Social Council, to secure the adoption of the recommendations required to establish such a regional project. Such recommendations should enable governments in due course to draw up joint requests to ECLA, FAO and TAA.

363. Finally, the Meeting recommends that the various bodies responsible for the preparation of technical assistance programmes should give this project the priority it merits, having due regard for the need and importance of the development of pulp and paper production in this region.

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364. The experts recommended at the final plenary session, that the attention of the international agencies concerned be drawn to the desirability of convening at some future date a second Latin American meeting of pulp and paper experts to report on the progress made and to consider social problems.

Appendix I

LIST OF PARTICIPANTS IN THE MEETING

1. Latin American countries

a) Official Delegation[1/]

President

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| TORTORELLI, Lucas A. | General Administrator of National Parks |

Ministry of Foreign Affairs and Worship

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| BECKMANN, Conrado Carlos | Director of the Economic and Social Department, Envoy Extraordinary and Minister Plenipotentiary |
| ABAL, Enrique | Deputy Director of International Organizations and Treaties, Envoy Extraordinary and Minister Plenipotentiary |
| PEREZ VILLAMIL, Alberto D. | Envoy Extraordinary and Minister Plenipotentiary |

Ministry of Agriculture and Livestock

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| CARMELICH, Jorge N.F. | General Administrator of Forests |
| RAGONESE, Arturo Enrique | Director of the Botanic Institute |
| D'ADAMO, Orlando A. | Secretary of the National Forest Commission |

Ministry of Trade

SANTOS SIDOTI, José

FELIX CARLEVARI, Isidro José

MELERO, José

LOZANO, Emilio

Ministry of Finance

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| BRUSTIA, José Luis | Department Chief of the Banco Industrial de la República Argentina |
| VILLORIA, José S. | Deputy Department Chief of the Banco Central de la República Argentina |
| RONCO, Oscar P.S. | Department Chief of the Banco de la Nación Argentina |

Ministry of the Treasury

| | |
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| MAÑANA, Delfor M. | Dirección Nacional de Química |

1/ Argentina, as the host government, sent an official delegation in addition to the other Argentine participants who attended in their own capacity as experts. As this was a meeting of experts no other official delegations from governments were present, although some governments sent members of their Embassies in Buenos Aires as observers.

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DEGIORGI, Helvecio P.

Ministry of Industry

DELGADO, Juan Román

PALIA, Jorge José

Economic Affairs Secretariat

VIDAL, José Carlos

Advisers

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| PARDO, Luis L. | Chief of the División Productos Derivados of the Administración Nacional de Bosques |

Ministry of Industry

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Secretariat of the Delegation

General Secretary

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| PERETTI, Italo José | Secretary of Embassy |

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| MAY, Stacy | Economic Adviser to the Rockefeller Office, 30 Rockefeller Plaza, New York (N.Y.) |
| McCOY, C. Dana | International Director, The Rust Engineering Co., 575 6th Avenue, Pittsburgh (Pennsylvania) |
| NOLAN, William G. | Pulp and Paper Laboratory, University of Florida, Tallahassee (Florida) |
| TINKER, E.W. | Executive Secretary, American Paper and Pulp Association, 122 East 42nd Street, New York 17 (N.Y.) |
| VELEZ, Guillermo | Export Manager, Cameron Machine Co., 61 Poplar Street, Brooklyn 1 (N.Y.) |
| WOLLAGE, John C. | Research Director, Kimberly Clark Corporation, Neenah (Wisconsin) |

/b) Representatives

3. Representatives of International Organizations

| | |
|---|---|
| United Nations | Raúl PREBISCH, Executive Secretary of the Economic Commission for Latin America representing the Secretary-General |
| Food and Agriculture Organization of the United Nations (FAO) | Egon GLESINGER, Deputy Director of the Forestry Division representing the Director-General |
| | Siegfried von der RECKE, Head of the Latin American Forestry Office |
| United Nations Educational, Scientific and Cultural Organization (UNESCO) | Alfredo PICASSO OYAGUE |
| Technical Assistance Administration (TAA) | Raúl PREBISCH, Executive Secretary of the Economic Commission for Latin America representing the Director-General |
| Economic Commission for Europe (ECE) | Egon GLESINGER, Director of the Timber Division of ECE |

/Appendix II

Appendix II

ADDRESS BY THE ARGENTINE MINISTER FOR AGRICULTURE AND LIVESTOCK, MR. CARLOS A. HOGAN, AT THE INAUGURAL SESSION OF THE LATIN AMERICAN MEETING OF EXPERTS ON THE PULP AND PAPER INDUSTRY ON 19 OCTOBER 1954

As a Minister of the Argentine Government, it is a very great pleasure for me to express to this meeting, in the name of His Excellency the President of the Republic, General Juan D. Perón, our Government's welcome to all the delegates.

The direct importance of this international meeting is linked with the indispensable and fundamental role that paper plays on the modern social scene.

In spite of the valuable assistance rendered by other means of communication, paper is still vitally necessary for the exchange of ideas and the advancement of human culture. The steady increase which may be observed in world consumption calls for a special study of the technical and economic problems connected with its production and distribution.

Published figures stress the large share of paper used for newsprint; it is estimated that in Latin America 400,000 tons go into newsprint out of a total annual consumption of 1,500,000 tons.

Paper provides a wide subject for a speech, because it is so necessary and because it has a place in every civilized activity.

I will not take up your time, however, with arguments and comparisons that you all know and understand. It is sufficient to be fully aware that we are considering a factor essential to the maintenance of human progress, that as such it requires our keenest attention to the various aspects of the balance that must be assured between an increase in consumption and a corresponding stimulus to sources of supply.

Nor is woodpulp any less important. This valuable product which has so many uses is vital to the paper and other basic industries, as, for example, those connected with foodstuffs.

/Both woodpulp

Both woodpulp and paper products have received preferential consideration from the Argentine Government for many years. Already our First Five-Year Plan has included a special project concerning pulp and paper based on previous research and studies carried out by the Ministry of Agriculture and Livestock.

To our great satisfaction, it was shown that Argentina offers extensive possibilities for pulp and paper production. This is because several of its forest species are highly suitable, while both soil and climate are excellent in the areas which naturally lend themselves to large-scale production of these raw materials.

One of the specific characteristics of the political, social and economic transformation which Argentina wishes to make known to the world, is the desire to obtain a better knowledge of our sources of wealth. A rational exploitation can thus be undertaken for the benefit, not only of the Argentine people, but of the Americas and the whole world.

I formally declare that this humanitarian and universal principle is in no way an unrealisable or stereotyped hope, but one of the basic purposes of the doctrine which inspires the Government of Argentina, which was adopted as a national doctrine and named "Justicialismo" or "Peronismo" in homage to its creator and chief executive.

The Second Five-Year Plan includes several measures to increase pulp and paper output. These refer, mostly, to provisions for the country's forestry policy - to create, maintain, increase and protect this source of wealth.

Furthermore, we have not lost sight of the pulp resources from crop residues of various agricultural products, which can also be used in the production of different types of chemical pulp and paper.

The Parana Delta, situated at the very door of Buenos Aires, has an area of almost one million hectares, and is of great importance to us for pulp and paper production as its natural suitability as a source of pulpwood provides excellent yields, a fact which delegates will be able to appreciate personally by paying it a visit.

This is a zone from which we shall extract a large part of the raw

/materials for

materials for pulp, supplementing them with others provided by the Territory of Misiones, whose contribution is not only substantial but which also offers truly exceptional conditions for the growth of those species which are of the greatest interest to the industries we are considering.

The Ministry of Agriculture and Livestock is responsible for research on, and encouragement, control and management of the country's forest wealth. Its technical services are based upon a law drafted for the First Five-Year Plan, and subsequent research has allowed for substantiation and discoveries of great economic importance. I may mention, as an example, the shorter period necessary for the complete growth of some species in Argentina as compared to other countries.

Within the general policy conceived and planned by His Excellency the President of Argentina, the aim of economic independence, towards whose achievement numerous measures adopted by our Government are directed, is in no way incompatible with increasing co-operation between all countries. On the contrary, our own development and the free determination obtained through a control of the fundamental sources of our national economy, enable us today, with more facility than at any other period of our history, to raise the standard of our trade with the rest of the world on equitable terms which are beneficial to all concerned.

In this order of ideas and aims we have promoted the expansion of forestry and its allied industries in this country.

The type of organization and the results obtained must serve not only to aid our economic independence, but also to encourage greater progress in our trade relations with other countries.

In this respect we shall receive with pleasure any suggestions which the delegates and experts may make, not only as regards the organization of production, but also on the output of end-products and the marketing of those goods which interest us.

We are exceedingly pleased that the Economic Commission for Latin

/America has

America has singled out our country as the host for this Meeting. This is, of course, an opportunity for strengthening the bonds with the representatives of our sister countries in Latin America, and we are at their service, as always, to co-operate with our best goodwill for an attainment of those high ideals which we mutually possess.

With these sentiments I want to express my best wishes for the great success of this Meeting. It is up to the experts to make the scientific and technical contributions to form the basis required by Latin American governments to perfect their plans for pulp and paper production, and to contribute, by these means, to the general welfare of our peoples.

In repeating to the delegates the most cordial welcome of the Argentine Government and people, on behalf of His Excellency the President, General Juan D. Perón, I have the honour to declare the sessions of this Meeting open.

/Appendix III

Appendix III

ADDRESS BY DR. RAUL PREBISCH, EXECUTIVE SECRETARY OF THE ECONOMIC COMMISSION FOR LATIN AMERICA, AT THE INAUGURAL SESSION OF THE LATIN AMERICAN MEETING OF EXPERTS ON THE PULP AND PAPER INDUSTRY ON 19 OCTOBER 1954

When the Government of Argentina extended its gratifying invitation to ECLA to hold this expert meeting under its auspices at Buenos Aires, it was interpreted by us as further proof of its unswerving support of this United Nations' regional organization. I immediately decided to attend the Meeting personally to demonstrate how much we appreciate this happy gesture. In fulfilling this pleasant duty, I am here to convey the gratitude of the Secretary-General of the United Nations and of the Director of the Technical Assistance Administration to the Argentine Government, to which I should like to add my own appreciation and that of my collaborators at this Meeting. This is the first time that those who lead the technical staff of ECLA in Santiago de Chile have had the opportunity to meet the Argentine public, and it therefore appears to me an appropriate occasion to give the background for the Commission's task.

A substantial proportion of the world's population lives under very precarious social and economic conditions. The striking difference in per capita income between the industrial centres and the great masses who live on the periphery of the world's economy is more and more apparent. It constitutes a serious problem which continually arises in the councils of the United Nations. Those who suggest the need for radical solutions naturally do not share the characteristic illusion of the nineteenth century, according to which the free play of international economic efforts would ensure the benefits of greater technical progress in the world for under-developed countries. A vigorous policy for international economic co-operation will alone achieve this aim, not in order to replace a national development policy, but rather to supplement it through the technical and economic co-operation of the more advanced countries.

The United Nations has agreed to collaborate in drawing up this policy

/of international

of international co-operation, and the Meeting that opens today bears witness to this objective in the technical field. This policy is in its merest infancy, its initial steps are still hesitating and modest, because considerations deemed of greater urgency are absorbing the efforts and resources of the larger countries. The solutions depend primarily upon these countries, and it is our role as officials of the United Nations to continue carrying out the research essential for the establishment of a firm basis for international co-operation, and to link such solutions with each government's individual development programme.

In performing these tasks under the provision of its Charter, the Secretariat of the United Nations acts with complete independence, and is not permitted to receive private instructions from any government. This is to preserve the absolute impartiality of opinion among United Nations officials. It has been a most important factor in the existence of ECLA, and was recognized as such by its member States when they decided to make the Commission a permanent body.

The problem is of vast dimensions. To transfer the modern productive techniques of the advanced countries to those which are less developed, adapting them to individual conditions, is a task which, in addition to other requisites, demands large capital investments which under-developed countries cannot afford without dangerously limiting the low living standards of their peoples. The aid of foreign capital is therefore indispensable to accelerate the rate of growth, and to rectify little by little the great income disparities between the centres and the periphery of the world economy.

As regards Latin America, the preparatory group appointed by ECLA to present concrete recommendations to the forthcoming Conference of Ministers of Finance or Economy at Rio de Janeiro, considered that, for a period of 10 years, the minimum foreign investment required is 1,000 million dollars annually. It also felt that two-thirds of this capital should be found by the two international credit institutions. Their loans for economic development are thought to be very inadequate, since during the past four years they have only averaged 80 millions annually.

/These figures

These figures are sufficient to provide an idea of the size of the problem. The cost of technical co-operation is also substantial, and to date the available funds have been extremely limited. Progress, however, has been effective. While preliminary steps are being taken in this specific field, a fundamental change of attitude towards the problem of economic development has taken place, and in this achievement the United Nations has played a predominant part. The theory that industrialization, to the extent needed by individual conditions in each country, is an essential requirement for development and must be closely linked with better techniques for agriculture, is constantly spreading and being more widely accepted, despite some deep-rooted doctrinal prejudices which have not yet entirely disappeared.

This Meeting will consider one special problem of industrialization, that of pulp and paper. Another meeting which we held two years ago in Bogota referred to what may be considered an even more significant question from the point of view of industrialization itself, the production of iron and steel in Latin America. Who would have thought some years ago that an international organization, which has amongst its aims the encouragement of reciprocal trade to improve national economies, would summon outstanding world experts who, together with Latin American specialists, would recommend the most efficient methods for industrializing the raw materials of our countries or for taking advantage, through industrialization, of their great consumer power? Does not industrialization endanger international trade? Would it not be more advantageous for the Latin American countries to concentrate their efforts upon exports and leave industry to develop spontaneously without the aid of tariff protection?

Such questions have a clear theoretical answer which must serve as the basis for a development policy. Industrialization is in no way incompatible with the encouragement of exports and international trade; if it were, we, as officials of the United Nations, could not defend it. The plan laid down by ECLA economists is as follows. About 60 per cent of the active population in Latin America is still working at a very low rate of productivity in primary production, principally agriculture.

./In addition,

In addition, there is a considerable proportion of the population occupied in artisan-type work with low productivity. It is necessary to give an impulse to greater technical skills, both in agriculture and in these other activities. As greater use is made of technical methods, there can be no justification for the employment of so many workers. Less and less manpower is required for primary production and for other activities with low productivity, while there is an increasing need in industry and services. Exports can only absorb a relatively small proportion of the greater labour availability caused by a more intense use of technical methods. Such manpower, therefore, must be absorbed by industry and services. This is the reason for the close connexion between industrialization and the use of better technical methods in agriculture. There is no incompatibility between them; on the contrary the two processes are complementary, and an extreme in one direction or the other is detrimental to economic development.

If an adequate balance is maintained between these two processes, there is no reason why industrialization should unfavourably affect either exports or, as a result, international trade. It is true that the domestic production of goods which were previously imported, causes a reduction or the disappearance of certain imports. But the latter are soon replaced by other goods. The demand for industrial products and, consequently, the need to import them is extremely great in countries in course of development. Thus, protective measures required by the development of domestic industries only lead to a change in the composition of the goods purchased abroad, without disturbing their growth and always provided that protective measures remain within certain limits.

The customs tariffs, by means of which the large industrial centres control imports of primary products, are of a very different nature. Only a few days ago, an economist from the United States with whom I was discussing problems related to the forthcoming Rio Conference, remarked with great conviction: "Don't you consider it incongruous to favour protective measures as a means for industrialization in Latin

/America and

America and simultaneously show satisfaction at the government policy in the United States to reduce duties there - or at least to avoid their increase?" There is nothing incongruous in such a position. It is inadmissible that the centre of the world economy should have the same economic policy as the countries on the periphery which are in course of development. Higher duties upon a primary product at the centre unfavourably affect both imports and world trade, since there is no reason for the decline in imports of this nature to cause a rise in other imports to offset the initial decrease. In contrast, a decline in imports of one commodity causes an increase in others in the case of a country being developed.

It has been essential to revise traditional concepts in order to penetrate further the problems of development and to suggest concrete solutions. The doctrine of the international division of labour, based upon free trade, is as naive as the concept of self-sufficiency, of which, fortunately, only harmless traces remain. Both theories undermine development since the former hinders industrialization and the latter obstructs world trade and does not permit countries with primary production to expand their exports with the object of accelerating industrialization.

The tendency for the consumption of industrial goods to grow more rapidly than income, thus causing a steep increase in the demand for imports, provides a typical example in the case of pulp and paper. Paper consumption in Latin America tends to rise more rapidly than per capita income. Broadly speaking, it may be said that, in our countries, for every 1 per cent of income growth paper consumption tends to rise by 1.75 per cent; yet this is no exceptional phenomenon. On the contrary, it is characteristic of industrial demand that it must lead to a policy of substituting domestic output for imports. Unless this occurs there is neither growth nor industrialization.

If economic development is accompanied by the characteristic phenomena of external disequilibrium through the marked increase in the demand for industrial goods, which contrasts with the slow rise in the demand for raw material imports in the great industrial centres, then a

/far-sighted development

far-sighted development policy must include measures to encourage domestic production. For pulp and paper there is a further motive for this policy. The current prospects for future supply appear to indicate that the established producers will be unable to meet the probable rise in demand. It is therefore essential to provide new sources of supply, and, among them, those of Latin America which appear to have been scarcely touched. Allowing for a moderate annual rate of increase it can be estimated that, by 1965, consumption will have doubled. In order that this increase may not weigh too heavily upon a world supply that appears somewhat unpromising, Latin America must be prepared to take the fullest advantage of its own raw materials. In the course of our studies we have reached the conclusion that existing development plans for this industry will not cover the requirements. New sources and new processes must be explored.

To contribute to solving such problems, the United Nations, jointly with its specialized agency, FAO, have convened this technical meeting. Careful preparation over nearly two years was required to collect the basic material without which such meetings often waste time in generalizations. The first suggestion for this meeting dates from one of the first ECLA meetings in recent years. It was made by two distinguished FAO experts, Egon Glesinger and Pierre Terver, who are with us here and to whom I should like to pay tribute now.

Combined with technical subjects we shallalso consider the economic and financial aspects of pulp and paper production. To provide some idea of its magnitude, it will suffice to point out that were Latin America to produce the tonnage required to meet the greater demand in 1965, according to reasonable hypotheses regarding the rate of growth, an investment of from 750 to 1,300 million dollars would be required. It may well be supposed that these investments cannot be envisaged in an isolated form, but rather within a general development programme. The mere fact that it may be technically possible to produce pulp and paper in this or that area does not necessarily imply that it would be advisable to do so from the economic standpoint. It is possible that

/other investments

other investments may be more suitable for the economy of a country. And this leads me to another subject to which ECLA is devoting much effort and attention, the programming of economic development. I expect to speak of this subject again in Buenos Aires within the next few weeks.

If the governments of the Latin American countries continue their far-sighted policy of encouragement, there is no doubt that local capital will become increasingly interested in pulp and paper production. Interest has also been shown by foreign capital, and I feel sure that in this respect we shall, in due course, hear a very significant statement presenting such a broad outlook of Latin American industrialization problems that it will impress the experts of our countries most favourably. Formulae that will adequately bring together foreign technical experience, capital from abroad and the initiative of the Latin American entrepreneur will have to be sought. This problem is far from having been solved.

It is necessary to strengthen the Latin American entrepreneur, so that he may meet the competition of foreign capital, may be associated with it, or may receive the technical services of the foreign entrepreneur under more favourable conditions than those at present prevailing. In a large Latin American country, I have recently noticed some concern over a symptomatic occurrence. Local entrepreneurs of a consumer goods industry which was previously well established, are losing the market through the competition of foreign entrepreneurs who are introducing new manufacturing processes. Such methods are also available to the local manufacturers, but they lack sufficient capital to use them. Herein lies one of the roots of the evil which hinders the achievement of reasonable formulae for external co-operation. The Latin American entrepreneur must have access to international sources of both capital and technical knowledge.

ECLA has also made a concrete proposal on this significant matter to the governments which will meet at Rio. This is the establishment of a Fund for Industrial and Agricultural Development to make loans to Latin American entrepreneurs, without government guarantee and through the banking and financial system of each country. It is hoped that for

/this purpose

this purpose, the United States may be able to devote 50 million dollars over a period of 15 years, to accrue from a tax which will not burden the United States taxpayer but comes from a Latin American source. I refer to the tax on the profits of United States capital investments in our countries, the yield of which is estimated at some 100 million dollars annually. The collaboration of money markets and of international credit institutions is also anticipated.

I believe that if a measure of this nature is applied with enthusiasm and with conviction it would give a considerable impulse to Latin American initiative in accelerating the development rate of our countries, and would also contribute to lessening the tension which often arises when foreign investments are made in this region.

I have no doubt that this ECLA proposal will be considered with interest at the present Meeting, apart from the technical problems with which it will deal. We have invited outstanding specialists from the United States, Canada and Europe, as well as Latin American experts. All of them will enjoy the facilities kindly placed at our disposal by the Argentine Government and the assistance of experts, both from the official sphere and that of private enterprise, who will doubtless give us the benefit of their wide experience. I wish to express the appreciation of the United Nations for the papers these experts have prepared and for the assistance that their knowledge and experience will contribute to this Meeting.

In point of fact it has not been easy to bring such a large gathering together, nor to prepare the many valuable documents now before the Meeting. It is our good fortune to have the services of two first-class Co-Directors: Arne Sundelin from Sweden, appointed by FAO, and Carlos Quintana, a Mexican who, having been chosen for this post from within ECLA, merits a special mention. His thinking is clear and well co-ordinated, and he has faith in the industrialization of Latin America. He is an example of the young and enthusiastic men I have managed to attract to Santiago in order to perform the vast and stimulating task upon which we are engaged. I am now devoting all my energies to it, with the same enthusiasm, though perhaps somewhat moderated, that I once put

/into my

into my work for Argentina.

I have no doubt, gentlemen, that as regards the financial, and more especially the technical, aspects of pulp and paper, this Meeting will meet with the success anticipated for it by the Argentine authorities, worthily represented by His Excellency the Minister of Agriculture. Nothing gives greater and more legitimate cause for satisfaction to Argentine opinion than the knowledge that its support has been of service to the other Latin American countries. Therefore, I cherish the hope that the Argentine experts attending this Meeting, both officially and as representatives of private enterprise, will be prepared to place their valuable knowledge at the disposal of all. In the expectation that this hope would be fulfilled by Argentina, I was most desirous that this Meeting should be held in Buenos Aires. I trust that such well chosen guests will meet with all the warmth and generosity of Argentine friendship in this city - the friendship of my fellow countrymen. And nothing will give me greater pleasure than to know that in leaving Buenos Aires, one and all are inspired with feelings of keen affection for this great and productive land, and for those who labour here to develop its greatness in peaceful international fellowship.

/Appendix IV

Appendix IV

ADDRESS BY MR. EGON GLESINGER, DEPUTY DIRECTOR OF THE FORESTRY DIVISION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS AT THE INAUGURAL SESSION OF THE LATIN AMERICAN MEETING OF EXPERTS ON THE PULP AND PAPER INDUSTRY ON 19 OCTOBER 1954

The opening of the Latin American Meeting of Experts on the Pulp and Paper Industry marks an important date in FAO's history.

In the past half century, pulp and paper manufacture has grown from a rather minor outlet for small-sized roundwood to an industry which is competing with sawmills for first place among forest industries. The world's sawmills still convert about twice as much roundwood as the pulp industry. But in Europe and North America, pulp and paper output already exceeds in value the production of sawmills. In Sweden, pulp manufacture even uses more roundwood than the country's famous sawmills, and in many countries the pulp mills have become heavy competitors of sawmills as buyers of roundwood. The attention given to the development of pulp and paper industries within the framework of FAO's forestry programme, therefore, needs no explanation.

Let me mention briefly the principal events that have led to the Conference which opens today:

In April 1949, FAO organized a preparatory woodpulp conference at Montreal.

In June 1949, I was privileged to attend ECLA's second session at Havana in the course of which FAO drew attention to the importance of developing pulp and paper industries in Latin America. From this date a most fruitful co-operation grew up, based on regular contact, from whose joint efforts the present Meeting has arisen.

In June 1951, my colleague Mr. Terver presented to the fourth session of ECLA a report on Latin America's pulp and paper prospects which led to the adoption of a resolution inviting FAO and ECLA to undertake jointly the study on Possibilities for the Development of the Pulp and Paper Industry in Latin America. This joint study, as you know, was presented to the fifth session of ECLA held in April 1953 at Rio de Janeiro.

In the summer of 1951, UNESCO alerted ECOSOC about the dangerous implications of a paper shortage, and

/in September

In September 1951, ECOSOC passed a resolution requesting the Director General of FAO to advise member governments on a long-term programme to provide all countries with adequate pulp and paper supplies to meet the increasing needs.

Since the adoption of that resolution the acute paper shortage, which had been caused by the Korean raw materials boom, has disappeared. However, the long-term problem remains. FAO, together with the Regional Economic Commissions for Latin America and Europe, has therefore pursued its course of action, in particular:

- Sending pulp and paper survey missions to 24 countries to investigate on the spot the raw material availabilities and economic prospects for establishing pulp and paper mills.

- Organizing in December 1952 a consultation of pulp experts, to determine the technological possibilities and the prospective cost of manufacturing pulp and paper from tropical woods, bagasse, straw and other less conventional raw materials. The results of this consultation were published in a pamphlet entitled Raw Materials for More Paper, which aroused considerable attention and continues to be widely quoted and used. I am happy to welcome here many of those who assisted in that work and upon whose continued co-operation we may still rely.

- Preparing a world survey of pulp and paper prospects which will be presented to the next session of ECOSOC. This has just come from the printer and is being distributed to delegates attending this Meeting.

As these actions were proceeding, we felt that the time was approaching when the results of these technical and local investigations should be placed before Latin American governments, industrialists and technicians. In the summer of 1952, therefore, ECLA and FAO decided to convene, in co-operation with TAA, this Latin American Meeting of Experts on the Pulp and Paper Industry as soon as preparations could be adequately completed.

This short historical description illustrates the great importance which FAO attaches to the present Meeting. You will therefore be scarcely surprised if I tell you that Monsieur Leloup, the Director of FAO's Forestry Division, as well as that Organization's Director-General, Dr. Cardon, had both intended to attend at least part of the Meeting

/themselves. It

themselves. It was a great disappointment to Dr. Cardon that the session of the FAO Council and other urgent meetings prevented him from carrying out this plan. Mons. for Monsieur Leloup, he only decided quite recently that he could not include this Meeting in his other commitments. It is, therefore, my duty first and foremost, to convey to you, on behalf of Dr. Cardon and Monsieur Leloup, their regrets for not being able to join you today and their best wishes for a successful Meeting.

It is customary in opening speeches to characterize the conference as a matter of outstanding importance. Let me assure you that I am not resorting to stock phrases when I refer to the significance of this Meeting; in my opinion, the development of pulp and paper capacity in Latin America is a matter of considerable importance for three basic reasons which, since they are essentially independent, reinforce each other. These three reasons are:

I. High paper consumption and high living standards are almost inseparably linked to each other. A standard of living is made up of many elements, but a high standard of living is never achieved without rather substantial amounts of food, textiles, housing materials and certain other essentials. Paper is one of these essentials. Perhaps the size of the Sunday edition of the New York Times, compared with that of newspapers in France or Britain, does not accurately measure the relative degrees of civilization attained in those countries. Nevertheless UNESCO's contentions remain true: that a first condition for literacy is the availability of textbooks, and that modern democracy cannot function properly without newspapers of a reasonable circulation and size. It is equally true that modern methods of distribution require huge amounts of packaging and wrapping paper both for efficient distribution and in the interest of public hygiene.

The first reason conferring importance on this Meeting, therefore, is that we must provide for rapidly rising supplies of paper in all forms, if we want to make sure that the living standards of Latin American people rise at the rate which appears both possible and desirable.

II. The second important aspect of this Meeting has already been referred

/ to by

to by Dr. Prebisch. It is the part which pulp and paper factories can play in the industrial and economic development of new countries. I have always believed that pulp factories constitute the right type of investment in the early phases of industrialization wherever the three basic needs of that industry - namely, wood, water and power - are present. This is in contrast with various secondary industries which can function well only within the framework of a reasonably advanced industrial setting and which, for that reason, are less suited for the early phases of industrial development.

These are the considerations which have induced FAO and the Economic Commissions of the United Nations to advocate a measure of decentralization of pulp and paper production, and the establishment of capacity in Latin America and certain other regions of the world which have hitherto relied predominantly on imports for their pulp, their paper or both.

Thus the second aspect of this Meeting stems from the fact that it will contribute to sound progress in Latin America's economic development. It may, at the same time, provide new opportunities for closer co-operation between the industrialized countries of Europe and North America and this region, especially if it should be possible to associate the "know-how" of the big pulp manufacturing countries and the exporting interest of the manufacturers of pulp and paper machinery in America and in Europe with the development we have come together to discuss here today. Professor Gunnar Myrdal, the Executive Secretary of the Economic Commission for Europe, with whom it is my privilege to be closely associated, is particularly interested in this aspect of your deliberations, and had planned to come to Buenos Aires in order to take part personally in your discussions with regard to trade and financing. Unfortunately, the important conference on East-West Trade, which is in progress in Geneva, compels his presence there.

III. There is a third reason why this Meeting strikes us, in FAO, as a matter of special importance - namely, that a gradual development of pulp and paper capacity is probably the key that will open the door to that enormous storehouse of wealth constituted by over 900 million hectares of forest located in Latin America. I hope you will permit me to dwell

/on this

on this particular aspect, both to illustrate what I mean and to dispel some dangerous but widespread misconceptions about the relationship between the size of Latin America's forests and the potential importance of its pulp and paper industries, at least in the foreseeable future.

The vast forests of Latin America cover one-third of the land area of this region; they constitute one-fourth of the whole world's forest area. To illustrate the size of this reserve in more tangible terms, it may be recalled that the present world output of pulp and paper requires annually some 180 million cubic metres of roundwood. If one assumed that all Latin American forests can grow wood at their present average rate of 3 cubic metres per hectare and that the annual harvest would include 1 cubic metre of pulpwood, one would find that there are enough forests in Latin America to produce, on a sustained annual yield basis, pulpwood for five times the present world consumption of paper. In fact, Bolivia alone has as many forests as Sweden and Finland combined which together produce 5 million tons of pulp, or more than three times Latin America's current pulp requirements.

Unfortunately, these statistical illustrations are as misleading as they are striking. The possession of adequate forest reserves by no means implies the possibility of establishing a pulp mill. In fact, even in accessible, homogeneous softwood forests, so many other factors have to be present at the same time that only relatively few offer sites suitable for a pulp factory. This is why Latin America, despite its vast forest resources, possesses so few modern pulp factories. And this, of course, is the principal reason why this conference is meeting here today - to devise a practical programme for changing this apparently paradoxical situation.

First, we must abandon sweeping generalizations and look more closely at the raw material resources at hand. I suggest we distinguish four categories, namely:

A. Tropical forests
B. Native conifers
C. Plantations
D. Bagasse

/This list

This list is not exhaustive. I have deliberately emitted some 100 million hectares of temperate broadleaved forests, because, save perhaps in Chile, they do not constitute one of Latin America's principal sources of pulping materials; nor do I propose to take up your time by reviewing the potentially significant contributions from straw, bamboo and various other fibres which the papermaker can use. I will confine myself to the principal materials of immediate practical significance.

A. Let us begin with Latin America's evergreen and deciduous tropical forests which represent the overwhelming bulk of the region's forest resources. They cover some 800 million hectares, more than six times the area of all Europe's forests west of the Soviet Union and, in fact, a land area 60 per cent larger than the entire "old continent".

As yet, these tropical woods are not being converted into pulp. Why not? In the first place, because tropical forests are composed of a great variety of species whereas papermakers have been accustomed to use homogeneous raw materials, such as spruce or pine. Secondly, the difference in specific gravity between tropical species is greater than between temperate woods. Thirdly, tropical woods have hitherto been expensive because only few species have acquired commercial value, with the result that tropical forests are "creamed" rather than logged in a systematic way. Hence, extraction costs are high and, in fact, often prohibitive for all but precious woods.

Finally, the industrial utilization of tropical forests is delayed by the fact that skilled labour, good transport facilities, cheap electric power, chemicals and other essential production factors are not available so that the establishment of a pulp and paper factory involves a far heavier investment than in industrially developed areas.

In a way, these difficulties have acted so far as nature's weapon for self-protection, because had these obstacles not existed, industries might have moved in and created even heavier destruction than they have done in some of the temperate forests of the world. Contrary to widespread belief, many tropical soils, especially in Latin America, are of low fertility, the humus cover is frecuently thin and deteriorates

/rapidly on

rapidly on exposure. The soil is sensitive to heavy rainfall and drought and, once the protecting tree cover is removed, erosion sets in and destroys the land. It is, therefore, indispensable that industrial utilization of tropical forests be preceded by the introduction of scientific management programmes which can safeguard the soil and the forests, and ensure permanent productivity.

Such methods for managing tropical forests exist. They have been successfully tested under commercial conditions in Africa and elsewhere. Also, methods for the pulping of tropical woods have been developed and applied for many years in pilot plants with satisfactory results. In particular, it has been found that the heterogeneous composition of tropical forests is not an insuperable obstacle; tropical mixtures of as many as 50 species have been successfully cooked in a digester and have produced better pulps than when a single tropical species has been used. It seems desirable to establish groups of species so that all wood in a pulping charge should be within a certain range of specific gravity. E.g. from 0.5 to 0.7; these conditions of "homogenized heterogeneity" can be established without undue difficulty. There are cases, it should be mentioned, where homogeneous wood supplies can be obtained also under tropical conditions. All over the tropical parts of Latin America there are important areas covered by pure stands of Cecropia ("cetico" or "guarumo" or "imbaúba"): moreover, pure stands of this species often arise after virgin stands of mixed woods have been clear cut, or after land has been abandoned following banana plantations. Cetico is characterized by very rapid growth and has excellent qualities for both chemical and mechanical pulp.

At the present time, foresters in experimental stations all over the world are searching for means of replacing commercially less valuable virgin stands by second growth forests composed of a somewhat smaller number of desirable species. Considerable progress has been made, and in a few weeks from now results from all over the world will be assembled and considered at the Fourth World Forestry Congress which meets under FAO sponsorship in Dehra Dun, India, and which has selected tropical forestry as its principal theme.

/It is

It is wisely believed that this transformation of the tropical forests into second growth stands of carefully planned composition offers the ultimate solution, not only for rendering these forests generally useful, but also for building up gradually a large pulp and paper industry in the tropics.

All these problems form the major subjects of this Meeting, and I would not dare to anticipate the discussions. I may, however, be permitted a word of warning against the danger of entertaining exaggerated hopes. Progress will be slow; and it must be so if we want to avoid failures and setbacks. But the time has come to make a beginning on an industrial scale, because our knowledge has reached a point when the risk connected with the establishment of a well-planned tropical pulp factory in no longer outside the normal range of business practice provided a proper site is carefully selected. We can no longer afford to let Latin America's tropical forests remain idle. This, Mr. Chairman, is, as I see it, the challenge facing this Meeting.

B. Latin America possesses a second significant source of pulp in its native conifers. Though they cover only some 3 per cent of the total area, they represent some 27 million hectares, or more than the entire forest area of Sweden. Indeed, if they were properly concentrated and accessible, these native conifers would be capable of yielding permanently, on a sustained-yield basis, all the pulpwood necessary to meet Latin America's prospective paper requirements for some time to come.

One must distinguish between two types: most significant are the Araucarias of which the best known is the famous Parana pine, which occupies nearly 10 million hectares in rather close uniform stands in the southern part of Brazil and contiguous portions of Argentina. There already exists in Brazil a large factory producing chemical pulp from Araucaria, a species which poses no fundamentally new problems to the papermaker. Artificial regeneration has given satisfactory results, and yields of 10 cubic metres per hectare and more are being reported. Even a much lower figure would be sufficient to cover Latin America's pulp requirements if all the Parana pine forests were put into use for that purpose and placed under proper management. And although a large

/portion of

portion of these forests is badly located with regard to transport, power and other production factors, Parana pine is bound to remain an important resource for pulp manufacture. However, these big trees constitute a precious reserve for the manufacture of heavy sawn timber and plywood, and should be reserved for these higher uses instead of being put through the pulping chipper.

The second concentration of native conifers lies in Mexico and Central America, especially in Guatemala, Honduras and Haiti. It consists of some 15 million hectares of various pines, most of which are probably suited for pulp manufacture, some already being used for that purpose.

However, a large portion of these pine forests performs important protective functions, and should not be exposed to regular industrial use. Already heavy damage has been inflicted to these stands by over-grazing, excessive grazing, resin-tapping, fire and insects. Therefore only some 2 million hectares in the Michoacán, the Chihuahua and the [illegible] regions of Mexico can be classified at present as a raw material source for pulp manufacture; in due course it may be possible to draw on other portions of Latin America's pines.

Plantations of quick-growing pulpwood species represent a third important resource. 250,000 hectares of Insignis pine, which have been gradually established in Chile since the beginning of the century, have become internationally known for their exceptionally high growth rate, and are said to average 20 and often 30 cubic metres annually per hectare. In a few years from now these plantations are expected to yield over 3 millions cubic metres of pulpwood annually. One factory to manufacture newsprint is now under construction there, and work is expected to commence shortly on a kraft pulp mill.

Plantations on a fairly substantial scale have been started with Araucaria in Brazil and in Argentina, with tropical broadleaved trees in certain parts of Brazil and with quick-growing poplars in the Delta del Plata. The potential significance of plantations for the supply of pulpwood is considerable, since 1 million hectares of such plantations could once again produce continuously, in reasonably accessible locations and in concentrated homogeneous stands, all the pulpwood which Latin

/America might

America might require.

Plantations are attractive since they introduce the idea of moulding nature to industry's needs, a procedure which might prove easier or cheaper than the usual course of adapting industry to nature. But the problem is not so simple as it looks. Experience shows that pure, even-aged stands of one species only are extremely vulnerable to insects and disease; it is also believed that monoculture may adversely affect soil conditions. In any case, basing a big new industry on a few hundred thousand hectares of forest plantations, simply because one has not yet been able to solve the problems connected with the use of hundreds of millions of hectares of natural forests, may seem expedient but does not impress me as the sound long-term solution which we have come here to discuss.

D. A fourth and rather important source of pulping materials exists in sugar cane bagasse. Latin America's annual supply of this waste product is estimated between 12 to 15 million tons dry weight.

Now if all the bagasse produced in Latin America were available for industrial conversion, some 6 million tons of chemical pulp could be obtained, about four times the equivalent of the region's present paper consumption. In fact, only a fraction of the figure mentioned can ever be made available for papermaking. Bagasse is the main fuel of the sugar mills, and significant surpluses become available only in modern mills which have efficient boilers, or in locations where cheap alternative fuel is available. Also, the fact that many sugar mills operate only three-six months a year means that bagasse would have to be baled, dried and stored at considerable cost in order to permit continuous pulp manufacture.

Hence, possibilities for establishing a pulp and paper manufacture based on this agricultural residue are more limited than might appear at first sight. However, it is important to remember that long-fibre pulp of good quality can be produced from bagasse by methods which have only recently been perfected, and about which more will be heard in the course of this Meeting. Thus, the already enormous reserve of pulping materials from Latin America's forests can be supplemented by a limited but

/nevertheless important

nevertheless important supply of agricultural residues, which is likely to become of particular significance in Central America and the Caribbean.

The basic impression which this very summary review of Latin America's resources for pulp manufacture is bound to produce, is best characterized by the French term "un embarras de richesse". And yet, despite this wealth, and despite the well-known dynamism and spirit of adventure of Latin America's industrialists, the region possesses to date but few modern installations for the manufacture of chemical pulp, and only one modern newsprint mill.

A closer look at the region's present pulp industry reveals two further significant facts. First, that all the existing pulp mills are based on what one might call the traditional, but in Latin America secondary, sources of fibre; and, second, that despite the abundance of such traditional raw materials as native conifers, forest plantations and agricultural residues, the pulping capacity of Latin America is still only some 500,000 tons or less than one-third of the region's current consumption.

In my opinion, this situation can be attributed in part to the inadequacy in supply and in part to the unsuitability of the raw materials. To be sure the pulping of tropical woods is only in its beginning. However, the growth of a large pulp and paper industry also depends considerably on the general industrial progress of the region, on the availability of capital and equipment and on several similar factors. I sincerely believe that industrialization and general economic conditions for progress have reached a point where they will permit the rather rapid growth of a substantial Latin American pulp and paper industry. I further feel pretty sure that, in the course of this process, it will be found that Latin America's raw materials are far better suited to pulp manufacture than they were previously believed to be.

In making these statements, I am thinking primarily of the tropical forests, both in their present state and that of the second growth stands into which they should be gradually transformed. I must admit that this belief is influenced by a very deep-rooted desire for such a development.

/For, indeed,

# Appendix II

## SUMMARIES OF THE TECHNICAL STUDIES PRESENTED TO THE LATIN AMERICAN MEETING OF EXPERTS ON THE PULP AND PAPER INDUSTRY

# PULP AND PAPER CONSUMPTION, PRODUCTION AND TRADE IN LATIN AMERICA

## Paper for Printing and Writing
## Tentative Forecasts for Demand in 1955, 1960 and 1965

by The Intelligence Unit of The Economist, London, and UNESCO

The Economist Intelligence Unit was asked by UNESCO to prepare forecasts of demand for (a) newsprint and (b) printing paper - other than newsprint - and writing paper, in the years 1955, 1960 and 1965, in all countries and territories of the world where demand for either one of these two groups of commodities is expected to be at least 50 metric tons yearly before 1965.

In the preparation of such estimates, special consideration was given to the following factors:

(i) Demographic trends. Here an examination was made of the present level of population, the rate of growth of population in recent years, and the probable change in the absolute numbers and the age structure of the population.

(ii) Trends in Literacy. Where data was available, a study was made of the trend towards the elimination of illiteracy in the country concerned. This trend was then associated with the likely change in the demographic trends.

(iii) The trend of domestic paper production. The possibility of demand being either partly or entirely met by domestic production was considered to be one of the important factors influencing the level of consumption in a given area, since it would free a particular country or territory from eventual marketing or foreign exchange problems.

(iv) Probable fluctuations in income. For certain countries, it was possible to relate paper consumption to the present levels of over-all or per capita national incomes in real terms; then an estimate was made to establish the probable trend of real income during the period under consideration in order to determine, at least to some extent, the probable levels of future demand.

/In short,

In short, the methods used were basically non-statistical in the sense that no elaborate statistical relationships were established nor correlations attempted. The relevant variations were considered to be so numerous and their long-term trends so uncertain that the results of any complex statistical analysis would have been of doubtful value. In fact, a careful examination and assessment of the importance of the relevant factors relating to each country or territory was felt to be the only method likely to produce worth-while results.

The figures shown in the paper are the result of the analysis made. Country by country forecasts are given only for America, and in particular Latin America. Lack of data on the consumption of "other printing and writing paper" prevented forecasts being made for Cuba, Honduras and Uruguay. In the case of Argentina, it was difficult to suggest estimates of future demand for (a) newsprint and (b) other printing and writing paper because the "true" level of demand in post-war years is not exactly known. In particular the forecasts of future demand for newsprint are speculative and may well prove to be inadequate. They should be interpreted with caution.

## Consumption trends in Wrapping, Packing and Industrial Papers and Paperboard

by Louis T. Stevenson

This paper discusses growth trends in the United States in the hope that a study of these may be helpful to the pulp and paper industry in Latin America.

The tremendous growth in the consumption of packaging paper and board in the United States has been due largely to mass-marketing techniques, including national advertising, standardized packaging and display techniques. Paperboard has lent itself readily to this through its ability to carry both the advertising message and the product. The growth of the chain stores and supermarkets has at once facilitated and been made possible by these developments. Paper and board have played an important role in this revolution in distribution. Economy of packaging, safety in transportation and encouragement of impulse buying have been important factors. Per capita

/consumption is

consumption is rising, and with increasing population the rise in consumption is expected to continue.

A projection of past trends indicates a demand in 1965 of over 17 million tons for paperboard and almost 5 million tons for coarse paper. Whether these levels of consumption will be realized depends upon the continued development of new uses. If manufacturers aggresively continue their research and development programmes these figures may well be attained.

## World Trends in Consumption of Newsprint, other Printing Paper and Writing Paper

by UNESCO

### Newsprint

Between 1928-1930 and 1950-51, world newsprint consumption expanded from an average yearly level of 6,340,000 tons to 9,283,000 tons.

In 1931-1933, owing to the depression, the average level of world consumption dropped to 5,786,000 tons. It then rose from 6,508,000 tons in 1934 to 8,095,000 tons in 1937, but dropped to 6,801,000 tons with the recession which took place in 1938.

From 1939 onwards, as a consequence of the second world war, world newsprint consumption dropped from 7,071,000 tons in the first year of the war to 4,549,000 tons in 1944.

From 1945 to 1951 increasing production gradually made it possible, as the world economic position recovered in the post-war period, to close the gap which had existed between supply and demand since 1939. It was only in 1949, however, when 8,464,000 tons of newsprint were consumed, that the pre-war yearly high of 8,095,000 tons in 1937 was surpassed.

The yearly average increase in world newsprint consumption from 1934 through 1937, when ground which had been lost during the depression of the early 1930's was being regained, was close on 600 thousand tons. The average yearly increase which took place in the post-war immediate period of recovery (1945 through 1950), was approximately 760 thousand tons.

Latin American newsprint consumption increased, between 1929 and 1947, in every year when the world figure advanced. Moreover, Latin

/American newsprint

American newsprint consumption increased in five years between 1929 and 1947 when aggregate world consumption dropped; these years being 1932, 1939, 1941, 1943 and 1944.

Excepting second world war years, the only years between 1929 and 1947 when the Latin American figure dropped were 1930, 1931 and 1938, when recessions in the United States affected the economy of several Latin American countries. While Latin America failed to show an increase in consumption in 1948, 1949 and 1950, this was not due to a decrease in aggregate demand but a consequence of the world newsprint shortage and of restrictions on imports made necessary in several countries by "hard" currency shortages. Excluding Argentina, which was perhaps the country most affected by the newsprint shortage, Latin America showed the following increase in consumption over the previous year: 13 thousand tons in 1948, 5 thousand tons in 1949, 17 thousand tons in 1950 and 30 thousand tons in 1951. Average yearly growth of Latin American newsprint consumption in 1947-1951 (excluding Argentina), was 17 thousand tons. The volume of demand for newsprint which remained unfilled in Latin America during this period is, however, not known exactly.

The second world war vastly changed the pattern of world newsprint distribution, the average figures for 1940-1945 being, in comparison with those for 1928-1939, as follows:

| Increases | | Decreases | | No change |
|---|---|---|---|---|
| United States and Canada | 16.8% | Europe | 15.6% | South Central Asia |
| Latin America | 1.4% | Far East | 1.3% | South East Asia |
| Near and Middle East | 0.1% | Oceania | 0.5% | |
| | | U.S.S.R. | 0.6% | |
| | | Africa | 0.2% | |

During the period 1946-1951, the newsprint purchasing position of United States consumers remained strong in comparison to that of consumers in other parts of the world, mainly owing to the division of world trade into "soft" and "hard" currency areas. The average percentage of world newsprint supplies consumed in the different areas in 1946-1951, in comparison to the 1928-1939 average, was as follows:

/Increases

| Increases | | Decreases | |
|---|---|---|---|
| United States and Canada | 14.0% | Europe | 15.0% |
| Latin America | 1.2% | Far East | 1.6% |
| U.S.S.R. | 0.9% | Oceania | 0.2% |
| South Central Asia | 0.3% | | |
| South East Asia | 0.2% | | |
| Near and Middle East | 0.1% | | |
| Africa | 0.1% | | |

The above figures would seem to indicate that the main trends in world newsprint distribution in the post-war years have been:

(1) A tendency for the combined United States and Canadian share of world supply to recede slowly.

(2) A lasting contraction, in comparison with pre-war, in the share of world supply taken by Europe (excluding U.S.S.R.)

(3) A stable consumption, on the long-term average, in Oceania, of approximately 2.5 per cent of the total world supply.

(4) A long-term trend, in the underdeveloped areas of the world - Africa Asia, Latin America, the U.S.S.R. - to take a larger share of world newsprint supply.

An examination of the growth of newsprint consumption in 1950-1951 over pre-war (1935-1939) in the various underdeveloped regions furthermore shows that, despite the world newsprint shortage and "hard" currency shortages, this expansion has been of 118 per cent in the near and Middle East, 100 per cent in South Central Asia and in Latin America (excluding Argentina) and 80 per cent in the U.S.S.R.; figures which compare with an increase of 67 per cent in aggregate United States and Canadian consumption.

Printing Paper (other than Newsprint) and Writing Paper

Only incomplete statistics are available on the world's consumption of other printing paper and writing paper. Nevertheless, consumption outside the People's Republics may be roughly estimated to have been as follows from

/1947 to

1947 to 1951: 1/

| | (Metric tons) |
|---|---|
| 1947 | 6,000,000 |
| 1948 | 6,200,000 |
| 1949 | 6,200,000 |
| 1950 | 7,000,000 |
| 1951 | 7,800,000 |

The above data would put the average yearly increase in world consumption (excluding the People's Republics) at approximately 450 thousand tons in 1947 to 1951. However, as consumption gains appear to have been much greater in 1950 and 1951 than in 1947-1949, and as the time series over which data are available is very short, it appears difficult to draw any definite conclusions in this respect.

Data on Latin American consumption of other printing paper and writing paper is only available for the years 1947 to 1951, and this excluding, for lack of information, consumption in the Bahama Islands, Barbados, Bermuda, British Honduras, British Guiana, Cuba, Guadeloupe, Honduras, Jamaica, Netherlands Antilles, Windward Islands and Uruguay. The incomplete figures which are known are given below:

| | (metric tons) |
|---|---|
| 1947 | 202,000 |
| 1948 | 182,000 |
| 1949 | 187,000 |
| 1950 | 216,000 |
| 1951 | 234,000 |

Judging from the above figures, Latin America would consume between 3 and 4 per cent of the printing paper (other than newsprint) and writing paper used in the world (excluding the People's Republics).

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1/ As used in the present paper, the term "People's Republics" is taken to include: Albania, Bulgaria, Continental China, Czechoslovakia, German Democratic Republic, Hungary, Korea (North), Mongolian People's Republic, Poland, Rumania, U.S.S.R. and Yugoslavia.

# ECONOMIC ASPECTS OF PULP AND PAPER MANUFACTURE FROM LATIN AMERICAN TROPICAL AND SUB-TROPICAL HARDWOODS

## Influence of Mills Size and Integration upon Investment and Cost

by AB Karlstads Mekaniska Werkstad

This paper consists of 15 specially prepared tables providing cost data for non-integrated and integrated sulphate kraft pulp mills. Comparisons are made for daily capacities of 50, 100, 200 and 300 metric tons, and for bleached and unbleached pulp. Capital investment requirements, labour and administrative costs and building volumes are all calculated for the different types of mill.

The general conclusion of the paper is that under Swedish conditions it is not profitable to build pulp or paper mills with a daily capacity of 50 tons or less, and that to be profitable the capacity should be at least 100 tons a day.

## Surveying of Locational Factors for the Installation of Pulp and Paper Industries in Tropical Regions

by The Centre de Recherches et d'Etudes pour l'Industrie de la Cellulose et du Papier

Tropical raw materials for the pulp and paper industry are abundant and cheap, but a detailed preliminary study is required before preparing definite plans to install an integrated pulp and paper mill.

This preliminary study falls into four distinct phases: (1) a rapid survey of the country as a whole, and of the general possibilities for pulp and paper development; this survey will enable certain areas to be delineated within which there seems to be a prima facie case for establishing a new project; (2) a more intensive survey of the areas selected, and a consideration of the process to be adopted; prospective sites will now emerge; (3) a detailed study of local conditions, covering all aspects of intended operations; and (4) an appraisal of production conditions, financial requirements, and production costs.

/The paper

The paper discusses the categories of information which must be sought at each stage, and the methods by which it can be obtained. The need for making the fullest possible use of existing sources of information is stressed.

## Forest Inventories in Tropical Regions

by Dammis Heinsdijk

More intensive management in temperate forests has led to the need for better assessment of forest resources. Earlier inventory techniques have been improved to give greater precision. In tropical forests, though a wider margin of error may be acceptable, the risks involved in pioneer development impose the need for careful assessment.

In the tropical forest there is no technical alternative to aerial survey combined with surface sampling. The latter is difficult and costly, but the extent, and therefore the expense, of the field work necessary to achieve a required degree of precision can be considerably reduced by appropriate air surveys and correct interpretation of air photographs. The experience and skill of the photo-reader are extremely important, since skilled interpretation, making use of data accumulated in widespread sampling, can provide a wide range of information.

Aerial survey can do little to help the entrepreneur concerned with the selective exploitation of a limited number of precious species. So far as pulp exploitation is concerned, the wider the range of fibres (and species) acceptable for pulping, the better will be the information obtained, both in volume and precision, for a given expenditure.

The paper presents some preliminary results of field work carried out in the Amazon. The experience of tropical inventorying in the Amazon so far tends to confirm that acquired by the author earlier in Surinam.

/Preliminary Projects

## Preliminary Projects for Pulp Mills and their Service Facilities in Tropical Regions

by The Centre de Recherches et d'Etudes pour l'Industrie de la Cellulose et du Papier

This paper sets out the general principles to be borne in mind in drawing up plants for the establishment of a pulp mill in a tropical region. It examines the various stages, from the conception of the plant and the specification of equipment and buildings, to the laying down of a work schedule in its different phases; it draws attention to the difficulties which are likely to be met with at each stage in consequence of the special environmental conditions (climate, lower productivity of labour, communications, etc.).

While the method of building a tropical mill does not differ essentially from that employed in building a mill elsewhere, planning needs to be at once more detailed and more flexible. Generally speaking it will take longer, and the work schedule must allow for the fact that, because of the lack of local expertise and the distance from equipment suppliers, relatively slight hitches, which could be rapidly overcome in a developed country, can occasion considerable delays and pile up costs.

## Wood Extraction and Transportation in Tropical Regions

by Pierre Allouard

This paper describes the conditions offered by tropical and sub-tropical forests for the extraction and transport of wood for making pulp. It also examines the influence exerted by these conditions on the investment required for exploitation and on the cost of the wood delivered to the mill.

Certain sites were selected to illustrate these points. These were in Yucatán (Mexico), Amapá (Brazil), Misiones (Argentina) and the River Magdalena Valley (Colombia), in which the author either carried out surveys or undertook visits of inspection.

Estimates of pulpwood costs in these four locations are given, explained and compared.

/Economic Availability

## Economic Availability of Pulpwood from Latin-American Sub-tropical Forests

by Orlando A. D'Adamo

This paper emphasizes the need for comprehensive planning of raw material supplies from sub-tropical forests for industrial pulp and paper mills. The danger of exhausting forest reserves must be avoided. In the case of tropical and sub-tropical rain forests, irrational exploitation inevitably leads sooner or later to a limitation of industrial development, with consequent economic and social disturbances.

Industrial planners must recognize the fundamental need to conserve forest stands either by reafforestation or by natural regeneration. Studies carried out in heterogeneous forests in the Province of Misiones (Argentina) show the economic possibility of ensuring industrial supply by applying specific sylvicultural methods.

The paper considers the economic exploitation of tropical forests for the dual purpose of: a) providing raw material for the pulp and paper industry; and b) providing raw material for other industries. This dual possibility arises from the very nature of the stands, where species of recognized industrial and commercial value are found in association with others of little or no value. The utilization of the latter in the pulp and paper industry would provide all the conditions for conserving and improving Latin-America's forestry resources.

## Pulpwood from Peruvian "Cetico" (Cecropia)

by Banco de Fomento Agropecuario del Peru

The paper assesses the forestry resources of the Amazon basin and goes on to give a detailed description of the botanical and silvicultural characteristics of Cecropia. This tree grows rapidly, has good fibre properties and is ideally suited to provide raw material for making pulp and paper.

The Banco de Fomento Agropecuario del Peru began studies in 1939 to determine the technical and economic possibilities of using this raw

/material. Tests

material. Tests made by the Cellulose Development Corporation (England), by a pulp mill at Turin (Italy) and by the Batineyret Company (France ) led to the production of several tons of newsprint; these were used for normal newspaper issues in Italy, France and Peru.

At the same time the Peruvian National Aerial Photography Service carried out a preliminary inventory which indicated that there were large stands of cetico in the Pucallpa region. This is undoubtedly the most suitable area for installing a pulp and paper mill.

The sylvicultural studies on the spot have examined the characteristics of the natural growth and regeneration of cetico and the possibility of establishing plantations.

According to the work undertaken in Italy and England and in connexion with the Batineyret project, paper produced entirely from cetico can compete in the Lima market with imported papers; a mill with an annual capacity of 18,000 tons could be installed in the zone of Pucallpa. Peru currently imports some 12,000 tons a year of newsprint, at a cost of three million dollars.

A FAO mission has advised that the project is perfectly feasible, both from the technical and the economic standpoint.

## Pulping of Latin American Woods

by G.H. Chidester and E.R. Schafer

This report describes briefly various pulping experiments at the U.S. Forest Products Laboratory on 39 individual species and 10 mixtures of species. The various mixtures were comprised of some of these woods and 70 additional ones, making a total of 109 woods tested individually, or in mixtures, or both. The mixtures ranged in composition from 2 to 32 different woods.

## The Technique of Pulping Mixtures of Tropical Woods

by Régie Industrielle de la Cellulose Coloniale

This paper aims at demonstrating that from the point of view of the pulp and paper industry the only rational exploitation of tropical forests

/consists of

consists of pulping mixtures of various species. The advantages of pulping mixed woods shown by tests carried out in a pilot plant installed at Bimbresso on the Ivory Coast are discussed, and the results obtained with alternative mixtures of twelve different species are shown.

The second part of the study describes the mixing technique used in order to pass from the laboratory to the industrial stage. Moreover, tropical species are classified into two groups according to their paper-making and pulping properties.

As regards to variations in the composition of the mixtures, the results obtained in two series of studies are examined, their respective objectives being to assess the degree of variation allowable within each mixture and to determine the effects of too great a variation.

The regeneration of the forest after its first exploitation should tend towards "controlled heterogeneity".

It is stated that the composition of the mixture can contain important botanical differences without prejudicing the constancy of results, and it is suggested that the sulphate or the soda-sulphur processes with slight modifications according to the mixture are the most suitable.

## Preliminary Results on the Pulping of some Brazilian Tropical and Sub-Tropical Hardwoods

by L. Rys, A. Boenisch, W. Overbeck and H. Schwarz

About twenty tropical wood species from the Amazon region and thirty species of subtropical wood from Paraná State were examined as to physical properties, chemical wood composition and fibre length, and microphotographs of the fibres of these single woods after cooking by the sulphate process are presentes.

The mixture of these woods was cooked in a laboratory digester, using the standard sulphate process. The resulting pulps were tested before and after bleaching and the mechanical properties determined after beating in a laboratory Valley beater.

It was found that the mixture of woods with a density range from 0.25 to 1.1 could be cooked successfully by the sulphate process, and the resulting pulp could be bleached to a good colour without difficulties, using a normal three-stage bleaching method.

/The mechanical

The mechanical strength of these pulps, bleached or unbleached, is satisfactory for paper making.

These results indicate that similar tropical or subtropical wood could be used for paper making without any special selection.

## The Pulping of Peruvian Cetico for the Manufacture of Newsprint by Batineyret

During 1951 and 1952, at the request of the Corporación de las Amazonas (later to become the Departamento de la Selva de Fomento Agropecuario del Perú), the French firm of Batineyret studied the possibility of manufacturing newsprint from Peruvian cetico. For this purpose, the Corporación de las Amazonas sent 50 tons of cetico logs to France.

Part of this wood was treated industrially in a mechanical pulp mill in the French Alps. A mechanical pulp was obtained with good physical properties.

Mixed with 25-30 per cent chemical spruce pulp, the cetico mechanical pulp gave a paper comparable in every aspect with ordinary newsprint. This paper was used successfully for a February 1952 issue of a French daily newspaper.

### Cetico Chemical Pulp and 100 per cent Cetico Paper

Laboratory and semi-industrial trials were then undertaken, using the sulphate process to ascertain whether cetico chemical pulp could be used as a substitute for resinuous chemical pulp in the manufacture of newsprint. Bleached and unbleached pulps were obtained, with characteristics very closely resembling those of pulps from European resinous species, and only slightly inferior to spruce pulp characteristics.

From a mixture of cetico chemical and mechanical pulps (35 per cent chemical), newsprint was manufactured on a semi-industrial scale; this had characteristics wholly similar to those of newsprint currently available on the world market.

A Batineyret mission spent several months in Peru studying local conditions for establishing a mill. Details of organization, production and cost price were considered.

/The mission

The mission studies the availability and cost of all raw materials, the organization of transport facilities; sources of power; mill site; cost of manual labour; investment; and working capital required. It was concluded that the establishment of a newsprint-mill, using cetico as raw material, would be a technically feasible and profitable undertaking.

## Economics of Newsprint Production

by P.R. Sandwell, President, Sandwell & Co. Ltd.

In the major newsprint export countries the minimum economic size of a new newsprint paper mill has risen from 300 to 500 tons of daily capacity in the past fifteen years. The purpose of the paper is to discuss the reasons for this situation and to examine the extent to which they would apply in Latin America. The information contained in the paper is intended to explain current North American newsprint manufacturing practices and to establish a basis for assessing proposed developments in Latin America.

In Part I of the paper the relationship between mill size and capital investment and the corresponding total fixed charge against production is evaluated for North American and European conditions. Similar relationships between mill size and manufacturing cost and profit are developed. It is evident on the basis of the figures so developed that in North America and Europe a new mill to produce newsprint in its usual form can only do so economically if it is of relatively large size. Part I concludes by enumerating the conditions which have fostered and allowed this situation.

Part II of the paper deals with Latin American conditions. Comparative relationships between size and capital investment are developed for a hypothetical mill which would have raw materials suitable for pulping by conventional methods and which would serve the larger metropolitan markets. Capital costs are found to be more or less the same, and because of compensating factors, fixed charges are found to be about the same as in North America. General economic circumstances in respect to markets, raw materials, energy, transportation, labour, and sources of capital alter the relationships between mill size and manufacturing cost and profit as they are known in North America.

/On the

On the basis of conventional techniques, and under the conditions assumed for the purpose of this paper, it appears that newsprint can be produced economically in mills of more modest size in Latin America than in the Northern Hemisphere. Very small mills, sized to match raw material or market conditions, require either some special local advantage or integration with other plants in order to make them economic. It is evident, however, that conditions in Latin America are sufficiently different from those in North America to justify departure from conventional techniques. More liberal paper quality requirements and the current development of new processes well suited to Latin American raw materials suggest the possibility of new mill designs, equipment better suited to small capacities, and a balance between heat and power, the combination of which may well overcome the disabilities of the cost patterns inherent in conventional newsprint manufacturing techniques.

## The Use, in Newsprint, of Bleached Cold Soda Pulps from certain Mixtures of Latin American Hardwoods

by G.H. Chidester and K.J. Brown

The high yield, cold soda pulping process was applied to two mixtures of Latin American hardwoods. Mixtures of equal parts of 8 hardwoods from the Yucatán forests and 4 Brazilian eucalypts were pulped under varying conditions. Quantities of the cold soda pulps, prepared under optimum conditions, were semi-bleached and used in newsprint papermaking trials.

The major results were as follows:

(1) Newsprint papers made entirely from the semi-bleached cold soda pulps were more than adequate in strength and brightness but were more transparent than standard newsprint, and the porosity was high. The opacity was improved equally as well by adding 40 per cent of groundwood pulp or 15 per cent of clay to the furnish containing the Yucatán cold soda pulp. These additions also decreased the strength properties of the paper, but not below those of a commercial newsprint.

(2) Satisfactory cold soda pulps were obtained in yields of 84 to 91 per cent. The pulps were bulky and slightly darker and weaker than cold soda pulps prepared from aspen and cottonwood by this process.

/(3) The

(3) The cold soda pulps were bleached to brightnesses in a range of 56 to 69 per cent by the application of calcium hypocholorite with 10 to 15 per cent available chlorine based on the moisture-free pulp. The pulps had good appearance and were satiafactorily free of shives.

## Economic Aspects of Integrating Pulp and Paper Industries with other Forest Industries

by J.A. Hall

In this paper the author points out the effects of a rational exploitation of the forest on its yield, and the advisability of integrating the forest products industries in order to make the best possible use of the crop.

It is emphasized that the industrially less-developed countries of the world should take advantage of the experience gained by those countries with a higher degree of industrialization, and reference is made to the special example provided by the United States whose forest resources were almost depleted in the past century in order to meet the extraordinary demand for wood resulting from its industrial development. Fortunately, it was gradually realized that the character of the forests is limited and that it would be necessary to exploit them in an integrated form in order to be able to produce the wood needed to maintain the standard of living.

It is recommended, therefore, that, in the long-range planning of the exploitation of Latin American forest resources, integrated operations should be envisaged such as are now common in the northern hemisphere.

The author points out an important feature of forest crops, namely, that the methods used in harvesting go far towards determining the yield and quality of succeeding crops.

Reference is made to an ideal integrated plan according to which the residue from one stage in processing would be picked up and used at an earlier stage, and in which activities based on mechanical conversion, such as sawmills and chemical industries like that of pulp and paper, would take a part. Chemical industries act as scavengers, converting great quantities of waste material into valuable products.

Next are reviewed the minimum economic size of each component of an

/integrated operation

integrated operation, the size of the potential market for each product, the adequate forest inventory which is a prerequisite for the establishment of an integrated industry as well as the adequate marketing research.

The degree and form of integration that is best for any given situation such as the size and character of forest ownership, the history of forest exploitation and development, the nature of the industrial setup and various economic conditions such as density of population, size of the potential market, distance from markets, transportation facilities, sources of power, etc. are also discussed here.

Completely integrated operations usually demand a sustained supply of raw material. In many cases such a supply is dependent upon the general state of industrial and cultural development in a given area. Integration, therefore, will usually proceed parallel to the general industrial development of the country. If this moves too fast, it may bog down in raw material shortages or a lack of markets for its products.

Wood by-products are briefly enumerated and some important comments are made on the use of wood as a source of carbohydrates which in their turn could serve to increase the world food supply.

Finally, it is stated that planning for the integrated utilization of a forest in an industrially under-developed country requires vision, study, and careful consideration of inter-related economic factors. The result of such planning would be the more complete employment of wood in meeting human needs.

## The Amazon Region and the Paper Industry

by A. de Miranda Bastos

The Amazon basin covers a vast area of some 7 million square kilometres, about half of which lies within the territory of Brazil. Because of its extent and the variations in its climate, it contains a large variety of trees, which have been the object of research for many years. It is only recently, however, that a systematic study has been made of the density of the stands in some areas and of their economic value in terms of area covered, means of transport, composition of the stands and frequency of the various species.

/The Amazon

The Amazon basin is destined to become a world centre of pulp and paper production. Nevertheless, many of the projects and plans put forward over the last fifty years with a view to industrializing local economic resources, have been doomed to failure. There have been many reasons for such disappointments, including shortage of capital and labour, unhealthy conditions, poor transport and insufficient agricultural production to meet local demand.

These difficulties are in course of being overcome. Towards the end of 1951, the Food and Agriculture Organization of the United Nations appointed a mission which is making field studies. Its findings will be particularly interesting, in view of the information and recommendations contained therein.

In addition, the Superintendencia do Plano de Valorizacao Economica da Amazonia (SPVEA) set up in 1953 to foster the development of agricultural, industrial and mining production in the region, is undertaking development work of a positive nature, for which it has large and ever-increasing economic resources at its disposal. The Federal Territory of Amapá, created in 1943, contains, apart from its fibre resources, rich manganese deposits and a considerable hydro-electric potential, and has helped to develop the Brazilian Amazon region. Studies of forest species have been made in the Territory with a view to exploitation. Experts from FAO and ECLA have concentrated their efforts on the area close to the Paredao waterfalls on the Araguavi river; a hydro-electric plant is planned at these falls, with an initial capacity of 25,000 kilowatts and possibilities of expansion to 100,000 kilowatts. All the conditions are present for converting this zone into a large paper-producing centre. Light-coloured species, with a low density, predominate in the area. It has been estimated that economic exploitation could be based on a minimum of 250 cubic metres per hectare. Again, surveys made in the vicinity of the Vila-Nova River proved that, on the basis only of trees with diameters of more than 30 centimetres, over 240 cubic metres of usable wood per hectare would result; this wood conversely, is dark-coloured and has a high density. This proves that there is an immense variety of species to be found in the region and that, as regards the paper industry, the important thing is to know how to select the area which will meet technical and economic requirements.

/Potential Use

## Potential Use of Wood from the Upper Parana (Paraguay) for making Pulp and Paper

by E.B. Hamill

The dense sub-tropical forest of the Upper Paraná, in Paraguay, has excellent potentialities for the establishment of a pulp and paper industry. The soil is fertile and the climate is good; large coniferous plantations can be developed; there is a navigable river system; plenty of water is available for pulping operations and as a potential source of hydro-electric power. The Servicio Técnico Interamericano de Cooperación Agrícola, at the request of the Paraguayan Government, undertook a study which established that the installation of a pulp and paper industry in this area would be a key factor in an integrated forest utilization programme and in the colonization of the region. The problems to be solved are of an economic rather than of a technical nature.

The upper Paraná forest is some 350 kilometres in length and from 50 to 75 kilometres wide. A section of this area extending some 100 kilometres along the Paraná river and about 30 kilometres wide offers the best prospects. It is crossed by navigable rivers and contains the three most important hydro-electric potentials. There are on an average some 30 different tree species per hectare; Leguminosae predominate, over 27 of that family having been identified. Enough varieties of bamboo are found to provide roughly 10 per cent of the fibrous raw material available in the Alto Paraná for paper making. It is estimated that, including all species, this region could supply about 100 cubic metres of usable wood per hectare.

Despite their heterogeneous nature, the species of the Upper Parana forest region, mixed in the same proportion as found, will make a homogeneous paper pulp under normal working conditions. No special methods are required. The use of chemicals is relatively low in both cooking liquor and bleaching. The pulp is not suitable for making high-resistance packing paper, since its properties are only average, but by mixing it with 40 to 60 per cent coniferous pulp or pulp made from certain tropical plants, first quality wrapping papers can be obtained. The pulp is easy to bleach and can be used to make various types of writing paper. Mixed with 20 to 40 per cent of coniferous pulp, it can be used for fine printing papers. It can be blended

/with mechanical

with mechanical pulp or other low-grade materials to make ordinary writing or printing papers; there seems little likelihood, however, that the pulp could be used alone for making newsprint, in view of its poor resistance characteristics. Tests of the suitability of Upper Parana species for making purified pulp for chemical use do not entirely rule out this possibility, though they lead to no definite conclusion.

## ASPECTS OF PULP AND PAPER MANUFACTURE BASED ON OTHER LATIN AMERICAN FOREST RESOURCES

### Mexican Experience with Coniferous Plantations for Pulp and Paper

by Hans Lenz

In Mexico industrial plantations of timber were originated by paper manufacturers with a view to increasing their long-term resources of raw material. The paper describes the results achieved at the privately-owned plantation of "La Venta", located 24 kilometres from the capital, at an average altitude of 2,700 metres. This plantation has supplied wood for the paper industry since 1920.

Planting tests have been made with a number of exotic species such as Pinus radiata, P. caribaea, P. nigra, P. alepensis, P. resinosa, P. ponderosa and others, and also with Douglas fir (Pseudotsuga taxifolia) and Abies concolor. It has been found, however, that the native species yield better results particularly Pinus patula, P. montezumae and Abies religiosa (oyamel). Special care has to be taken to protect the oyamel during its growing period.

The experience at "La Venta" has been corroborated by similar work carried out at Zacayucan where the first trees were planted in 1936. Here the species have had to be limited to pines (Pinus patula and P. montezumae) since the oyamel did not thrive because of the altitude.

### Pulpwood from Eucalyptus Plantations

by Armando Navarro Sampaio

In this paper the author deals with the economic culture of the eucalyptus in the State of Sao Paulo, Brazil, initiated in 1903 by the Paulista Railroad Company, under the directoin of the agronomist Edmundo Navarro de Andrade.

/After a

After a brief historical description of the dissemination of the genus Eucalyptus in Latin America, observations are presented on the behaviour of the different species in various types of soil and climate, bearing in mind the future utilization of the wood.

He describes in detail methods of planting and soil treatment, control of diseases and pests, and the problem of fires.

He also presents in detail a plan for the selection of genetic studies on the principal species planted.

Estimates in physical units, and in Brazilian currency per hectare have been made on the cost of planting and cultural operations until the exploitation of the wood.

The best methods of exploitation of the wood for various purposes are described, and presented together with statistical data on fuelwood production per hectare, and the development in diameter and height of the different species planted in the State of Sao Paulo.

He includes all the data obtained during fifty years of research, on the various uses of eucalyptus wood for fuel, charcoal, posts, piles, sleepers, civil constructions, joinery, pulp, essential oils and tannin.

The result of the author's observations in Australia, where he travelled during September and October of 1952 as Brazilian representative in a UNFAO mission to study the use of eucalyptus for pulp and paper, are also related. He visited three big paper factories there working with eucalyptus pulp, utilized in the following proportions:

| | |
|---|---|
| Newsprint paper - Eucalyptus pulp | 80% |
| Long-fibre pulp | 20% |
| <u>Mechanical pulp</u> | |
| Kraft paper - Eucalyptus pulp | 60% |
| Long-fibre pulp | 40% |
| <u>Chemical pulp</u> | |
| Superior quality paper for books, magazines and writing paper | |
| Eucalyptus pulp - | 90 to 100% |

Finally he describes what is being done in relation to the production of pulp and paper from eucalyptus wood in the State of Sao Paulo, where there are several firms producing different types of paper using varying proportions of <u>Eucalyptus Saligna</u> pulp, together with mechanical pulp from

/the Paraná

the Paraná Pine (Araucaria angustifolia)or imported long-fibre pulp. The average proportion of eucalyptus pulp used in the fabrication of writing paper and book paper in Sao Paulo is 75 per cent.

## Pulpwood from Plantations of Exotic Confiers in the Paraná Delta by Celulosa Argentina S.A.

1) During 12 years of experimentation with 9 species of conifers in the low floodlands of the Paraná Delta, only Pinus Elliottii (until 2 years ago considered to be P. caribaea) and Pinus Taeda have shown a favourable adaptation to this environment with a rapid rate of growth, resistance to edaphic humidity, and tolerance to waterlogged lands and acid soils.

2) Planting may be carried out between April and August, on land with or without flood control once ditches have been made, utilizing bare root plants or plants placed previously in rough clay pots; the bare root plants placed in their final position cost approximately Arg. $0.10 each, while those in clay pots cost Arg. $0.40 each.

3) The following spacing in planting is considered advisable: 2 x 2 metres in the case of Pinus Elliottii and 2 x 2.5 metres for Pinus Taeda.

4) As the large majority of the Delta lands do not have a deep underground water layer, the roots of the pines extend laterally between 10 and 50 centimetres below the surface of the soil.

5) The highest rates of growth have been noted in soils that have their sandy layer near the surface, or in those which have a thin, loose, permeable layer of silt underneath the organic layer, permitting the capillary rise of the water contained in the sandy layer.

6) The average annual growth of the existing plantations in the Delta has been more than 1 metre in height and over 1.5 centimetres in diameter (measured at a height of 1 m. 30 cm.).

7) On the basis of the average height and diameter measurements of pines in a small forest and the thinning carried out in the same plantation, the estimated volume per hectare in the twelfth year of growth has been 255 cubic metres of barked wood in the case of Pinus Elliottii and 280 cubic metres for Pinus Taeda.

8) Under present conditions of cultivation the average annual increase

/per hectare

per hectare, taking as a basis the volume of gross wood, has been 30 cubic metres for Pinus Elliottii and 33 cubic metres for Pinus Taeda.

## Forestry Measures Undertaken by the Argentine Government in order to Increase Pulp and Paper Production

by Administración Nacional de Bosques, Ministerio de Agricultura y Ganadería de la Nación (Argentina)

In 1938 the importance of paper consumption in Argentina was already apparent, and demand had increased gradually year by year.

With the object of promoting pulp and paper production, the Argentine Government has projected, as part of the First and Second Five-Year Plan, the installation of new mills - issuing Decree 8594/49 to promote supplies of raw materials - and the cultivation of plantations of species adequate for this purpose.

The Government set aside the forests of the San Pedro Colony in the province of Misiones, where araucaria angustifolia is grown, a species that can be satisfactorily utilized in the manufacture of chemical pulp, and also the Paraná Delta zone, with appropriate climatic and soil conditions and an extensive area for plantations of Salicaceous species, employed in the manufacture of mechanical pulp, and had initiated a definite development movement in these areas.

This naturally does not mean that other species and areas which could contribute to increased production of raw materials for pulp and paper are not being taken into consideration.

In turn, forestry credit - guaranteed by Art. 59 of Law 13,273 - favours the cultivation of tree plantations by private enterprise, and this, together with permanent technical advice and the necessary supplies of seeds, slips and plants at favourable prices, will enable Argentina's forestry activities to supply the paper industry with the raw material required for its development.

Furthermore, in order to consider the possibilities of utilizing native species as raw material to satisgy the demand of the pulp and paper industry, the National Administration of Forests is carrying out the necessary technological investigations.

/In conclusion

In conclusion, the Argentine Government, determined to solve this serious problem, has organized the country's forestry activities in order to ensure an adequate supply of raw materials required by the pulp and paper industry to meet domestic demand.

## South African Experience in the Planting of Exotic Species

by N.L. King

This paper briefly outlines the natural timber resources of South Africa and the efforts that have been made to augment the meagre supplies.

It traces the development of forestry from South Western Cape eastwards through Natal to the Transvaal and indicates the main species that have proved successful.

It gives the areas afforested with exotic species, the present yield and the uses to which the woods are being put.

Finally, it discusses the timber requirements of South Africa, the potential yield of plantations and forests and the possibility of extending plantations to an extent sufficient to satisfy the needs of the country.

## Production of Chemical Pulp and Groundwood from Willow, Poplar and Poplar Willow

by Celulosa Argentina S.A.

The paper gives a short account of the salicaceous species with special reference to the types growing in the Paraná Delta. Poplar and willow woods in Argentina provide good mechanical pulps for the manufacture of many types of board and certain grades of paper. Particulars are given of experiments carried out with the aim of improving the quality of the pulps.

Tests at the Forest Products Laboratory, Madison, U.S.A., have shown that the varieties of poplar found in the Delta can be used to make semi-chemical pulps, because of their high cellulose and low lignin contents. The results of tests are presented in several tables.

Tests were also made to determine the quality and characteristics of the mechanical pulp obtained by dressing the pulpstone of the grinder at different speeds. The results of these tests are described, and the conclusions enumerated.

/Pulp and

## Pulp and Paper Making from Eucalyptus in Australia

by R.B . Jeffreys

In this paper the author discusses the use of Eucalyptus in Australia for the manufacture of pulp and paper. Reference is made to the fact that although there are over four hundred species of Eucalyptus growing in Australia, less than twenty of them are used in the pulp and paper industry. A list of the species that are used is given. The other species are not all unsuitable for paper making and the reasons for the limitations in use to twenty species are discussed.

Brief references are made to the use of Bleached Soda Eucalypt pulp in the manufacture of writing and printing papers, and to the use of Eucalypt Mechanical pulp in the manufacture of newsprint. The manufacture of Eucalypt Kraft pulp and its uses in the unbleached and bleached forms for making wrapping papers, lithos and liner boards are discussed in some detail.

Particular attention is paid to the difficulties that have been experienced in making and using Eucalypt Kraft pulp. Methods of overcoming the difficulties are mentioned. In making the pulp the main difficulties were associated with evaporating and burning the black liquors. The black liquors have a very high viscosity which effects the evaporation and the solids tend to form a black inert mass on the floor of the recovery furnaces.

Reference is made to the wide variations in the quality of the pulps produced from Eucalypts of different species and to the effect of growth rate and age on the pulping properties of pulpwoods from the same species. The effect of these factors on black liquor properties is also discussed.

On the paper machine the chief trouble experienced was sticking at the press and the solution to this problem is mentioned.

The author compares the Eucalypt forests of Australia from which the various pulp mills are being supplied, with the Eucalypt plantations in other parts of the world. Most of the Australian pulpwood comes from mature and overmature forests, a considerable proportion of which have grown at a slow rate. The overseas plantations are comparatively young and appear to have

/been goown

been grown mainly at a fairly rapid rate. It is suggested that the overseas Eucalypts will probably make better chemical pulps than the average Australian pulpwood and that the black liquors will probably give less trouble in the evaporators and the recovery furnaces.

## Research into the Use of Trithrinax Campestris (Palma, Palmera, Caranday) leaves as Raw Material for Paper

by Walter Ginzel

The palm, Trithrinax campestris, grows in natural stands in various parts of Argentina, such as Santa Fé, Cordoba, San Luis, Santiago del Estero, Tucumán, Corrientes and the province of Entre Ríos, where the largest stands are found. This palm, which is popularly known as the "palma", "palmera" or "caranday" according to the area where it is found, grows to a height of 2 to 4 metres, the trunk being covered with remains of foliage; the leaves are flabellated and divided into segments. It is these leaves which can be used, not only in the textile industry, but also, when green and well-developed, in the paper industry.

The fibres are from 0.7 to 2.5 millimetres long and from 8 to 20 micra wide; thus the average length/width ratio is 100:1, making them suitable for use in paper. Their structure is cylindrical, with very thick walls, so that they are suitable without much refining, for making bulky, absorbent papers; because of their fibrillating capacity, they can also be used to obtain strong papers.

The alkaline process, with caustic soda, was used for tests on a laboratory and on a semi-industrial scale. Air-dried leaves with 10 per cent moisture were cut up into sizes of 2 to 3 centimetres and treated in the digesters. Caustic soda consumption ranged from 8 to 10 per cent, calculated on dry raw material, depending on the method of cooking used. The pulp yield was 40 to 50 per cent, which is similar to that of straw and other annuals already used industrially on a large scale. The completely dry pulp analysed as follows: 73 per cent cellulose; 17 per cent pentosans; 7 per cent lignin and 3 per cent ash. Because of the process used and the composition of the pulp, this may be classified as a type of "semi-chemical pulp".

/Trithrinax palms

Trithrinax palms grow abundantly in several parts of Argentina; this, coupled with their easy exploitation and the successful tests made, indicates that this new raw material for pulping can be used on an industrial scale.

## ECONOMICS OF PULP AND PAPER MANUFACTURE FROM SUGAR CANE BAGASSE

### Pulping with Particular Reference to the Mechano-Chemical Process

by Elbert C. Lathrop and Samuel I. Aronovosky

Sugarcane bagasse is a valuable material for the pulp and paper industries. Much has appeared of late in the daily and technical press about new processes for pulping bagasse, new mills to be built, and particularly about making newsprint from bagasse alone. These stories have been written for many purposes, political, promotional, and technical. Most of the reports have, of course, some basis in fact, but the bias with which some were written and the unqualified character of many of the statements have proved very confusing. On the one hand, a person might be led to believe that bagasse is ideally suited to make almost any kind of paper, and on the other that its utility is quite limited. Neither opinion would be correct. It is the purpose of this paper to present factual information concerning the kinds of pulps and papers, from the poorest to the best, that our present knowledge tells us may be made from bagasse.

From the standpoint of necessity owing to unavailability of wood or other pulps, it is possible to manufacture usable papers or boards from pulps made from whole or screened bagasse but these will be of low quality. Pulps made by cooking with lime will be useful only in making low-quality board or wrappings. Waste papers if available can be used to advantage in the manufacture of such products.

By pulping with the pressure, Celdecor, or mechano-chemical (M-C) processes, using chemicals composed of or containing caustic soda, much higher grade products, including bleached pulps, may be made from whole or screened bagasse. When bagasse pulps and waste papers alone are available, the use of liberal amounts of fillers in making printing and other higher

/grade papers

grade papers is advisable. By using such methods, boards as well as printing papers of various quality can be produced which will be acceptable in many markets. Much better results will ensue if mechanical wood pulps or kraft pulps made from tropical or hard woods are available for blending with the bagasse pulps. In such cases the best use for the bagasse pulps will be as blends with the virgin wood pulps and such waste papers and fillers as may be available. The use of various such combinations will make possible the manufacture of a much wider range of fairly good to good papers.

The best results can be expected from pulping only depithed bagasse fibre. If commercial uses for the separated pith, such as fuel, feed, or paper filler, can be found, the costs of such depithed pulps may be lower than those of pulps made from whole or screened bagasse. Such bagasse pulps can be used alone for the manufacture of the highest quality corrugating board medium and also for the manufacture of glassine and certain kinds of waxing papers. When these unbleached pulps are blended with kraft or sulfite softwood pulps, superior wrappings, bag, and multiwall bag papers and liner boards can be manufactured. When the pulps are bleached and blended with bleached mechanical pulps or bleached chemical wood pulps, a wide variety of very high-quality printing and specialty papers becomes available. These bleached bagasse pulps can replace other chemical pulps in blends with mechanical wood pulps to produce newsprint, magazine-book, coated book, and other papers containing large amounts of mechanical pulps. Furthermore, the high tensile strength of these bagasse pulps when produced by the mechano-chemical process suggests that weak mechanical pulps might find a much wider use in the manufacture of good papers.

If it should prove expedient to make newsprint from 100 per cent bagasse pulp and filler, a collateral market for the use of the bleached pulp in printing, writing and other papers should be rapidly developed to provide for the loss of the newsprint market in the event that mechanical pulp or lower cost imported newsprint becomes available.

In selecting pulping methods, consideration should be given not only to the cost elements, such as low initial capital investment, maintenance, and operating costs, but also to simplicity and utility of equipment, flexibility of changing processing conditions to meet changing pulp

/requirements, and

requirements, and ease of process control. Bagasse is a variable raw material; the paper and board industry in any country is bound to expand with time; and competition in world markets will increase. It is desirable and should be possible to design new mills with great flexibility so as not only to manufacture, from the bagasse and other raw materials available in the local market, the best products possible but also to provide increasingly better products and some of wider use as the market expands or as other types of pulps and raw materials become available for blending with the bagasse pulps.

## Economic and other Factors to be Considered in the Use of Sugarcane Bagasse as a Raw Material for Pulp and Paper Manufacture

by Elbert C. Lathrop

Neither paper nor sugar manufacturers seem to have a clear understanding of each other's problem nor appreciate the full significance of the economic and technological factors under their joint control that may contribute to lasting success in both industries . It seems desirable, therefore, to discuss the subject fully so that new ventures into bagasse utilization may be made with the least risk of failure.

Factors relating to bagasse production, which are more or less under the control of the sugar producer, are discussed rather fully. Variations in quality and quantity of bagasse due to cane variety and culture, to cane harvesting practices, and milling practices are shown to produce rather wide variations in the chemical and particularly in the physical characteristics of bagasse, including dirt and carbon contaminations.

The present uses and value of bagasse as a raw material for fuel, building material, and paper manufacture, and for use as litter or mulch are briefly described. It is pointed out that surplus bagasse is present at most sugar mills, requiring burning for disposal.

Problems concerning baling, handling, storage, losses during storage, and the cost of stored bagasse are discussed at length because the subject is evidently not generally well understood.

At the present time no method exists for the economic utilization of

/"total bagasse".

"total bagasse". The objections to pith in paper manufacture are discussed at length. Methods used to separate pith from fibre have been perfected. Several of these are described, including flow sheets and cost data. From this data estimates on costs to produce several grades of papers from depithed fibres vs. whole bagasse show the fallacy of believing that depithed fibre is more costly to use for papermaking. Uses for pith, particularly as an absorbent for molasses for feeding, are discussed.

From the analysis presented the sugar mill is the logical place to prepare depithed fibre, in which event high-grade pith becomes available. By combining pith and blackstrap molasses and using this material for feeding cattle on the plantation, the highest value will be realized for both. Silage and fodder is also available on the plantations in the form of tops from the cane. Thus based on integration between the paper and sugar industries, pith-free fiber could be made available for high-grade papermaking, pith and molasses for feed.

In considering the close integration of a sugar and pulp and paper mill, however, the writer adds a word of warning. The paper mill, if it is to make bleached paper should not burn bagasse or pith for fuel, because of the almost certain contamination of the bleached pulp with carbon particles. If the paper mill is to be located near a sugar mill, it should be so located as to avoid the same hazard.

## Saving of Bagasse for Paper Making : Thermal Considerations

by Cellulose Development Corporation

If bagasse is required for purposes other than burning, a factory which used, say 600 kgs. of steam per ton of cane can make several economies. The following table summarises those for which calculations have been made.

/Summary of

Summary of Economies Discussed

| | Savings in Kgs. steam/ton cane | Bagasse saved Pc. bagasse produced |
|---|---|---|
| Installation of an airheater or economiser | | 10-15 |
| Circulation of the condensates in the evaporators, maximum | 10 | 1.5 |
| Introduction of steam bleeding from the multiple effect for use in juice heating, say | 50 | 7.5 |
| Reduction of the Imbibition Water from 33% to 20% | 32 | 5 |
| Installation of a thermocompressor on the 1st effect | 40 | 6 |
| | | 30-35 |

Most of these modifications could be made concurrently, but the total economy would not quite equal the sum of the economies made separately. The first three are all measures which have been quite widely used in the industry; there are still a number of factories which have not adopted all of these and some who have not adopted any.

Whilst deliberate reduction of imbibition water and the installation of a thermocompressor have less appeal, there are other steps not enumerated but discussed which may be described as the more diligent application of scientific common sense: elimination of steam exhausting to atmosphere, thermal insulation, close control of imbibition water and of final moisture of bagasse.

In addition, in certain special circumstances, the surplus of bagasse may be increased by the direct production of alcohol on a large scale; also by growing cane with a high fibre content.

In general, the economies outlined may be said to save between one quarter and one third of the bagasse.

It would be possible to make more drastic savings where the possibility exists of using high-pressure exhaust steam and some pressure evaporation, and also of increasing the number of effects.

/When the

When the means of economy are exhausted, alternative fuels may be used; this may be quite economic and will also result in more satisfactory boiler operation than when bagasse is used as fuel.

Of the possibilities discussed in the paper, probably the most attractive are those which least complicate the sugar mill operations. Undoubtedly thermo-compression requires a degree of technical control which makes it suitable only for more advanced sugar factories, whereas stepped steam-bleeding from the evaporators is considered simple enough for any sugar factory to apply.

Improvement in boiler efficiency is straightforward, and is applicable to almost every mill. An important yet straightforward improvement is the electrification of all machines which are driven by steam engines which merely exhaust to the atmosphere, and the lagging of pipes and condensate tanks.

## Saving of Bagasse by Improved Boiler House Operations

by G. Ranwez

The paper industry, compelled by increasing raw material requirements, has experimented successfully with the use of bagasse. Difficulties arise, however, in obtaining supplies of bagasse, since its main use is in the sugar mills themselves, in supplying their requirements of fuel.

A simple and profitable solution to this problem may be found in rationalizing and improving combustion, and in the introduction of heat recovery elements and modern combustion devices.

It is estimated that the modernization of sugar mill boiler plant could, in the case of Argentina, release sufficient bagasse to manufacture some 22,000 tons of pulp per year. This need not involve either the use of additional fuel, such as wood, nor resort to an alternative fuel, such as oil, which is imported.

/Preservation, Handling

## Preservation, Handling and Storing of Baggasse

by The Celotex Corporation

For more than thirty years the Celotex Corporation has been engaged in the collection and handling of bagasse in the state of Louisiana, U.S.A., and its use in the manufacture of insulation fiberboard products in a factory located in the same state. As a raw material for this purpose, bagasse has both advantages and disadvantages, but the former outweigh the latter, and the disadvantages have had their effect on the development of equipment and techniques used to handle this annual crop. Multiple installations are required to bale and stack, and then later unstack and ship, this bulky material to the factory. The large investment required for many baling stations and storage fields, and the seasonal nature of the operation, represent "hidden costs" which must be taken into account in considering the economics of bagasse usage.

## Factors Influencing the Selection of Processes and Choice of Equipment for Bagasse Pulp Manufacture

by Joseph E. Atchison

In this paper the writer reviews all the important factors which might influence selection of the process and the choice of equipment for a bagasse pulp mill. It is pointed out that the first step in the development of any project for the production of pulp from bagasse should be a complete technical and economic survey by personnel who are specialized in this field. The question of choice of process and equipment, as well as the decision regarding the feasibility of any project, involves a complicated inter-relationship of many technical and economic factors which can be properly treated and analysed only by highly experienced personnel.

The great importance of depithing sugarcane bagasse before pulping the fibre is reviewed in considerable detail. Numerous reasons are given for removal of the pith before pulping and the author points out many difficulties which may be experienced in all phases of the operation if the pith is not removed before pulping. A review is given of some important work which has been carried out in this field in Formosa and Louisiana.

/It is

It is pointed out that conventional pulping methods normally used for wood are not, without modifications, applicable to pulping bagasse. A number of these modifications are described.

A review is given of the most important processes now available for pulping bagasse, taking into consideration methods in commercial use in various parts of the world for cooking both bagasse and straw. The five processes described are the

Soda Process,
Sulphate Process
Monosulphite or Neutral Sulphite Process
Caustic Soda-Chlorine Process
Mechano-Chemical Process

These processes are compared and some advantages and disadvantages of each are given. Flow diagrams are included for the mechano-chemical process and for pressure digestion cooking by either the soda, sulphate or monosulphite processes.

Each of the technical and economic factors which must be considered in selecting the proper process and equipment for any bagasse pulp mill project are discussed at length and the relationship of each one of these factors to the choice of process and equipment is given. The factors discussed are as follows:

1. Initial cost of equipment for each process or the capital required for a mill of given size;
2. The relative availability and cost of chemicals necessary for each process in the specific area;
3. The availability and cost of fuel delivered to the plant site;
4. The availability and cost of purchased power;
5. The availability and cost of labour in the area;
6. The availability and cost of an adequate water supply;
7. Means available and cost of effluent disposal;
8. The cost of bagasse delivered to the pulp mill site;
9. The grade of pulp, paper or paperboard which is to be manufactured.

/Experience of

## Experience of Industrial Bagasse Pulping

by Cellulose Development Corporation Limited (England)

The interest in pulping bagasse for paper-making and the reasons for it are discussed against the background of present world pulp resources and consumption trends.

Successful enterprises data only from about 1939, but there are now about a dozen mills in various parts of the world pulping bagasse on a commercial basis. Four of these mills produce bleached pulp, three using the Celdecor-Pomilio process (as at mid-1954).

Bagasse availability, storage and pulping by different processes is considered, and the uses, special properties, and limitations of bagasse for pulping are discussed.

After more than 100 years of experiment, bagasse pulping is now established on a sound basis; it is believed it can play a significant part in meeting increasing world demand for pulp and paper.

## Industrial Experience in Bagasse Pulp Manufacture in Argentina

by Celulosa Argentina S.A.

This paper describes the manufacture of chemical pulp from bagasse in the State of Tucumán, Argentina. After indicating the source of the raw materials and the process adopted, it discusses the early problems encountered in the baling and storing of bagasse, and the way in which these were solved. An explanation is given of how the pith is eliminated before cooking.

A description follows of the investigations undertaken at the company's research laboratories concerning the influence of pith on the various stages of the process and on the resultant pulp. The relative merits of producing pulp from bagasse containing pith as opposed to bagasse freed of pith are discussed.

The experiences at the Capitán Bermúdez and Tucumán mills in making bleached pulp from depithed bagasse are described, as well as the operational procedures.

Finally, a description is given of laboratory and industrial-scale tests carried out with a view to using bagasse pulp for the manufacture of newsprint.

/Industrial Experience

## Industrial Experience in Bagasse Pulp and Paper Manufacture in Paramonga

by José Correa S.

The paper describes how an agricultural by-product (bagasse) has been converted into a great variety of papers by W.R. Grace & Co. at their mill at Paramonga. This mill has successfully operated for more than fifteen years. It is situated in close proximity to the sugarcane plantation operated by an affiliate of the company in the Peruvian coastal lowlands.

A modified soda process is employed for producing pulp from depithed bagasse for the manufacture of all kinds of wrapping and packing papers. For higher qualities some imported pulp is used as well.

## Twenty-five Years of Argentine Industrial Experience in the Pulping of Straws and Cane

by Juan Di Filippo

The paper begins with a description of the studies and procedures carried out by Celulosa Argentina since its establishment in 1931. The early background of the caustic soda-chlorine process is given.

Problems connected with raw materials, water, fuel and power are dealt with and an enumeration is given as to the availability of straw and salt in the vicinity of the original mill. The company's first mill was located at Capitán Bermúdez (formerly Juan Ortiz) Argentina, and began operations in 1930-31. Its technical features at that time are described, and contrasted with the present ones.

Data are provided relating to numerous laboratory tests which have been made for the pulp mill.

## Bagasse Pulp and Paper Mill at Piracicaba

by Lino Morganti

The political, economic and technical considerations which led to the decision to establish a pulp and paper mill based on bagasse at Piracicaba are described. This mill is planned to produce 15 thousand tons of pulp and paper annually by the Celdecor-Pomilio process. The pulping process

/is described,

is described, and an account is given of the way in which power, water, chemicals and other requirements are to be met.

The paper concludes with a description of the operations from the reception of the bagasse from the sugar mills to the finishing processes in the paper mill section.

## The Alkaline Pulping of Bagasse for High-Strength Papers and Dissolving Pulps

by William J. Nolan

A method has been developed for the depithing of bagasse which recovers 70-80 per cent of the bagasse as very clean fibre. The pith fraction contains a very small proportion of fine fibres. Photographs are furnished to show the quality of the fibre and pith fractions. Bagasse fibre has been pulped at constant steam pressure and liquor concentration to produce high purity pulps. Pulps of 45 per cent yield, containing 2.0 per cent pentosan, 0.8 per cent lignin, 95-96 per cent alpha cellulose, have been produced in 10 min. cooking time. Degree of polymerization of these pulps is about 1000-1100. Pulps of about the same purity and slightly higher yield can be produced in 5 min. cooking time but the degree of polymerization is too high for dissolving purposes, being 1700-2000. These pulps can be bleached to 84 G.E. brightness by a 5 stage standard process, using 1.5 per cent equivalent chlorine. To realize this brightness it is necessary to extract the pulp with dilute HCl before bleaching. Ash content of the bleached pulp is high (about 0.14 per cent). Pulps of paper-making grade can be produced from bagasse fiber at low concentration and constant steam pressure in 15-20 min. cooking time. Yield of pulp is 60-63 per cent of the original fibre and the pulps are very high in pentosan content, 23-24 per cent. These pulps are 20 per cent stronger than the maximum tensile strength of pine kraft and 10 per cent stronger in bursting strength. They are considerably stronger in double folds but are less than half as strong in tear. The pulps can be hydrated to maximum strength with the expenditure of very little power. Unbeaten strength in burst, tensile and double folds is unusually high. The low lignin content of these pulps (2.0 per cent) indicates that they should require only 3-4 per cent chlorine for bleaching.

/PRESENTATION OF

PRESENTATION OF PAPERS ON SELECTED TECHNICAL MATTERS

## Modern Trends in Layout and Design of Pulp and Paper Mills

by A.M. Hurter

With few exceptions there has been little change in the technology processes and equipment for pulp and paper manufacturer during the past decade and there is no indication that this situation will change in the near future.

The considerable change in the industry and the present trend is more a matter of the careful application of established processes and equipment than of the introduction of any revolutionary development.

Automatic control, continuous processing, carefully applied materials handling methods, efficient mill layouts and mill integration, to reduce both waste and manpower, distinguish modern mills and represent the present trends in modern mill design.

Automatic control and continuous processing have had a marked influence on modern mill design. Materials handling methods are also a very important phase of modern mill design. However, it is often not fully appreciated that efficient materials handling in the movement of materials at the lowest possible cost under the circumstances and that the technically neatest solution is not necessarily the best.

The mill layout and the mill property have a very definite influence on not only the overall efficiency of the mill as originally built but also on the capital expenditure required for expansion and the overall efficiency of the mill when enlarged.

The principal trend in equipment design has been toward continuous, high capacity units. These features are of lesser importance in the case of small diversified mills and for such mills the use of second hand machinery should be carefully considered.

The acquisition of modern machinery does not necessarily result in a modern mill. It is quite possible to design an essentially modern mill using equipment available a decade ago. The opposite is equally true; if modern design concepts are overlooked it is quite possible to obtain an obsolete mill even when using modern equipment.

/Water Supply

## Water Supply and Waste Effluent Disposal as Factors in Locating Pulp and Paper Mills

by Julius Grant

The subject is considered under three main headings, namely the quantity and quality of the water supply, and the disposal of waste effluent.

Estimates are given of the quantities of water required for the preparation of different types of pulp with or without integrated paper manufacture. Where water supplied are limited or vary in quality it is shown how water of different degrees of purity may be used for different parts of the process. Economy of water by recovery methods is also discussed.

The relative merits of lake, river and well waters are considered. The first is preferred, because of its relative constancy of volume and composition, and freedom from suspended matter. Dependence on wells may involve certain risks, and unless adequate wells actually exist it is safer to choose a site where there is visible water all the year round.

Criteria of quality of water for different types of paper and pulp are tabulated and discussed, with special reference to colour, hardness, iron content, dissolved solids and pH value. Methods for the treatment of water supplies are also dealt with.

Considerations affecting the discharge of effluents into rivers, lakes, the sea or elsewhere are discussed and compared. The importance of full and frank collaboration in these matters with local authorities is emphasized. In general, paper mill alkali pulp process effluents are more amenable to treatment than are other types of effluent, and a method is envisaged for the complete elimination of polluting effluent in certain of the former instances. Brief reference is made to methods of treating effluents and to methods of assessing the capacity of an effluent to produce pollution.

/The Relationship

## The Relationship Between the Morphological Characteristics of the Fibres from Tropical Woods and the Quality of the Pulp and Paper Obtained from them

by the Régie Industrielle de la Cellulose Coloniale

This paper examines the results obtained in the research laboratories of the Régie Industrielle de la Cellulose Coloniale, Ministere de la France d'Outre-Mer, on the factors governing the strength characteristics of paper from tropical woods.

Some rules are laid down regarding the relationships which exist between biometric data and paper characteristics.

Three species in particular were studied: Kaka (Phialodisens plurijugatus), Ohnon (Euadenia trifoliata) y Amón (Buchelcia coriacea). The principal laboratory findings are as follows: the higher flexibility coefficient the better is the tensile strength; the greater the felting power the poorer is the tensile strength and the higher the tearing factor. Although influenced by biometric characteristics, especially by ratios length/lumen and width/lumen, folding strength is governed more by other as yet undetermined factors.

The final conclusion is that only by the use of a complex mixture of tropical woods could a paper be produced which would have satisfactory characteristics in all respects.

## A New Process for Bleaching Pulp from Tropical Woods

by A.M. Hurter

This paper refers to laboratory tests carried out with a view to improving the classical processes for bleaching tropical wood pulps involving the use of chlorine, hypochlorite, alkaline chlorite and chlorine dioxide.

Investigations have shown that it is possible to increase the speed of reaction and to obtain satisfactory strength characteristics and brightness by using nascent chemicals or by carrying out the operation under special concentration and pH conditions.

To bleach tropical wood pulps the following method is suggested:

/1) one

1) one chlorination
2) one soda treatment
3) one nascent hypochlorite treatment
4) one post-chlorination
5) one acid hypochlorite treatment

The application of this new method resulted in better brightness and strength characteristics than those obtained with the classical method.

The principal advantages of this new system are: speedier operations, the possibility of obtaining a high degree of brightness using low-cost chemicals, a considerable saving in operational costs and a reduction in the initial investment required for new mills.

These are merely laboratory findings and it would be necessary to verify them on an industrial scale and to solve some problems arising in this connection.

## Low Cost Supply of Sulphur Dioxide for South America

by C.J. Wall

There is a shortage of low cost domestic elemental sulphur in South America, Europe and Japan. The solution found by industrial countries has been to make up the deficit by producing $SO_2$ gas from the sulphide minerals of iron, copper and zinc. The iron sulphides, pyrite ($FeS_2$) and pyrrhotite ($Fe_7S_8$) would be of the greatest interest to South American sulphur users, since they are very common and are usually found associated with any ore body.

The author points out that the Dorrco FluoSolids System is a new and improved method of roasting these sulphides, developed over the past twelve years. Forty-four commercial and eleven pilot plants using the FluoSolids System are at present in operation or under construction, and new fields for this technique are being opened up daily. Among the applications for the system is its use in pulp mills, as iron sulphides provide a cheaper source of sulphur dioxide than elemental sulphur.

/Economics of

## Economics of Waste Liquor Recovery and Burning in the Sulphate and Sulphite Processes

by Gustaf Edling

Sulphate Mills. The paper deals with questions regarding heat production by burning the black liquor, and the heat consumption in sulphate kraft mills.

All the data provided relate to normal mill practice in Sweden and have been checked by engineers belonging to the Swedish Steam Users Association of Stockholm. From the figures given it is evident that a modern sulphate mill, properly planned and operated should be self-supporting with regard to fuel.

Sulphite Mills. The paper mentions that the first Swedish sulphite mill was started in 1874, and that by 1890 17 such mills were in operation. Consumption of fuel was, naturally, very high, since the waste liquor was not utilized at all.

The first plant to produce alcohol from the sugar contained in the liquor was started in 1909 and there are now 30 of these factories in Sweden. Such plants, however, utilize only about 20 per cent of the organic matter in the liquor.

In 1920 the first installation for the evaporation and burning of sulphite waste liquor was started. It is of interest to mention that this first plant had an evaporator using a thermo-compressor.

Since the close of the 1930s development in the utilization of liquor has proceeded to such an extent that at present about 20 plants of this kind are in operation in Sweden. Experience from these plants proves that the main problems in connection with the evaporation and burning of the liquor have been overcome and that quite a normal operation may be obtained.

Data are given to illustrate the quantity of heat which can be produced by burning the liquor. These figures as well as those indicating the consumption of heat in the different departments of the mill (cooking, drying, evaporation) are all based on results achieved during normal operation. Moreover, they demonstrate that a sulphite mill can in some cases also be self-supporting with regard to fuel.

The paper concludes with data relating to the capital costs involved for different kinds of plants.

/Economics of

## Economics of Electric Power and Steam Consumption in the Paper Industry

by G. Ranwez

The paper consists of a comparative study of costs per ton of paper, of thermic and electric energy, calculated for different steam pressures. A model mill is used as the basis for the calculations, and it is assumed that steam pressures in the boiler may range from 15 to 90 atmospheres, with different degrees of super heating. It is further assumed that a bleeding turbine is used, with extractions at 8 and at 3 atmospheres, and having a pressure of 0.06 atmospheres in the condenser. The various steam circuits are illustrated in a series of charts.

It is concluded that a considerable economy of fuel is obtained, the higher the pressure used.

## The Aschaffenburger Zellstoffwerke Method of Manufacturing Newsprint from Bagasse

by Rudolf Schepp

Sugar cane bagasse provides large quantities of fibrous raw material; usually this fibre serves only as fuel in the sugar mills. For more than a century efforts have been made to produce from bagasse a paper suitable for newsprint.

Bagasse cannot be pulped by a simple mechanical process, as in the preparation of groundwood from conifers. Chemical pulping is necessary, but this is not easy on account of the fibre characteristics.

The essence of the economic problem of manufacturing newsprint from bagasse is to use a relatively simple pulping process, without bleaching, and yet obtain a paper comparable with newsprint in colour and printing properties. In our view the only possible solution is a modified neutral-sulphite process. Very careful preparation of the bagasse is necessary to remove discolouring matter inherent in the fibre or caused by fungal growth during drying. The removal of the pith is of less consequence. Because of the morphological heterogeneity of the stem, complete cooking is not recommended; it is advisable to complete the pulping process by mechanical

/action, as

action, as for semi-chemical pulp. A short prehydrolisis ensures regularity in the subsequent pulping, as well as completing the elimination of colouring matter. The operations can be varied in accordance with the qualities desired, and these variations determine the yield, which ranges from 55 to 68 per cent. The limit of technical defibration is around 68 per cent.

The strength properties of bagasse newsprint compare favourably with those of standard newsprint because the strength properties of bagasse pulp are superior to those of spruce groundwood.

A short comment follows on the manufacture of other qualities of paper from bagasse pulp, and, finally some cost data are presented.

## Defibrator Continuous Semi-Chemical Pulping Process

by Aktiebolaget Defibrator

Although semi-chemical pulp has only been used on an industrial scale for a relatively short time, its applications are becoming more and more widespread. Some species of wood which are not readily pulped by conventional processes, can be advantageously made into semi-chemical pulp.

The paper outlines briefly the various types of semi-chemical processes that have been developed, but points out that the continuous semi-chemical process is to be particularly recommended when a completely new plant is contemplated without relation to some previously existing pulp mill. The advantages of a continuous semi-chemical pulping system as compared with a batch system are enumerated, and the special process developed by the authors is described. A flow sheet is included of a typical installation, showing the basic principles of the process.

## Modern Pulp Screening Equipment and Systems

by Karl Lindgren

The paper deals with many different screening units and screening system designs. It emphasizes that the efficiency of a screen depends on the design, the time that the pulp remains in the screen, the kind and quantity of the dirt present, the pulp consistency and the overscreening

/percentage. Some

percentage. Some screens are better able to remove long particles than spherical ones, while others are more efficient in extracting round dirt. Thus combinations of various types of screen are advisable. The choice of correct screen is important, but the use of a correct screening system is even more so.

The particular features and performance details of the types of screen in most common use are discussed and their most suitable position in a screening system indicated. The author classifies the screen types in six different groups:

Flat diaphragm
Low frequency rotary
High frequency flat
High frequency rotary
Centrifugal
Vortex separators

Sections are included covering screening systems for

Bleached and unbleached sulphite pulp
Bleached and unbleached sulphate pulp
Groundwood
Wastepaper
Straw and bagasse
Screening ahead of paper and board machines

In discussing these systems the author describes the principle of double screening, the necessity in many cases of overscreening the advantage of correct choice of consistency, the value of constant conditions and even pulp-flow, and the choice of suitable screen plate perforations and slot widths. Some appropriate flow diagrams are also given.

Special attention is devoted to screening equipment of the latest type, and how screening departments may be modernized by using these units. Screening departments for different purposes, however, must be planned in accordance with certain main principles and every screening problem needs to be treated as a separate case. The science of screening, if such a pretentious expression may be used, is not an exact science, but often a feeling for the right combination of equipment available and the application of ideas verified by actual tests.

However, it is not in itself sufficient to equip a screening department with the most modern units and in strict accordance with accepted rules. The different units must be given careful attention, properly maintained and run in accordance with instructions, though one often finds neglect or indifference to these simple but excellent rules.

/The Modern

## The Modern Paper-Making Machine Applied to the Utilization of Short-Fibred Materials

by Ralph C. Heys

The paper now presented is confined to an analysis of the application of the modern Fourdrinier type of paper machine for the manufacture of papers from a weight of, say, 20 grammes per square metre to 300 grammes per square metre or thereabouts; on the one hand, it does not consider the manufacture of multiple boards, which, almost without exception, are made on cylinder mould or vat machines, and, on the other hand, only a brief reference is made to that type where a single large dryer is used in the manufacture of such specialties as cellulose wadding.

Before attempting to describe what the author considers to be a modern paper machine with characteristics making it particularly suitable for the manufacture of paper from short-fibred stock, some clarification is needed as to what the term "Modern Paper Machine" really means.

First, he maintains without reservation that a newly manufactured paper machine is not necessarily a modern machine; unfortunately new machines are still being built to obsolete designs, using patterns which should have been scrapped long ago. The capital cost of such a unit may be lower, but the difference in price between it and a modern machine, which has a potential for increased production and speeds, should not be a deciding factor, as the purchaser has mortgaged his future.

Advances which have been made during the last ten years for increasing production - especially in speeding up well-designed machines originally built as early as 1924 for conservatively running at 200 metres per minute and which now make newsprint at 450 metres per minute and over - illustrate quite well that any paper machine designed today should have the possibility of being speeded up, as the life of such a machine can well be over 30 years.

On the other hand, there is no need to complicate the design unnecessarily with non-essentials and expensive gadgets; a modern machine should be as simple as the circumstances dictate; automatic devices which become essential with higher operating speeds may be added when and as required.

Secondly, there are many older paper machines which - if reconstructed

/by reliable

by reliable paper making machinery engineers - are not only suitable for the quality of paper required and speeds at which the paper can be manufactured, but, after reconstruction, can be considered modern in the widest sense of the term.

The essentials of a modern machine vary with the types of paper to be manufactured, but certain elementals are common to all machines whether these are to run at 30 metres or 600 metres per minute. Moreover, generally speaking, most older type machines made by well-known builders can be modified to incorporate these improvements.

### Improved Quality and Production from Existing Paper-Making Equipment

by Frank T. Peterson

An outline is given of the development of stock preparation equipment and paper stock treating machinery to impart selective qualities to the paper to be produced. Modern stock preparatory systems as outlined are broken down into three main functions: pulping or slushing; refining; and cutting. The author has demonstrated various methods of applying this type of stock preparation theory.

A discussion follows of paper machine formation and suction roll equipment modifications to further enhance production and paper machine speeds and so forth.

## REVIEW OF THE DEVELOPMENT PROSPECTS FOR PULP AND PAPER INDUSTRIES IN SELECTED LATIN AMERICAN COUNTRIES 1/

### Brazil

by José Carlos Leone

In 1953, Brazil consumed 170 thousand tons of chemical pulps, 206 thousand tons of mechanical pulp - including waste paper - 146 thousand tons

1/ No papers on this subject for Argentina, Bolivia, Paraguay and Perú were submitted. Nevertheless the final printed report will contain the statements made on this matter by experts from those countries.

/of newsprint

of newsprint and 250 thousand tons of other papers and boards. The respective production figures were: 51 thousand tons of chemical pulp, 104 thousand tons of mechanical pulp (including waste paper), 43 thousand tons of newsprint and 220 thousand tons of other papers. In other words, domestic output met requirements to the following extent: chemical pulp, 30 per cent; mechanical pulp, 52 per cent; newsprint, 30 per cent; other papers, 97.3 per cent.

Chemical pulp is made in 14 mills, one of them having an annual capacity of 35 thousand tons while the other thirteen average slightly over one thousand tons each. Paper - other than newsprint - is manufactured in 53 mills with a total capacity of 246 thousand tons; 68 per cent of these mills had annual capacities below 5,000 tons, while only five could produce more than 10 thousand tons a year. There is only one newsprint mill, having a daily capacity of 100 to 120 tons. Absence of detailed statistics prevents any true assessment of domestic capacity for making mechanical pulp; all that can be confidently asserted is that 11 mills have an aggregate capacity of 55 thousand tons, but there are other small mills distributed mainly throughout the states of Paraná and Santa Catarina.

Newsprint production - unlike that of other types of paper, which practically meets demand - shows no great expansion in Brazil. Various factors have hampered its development, among them the exemption of newsprint from import duties, the high cost of the equipment required for large-scale production and the inadequate domestic output of mechanical pulp. Meanwhile, the growing imports of newsprint have an unfavourable impact on the country's balance of payments. In 1950, Brazil spent nearly 8 million dollars on newsprint; in 1953, the figure rose to 19 million dollars, placing this product fifth on the list of Brazilian imports.

By 1960, it is estimated that the demand for paper and board will have risen to 539 thousand tons, 187 thousand of which correspond to newsprint and 352 thousand to other papers and boards. Pulp requirements to meet a production of such size would be 191 thousand tons of chemical and 208 thousand tons of mechanical pulp.

The exchange reform introduced in October 1953 has, by making imported goods more expensive, awakened the interest of industrialists, particularly as regards pulp production. The Government, moreover, has recently taken a

/keen interest

keen interest in the expansion of the pulp industry, which has been included among those industries considered as basic to the country's economic development. Taking into account only the plans for expanding the capacity of integrated pulp and paper mills - which are almost certain to be put into effect - there should, by 1960, be a minimum increase in paper production of some 96 thousand tons.

There are in Brazil four main sources of raw material for the pulp and paper industry. These are:

1. The virgin forests of Paraná pine (Araucaria angustifolia), of which the wood provides an excellent pulp for wrapping papers, and is already used by the largest pulp mill in the country;
2. The eucalypt plantations in the Sao Paulo region, the pulp of which is suitable for the manufacture of writing and printing papers;
3. Sugar cane bagasse from the states of Pernambuco, Alagoas, Rio de Janeiro and Sao Paulo, the use of which is already being successfully practised in the last-named state and is likely to be extended in the near future; and finally
4. Tropical woods from the north, which for the time being offer long-term potentialities.

Taking into account the specific conditions of location, energy, economic size of the mill and other technical or economic factors, only the two first-mentioned sources of supply may be said to deserve consideration for the immediate expansion of pulp and paper capacity. Bagasse and tropical woods will undoubtedly also represent very important resources, once the problems defined above have been overcome.

## CENTRAL AMERICA

by the FAO Forest Mission

### 1. Costa Rica

In 1951, paper consumption in Costa Rica totalled 3,850 tons, including 1,800 tons of newsprint. Until 1953 demand was covered entirely by imports, mainly from Canada and the United States. In September of that year the "La Perla" pulp and paper mill began operations, and is still the only one in existence (1954). It is designed for an annual output of 3,000 tons abaca

/waste fibre.

waste fibre. The raw material used is supplied by two abaca cleaning factories, the quantity available being estimated as sufficient to make 12 tons of paper a day, and it has already been proved that, with adequate care, a good quality kraft paper can be made.

Potential future sources of raw material for making pulp and paper include the forests of Heredia and Alajuela, San José and Puntarenas, and Limón, covering respectively some 400 thousand, 160 thousand and 130 thousand hectares. The first-named provide the most favourable conditions, as the topography is flat, and the San Carlos and Sarapiquí rivers, besides forming an excellent natural transport system, provide an abundant source of water. Sufficient raw material could be made available to supply a pulp mill of economic size, but detailed study of the composition and density of the forests is required.

A group of industrialists prepared a project based on using the species guarumo (Cecropia peltata) and poró (Erythrina peoppigiana) as raw materials for pulping. The quantities of these species are not, however, thought to be sufficient to supply a pulp mill of economic size.

As to the other raw materials required for the paper industry, Costa Rica produces limestone, salt and kaolin. At present the electric power capacity is deficient, but it will improve considerably once the Government's electrification plan, with the recommendations made by the Integration Programme's electrical mission, is put into effect.

Finally, short-term fibrous resources are available in the form of abaca fibre, in sufficient quantity to provide the Central American countries with wrapping paper and some kinds of writing and printing paper. From the long-term point of view, the broadleaved species obtainable from the virgin forests in Heredia and Alajuela, in the north of the country, might be taken into account.

2. El Salvador

In 1953, El Salvador's total consumption of paper and board reached approximately 6 thousand tons, about 2.75 thousand tons of which were newsprint. With a total population of slightly over 2 million, per capita consumption may be reckoned at roughly 2.9 kg. As El Salvador has no existing pulp or paper industry, all supplies are at present imported, mainly from the United States and Canada.

/Only the

Only the pine forests situated to the north of the country, near the border with Honduras, might be considered as a possible source of wood material for pulp and paper. However, it is believed that supplies from this area could not satisfy the requirements of a pulp mill of economic size.

In some places, "escobilla" (Sidi rhombifolia) has been planted to prevent soil erosion, although the altitude of the areas concerned is not particularly suited to its growth. The bark is suitable for the production of textile fibre and the stalk (1 to 2 cm. in diameter and approximately 2 m. in length) represents a possible but very limited source of short-fibred raw material which might be used for pulping.

Other fibrous raw materials, such as bagasse and henequen waste, are not available in sufficient quantities to consider them as possible sources of pulp.

Because of the lack of suitable raw materials and the present low domestic consumption of paper and paper products, there seems little prospect of El Salvador manufacturing its own supplies of pulp and paper for some considerable period to come.

3. Guatemala

In 1952, Guatemala's total consumption of paper and board amounted to 6,753 tons, including 2,428 tons of newsprint. With a population of rather less than 3 million, consumption per capita may be reckoned at roughly 1 kg. Except for some small quantities of wrapping paper and boards, all supplies are imported, mainly from the United States and Canada.

It has been estimated that by 1965 the country's annual requirements of paper and paperboard including newsprint, will have reached about 12,000 tons.

At present (1954) there is only one paper mill in the country - Industria Papelera Guatemalteca - situated in the Escuintla district. The raw materials used are racate limón or citronella grass; the company having its own plantations of the second. These materials are first distilled by steam to extract the oil. The plant has a capacity of about 12 tons per day but operation has been somewhat sporadic owing to marketing difficulties arising from the quality of the product.

/Guatemala has

Guatemala has abundant forest resources. From a pulping point of view probably the most important long-term sources of raw material in the country, and perhaps in the whole of Central America, are the typical tropical broadleaved forests in the immediate surroundings of Lake Izabal. Pine forests (Pinus oocarpa and P. caribaea) cover the neighbouring mountainous area, and thus could provide an important source of long-fibred pulp for chemical pulping.

Elsewhere, in the region of Peten, are found other extensive areas of tropical broadleaved forest and in the district south of Huehuetenango a large area under pines. Bad terrain and lack of communications, however, exclude the possibility of either of these areas being considered as potential sources of pulpwood supply, at least for the time being.

Apart from the forest resources, sugar-cane bagasse and henequen waste are available, but in very small quantities.

With regard to chemicals, there is sufficient lime and salt but materials such as saltcake, sulphur, alum, etc. would have to be imported.

Although consumption of paper and paper products in Guatemals is increasing, it is not at present sufficient to support commercial operation of another mill in addition to that of Escuintla. This mill could in fact supply most of the country's needs of wrapping paper and board if product quality and the mill's efficiency were improved, and providing it worked at maximum capacity. From the long-term point of view the Lake Izabal area appears to offer the most favourable prospect for increasing local production capacity.

4. Honduras

Consumption of paper and paper products in Honduras has been increasing at the rate of about 4 per cent per year; it amounted in 1953 to over 2.7 thousand tons (including nearly 500 tons of newsprint). At present all supplies - equivalent to 1.7 kg. per caput - are imported, chiefly from the United States and Canada. The country has at present no pulp or paper industry.

With 43 per cent of the land under forests, Honduras possesses several potential sources of raw material for pulp and paper, but unfortunately lack of transport facilities in some places and inadequate supplies of water in others preclude their exploitation for this purpose in the near future.

/Nevertheless in

Nevertheless in the area around Lake Yojoa - a region served with a good highway - there are large stands of pine, chiefly Pinus oocarpa, which it is estimated could maintain supplies to a pulp mill with a capacity of 100 tons a day, sufficient to meet the needs of the entire Central American market, and to give an exportable surplus by 1965, estimated at some 21,000 tons.

Elsewhere in the Yoro district - an area comprising about 250,000 hectares - there are other large resources of pine (Pinus oocarpa and P. pseudostrobus). With proper sustained yield management it has been calculated that these resources could meet the demands of a pulp mill of at least 50,000 tons capacity a year and probably very much more.

Stands of broadleaved species and plenty of conifers are found in the Olancho district and "guaramo" (Cecropia) - suitable for making newsprint is said to grow abundantly on the banks of the Paulaya river. Immediate exploitation is impossible, however, owing to lack of communications.

So far as chemicals, fuel and power are concerned, Honduras has plentiful supplies of good quality salt and limestone in the Lake Yojoa and Yoro districts, but wood, which is expensive, is the only available domestic fuel. Present production of electricity is insufficient to meet the country's industrial demand, though a large-scale hydro-electric plant is projected at the Rio Lindo falls, and could supply a large pulp mill.

It is evident that domestic consumption of paper and paper products in Honduras will not be sufficient to support production from a pulp and paper mill of economic size for many years to come. Nevertheless reports indicate that the country possesses large resources of raw material suitable for pulp, especially in the regions of Yoro and Lake Yojoa, which should be borne in mind for the future.

5. Nicaragua

Total consumption of paper and board in Nicaragua in 1953 was approximately 2.3 thousand tons (of which about 750 tons were newsprint), or around 2 kg. per capita. The entire supply is imported, mainly from the United States and Canada. No pulp and paper industry exists in the country at present.

/Nicaragua has

Nicaragua has considerable resources of timber potentially suitable for pulpwood. The coniferous forests in the district of Nueva Segovia, an area covering approximately 170,000 hectares, could supply high quality pinewood, but mountainous terrain, lack of transport facilities and an inadequate water supply prevent the installation of a pulp and paper mill, at least in the near future.

About 670,000 hectares in the El Cabo and Zelaya districts are thinly covered with Pinus caribaea. The forest has, in many places, been depleted by fires, poor exploitation and the pasturing of animals. Even so, it is believed that this area, given proper management, could maintain supplies to a pulp and paper mill of economic size. The terrain is favourable for road building and certain rivers in the region (Coco, Huahua and others) could serve as a source of water and as a means of transport.

South of Zelaya, broadleaved forests cover an area calculated at over 6,000,000 hectares, but exploitation is at present impossible owing to a complete lack of communications.

It is concluded that many years will elapse before domestic consumption of paper and paper products in Nicaragua is likely to reach sufficient proportions to support a pulp mill of minimum economic size. Moreover, before any pulp and paper scheme based on the woodland resources of the El Cabo and Zelaya districts could properly be considered, a system of sound forest management would have to be developed and reafforestation measures introduced.

## Colombia

by Manuel Archila M.

The report prepared by the Currie Mission, and sponsored by the International Bank for Reconstruction and Development, estimated Colombia's annual per capita paper consumption at 3.26 kg in 1951. The annual increase in demand was set at 6 per cent, which would mean that demand in 1955 would amount to about 65,000 tons, thus justifying the installation of a domestic paper industry.

The following may be considered as potential sources of raw material:

/a) Some

a) Some tree species from tropical or sub-tropical forests;

b) Sugar-cane bagasse; some 170,000 tons of dry bagasse are available each year, and at present are used only as fuel;

c) Rice straw; production of this cereal is increasing very rapidly, particularly in the districts of Tolima and the Cauca Valley, where climatic conditions and modern irrigation systems allow almost continuous harvests to be obtained;

d) Several species of willows, eucalypts, pines, etc., which could be artificially cultivated over large non-forested areas to provide raw material for a paper mill.

The Instituto de Fomento Industrial is currently engaged in a detailed and systematic study of the forests in the middle valley of the Magdalena river, with a view to installing a pulp and paper mill. The materialization of this project depends on whether it is technically and economically feasible.

The only mill at present operating in Colombia is Cartón de Colombia S.A. It uses imported pulp, bagasse and waste paper, and has an annual output of 12,000 tons of wrapping and writing paper, and 12,000 tons of paperboard. It is planning to expand its output to 36,000 tons a year in order to meet the demand for papers of the kraft type.

The sugar-producing region of the Cauca Valley combines favourable conditions for the installation of a paper industry based on bagasse; the coal in which the area is rich could replace bagasse as fuel for the sugar mills; moreover the harvest is continuous and not seasonal as in other sugar areas.

## Chile

by the Corporación de Fomento de la Producción

Although the paper industry in Chile meets domestic demand to a greater extent than is true of most of the Latin American countries, it is still largely undeveloped. Over the last five years, 57 per cent of newsprint requirements and 15 per cent of those for all other paper and board, plus 85 per cent of the chemical and 10 per cent of the mechanical pulp used in production, have had to be met by imports. This means in

/fact that

fact that imports have amounted to 13,700 tons of newsprint, 3,400 tons of other paper and board, 26,700 tons of various kinds of chemical pulp and 1,400 tons of mechanical pulp.

Domestic production of all paper and board has increased by 11.5 per cent over the past five years. Imports have declined, however, so that apparent consumption has remained constant.

A single company has supplied 96 per cent of total domestic production, and is the only one to make newsprint, writing and printing paper. The remaining output corresponds to numerous small plants whose capacities, with one or two exceptions, do not exceed a thousand tons a year.

As regards chemical pulp production, there is only one mill in the country, using wheat straw and employing the Pomilio soda-chlorine process. It has an annual capacity of 5,500 tons. All the pulp is bleached, and is used by the same mill to make writing papers. Production at this single mill has fallen off by 20 per cent in recent years, because the increasing use of combine harvesters in the wheat fields makes the supply of raw material ever more difficult. Apparent consumption of bleached pulp has remained practically constant, however, since imports have increased.

Unbleached pulp comes entirely from abroad. Save for an occasional fluctuation, some 17 thousand tons a year have been used.

The two rayon and short-fibre mills have increased their imports of dissolving pulp by 50 per cent since 1949, reaching the figure of 3,400 tons in 1953.

Mechanical pulp, using insignis pine (Pinus radiata), began to be made in Chile several years ago. In 1953, productive capacity amounted to 18,000 tons a year, coming from two mills which make the pulp for their own use.

During the five-year period ending in 1953, apparent consumption and output reached approximately the figures shown below.

| | Apparent consumption (tons) | Output (tons) |
|---|---|---|
| Bleached chemical pulp | 10,700 | 4,600 |
| Unbleached chemical pulp | 17,700 | - |
| Dissolving pulp | 2,900 | - |
| Chemical pulp | 16,600 | 15,200 |

/Total demand

Total demand in 1960 for paper and board is estimated at 119,400 tons, of which 41 thousand tons would correspond to newsprint and 78,400 to other paper and board. The demand for mechanical pulp is set at 45,300 tons and for chemical pulp at 55,500. Dissolving pulp requirements for rayon are estimated at 10 thousand tons.

Chile is in an excellent position to meet all its present and future requirements for pulp and paper, and even to become an exporter of these products. Not only are abundant fibrous raw materials available, in 6 million hectares (8 per cent of the country's total area) of natural forest consisting of broadleaved temperate zone species and extensive plantations of Pinus radiata, but also the other essential requirements for the development of the industry.

According to tests made, the natural forest in the south of Chile includes several species suitable for making chemical pulp. The Pinus radiata plantations have been established in the last 25 years, particularly in a district in the south-central sector, some 300 km. in length by 70 km. broad, where they cover nearly 200 thousand hectares. These artificial forests grow at the annual rate of 20 solid cubic metres, barked, per hectare. This means, since there are no difficulties in the chemical or mechanical pulping of the wood, that the plantations represent a vast productive potential, which would amount to nearly 200 thousand tons of pulp by 1960.

Development plans envisage an ever more complete utilization of the wood available, particularly that from Pinus radiata. The International Bank for Reconstruction and Development granted a loan to a private Chilean company for 20 million dollars, guaranteed by the Corporación de Fomento de la Producción. It is to be used to build two new mills. The first, which will eventually produce 47,250 tons a year of bleached and unbleached pulp and 10,500 tons of kraft paper, is to be located at the confluence of the Laja and Bío-Bío rivers. The other, on the southern bank of the Bío-Bío, opposite the city of Concepción, will have an annual capacity of 44 thousand tons of newsprint and 6,600 tons of board. The building of both mills has already begun and it is expected that they will enter production in 1956-1957.

Industrial utilization of the pine plantations on as complete a scale

/as possible,

as possible, means that a minimum annual output of 700 thousand tons of pulp will be attained within the next 15 years. This would require total investments amounting to nearly 200 million dollars.

The first part of this plan would be to instal a rayon mill, with an annual capacity of 60 thousand tons. Some 50 thousand tons would be available for export. According to tests made to date, insignis pine wood is perfectly suitable for making this type of pulp, and its manufacture would meet part of the growing needs of Latin American and European countries.

## Mexico

by the Nacional Financiera, S.A.

Mexico buys abroad all of its newsprint, part of its chemical wood pulp requirements and certain papers requiring rather more advanced technique. These imports reach a yearly average of 290 million pesos a year - some 23.2 million dollars - which, although a negligible amount in the world market, is very significant for a country like Mexico which has limited resources for meeting the needs of its economic and demographic development. In 1951, these purchases represented 4.25 per cent of all imports, and 12.5 per cent of the trade balance deficit.

Over the last twenty-five years, some thirty paper mills have been established; by 1954 they consumed 105 thousand tons of raw and bleached pulp, and about 18 thousand tons of mechanical pulp. Mixed with waste paper - purchased locally and, exceptionally, abroad - these pulps are used to make all the wrapping paper, board, writing and printing paper for Mexico's requirements. A direct survey conducted among the manufacturers revealed that chemical pulp production had risen to 51 thousand tons in 1954. The remainder - 54 thousand tons - continued to be bought on the world market together with newsprint and other papers which require very specialized manufacture.

Estimates drawn up by FAO and by the Nacional Financiera S.A. show that the maximum Mexican demand for pulp will reach 118 thousand tons in 1960. Newsprint consumption - the present level of which is approximately 70 thousand tons a year - will have risen to 87 thousand tons by that same

/year. In

year. In a period slightly exceeding five years, Mexico will require roughly 30 thousand tons more of chemical pulp and 80 thousand tons of mechanical pulp.

Conscious of the impact which these purchases have on its trade level and balance of payments, Mexico is studying methods to avoid such problems as well as the pitfalls of self-sufficiency. The aim is to eliminate, within two years, the present deficit of 54 thousand tons of chemical pulp. New mills have been built, some of which were already completed in 1954. Improved working methods have been introduced and some expansions have been made. By 1956 at the latest, a minimum of 100 thousand tons of chemical pulp will be produced, although this figure should rise to 137 thousand tons if all the mills work at full capacity. The Nacional Financiera S.A., between 1950 and 1953, granted credits for 245 million pesos - some 19.5 million dollars - to the new mills. Meanwhile private enterprise has invested at least a similar amount. If to this is added the investment made by the Compañía Industrial de Atenquique, which began operations in 1946, it appears that Mexico has spent over 70 million dollars in a decade with a view to attaining self-sufficiency in its raw and bleached pulp requirements.

Even so, there are still two problems to solve, relating to the production of newsprint and of special papers. Newsprint at first encountered a major obstacle - the excessive resin content of Mexican conifers. In the south of the United States, however, where there are similar varieties, the resin has been eliminated and ordinary mechanical pulp has been made. After a careful study of locational factors, it has been found that the forest area of Michoacán, with its centre in Uruapán, possesses the best conditions. An investment of 10 million dollars will enable its woods to be exploited and a mechanical pulp mill to be installed with an annual capacity for 36,800 tons. This tonnage, mixed with 5,200 tons of chemical pulp, will be used to produce 40 thousand tons of newsprint, sufficient to cover 57 per cent of present consumption and 46 per cent of that estimated for 1960. Other projects intended to hasten self-sufficiency depend for their execution on the development of the road network and of power plant, on the growth of domestic savings and on the possibility of obtaining foreign credits. If Mexico had the resources needed to exploit all its coniferous forests, it

/would become

would become an exporter of chemical pulp and of newsprint. However, it might enter the world market with other raw materials, such as sugar-cane bagasse, which is being successfully used by the Compañía Industrial de San Cristobal, and will shortly be used also by a new mill being built at Ayotla.

Imports of certain types of paper requiring very specialized manufacture amount, on an average, to about 5,660 tons a year (1949-1950), with a value of some 38 million pesos. Of these, the only one that can be eliminated in the near future is cellophane paper, imports of which exceed 5 million pesos each year. It will be produced in Monterrey by Celotex S.A., on the basis of alpha cellulose, to be made by Celulosa Chihuahua S.A., which is one of the new mills now nearing completion.

## Uruguay

By the Asociación de Fabricantes de Papel de
la Unión Industrial Uruguaya
(Uruguay)

The latest complete and reliable official data are those for 1949, since the production of 30 thousand tons estimated for 1950 undoubtedly represents the prospects at that time rather than the actual amount produced by the country's mills. Thus, in order to determine the current position (1954) private estimates have to be used, and any forecast of future demand for paper and board must be based on data prior to 1950.

In 1949, out of a total consumption of 42,734 tons, 19,501 tons corresponded to domestic production and 23,233 tons to imports. Of these, in turn, 17,034 tons were newsprint - all of which is imported - and 6,199 tons corresponded to other papers and boards. Per capita consumption in that year amounted to 18.1 kg., made up of 7.2 kg. of newsprint and 10.9 kg. of other papers and boards.

Estimated paper consumption during 1954 stands at an annual 55 thousand tons, of which only 28 thousand are produced in the country. The 20,500 tons of newsprint required are all imported, together with 6,500 tons of other papers and boards. This is equivalent to a per capita consumption of 22 kg., 8.2 kg. corresponding to newsprint and 13.8 kg. to other papers and boards.

/Current production

Current production of paper other than newsprint amounts to approximately 50 thousand tons, leaving a surplus of 22,000 tons annually in relation to consumption. To balance consumption and demand for all grades of paper, the following solutions are proposed:

a) To complete additional installations for the production of some paper and board which is at present imported (glassine, cigarette paper, bristol board for cards used in accounting, etc.) It is hoped that capacity to manufacture these products will rise by 5 thousand tons annually, enabling imports to be limited to 1,000 or 1,500 tons.

b) To promote, through agreements with other governments, exports of some paper grades which may be of interest to other countries (especially neighbouring ones), with a view to satisfying their immediate needs, at least until their own capacity is enlarged. It is impossible to foresee the tonnages that could be exported, since these mostly depend upon the relevant exchange agreements.

c) To produce domestically at least one-third of the present newsprint consumption. This will be the easiest problem to solve, provided that economic and financial arrangements can be made between the government, publishing houses and paper manufacturers. Its solution would also encourage domestic production of mechanical pulp, which is the most important raw material for newsprint manufacture.

In order to estimate future demand for paper and board, per capita paper consumption was correlated with per capita income, 2 per cent being taken as the average growth rate of income. For 1960 this method of calculation showed a demand for approximately 67 thousand tons, 27 thousand of which correspond to newsprint and 40 thousand to other paper and board.

No less than 10,730 tons of chemical pulp and 2,458 of mechanical pulp were imported in 1953. In addition, 3,800 tons of straw pulp were produced locally by the soda-chlorine process. Fibrous raw material resources are very limited and the market is too small to allow the installation of units of economic size which could produce the different types of pulp required. It would therefore be more advantageous for the country to enter into an inter-Latin-American co-operation plan and take part in the development

/of neighbouring

of neighbouring countries' projects by investing capital in exchange for a guarantee, on the part of these countries, to allow duty-free exports of given quantities of pulp to Uruguay.

As regards mechanical pulp, however, the situation is different. The large plantations of poplar and eucalypt established during the last few years could easily cover the needs of a new mechanical pulp mill with an annual capacity of 8,000 tons. Such an output would suffice to meet the annual newsprint demand and to replace imports of this pulp. Recently one of the paper-making firms has put into operation an interesting installation for making dark mechanical pulp which is particularly suitable for the manufacture of wrapping paper and boxboard.

## Venezuela

by the Corporación Venezolana de Fomento.

The strong currency and the ready supply of dollars which characterizes Venezuela's economy have, as far as production and consumption of paper and board is concerned, given rise to considerable imports of all types of paper. This in turn has meant that there is little incentive for investigating and developing the use of domestic raw materials. Until 1953, Venezuela produced only 15 per cent - 7,718 tons - of its paper and board requirements, in a mill operating on the basis of imported pump and waste paper. Consumption in that year amounted to 68,870 tons - 12.5 kg. per capita. It was distributed as follows: 20.4 per cent for newsprint; 19.3 per cent for printing and writing paper; 15.2 per cent for wrapping paper, 20.5 per cent for board and boxes, and 24.6 per cent for other papers and boards.

Domestic output consists of wrapping paper, mainly of the type used for cement sacks. At the beginning of 1954 another small mill for making toilet paper was installed in Guacara, a town near Valencia.

It is estimated that consumption of paper and board will rise to 91,200 tons (14.3 kg. per capita) by 1960.

Although Venezuela has tropical softwoods which can be used for pulping, they are difficult to exploit because of the high cost of labour and transport. This directs the immediate prospects towards the use of

/sugar-cane

sugar-cane bagasse as raw material for a pulp and paper mill. The Corporación Venezolana de Fomento has prepared a project for producing 13,500 tons of paper a year. The output would be distributed as follows: 3,500 tons of printing and writing paper; 5,500 tons of paper for multiwall sacks, 1,000 tons of wrapping paper, and 3,500 tons of corrugating board. Installation costs are estimated at 20 million bolívares. Meanwhile, private enterprise has formed a company with a capital of 25 million bolívares for a pulp mill with an initial annual output of 25,000 tons to be expanded later on to 35,000 tons. This pulp will be used to make wrapping, and kraft papers, ordinary board and corrugated board for boxes. At a later stage, the company will probably put into execution a plan for using the country's timber resources as its raw material. For this reason, the exact location of the mill has not yet been decided.