Economic Commission for Latin America
Food and Agriculture Organization of the United Nations
Bureau of Technical Assistance Operations

PULP AND PAPER IN LATIN AMERICA

Present situation and future trends of demand, production and trade

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CHAPTER I

INTRODUCTION, SUMMARY AND CONCLUSIONS

1. INTRODUCTION

The United Nations and its specialized agencies have devoted considerable time to Latin American problems, and it became evident at an early stage that questions relating to the region's paper supply deserved special attention. The first review of production possibilities was a joint study, by the Economic Commission for Latin America (ECLA) and the Food and Agriculture Organization (FAO), presented to the Commission at its fifth session held at Rio de Janeiro in 1953.[1]

FAO and ECLA continued their work on this subject and sent field missions to various countries to investigate existing possibilities. The results of these studies were placed before Latin American Governments, industrialists and experts during the Latin American Meeting of Experts on the Pulp and Paper Industry, held at Buenos Aires in October 1954 under the auspices of ECLA, FAO and the United Nations Technical Assistance Administration.

This Meeting examined the following problems:

(*a*) Present and probable future demand for pulp and paper in Latin America, in the region as a whole and in individual countries;

(*b*) The processes and costs of meeting current requirements;

(*c*) The probability, taking into consideration all fibre resources available for pulp and paper, of satisfying future requirements from Latin American resources alone or in combination with necessary and available imports;

(*d*) The suitability of known technical processes, their costs and their probable results when applied to Latin American woods and fibre crops with a view to producing the necessary kinds and qualities of paper to meet present Latin American needs;

(*e*) The areas requiring co-ordinated technical research in forestry in order to realize a development programme;

(*f*) 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*) The criteria by which new projects should be evaluated;

(*h*) Available sources of financing for developing pulp and paper industries.

The report of the Meeting was published in 1955,[2] and contains a considerable amount of information on the pulp and paper industry in general and on Latin American problems in particular.

The Meeting approved a list of recommendations and decided, *inter alia*, that it would be necessary to place a group of experts on the pulp and paper industry at the disposal of the Latin American countries. The United Nations (ECLA/FAO/TAO) Pulp and Paper Advisory Group for Latin America was therefore formed in 1955 for the purpose of assisting Governments and their development agencies in the preparation of general plans, preliminary surveys and feasibility studies required in the development of the industry within Latin America. The Economic Commission for Latin America gave further expression to the purpose of the Group in resolution 201 (IX) (13 May 1961):

> "To recommend to the secretariat that the future activities of the Group be primarily concerned with providing assistance to Governments which so request, in the preparation of specific programmes for the development of the pulp and paper industries in their countries and in clarifying the problems of training and technological and financial research to which the implementation of such programmes may give rise, in co-operation, on the technological side, with the Regional Institute for Forest Research at Merida (Venezuela)".

Since its inception the Group has been preparing various country studies at the request of Governments,[3] each study including an assessment of the factors of

[1] *Possibilities for the Development of the Pulp and Paper Industry in Latin America* (E/CN.12/294), United Nations publication, Sales No.: 53.II.G.2.

[2] *Pulp and Paper Prospects in Latin America* (E/CN.12/361/Rev.1), United Nations publication, Sales No.: 55.II.G.4.

[3] The studies undertaken were the following:

(*a*) *Resumen de la situación del papel y la celulosa en la Argentina: Posibilidades de desarrollo y aspectos económicos* (E/CN.12/485; FAO/ETAP No. 711), 1957.

(*b*) *Chile: Potential Pulp and Paper Exporter* (E/CN.12/424; FAO/ETAP No. 560; TAA/CHI/3), 1957.

(*c*) *Estudio del papel y de la celulosa en el Ecuador* (E/CN.12/534; FAO/ETAP/1118; TAO/ECU/10), 1959.

(*d*) *La industria mexicana de papel y celulosa: Situación actual y tendencias futuras* (E/CN.12/535; FAO/ETAP/1117; TAO/MEX/4), 1959.

(*e*) *La industria peruana del papel y la celulosa: Situación actual y tendencias futuras* (E/CN.12/537; FAO/ETAP/1116; TAO/PER/10), 1959.

(*f*) *La industria del papel y la celulosa en Venezuela* (E/CN./12/536; FAO/ETAP/1115; TAO/VEN/12), 1959.

(*g*) *La industria colombiana del papel y la celulosa: Situación actual y tendencias futuras* (E/CN.12/540; FAO/ETAP/1219; TAO/COL/9), 1960.

(*h*) *Report to the Surinam Government on the Prospects of the Pulp and Paper Industry in Surinam* (E/CN.12/539; FAO/ETAP/1220; TAO/SUR/1), 1960.

(*i*) *La industria del papel y la celulosa en América Latina* (E/CN.12/543; FAO/ETAP/1221; TAO/LAT/9), 1960.

(*j*) *La industria del papel y la celulosa en Cuba: Situación actual y sugerencias para su desarrollo* (Restricted; under consideration by the Cuban Government).

The Group has also taken an active part in the preparation of the *Relatorio do Grupo de Trabalho de Celulose e Papel*, *Conselho do Desenvolvimento*, Rio de Janeiro, 1957.

production, projections of future consumption and an evaluation of possible projects.

During the last few years the Latin American pulp and paper industry has made vigorous progress; in five years its production has doubled and, in particular, the use of sugar cane bagasse and eucalypts for paper pulp has gained considerably in importance. At the same time, plans for economic integration schemes within the region have begun to take shape, and it is believed that this new economic co-operation between the different countries of the area will greatly facilitate economic development as well as substantially change the traditional pattern of production and distribution.

In view of these circumstances, it has been thought necessary to make a fresh analysis of pulp and paper problems in Latin America as a whole, through a compilation of the information on new trends in production, consumption and trade.

The present study[4] deals with the latest developments of the pulp and paper industry, thus complementing the highly detailed information published in the report of the Meeting. An attempt is also made to project future demand for paper and board in the countries of the region, as well as to analyse the possibilities of supplying that demand, with regard to economic integration projects.

In the preparation of this study the Group has made use of all the above-mentioned publications, bringing the information up to date by direct consultations with the authorities in the respective countries. The recent United Nations series on population and income growth have been adopted as a basis for the projections, and ample use has also been made of a recent FAO publication.[5]

The present study does not pretend to be an exact and scientific forecast of coming events, since the statistics available and the methods used are not accurate enough for that purpose. It is an estimate of the possible development of the pulp and paper industry in a large region, an estimate based on the information that is extant on existing facilities and on the changes expected to take place in the near future.

In the course of time many unforeseen events are likely to occur which will considerably alter the picture as predicted. It will therefore be necessary to follow up the trend of developments continuously and to analyse the new situations in order to provide the authorities and industry with useful information for the preparation of their future plans.

2. Summary and conclusions

Between 1948 and 1955 world consumption of paper and paperboard rose from 36.3 million tons to 56.1 million tons, corresponding to an annual growth rate of 6.4 per cent. According to the FAO report mentioned previously,[6] world demand for paper and paperboard is expected to reach some 90 million tons by 1965, and around 141 million tons by 1975. Within twenty years, therefore (1956-75), the world paper industry may grow to two and a half times its size in 1955.

By far the largest estimated increase in demand is in North America, which accounts for one-third (27 million tons) of the expected increase between 1955 and 1975. Demand in Western Europe is estimated to increase by 17 million tons, or about one-fifth of the rise. In Latin America it is expected to rise from 1.8 million tons in 1955 to 6.5 million in 1975, or by 4.7 million in twenty years, with an annual growth rate of 6.6 per cent. It is also estimated that world demand for paper pulp will grow from 46 million tons in 1955 to some 74 million in 1965 and 117 million in 1975.

The main consumers in Latin America are Brazil, Argentina, Mexico, Cuba, Venezuela and Colombia, in that order, accounting for some 85 per cent of all paper and paperboard consumed in Latin America. Per capita consumption in 1958-59 in Latin America reached approximately 12 kilogrammes, in comparison with 30 kg in the world as a whole, 43 kg in Europe and 165 kg in North America; within Latin America, the range was from 0.8 kg in Haiti to 25 kg in Argentina.

Paper and paperboard production in Latin America increased from 684,000 tons in 1949-50 to over 1.4 million tons in 1958-59, or about three-fifths of requirements. In 1958-59, Argentina, Brazil, Chile and Mexico accounted for 1.2 million tons, or 85 per cent of the region's output, and 72 per cent of its apparent consumption.

With the notable exception of Chile, all the countries in the region depend upon imports to satisfy a sizable part of their paper and paperboard requirements, in some cases the whole of them. In 1958-59 the region depended upon imports for one-third of its requirements —an improvement over the one-half recorded in 1949-50. However, during this period regional net imports grew from 610,000 to 823,000 tons. The major importers during 1958-59 were Brazil, Argentina, Venezuela, Mexico and Cuba. The principal suppliers of these imports were North America and Scandinavia.

Consumption of paper pulp in Latin America increased from 560,000 tons in 1949-50 to 1 million tons in 1958-59. The production of pulp for paper making within the region increased from 268,000 tons in 1949-50 to 608,000 in 1958-59. During this period, fibres other than wood, principally bagasse, increased their share from one-fifth to one-fourth. In 1958-59 Argentina, Brazil, Chile and Mexico accounted for 94 per cent of all the pulp produced in the region, including 99 per cent of the wood-pulp.

Net imports of wood-pulp into the region (other paper pulps were not imported) increased from 290,000 tons in 1949-50 to 365,000 in 1958-59, the increase being accounted for principally by Argentina and Brazil. The principal wood-pulp suppliers were North America and Scandinavia.

It is estimated that Latin American demand for paper and paperboard will rise to 3.5 million tons in 1965 and to 6.7 million tons in 1975. Argentina, Brazil and Mexico account for two-thirds of the projected demand.

On the basis of known plans for plant expansion, it is estimated that the region will produce 2.6 million tons of paper and paperboard in 1965, requiring 0.9

[4] This report is a revision of the provisional text issued in April 1961 under the same title. (See E/CN.12/570.)

[5] See *World Demand for Paper to 1975. A Study of Regional Trends* (FAO/WPPC—59/2), Rome, 1960.

[6] *World Demand for Paper to 1975*, op. cit.

million to be imported in order to satisfy demand. In order to produce this amount within the region, it is estimated that 2 million tons of new fibre plus 0.8 million tons of waste paper will be consumed. Of the new fibre required, it is estimated that 1.75 million tons will be produced within the region, 0.25 million tons requiring to be imported in order to satisfy the demand. The principal pulp-producing countries are expected to be Brazil, Chile and Mexico.

Because regional plant development by 1975 cannot be foreseen at this time, it has been assumed, as one workable hypothesis, that the level of imports estimated for 1965 would continue to 1975. On this assumption, the region would produce 5.8 million tons of paper and paperboard in 1975 and import 0.9 million. In order to produce this quantity, the region would consume 4.55 million tons of new fibre and 1.6 million tons of waste paper. Of the new fibre required, 4.3 million tons would be produced within the region and 0.25 million tons would be imported.

For the projected production of new fibre in Latin America, it is estimated that 5.1 million cubic metres of wood, 1 million tons of dry bagasse and 250,000 tons of straw would be required in 1965 as the principal fibrous raw materials. Similar projections for 1975 are 12.3 million m^3 of wood and 2.6 million tons of dry bagasse.

The anticipated requirements of all types of fibrous raw materials for both years are set forth in the report. According to the limited information available, it is thought that only the supply of coniferous pulpwood is open to question; it is estimated that 3.8 million m^3 will be required in 1965 and 8.0 million in 1975. Only Chile appears to be well endowed with coniferous pulpwood resources, and there is some question as to whether Brazil and Mexico will be able to supply their projected coniferous pulpwood requirements. On a regional basis, however, the picture is brighter because of the only partially-utilized Chilean coniferous plantations, which are estimated to be capable of furnishing 700,000 tons annually of chemical wood-pulp, and because of the untapped pine forests of Central America.

In 1958-59, it is estimated that waste paper was recovered within the region at the rate of 23 per cent of the consumption of paper and paperboard and used at the rate of 36 per cent of the total fibre furnish in paper manufacture. The recovery rate is expected to remain nearly the same through 1975, but the usage rate is projected to decline to 28 per cent in 1965 and 26 per cent in 1975, resulting in a marked improvement in product quality.

An examination of the chemical requirements of the industry indicates that the region could supply its entire needs, although no estimate is made of the likelihood of the necessary facilities being installed.

Because of its importance as the largest individual paper quality, newsprint has been considered separately. World output in 1960 was 14 million tons, one-fifth of all paper and paperboard. Canada, Finland and Sweden are the principal exporters, accounting for half the world output. The FAO document mentioned[7] forecasts world consumption as increasing to 18 million tons in 1965 and 27 million tons in 1975.

Latin American newsprint consumption in 1960 was 700,000 tons and is expected to rise to 940,000 tons in 1965 and 1.7 million in 1975. However, only 155,000 tons was produced in 1960 within the region, or 22 per cent of consumption. Virtually free entry to nearly all countries has discouraged the establishment of an indigenous industry. Only Chile and Brazil produce newsprint on a scale adequate to meet world competition. Argentina, Cuba and Mexico produce relatively small quantities and the others none at all. In 1965, Chile is expected to export 95,000 tons of newsprint (principally to Argentina, Brazil and Mexico) and Brazil to supply about half its needs, whereas the others will continue to be heavily dependent upon imports. Regional production is expected to reach 310,000 tons in 1965, or about one-third of demand, an increase over the one-fifth recorded in 1960.

Development plans for the period 1959-65 are presented in detail. It is estimated that nearly 700 million dollars will be invested in plants during that period, or some 100 million per year. In order to meet the plant requirements of the 1975 hypothesis described earlier, it is similarly estimated that 1,600 million dollars must be invested in plants during the 1966-75 decade —a rate of 160 million dollars annually. It is further estimated that these investments, in conjunction with investment in economic infrastructure, will result in reductions in pulp and paper imports to the value of 290 million dollars in 1965 and 960 million in 1975.

The development of facilities for manufacturing pulp and paper machinery within the region is also examined. Only Brazil and Argentina produce significant amounts of such equipment, and not yet in quantities sufficient to supply the needs of those countries.

The possible effect of the Latin American Free-Trade Area upon the region's pulp and paper industry is speculated upon briefly, and intra-regional trade in pulp and paper is discussed. Chile is the only country which is now, or is expected to become, a significant exporter, although Brazil has had and may continue to have an exportable surplus of short-fibre chemical pulp. In 1960, Chile exported 35,000 tons each of long-fibre sulphate pulp and the same amount of newsprint, primarily to Argentina, Brazil and Mexico. In 1965 these exports are expected to rise to 140,000 and 95,000 tons respectively, and in 1975 to 260,000 and 290,000 tons.

It is concluded from the foregoing that:

(*a*) Although starting from a low base, Latin American pulp and paper consumption has recently been growing and is expected to continue growing at a rate comparable to that of the rest of the world;

(*b*) Over the next few years, the region is expected to approach self-sufficiency in all pulp and paper products except newsprint, of which about two-thirds of requirements must be imported;

(*c*) Pulp and paper production is concentrated in four countries (Argentina, Brazil, Chile and Mexico) in greater proportion than their share of the population;

[7] *World Demand for Paper to 1975*, op. cit.

(*d*) Chile will probably continue to be the only significant pulp and paper exporter supplying an increasing proportion of the region's needs;

(*e*) Inconclusive indications are that the region will be able to supply its fibrous raw material requirements through 1975, although there is some question whether long-fibre resources will be adequately developed;

(*f*) In order to meet the needs of the 1966-75 decade, plant investment will have to be at a rate 60 per cent higher than that of the period 1959-65.

CHAPTER II

CONSUMPTION, PRODUCTION AND TRADE

What is happening in the pulp and paper field elsewhere in the world, and especially in North America and Europe, is clearly of considerable significance and interest to those concerned with the development of the industry in the main consuming and producing countries of Latin America. The present chapter therefore starts out with a brief review (section 1) of some of the main conclusions reached at a World Consultation on Pulp and Paper Demand, Supply and Trade convened by FAO at Rome in September 1959 and attended by some twenty-five of the world's leading experts in this field. The purpose of the Consultation was "to review world trends in consumption, consider the methodology of demand projections, and seek to arrive at an informed view of likely future demand trends"; and the findings have been published in the FAO document cited in chapter I.[1]

The chapter then goes on (section 2) to examine historical trends in consumption, production and trade in respect of paper, paperboard and paper pulp in Latin America, and to review the increases that took place in total apparent consumption during the decade 1949-50 to 1958-59 and the extent to which domestic production expanded during that period to meet the region's increasing needs.

Finally, in section 3 demand projections are presented for the years 1965 and 1975 for each country in the region. These forecasts, which are based on the latest information about demographic trends and estimates of economic development in the different countries, are shown broken down into the various paper categories. It must be clearly emphasized, however, that the detailed forecasts given are provisional and will require subsequent revision. Statistics of paper and paperboard consumption in the region are far from being complete; and such as are available are not always reliable.

Future consumption cannot be measured; it can only be estimated. The forecasts of demand which are presented in this chapter for the different countries in the region should therefore be interpreted with caution. Nevertheless, while all estimates of future consumption are inexact their importance for planning should not be underestimated.

1. A SUMMARY OF REGIONAL TRENDS

(a) *Projections of demand by regions*

After the Second World War the consumption of paper and paperboard increased at an unprecedented rate in almost all regions of the world. Between 1948 and 1955 world consumption rose from 36.3 million tons (of which 7.5 million tons were newsprint) to 56.1 million tons (11.3 million tons newsprint) corresponding to an annual growth rate of 6.4 per cent. Since economic progress is likely to be slower now that post-war adjustment is complete, and since at higher income levels demand is likely to grow at a slower rate in relation to economic growth, this high annual rate of growth is likely to slow down. Even so, the over-all expansion in demand for paper products is expected to be considerable.

According to *World Demand for Paper to 1975*, over-all demand for paper and paperboard is expected to reach a total of some 90 million tons (of which 17.4 million tons would be newsprint) by 1965, and around 141 million tons (26 million tons newsprint) in 1975. These forecasts mean that within the relatively short period of twenty years (1956 to 1957) the world's pulp and paper industry may grow to two and a half times its 1955 size.

No two regions are alike, and consumption will, of course, grow at different rates in different regions of the world. Table 1 shows the expected evolution of demand for the various regions and the annual growth rates implied. By far the largest estimated increase in demand is in North America, which accounts for one-third (27 million tons) of the total expected increase in consumption between 1955 and 1975. Consumption in Western Europe is estimated to increase by some 17 million tons, or about one-fifth of the total expected

TABLE 1. PROJECTION OF WORLD DEMAND FOR PAPER AND PAPERBOARD, 1965 AND 1975[a]

Region	*Total paper and paperboard demand (million tons)*			*Annual growth rate (percentage) 1956-75*
	1955	*1965*	*1975*	
North America	31.5	42.8	58.6	3.2
Western Europe	13.2	21.3	30.2	4.3
Far East	3.0	6.9	13.8	8.0
U.S.S.R.	2.5	6.1	12.3	8.4
Eastern Europe	1.9	3.9	7.1	6.8
Latin America	1.8	3.5	6.5	6.6
Mainland China	0.9	3.1	8.8	12.3
Oceania	0.8	1.3	1.8	4.5
Africa	0.5	0.9	1.6	6.2
Near and Middle East..	0.14	0.28	0.53	6.9
WORLD TOTAL	56.1	90.0	141.4	4.7

[1] *World Demand for Paper to 1975*, op. cit.

[a] Figures may not add up because of rounding.

rise. In the case of Latin America total demand is estimated to increase from 1.8 million tons in 1955 to about 6.5 millions in 1975, i.e., by 4.7 million tons in the space of twenty years, with an annual growth rate of 6.6 per cent.

(b) *The fibrous raw material supply: long-term problems*

On the basis of the forecast of demand for paper and paperboard outlined in the FAO report,[2] and presented here in table 1, total world consumption of paper pulp is estimated as growing from about 46 million tons in 1955 to rather more than 74 million tons in 1965, and to slightly more than 117 million tons in 1975.

The total quantity of fibrous raw material needed to produce the additional annual quantity of about 70 million tons of paper pulp required by 1975 corresponds to the equivalent of some 310 million m^3 of roundwood, which is approximately one-third of current annual total world fellings of wood for industrial purposes, and about one-fifth of total removals of wood for all purposes.

Bearing in mind the potential yield from the vast untapped forest resources of the world and the possibilities of utilizing other fibrous raw materials as well (agricultural residues, bagasse, etc.) it is clear that, on a global basis, the physical availability of fibres will not set a limit to the expansion of the pulp and paper industries in the foreseeble future.

At the same time the World Consultation in Rome noted that difficulties in the long-term supply of fibrous raw materials already existed, or might arise by 1975, in Western and Eastern Europe, in the Near and Middle East and in areas of the Far East. And because of the time required before measures to raise forest output can take effect, the Consultation emphasized the great importance of making long-term plans to secure the industry's future raw material supplies.

[2] *World Demand for Paper to 1975*, op. cit., p. 53, table 2.32.

2. Historical trends in Latin America

(a) *Historical trends in consumption, 1950-59*

Data showing the extent to which apparent consumption expanded in the individual countries of Latin America during the ten-year period 1950 to 1959 are given in table 2.[3]

In the decade 1950 to 1959, consumption of paper and paperboard in Latin America nearly doubled, from about 1.3 million tons (of which some 370,000 tons, or roughly 29 per cent, consisted of newsprint) in 1950 to 2.3 million tons (of which rather more than 600,000 tons, or about 27 per cent, was newsprint) in 1959. This corresponds to an annual growth rate of 6.6 per cent.

It will be seen that the main consumer centres at the end of the decade were Brazil (602,000 tons), Argentina (509,000 tons), Mexico (443,000 tons), Cuba (157,000 tons), Venezuela (145,000 tons) and Colombia (103,000 tons); at that time these six countries together accounted for nearly 2 million tons, or no less than 85 per cent of the region's total apparent consumption of all paper and paperboard, and about 518,000 tons, or approximately 85 per cent of the demand, for newsprint. The corresponding figures for 1949-50 were 1.1 million tons, or approximately 86 per cent of all paper and paperboard, and slightly less than 300,000 tons, or about 80 per cent, of regional demand for newsprint.

[3] Historical series for each country covering the period 1925 to 1950 are given in *Possibilities for the Development of the Pulp and Paper Industry in Latin America*, op. cit. Historical series for 1955-59 and an estimate of 1960 consumption figures are included in appendix I at the end of this chapter.

Table 2. Latin America: development of average apparent consumption[a] of paper and paperboard, 1949-50 and 1958-59

	1949-50				*1958-59*			
	Total paper and paperboard consumption		*Newsprint consumption*		*Total paper and paperboard consumption*		*Newsprint consumption*	
Country	*Thousands of tons*	*Percentage of total*	*Thousands of tons*	*Percentage of total consumption*	*Thousands of tons*	*Percentage of total*	*Thousands of tons*	*Percentage of total consumption*
Brazil	294	22.7	84	22.7	602	26.6	208	34.0
Argentina	403	31.1	109	29.5	509	22.5	153	25.0
Mexico	184	14.3	49	13.2	443	19.6	80	13.0
Cuba	127	9.8	32	8.7	157	7.0	35	6.0
Venezuela	45	3.5	9	2.4	145	6.4	17	3.0
Colombia	59	4.6	15	4.1	103	4.6	22	4.0
Chile	65	5.0	26	7.0	80	3.5	22	4.0
Peru	31	2.4	9	2.4	65	2.9	15	2.0
Uruguay	48	3.7	17	4.6	62	2.7	25	4.0
All others	38[b]	2.9	20	5.4	94[c]	4.2	32	5.0
Total	1,294	100.0	370	100.0	2,260	100.0	609	100.0
Rounded to	1,295				2,260		610	

[a] Excluding imports of books, newspapers, periodicals and printed matter in general.
[b] None over 10,000 tons.
[c] None over 16,000 tons.

Among the spectacular increases in consumption were those recorded for Brazil (8.3 per cent per year), currently Latin America's largest paper consumer, where apparent consumption more than doubled from 294,000 tons at the beginning of the decade to 602,000 tons at the end; Mexico (10 per cent per year) where consumption multiplied two and a half times from 184,000 to 443,000 tons; Venezuela (14 per cent per year) where consumption trebled from some 45,000 tons in 1949-50 to approximately 145,000 tons in 1958-59; Colombia (6 per cent per year) which recorded an advance from 59,000 to 103,000 tons; and Peru (9 per cent per year) where consumption also more than doubled, from 31,000 to 65,000 tons.

Elsewhere, for example, in Costa Rica and El Salvador, consumption trebled, and it doubled in the Dominican Republic, Guatemala and Panama. In each of these five countries, however, total apparent consumption was still comparatively small and in none of them had it reached more than 14,000 tons by the end of 1958-59.

Data on per capita consumption of newsprint and other paper and paperboard at the beginning and end of the period under review are shown in table 3.

For the region as a whole it will be seen that total consumption per head increased from 8.4 kg (of which approximately 2.4 kg was newsprint) in 1949-50 to 11.8 kg (of which approximately 3.2 kg was newsprint) in 1958-59. In 1958-59 it ranged from 25 kg in Argentina and 24 kg in Cuba to around 800 grammes in Haiti. Only in Venezuela, Uruguay, Cuba and Argentina, however, did total consumption per head come anywhere near the world average of approximately 30 kg. Elsewhere in the region, even in Brazil, Chile and Mexico, it fell well below that figure.

The high consumption growth rates recorded in many if not most of the countries of the region need to be seen in their right perspective. The rate of economic progress was very rapid in some of the countries and the establishment of local production facilities undoubtedly led to a rise in consumption which could not have been achieved if growing requirements had had to be satisfied primarily through imports. In some countries, however, there is no doubt that import controls, lack of foreign exchange and slow expansion of domestic production facilities acted as brakes on consumption growth.

(b) *Domestic paper and paperboard production, 1950-59*

It is unlikely that the high rate of growth of paper and paperboard consumption in Latin America (6.6 per cent annually) could have been achieved if expansion in demand had had to depend largely on imports. It is of interest therefore to find out not only to what extent production has expanded throughout Latin America, but also how far the individual countries of the region have been able to supply their own growing needs. Table 4 shows the production volume of newsprint, and of all paper and paperboard, in the individual

TABLE 3. LATIN AMERICA: AVERAGE PER CAPITA CONSUMPTION OF PAPER AND PAPERBOARD, 1949-50 AND 1958-59

(Kilogrammes)

Country or area	Newsprint		Other paper and paperboard		Total	
	1949-1950	1958-1959	1949-1950	1958-1959	1949-1950	1958-1959
World	3.7[a]	5.9[b]	13.0[c]	24.0[b]	16.7	29.9
Europe	4.8[a]	8.2[b]	20.2[c]	35.0[b]	25.0	43.2
North America	33.5[a]	34.5[b]	118.1[c]	130.0[b]	151.6	164.5
Latin America	2.4	3.2	6.0	8.6	8.4	11.8
Argentina	6.4	7.5	17.3	17.4	23.7	24.9
Bolivia	0.9	0.5	0.5	0.8	1.4	1.3
Brazil	1.0	3.3	4.7	6.2	5.7	9.5
Chile	4.3	3.0	6.4	7.8	10.7	10.8
Colombia	1.4	1.5	3.9	5.7	5.3	7.2
Costa Rica	1.9	3.0	2.6	5.6	4.5	8.6
Cuba	6.0	5.2	15.6	18.6	21.6	23.8
Dominican Republic	0.6	0.9	2.0	4.2	2.6	5.1
Ecuador	1.3	1.5	1.5	2.4	2.8	3.9
El Salvador	1.1	1.9	1.0	3.3	2.1	5.2
Guatemala	0.7	1.0	1.4	2.2	2.1	3.2
Haiti	0.1	0.1	0.5	0.7	0.6	0.8
Honduras	0.3	0.5	0.7	1.7	1.0	2.2
Mexico	1.9	2.4	5.3	11.0	7.2	13.4
Nicaragua	0.7	1.0	1.0	2.1	1.7	3.1
Panama	3.0	2.6	5.4	10.4	8.4	13.0
Paraguay	0.3	0.6	1.0	1.0	1.3	1.6
Peru	1.1	1.4	2.6	4.9	3.7	6.3
Uruguay	7.0	9.4	13.3	13.3	20.3	22.7
Venezuela	1.9	2.6	7.3	19.3	9.2	21.9

[a] *Newsprint Trends 1928-51*, UNESCO (February 1954).
[b] 1957-59 average; *Yearbook of Forest Products Statistics* (FAO, 1960), table 43.
[c] *Ibid.*, 1951.

TABLE 4. LATIN AMERICA: DEVELOPMENT OF PAPER AND PAPERBOARD PRODUCTION

Country	1949-50		1958-59	
	Newsprint	Total paper and paperboard	Newsprint	Total paper and paperboard
	Thousands of tons			
Argentina	—	195	9	352
Bolivia	—	0.5	—	0.9
Brazil	30	233	65	428
Chile	10	45	46	99
Colombia	—	8	—	46
Costa Rica	—	—	—	—
Cuba	—	29	4	58
Dominican Republic	—	—	—	—
Ecuador	—	0.3	—	0.8
El Salvador	—	—	—	0.5
Guatemala	—	—	—	0.6
Haiti	—	—	—	—
Honduras	—	—	—	—
Mexico	2	125	7	341
Nicaragua	—	—	—	—
Panama	—	—	—	—
Paraguay	—	—	—	0.5
Peru	—	18	—	41
Uruguay	—	25	—	35
Venezuela	—	5	—	34
TOTAL[a]	42	684	131	1,437
	Percentage of consumption			
Argentina	—	48	6	69
Bolivia	—	11	—	19
Brazil	36	79	31	71
Chile	38	70	210	124
Colombia	—	14	—	45
Costa Rica	—	—	—	—
Cuba	—	25	11	37
Dominican Republic	—	—	—	—
Ecuador	—	3	—	5
El Salvador	—	—	—	5
Guatemala	—	—	—	5
Haiti	—	—	—	—
Honduras	—	—	—	—
Mexico	4	68	9	77
Nicaragua	—	—	—	—
Panama	—	—	—	—
Paraguay	—	—	—	20
Peru	—	58	—	62
Uruguay	—	52	—	57
Venezuela	—	11	—	23
TOTAL[a]	11	53	22	64

[a] The totals may not add up because of rounding.

countries of Latin America at the beginning and end of the ten-year period under review (1950 to 1959), and also production of newsprint, and of all paper and paperboard, expressed as a percentage of total apparent consumption over the same period.

It will be seen that the number of countries manufacturing paper products rose from ten in 1949-50 to fourteen in 1958-59. The countries producing newsprint also increased from two to five (Argentina, Brazil, Chile, Cuba and Mexico).[4] Meanwhile five of the twenty countries in the region were still without any paper-producing facilities at all.[5]

During the period under review local production of all paper and paperboard more than doubled, from 684,000 tons in 1949-50 to more than 1.4 million tons in 1958-59. Newsprint output trebled from 42,000 to 131,000 tons. These are substantial increases. Even so Latin America was still producing only a little over three-fifths of its total requirements of all paper and paperboard and no more than one-fifth of its demand for newsprint. Moreover, in 1958-59 four countries alone—Argentina, Brazil, Chile and Mexico—accounted for nearly 1.22 million tons or 85 per cent of the region's total output (and consumed 72 per cent of the over-all apparent consumption). The same four countries among them also manufactured about 127,000 tons (97 per cent) of Latin America's output of newsprint, and accounted for 76 per cent of over-all apparent newsprint consumption.

Nevertheless the data given in the first part of table 4 bring to light the remarkable fact that in ten years local production practically trebled in Mexico, from 125,000 tons in 1949-50 to 341,000 tons in 1958-59; increased almost twofold in Brazil (from 233,000 to 428,000 tons) and Peru (from 18,000 to 41,000 tons); and almost doubled in Argentina (from 195,000 to 352,000 tons). In Colombia, the relatively small output of 8,000 tons in 1949-50 had reached a yearly average of 46,000 tons by 1958-59. The increase was no less spectacular in Venezuela, where local output increased from an average of 5,000 tons at the beginning of the decade to around 34,000 tons at the end. To say the least, these were truly outstanding developments.

The number and average capacity of paper and paperboard mills in the individual countries of the region and the estimated capacity and actual production for each country during 1958 are given in appendix II at the end of this chapter. At that time Latin America had a total of about 218 paper mills, of which five were newsprint mills.[6] Average capacity per mill was around 31,000 tons for newsprint and 7,100 tons for other paper and paperboard;[7] actual production during that year amounted to about 1.38 million tons.

Many of the countries are in the process of expanding their production of paper and paperboard considerably, especially Argentina, Brazil, Chile, Colombia and Mexico. These developments are discussed later in chapter V. At the same time there are wide variations within the region in self-sufficiency as regards grades.

[4] Newsprint production proper in Mexico only started in late 1958. Up to that time output had been limited to small runs in what was essentially not a newsprint mill.

[5] There is a mill in Costa Rica but this has remained closed since 1955.

[6] In Brazil seven more mills were occasionally producing newsprint.

[7] See appendix III for the distribution of total capacity by size and type of mills.

The manufacture of newsprint is dealt with in chapter IV. In the case of printing and writing paper, countries such as Argentina, Brazil, Chile, Mexico and Uruguay have been self-sufficient to a high degree, generally importing only special papers and grades for which demand is too small to justify local production. Their rate of self-sufficiency for these grades in 1959 was estimated at about 88 per cent. Of the other countries, only Cuba and Peru—and more recently Colombia[8]—produce printing and writing paper. Elsewhere, with the exception of Venezuela, local demand has been too small to justify domestic production.

In the main consumer countries the production of other paper and paperboard is in very much the same situation as that of printing and writing paper. The southern group of countries—Argentina, Brazil, Chile and Uruguay—cover over 95 per cent of their requirements, importing only such specialities as cigarette paper, greaseproof paper and a certain amount of kraft. This is also true of Mexico. In Colombia, Cuba, Peru and Venezuela, domestic production has been appreciable and capacity is expanding considerably. Elsewhere consumption in itself is limited and existing production is based primarily on waste paper.

(c) *Import dependence (paper)*

(i) *Volume*

There was a substantial improvement in self-sufficiency over the decade. However, with the notable exception of Chile (which began exporting newsprint in quantity in 1958), all the countries in the region still depend on imports to satisfy a sizable part of their paper requirements, and in some cases all of them, as table 5 shows.

In 1958-59 the region as a whole depended upon imports for approximately one-third (36 per cent) of its requirements of all paper and paperboard and about four-fifths (78 per cent) of its consumption of newsprint. These figures show an improvement over the situation in 1949-50, when the corresponding amounts were 47 and 89 per cent respectively.

Despite very substantial progress in domestic production, however, the volume of net imports increased appreciably in practically all the countries throughout the region. This is evident from table 6, which summarizes developments in net trade for each country.

For Latin America as a whole there was a 34 per cent over-all increase in the volume of net imports, from some 610,000 tons in 1949-50 to around 823,000 tons in 1958-59. Particularly substantial increases occurred in the case of Brazil (from 62,000 to 174,000 tons), currently the leading paper importer in the region; Mexico (60,000 to 101,000 tons); Peru (13,000 to 25,000 tons); and Venezuela (37,000 to 111,000 tons). The situation showed some improvement in the case of Argentina, although that country was still importing at the average rate of 158,000 tons per year during 1958-59. A major change was registered in Chile, where net imports of 20,000 tons in 1949-50 had been converted into net exports of 24,000 tons ten years later.

(ii) *Value*

In terms of value, the increase in net imports was even greater because of rising prices for paper and

[8] The production of printing and writing paper in Colombia began in 1961.

TABLE 5. LATIN AMERICA: IMPORT DEPENDENCE (IMPORTS/TOTAL CONSUMPTION), 1949-50 AND 1958-59

(Percentages)

Country	1949-50		1958-59	
	Total paper and paperboard	*Newsprint*	*Total paper and paperboard*	*Newsprint*
Chile	30	62	Net exporter	Net exporter[a]
Mexico	32	96	23	91
Brazil	21	64	29	69
Argentina	52	100	31	94
Peru	42	100	38	100
Uruguay	48	100	43	100
Colombia	86	100	55	100
Cuba	75	100	63	89
Venezuela	89	100	77	100
Paraguay	100	100	80	100
Bolivia	89	100	81	100
Ecuador	97	100	95	100
Guatemala	100	100	95	100
El Salvador	100	100	96	100
All others	100	100	100	100
TOTAL, Latin America	47	89	36	78

[a] Chile began to export newsprint in 1958. In 1958 and 1959 total Chilean exports of newsprint amounted to 20,000 and 35,000 tons respectively.

TABLE 6. LATIN AMERICA: DEVELOPMENT OF NET TRADE IN PAPER AND PAPERBOARD

(Thousands of tons)

Country	*1949-50*	*1958-59*
Argentina	—209	—158
Bolivia	—3.9	—3.7
Brazil	—62	—174
Chile	—20	+19
Colombia	—51	—57
Costa Rica	—3.6	—9.4
Cuba	—89	—99
Dominican Republic	—5.4	—14
Ecuador	—8.6	—15
El Salvador	—3.8	—12
Guatemala	—5.9	—11
Haiti	—2.0	—2.9
Honduras	—1.4	—4.1
Mexico	—60	—101
Nicaragua	—1.7	—4.3
Panama	—6.6	—13
Paraguay	—1.8	—2.1
Peru	—13	—25
Uruguay	—24	—26
Venezuela	—37	—111
TOTAL[a]	—610	—823

Net imports (—).
Net exports (+).
Sources: 1949-50: *Possibilities for the Development of the Pulp and Paper Industry in Latin America,* op. cit.; 1958-59: annual trade yearbooks.
[a] Totals may not add up because of rounding.

paperboard. Table 7 shows the estimated values of average annual imports into Latin America at the beginning and end of the decade.

For the region as a whole it will be observed that there was an increase of 43 per cent, from about 117 million dollars in 1949-50 to some 167 million in 1958-59.

The combined net imports of five countries alone —Argentina, Brazil, Cuba, Mexico and Venezuela— accounted for 138.7 million dollars or 83 per cent of the total value of the region's net imports at the end of the decade. In terms of volume, the corresponding figure was 643,000 tons, or 78 per cent.

The main suppliers of paper and paperboard (and pulp) to Latin America have been and still are Scandinavia (particularly to the seven southernmost countries) and North America (particularly to the northern countries of the region). Domination of the market by two such different sources is due to tradition, trade agreements, and, in the northern zone, to the proximity of and traditionally close commercial ties with North America.

The pattern of Latin American imports is changing however; indeed it has already changed to some extent and it will certainly be influenced further by the recent establishment of the Latin American Free-Trade Area. But the salient feature of the import pattern—the fact that Europe is the main source of imports to the southern area of Latin America while North America supplies the northern area—seems likely to remain much the same for some time to come.

(d) *Domestic production of paper pulp, 1950-59*[b]

Table 8 shows the pattern of expansion in the production of paper pulp (split up into wood-pulp and other fibre pulp) in Latin America during the post-war decade. The number of pulp-producing countries increased from seven (four manufacturing wood-pulp) in 1949-50 to eight (six manufacturing wood-pulp) in 1958-59. Uruguay began to manufacture groundwood pulp (from maritime pine or *Pinus pinaster*) in 1957, and Colombia started to produce chemical pulp from mixed tropical broadleaved species in 1959. Cuba came into the picture with the production of pulp from bagasse in 1959.

During the ten years under review domestic output of wood-pulp more than doubled, from 213,000 to 465,000 tons, and that of other fibre pulp practically trebled, from 55,000 to 154,000 tons. The total combined output of pulp increased more than two and a quarter times from 268,000 tons in 1949-50 to 608,000 tons in 1958-59. At the same time the share of other fibre pulp in total production showed an increase from one-fifth to one-quarter.

Of particular interest in the non-wood-using sector of the industry was the increase in the number of mills manufacturing pulp from bagasse. From eight such mills producing between 25,000 and 30,000 tons of bagasse pulp in 1954 the number had increased to sixteen mills in 1959 with an estimated output at that time of around 90,000 tons.

It will be seen from table 8 that the production of pulp, like that of paper (table 4), is mainly located in Argentina, Brazil, Chile and Mexico. In 1958-59 these

[b] Historical series for production, imports and consumption in 1955-59, and an estimate for 1960, are included in appendix IV at the end of this chapter.

TABLE 7. LATIN AMERICA: ESTIMATED VALUE OF NET IMPORTS OF PAPER AND PAPERBOARD

(Millions of dollars)

Country	*1949-50*	*1958-59*
Argentina	38.4	28.7
Brazil	13.0	34.6
Chile	4.4	1.6[a]
Colombia	9.3	4.5
Cuba	17.0	28.7
Mexico	7.3	19.8
Peru	4.0	6.6
Uruguay	4.7	4.7
Venezuela	10.1	26.9
Other countries	8.8	11.0
TOTAL	117.0	167.1

Source: Annual trade yearbooks.
[a] Although Chile is a net exporter in terms of volume (see table 6), the high value of the imported products makes the country a net importer on a value basis.

TABLE 8. LATIN AMERICA: PAPER PULP PRODUCTION BY COUNTRIES
(Thousands of tons)

Country	1949-50			1958-59		
	Wood-pulp	*Other fibre pulp*	*Total*	*Wood-pulp*	*Other fibre pulp*	*Total*
Argentina	11	23	34	46	35	81
Brazil	130	16	146	218	33	251
Chile	14	5	19	51	2.4	53.4
Colombia	—	0.4	0.4	—	2.7	2.7
Cuba	—	—	—	—	5	5
Mexico	58	3	61	152	35	187
Peru	—	5	5	—	23	23
Uruguay	—	3	3	1.9	3	4.9
TOTAL[a]	213	55	268	469	139	608

[a] Totals do not add up because of rounding.

four countries produced practically all (99 per cent) of the region's wood-pulp and 77 per cent of the other fibre pulp—in all about 94 per cent of the pulp production of the region.

The industry differs fundamentally, however, in each of these countries. Brazil has a considerable number of very small groundwood mills (possibly as many as 300) but because of their small and uneconomic size and the difficulties they have in obtaining a continuous supply of pulpwood, the large majority are not in a position to compete on the market during times of normal price levels, and remain closed down. Paraná pine (*Araucaria angustifolia*) is the main species used for mechanical pulp in Brazil. Of the chemical pulp produced there in 1959, approximately 50 per cent came from coniferous trees, about 33 per cent from eucalypts and the remainder largely from bagasse. Rather more than 70 per cent of all the pulp produced in the country came from conifers.

In Mexico coniferous trees are also the main source of fibrous raw material. Of the total volume of chemical pulp manufactured in 1959, about 65 per cent came from that source, 20 per cent from bagasse and 15 per cent from straw. *Abies religiosa* is the species used for the production of Mexico's mechanical pulp.

In Argentina mechanical pulp is produced from poplar and willow, and chemical pulp approximately 50 per cent from wood and 50 per cent from agricultural residues, chiefly straw.

In Chile the manufacture of both mechanical and chemical pulp at the present time is based almost wholly on *Pinus radiata*.

Of the other six countries with pulp-producing facilities in the region, mention should be made of Cuba and Peru (both of which rely 100 per cent on bagasse) and Colombia, which in 1959 installed the region's first semi-chemical pulp mill to operate exclusively on mixed tropical broadleaved species.[10]

The number and estimated average capacity of pulp mills in the individual countries of the region, and the estimated capacity and actual production of each country during 1959 are given in appendix II at the end of the present chapter. In that year Latin America had a total of some seventy-three pulp mills, of which eighteen were producing mechanical pulp.[11] Average capacity was around 11,600 tons for mechanical pulp and about 8,300 tons for the other grades. Total capacity of the mills in operation in 1958 was estimated at some 724,000 tons per year; of this amount mechanical pulp accounted for approximately 210,000 tons, and chemical and semi-chemical pulp around 514,000 tons;[12] actual production amounted to about 186,000 and 371,000 tons respectively, i.e., total pulp output was about 557,000 tons. Large-scale expansion projects are under way in many of the countries in the region. Even so it seems likely that in 1965 there may still be ten countries without any pulp-producing facilities at all and two (Ecuador and Guatemala) with a purely nominal output.

Among the most important of the "newer" producers is Chile, where a substantial industry has been established and is being expanded on the basis of raw material from the extremely fast-growing *Pinus radiata* plantations. Sulphate pulp began to be exported in 1959. The Chilean plantations could support an industry with a pulping capacity of approximately 700,000 tons per year, and leave a margin for the sawmilling industry. The Central American pine area, especially the forests in Honduras, may also play an important part in the future as a source of raw material for the pulp industry.

The lack of pulp production and the import restrictions in many countries have forced the paper industry to use a high percentage of waste paper in its fibre production. As this paper is often of poor quality, it was inevitable that the paper produced should also frequently be inferior. It is of the utmost importance for the whole region to develop its own pulp industry, not only in order to reduce the outflow of foreign exchange for imports of the fibrous raw materials required to increase paper productoin, but also to improve

[10] Capacity 18,000 tons per annum.

[11] The large number of very small groundwood mills in Brazil has not been taken into account.

[12] See appendix V for the distribution of total capacity by size and type of mills.

TABLE 9. LATIN AMERICA: NET IMPORTS OF WOOD-PULP BY COUNTRIES
(Thousands of tons)

Country	*1949*	*1950*	*1949-50*	*1958*	*1959*	*1958-59*
Argentina	70	70	70	107	113	110
Brazil	96	132	114	95	88	92
Chile	23	25	24	29	41	35
Colombia	1	1	1	26	33	30
Cuba	12	20	16	30	25	27
Mexico	27	53	40	25	20	23
Peru	6	8	7	9	7	8
Uruguay	6	12	9	10	19	15
Venezuela	6	7	7	14	32	23
TOTAL	247	328	288	345	378	363
ROUNDED TO			290			365

the quality of the paper. Fortunately, the latest developments indicate that, in percentage terms, the pulp industry is now expanding faster than the paper industry and, in absolute terms, at almost the same rate. This means that more virgin "fibre" will be available in future for the manufacture of paper than during the past years, and that paper quality will probably improve.

The Latin American region has extensive untapped fibrous resources besides the pine forests and plantations of temperate broadleaved species which form the mainstay of the present industry.

(e) *Import dependence (pulp)*

The changes in the volume of net imports of paper pulp into Latin America by countries during the decade under review are summarized in table 9.

The data show that there was an over-all increase from about 290,000 tons in 1948-49 to around 365,000 tons in 1958-59, or 25 per cent for the region as a whole. The main increases were registered in Argentina (Latin America's leading importer of pulp in 1958-59) from 70,000 to 110,000 tons; Colombia, from rather less than 1,000 to 30,000 tons; Cuba from 16,000 to 28,000 tons; Uruguay from 9,000 to 15,000 tons; and Venezuela from 7,000 to 24,000 tons. Brazil, the region's second largest importer of pulp, averaged 92,000 tons for net imports per annum in 1958-59, in comparison with the average net imports of 114,000 tons ten years previously.

Argentina and Brazil together accounted for 202,000 tons or 56 per cent of the region's total net imports of pulp in 1958-59, as compared with 184,000 tons or 63 per cent in 1949-50.

As in the case of paper, net imports of pulp in terms of value increased faster than by volume. Table 10 shows the estimated average net import values for pulp and waste paper in 1949-50 and 1958-59.

For the region as a whole there was a 44 per cent increase, from around 36 million dollars at the beginning of the decade 1950-59 to some 51 million dollars at the end. In Argentina the value doubled during the ten years from 8.5 to 17.2 million dollars. In Brazil it decreased from 15.2 to 13 million dollars. Colombia, with practically negligible imports in 1949-50, was importing at the rate of over 4 million dollars by 1958-59. Other substantial increases occurred in Uruguay, from 0.9 million to 2.3 million dollars, and Venezuela, from 0.7 to 1.9 million dollars.

Again, as in the case of paper imports, the main suppliers of pulp imports to Latin America have been and still are Scandinavia and North America. Imports from Europe are almost exclusively of Scandinavian origin, except in the case of Argentina, which has bought substantial quantities from the USSR and Yugoslavia.

There is the same remarkable difference in the origin of the pulp imports by the southern and by the northern countries of Latin America: at the end of 1957 the Scandinavian countries were supplying approximately 85 per cent of the imports effected by the southern countries, whereas North America provided over 70 per cent of the northern countries' imports. While these are the historical relationships, it can be expected that the Scandinavian share of the wood-pulp market will decline because of rapidly growing demand in Western Europe, For example, in early 1961 North America was supplying most of Argentina's imports.

TABLE 10. LATIN AMERICA: ESTIMATED VALUE OF NET IMPORTS OF PULP AND WASTE PAPER
(Millions of dollars)

Country	*1949-50*	*1958-59*
Argentina	8.5	17.2
Brazil	15.6	12.9
Chile	2.8	5.3
Colombia	...	4.1
Cuba	1.5	3.4
Mexico	4.9	3.3
Peru	0.7	0.7
Uruguay	0.9	2.3
Venezuela	0.7	1.9
TOTAL	35.6	51.1

(f) *A summary of developments in the post-war decade*

The development of paper, paperboard and paper pulp consumption, production and trade in Latin America during the decade 1949-50 to 1958-59 is outlined in table 11 and may be summarized as follows:

(*a*) Total apparent consumption of paper and paperboard nearly doubled, from around 1.3 million tons in 1949-50 to some 2.3 million tons in 1958-59;

(*b*) Total apparent consumption of paper pulp increased by almost four-fifths from approximately 560,000 tons at the beginning of the decade to almost 1 million tons at the end;

(*c*) Local production of paper and paperboard increased more than two and a quarter times from about 684,000 tons (53 per cent of total apparent consumption) in 1949-50 to about 1.44 million tons (64 per cent of total apparent consumption) in 1958-59;

(*d*) Local production of paper pulp also increased more than two and a quarter times, from about 268,000 tons (48 per cent of total apparent consumption) in 1949-50 to around 608,000 tons (63 per cent of total apparent consumption) in 1958-59;

(*e*) Net imports of paper and paperboard increased by 34 per cent in volume, from about 610,000 to 819,000 tons, and by 43 per cent in value, from 117 million dollars to approximately 167 million dollars;

(*f*) Net imports of paper pulp increased by 25 per cent in volume, from about 290,000 to 363,000 tons, and by 44 per cent in value, from approximately 36 million to about 51 million dollars;

(*g*) The combined value of net imports of pulp and paper went up by 44 per cent, from about 152 million dollars in 1949-50 to almost 220 million in 1958-59.

TABLE 11. LATIN AMERICA: SUMMARY OF PAPER AND PULP DEVELOPMENT IN THE POST-WAR DECADE

	Paper and paperboard		*Pulp*	
	1949-50	*1958-59*	*1949-50*	*1958-59*
	(Thousands of tons)			
Production	684	437	268	608
Net imports	610	819	290	363
Consumption	1,294	1,256	558	971
	(Millions of dollars)			
Net imports	117	167.1	35.6	51.1

3. A PROJECTION OF DEMAND FOR PAPER AND PAPERBOARD IN LATIN AMERICA

(a) *Outline of previous projections*

The assumptions made in this study about future levels of factors such as population growth and per capita income (see appendix VI) are realistic. They are careful estimates of what these levels may in fact prove to be. All projections of Latin American paper and paperboard demand published by the United Nations in the last few years are based on the assumption of a more or less close relationship between the growth of the gross domestic product and the increase in paper and paperboard consumption. In the case of paper for educational purposes,[13] other independent variables —apart from the growth of the product—have been tested, such as indices of literacy, educational activities, printing and, in general, of educational progress, but the results have not been satisfactory owing to the dearth of statistics.

In the case of each Latin American country the first projection was based on a general correlation between paper and paperboard consumption and the per capita product for a group of countries comprising all those in Latin America and several outside.[14] On the assumption that a linear relationship existed between the above-mentioned variables, a constant elasticity coefficient was used for all income levels and all countries. The calculations prepared on the basis of this correlation formulated various hypotheses on the per capita growth of the product ranging from 1 to 5 per cent annually, 3 per cent being finally chosen as a working hypothesis.

These projections were followed by another set which made important innovations in the methodology used.[15] In the first place, it was considered that the relationship between paper and board consumption and the per capita product would be better represented by a second-degree curve than by a straight line as before. The use of this relationship enables a proven fact to be taken into account, namely, that income-elasticity[16] is greater when the level of income is low, and decreases as the latter rises.

Secondly, the hypothesis that the product grows at the same rate in all Latin American countries was discarded in favour of a separate analysis of its progression in each one. Two hypotheses were formulated in each case: one that might be termed optimistic and the other pessimistic. The first varied from 0.5 to 2 per cent and the second from 1.5 to 3 per cent. Demand thus projected for 1960 and 1965 was respectively 12 and 18 per cent less than when it was calculated in accordance with the first method described.

At the World Consultation on Pulp and Paper Demand, Supply and Trade, the FAO secretariat presented a forecast of world demand[17] prepared by a new method based on two fundamental assumptions: one, that consumption of paper and board will reach saturation with the indefinite growth of income and, two, that consumption will increase in accordance with a logistic curve determined by means of inter-country comparisons. The forecast adduces further proofs in support of the theory of decreasing elasticity coefficients. This theory is particularly important for projections covering a fairly long period when the product may be expected to vary considerably. For shorter periods, and when sufficient information is available on paper and paperboard consumption by specific categories as well as on the main economic factors that influence demand for each category, a logarithmic linear relation may be

[13] Newsprint and printing and writing paper.
[14] See *Possibilities for the Development of the Pulp and Paper Industry in Latin America*, op. cit.
[15] See *Pulp and Paper Prospects in Latin America*, op. cit.
[16] When a curve is fitted to two series of consumption and income observations, income-elasticity is determined by the slope of the curve at the point corresponding to a given income.
[17] *World Demand for Paper to 1975*, op. cit.

used in the certainty that the ensuing result will be very much the same as that obtainable by using a function of demand, with a decreasing elasticity coefficient.

The estimates of Latin American demand prepared by this method fall midway between the results of the other two projections mentioned.

In the different reports prepared by the Group on the industry's situation and prospects in various Latin American countries,[18] demand was projected by one or more of the methods described, in accordance with the amount of statistical data available and other circumstances peculiar to the case in point.

Thus, in the report on Argentina[19] the elasticity coefficients were estimated by the second of the two methods explained in this chapter. Initially, an attempt was made to obtain a historical correlation, but the sharp fluctuations in consumption during the post-war decade as a result of the restrictions placed on imports made it impossible to obtain satisfactory results. For Brazil, Ecuador, Mexico, Peru and Venezuela, the respective historical correlations were used, supplemented in some cases—such as that of Mexico—by a general correlation covering all the Latin American countries. In the case of Ecuador, it was decided, for purposes of comparison, to use elasticity coefficients calculated according to the method presented for consideration at the World Consultation in Rome.

For the projections of demand in Colombia and Cuba a general correlation covering all the Latin American countries, Canada and the United States was used, based on average consumption and the gross product in 1955-57. As this is the method adopted for the projections in the present document, it will be dealt with separately in the following section.

(b) *Procedure used in the projections*

The projection method is essentially the same as that adopted for the study submitted to the Latin American Meeting of Experts at Buenos Aires. Although the projections effected for each country were at hand in the reports published by the Advisory Group, this method was preferred for the following reasons:

(*a*) Most of the projections made in the Group's reports were based on the extrapolation of a logarithmic linear relation (with constant elasticity) between the historical consumption series and the product, covering ten or twelve years at the most, i.e., a fairly short period. As the projection period is nearly twenty years (1955-57/75) in the present case, it was considered that more realistic results would be obtained if decreasing elasticity coefficients were used;

(*b*) Although the projection formulated by FAO[20] also assumes a decreasing elasticity, preference was given to a different kind of projection which, while embodying the same principle, would facilitate the formulation of individual country projections. Moreover, a comparison of the two kinds of projection for the region as a whole shows that they give very similar results. The projection chosen for the present report was only 2 per cent higher than that used by FAO for 1975.

The choice of hypothesis on the growth of the product is recognized to be of vital importance for estimates of future demand. In the present case, the rates of growth adopted[21] were calculated on the basis of the following factors: (*a*) historical rates of growth; (*b*) an analysis of the situation for programming purposes in the countries where ECLA or other official bodies have undertaken or are undertaking economic development studies; and (*c*) the arbitrary assumption that no country would have a per capita rate of development lower than 1.5 per cent annually. In the particular case of Venezuela, a rate of 3 per cent—which is considerably less than the historical rate of 5 per cent—was decided upon on the supposition that diverse circumstances, including the international petroleum situation, would make it impossible for such an intensive rate of growth to be maintained.[22]

With respect to population growth a United Nations projection was used[23] which has been amended to a certain extent by ECLA and is now used by the latter as a working estimate.

The method of general correlation, which has been adopted for the projections in this report, was chosen on the assumption that the present relationships among the countries included in the correlation estimate would persist in every case.[24] The procedure, which resembles that followed in the document submitted to the Buenos Aires conference[25] was as follows. Consumption of paper and paperboard was divided into three categories —newsprint, printing and writing paper and other paper and paperboard—and the per capita average for 1955-57 worked out. These series, which included the twenty Latin American countries, Canada and the United States, were used, together with the series for the gross national product, to make the relevant logarithmic adjustments in the parabolas. Then, in order to obtain the elasticity coefficients, the first derivatives (slopes) of the function corresponding to the two levels

[18] Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, Mexico, Peru and Venezuela. See Chapter I, footnote 3.

[19] *Resumen de la situación del papel y la celulosa en la Argentina: posibilidades de desarrollo y aspectos económicos,* op. cit.

[20] *World Demand for Paper to 1975,* op. cit.

[21] See appendix VI, table C.

[22] Nearly all the projections undertaken up to now consist of two or more hypotheses on the growth of the product. In this case, however, it has been decided to work with one only, on the grounds that if the possibilities differ widely the projection will lose much of its validity, whereas if they are very close to one another, it is almost as advantageous to formulate a single hypothesis that reflects economic development prospects as fully as possible.

[23] See *The Future Growth of World Population* (ST/SOA/Series A/28), and table A, appendix VI to this chapter.

[24] Nevertheless, if a comparison is made between the elasticity coefficients thus obtained for a country and those deriving from a historical correlation between consumption and the product in the same country, the latter would be slightly higher. The difference—known as the *time trend*—is attributable to the influence exercised by factors that are unrelated to the growth of income, such as changes in consumption patterns and in the relative price of paper, or more rapid progress in the field of education, all of which have a bearing on elasticity when calculated by the historical method. The document submitted to the World Consultation at Rome contained a preliminary analysis of this subject. It indicated that the *time trend* was positive in the cases studied (which included Latin America), i.e., paper and board consumption increased more rapidly than might have been expected if the growth of the product alone had been taken into account.

[25] *Pulp and Paper Prospects in Latin America,* op. cit.

TABLE 12. LATIN AMERICA: PROJECTIONS OF PAPER AND PAPERBOARD DEMAND, 1965 AND 1975
(Thousands of tons)

Country	1955-57[a]				1965				1975			
	Newsprint	*Printing and writing paper*	*Other paper and board*	*Total*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*Total*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*Total*
Argentina	120	88	224	432	175	134	340	649	263	211	534	1,008
Bolivia	1	2	2	5	2	3	3	8	4	4	5	13
Brazil	189	132	212	533	334	235	386	955	636	451	758	1,845
Chile	25	17	39	81	40	28	64	132	67	48	111	226
Colombia	25	25	56	106	44	46	102	192	77	81	185	343
Costa Rica	3	1	4	8	5	2	8	15	10	3	15	28
Cuba	35	19	92	146	59	34	166	259	106	65	316	487
Dominican Republic	1	1	7	9	2	2	12	16	5	3	24	32
Ecuador	6	2	6	14	12	3	11	26	25	5	23	53
El Salvador	4	1	5	10	6	1	9	16	11	2	16	29
Guatemala	3	3	4	10	5	5	6	16	9	9	12	30
Haiti	—	—	2	2	1	1	3	5	1	1	6	8
Honduras	1	1	2	4	2	1	3	6	3	2	6	11
Mexico	67	65	225	357	135	132	468	735	275	274	995	1,544
Nicaragua	1	—	2	3	2	1	4	7	4	1	8	13
Panama	3	1	9	13	4	2	13	19	6	3	24	33
Paraguay	1	—	1	2	1	—	1	2	2	1	3	6
Peru	17	8	34	59	30	14	62	106	57	26	116	199
Uruguay	26	11	24	61	35	15	32	82	45	20	42	107
Venezuela	19	19	63	101	44	49	162	255	95	130	419	644
TOTAL	547	396	1,013	1,956	938	708	1,855	3,501	1,701	1,340	3,618	6,659

NOTE: A dash signifies that the amount is less than 500 tons.

[a] Actual demand.

of income at either end of the projection (1955-57) were ascertained; thereafter the arithmetic average of the coefficients thus obtained was calculated and applied to average consumption in 1955-57. With the aid of the projections of the gross product and population, estimates of demand could then be made up to 1975 for each country. There was one exception to the rule —Venezuela. In this case, on the assumption that the unusually high level of the product was not a true indication of the degree of economic development reached by the country, it was considered that, if the same hypothesis with respect to decreasing elasticity had been applied, the growth of paper and board demand would have been underestimated. Demand was therefore projected by means of the product-consumption relationships calculated in the report by the Advisory Group of Venezuela.[26]

(c) *A tentative forecast of paper and paperboard demand in Latin America up to 1975*

Table 12 shows the results of the projections of demand made on the basis of the assumption[27] outlined above. It may be seen that demand is expected to rise

[26] *La industria del papel y la celulosa en Venezuela*, op. cit.
[27] The basic series and details of the procedure appear in appendix III.

TABLE 13. LATIN AMERICA: COMPARISON OF DEMAND FOR PAPER AND PAPERBOARD
(Thousands of tons)

Projection	1960	1965	1975
1. ECLA/FAO	2,681	3,807	—
2. ECLA/FAO/BTAO	2,346	3,126	—
3. FAO	—	3,500	6,500
4. Advisory group	2,538[a]	3,501	6,659

NOTE:
Projection 1: *Possibilities for the Development of the Pulp and Paper Industry in Latin America*, op. cit.
Projection 2: *Pulp and Paper Prospects in Latin America*, op. cit.
Projection 3: *World Demand for Paper to 1975*, op. cit.
Projection 4: As used in the present report.

[a] Included for purposes of comparison only.

at an annual average rate of nearly 6.7 per cent between 1955-57 and 1975, which is the same rate of growth as that registered between 1950 and 1959.

By 1965 it is expected that total demand for paper and paperboard in Latin America will have reached about 3.5 million tons (of which approximately 940,000 tons will be newsprint), i.e., nearly twice the 1955-57 average of a little less than 2 million tons (of which 547,000 tons was newsprint). By 1975 it is tentatively estimated that total demand will have reached 6.7 million tons, that is, it will almost have redoubled (of this 1.7 million tons will be newsprint).

Table 13 on page 15 gives an idea of the position of the projection on which the present report is based in relation to those effected earlier and mentioned in this chapter. The estimates presented in table 13 constitute an average of the alternative hypotheses comprised in each of the projections. As may be seen, the figures in projection 4 for 1960 and 1965 fall between the extremes of projection 1 (highest) and projection 2 (lowest).

In 1965 projection 3 coincides with projection 4 and for 1975 there is only a slight difference between them. A provisional estimate of consumption in 1960 gives a slightly higher figure than 2.4 million tons, so that projection 4 is 4.8 per cent above real consumption; but Argentina, one of the main consumers, shows a lower level for 1960 than for 1958 and 1959, although this small amount does not represent real consumption potential because it was an abnormal year.[28]

[28] Provisional figures for consumption in Argentina during 1961 show an increase of 150,000 tons over 1960.

Appendix I. Latin America: production, imports and apparent consumption of paper and paperboard, 1955-60

(Tons)

Country	1955				1956			
	Newsprint	*Printing and writing paper*	*Other paper and board*	*Total*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*Total*
Argentina:								
P	21,591	60,300	201,743	283,634	17,177	66,800	223,523	307,500
I	89,372	31,435	5,646	126,453	94,210	18,974	4,309	117,493
C	110,963	91,735	207,389	410,087	111,387	85,774	227,832	424,993
Bolivia:								
P	—	—	800	800	—	—	800	800
I	1,350	2,762	846	4,958	1,300	923	608	2,831
C	1,350	2,762	1,646	5,758	1,300	923	1,408	3,631
Brazil:								
P	37,233	106,349	189,568	333,150	39,398	111,782	229,357	380,537
I	130,371	12,838	3,213	146,422	136,460	24,770	3,896	165,126
C	167,604	119,187	192,781	479,572	175,858	136,552	233,253	545,663
Chile:								
P	11,462	17,351	38,503	67,316	11,214	17,481	37,538	66,233
I	13,915	667	1,202	15,784	13,189	465	1,347	15,001
C	25,377	18,018	39,705	83,100	24,403	17,946	38,885	81,234
Colombia:								
P	—	—	29,236	29,236	—	—	35,338	35,338
I	21,657	22,578	22,644	66,879	28,430	27,631	23,197	79,258
C	21,657	22,578	51,880	96,115	28,430	27,631	58,535	114,596
Costa Rica:								
P	—	—	—	—	—	—	—	—
C	2,691	1,022	3,649	7,362	2,827	1,040	4,792	8,659
I	2,691	1,022	3,649	7,362	2,827	1,040	4,792	8,659
Cuba:								
P	—	2,400	41,245	43,645	—	2,400	42,603	45,003
I	30,863	13,519	43,966	88,348	41,984	19,766	52,375	114,107
C	30,863	15,919	85,211	131,993	41,984	22,166	94,960	159,110
Dominican Republic:								
P	—	—	—	—	—	—	—	—
I	1,365	644	6,174	8,183	1,570	1,316	7,420	10,306
C	1,365	644	6,174	8,183	1,570	1,316	7,420	10,306

Appendix I (*continued*)

Country	1955 Newsprint	1955 Printing and writing paper	1955 Other paper and board	1955 Total	1956 Newsprint	1956 Printing and writing paper	1956 Other paper and board	1956 Total
Ecuador:								
P	—	—	600	600	—	—	600	600
I	7,377	665	4,780	12,822	5,836	1,190	5,087	12,113
C	7,377	665	5,380	13,422	5,836	1,190	5,687	12,713
El Salvador:								
P	—	—	300	300	—	—	300	300
I	2,723	527	3,988	7,238	3,909	536	4,773	9,218
C	2,723	527	4,288	7,538	3,909	536	5,073	9,518
Guatemala:								
P	—	—	300	300	—	—	300	300
I	2,335	1,777	2,465	6,577	2,711	2,739	3,210	8,660
C	2,335	1,777	2,765	6,877	2,711	2,739	3,510	8,960
Haiti:								
P	—	—	—	—	—	—	—	—
I	270	300	1,700	2,270	395	350	1,816	2,561
C	270	300	1,700	2,270	395	350	1,816	2,561
Honduras:								
P	—	—	—	—	—	—	—	—
I	720	500	1,500	2,720	1,055	625	1,552	3,232
C	720	500	1,500	2,720	1,055	625	1,552	3,232
Mexico:								
P	—	54,000	174,623	228,623	—	57,000	197,948	254,948
I	47,323	6,870	15,020	69,213	67,224	7,750	21,520	96,494
C	47,323	60,870	189,643	297,836	67,224	64,750	219,468	351,442
Nicaragua:								
P	—	—	—	—	—	—	—	—
I	1,149	272	2,211	3,632	1,419	277	2,091	3,787
C	1,149	272	2,211	3,632	1,419	277	2,091	3,787
Panama:								
P	—	—	—	—	—	—	—	—
I	2,099	704	7,489	10,292	1,866	1,002	7,022	9,890
C	2,009	704	7,489	10,292	1,866	1,002	7,022	9,890
Paraguay:								
P	—	—	400	400	—	—	400	400
I	500	300	550	1,350	651	315	587	1,553
C	500	300	950	1,750	651	315	987	1,953
Peru:								
P	—	2,908	23,764	26,672	—	3,150	30,635	33,785
I	15,418	4,864	4,287	24,569	18,408	4,330	5,052	27,790
C	15,418	7,772	28,051	51,241	18,408	7,480	35,687	61,575
Uruguay:								
P	—	9,000	21,000	30,000	—	9,000	21,000	30,000
I	24,505	1,732	1,950	28,187	25,408	1,701	956	28,065
C	24,505	10,732	22,950	58,187	25,408	10,701	21,956	58,065
Venezuela:								
P	—	—	12,263	12,263	—	—	14,871	14,871
I	16,090	16,942	44,547	77,579	19,727	18,254	42,543	80,524
C	16,090	16,942	56,810	89,842	19,727	18,254	57,414	95,395
TOTAL:								
P	70,286	252,308	734,345	1,056,939	67,789	267,613	835,213	1,170,615
I	412,093	120,918	177,827	710,838	468,579	133,954	194,135	796,668
C	482,379	373,226	912,172	1,767,777	536,368	401,567	1,029,348	1,967,283

Appendix I (*continued*)

Country	1957 Newsprint	1957 Printing and writing paper	1957 Other paper and board	1957 Total	1958 Newsprint	1958 Printing and writing paper	1958 Other paper and board	1958 Total
Argentina:								
P	11,972	69,182	221,459	302,613	11,472	80,000	265,552	357,024
I	125,294	18,057	13,822	157,173	160,791	7,471	7,517	175,779
C	137,266	87,239	235,281	459,786	172,263	87,471	273,069	532,803
Bolivia:								
P	—	—	800	800	—	—	800	800
I	1,600	883	852	3,335	1,700	1,000	900	3,600
C	1,600	883	1,652	4,135	1,700	1,000	1,700	4,400
Brazil:								
P	49,029	107,316	206,300	362,645	63,432	124,671	228,362	416,465
I	173,498	32,132	4,591	210,221	140,816	30,537	3,298	174,651
C	222,527	139,448	210,891	572,866	204,248	155,208	231,660	591,116
Chile:								
P	20,195	14,963	35,665	70,823	43,898	12,048	36,655	92,601
I	4,388	342	1,663	6,393	—15,536[a]	491	3,941	—11,104
C	24,583	15,305	37,328	77,216	28,362	12,539	40,596	81,497
Colombia:								
P	—	—	39,992	39,992	—	—	43,089	43,089
I	23,976	25,835	17,405	67,216	21,752	20,713	11,756	54,221
C	23,976	25,835	57,397	107,208	21,752	20,713	54,845	97,310
Costa Rica:								
P	—	—	—	—	—	—	—	—
I	3,208	1,444	4,205	8,857	3,100	1,500	4,500	9,100
C	3,208	1,444	4,205	8,857	3,100	1,500	4,500	9,100
Cuba:								
P	—	2,400	48,350	50,750	—	2,400	49,000	51,400
I	31,223	16,813	48,314	96,350	41,185	22,631	54,148	117,964
C	31,223	19,213	96,664	147,100	41,185	25,031	103,148	169,364
Dominican Republic:								
P	—	—	—	—	—	—	—	—
I	1,141	942	7,565	9,648	2,585	1,639	9,460	13,684
C	1,141	942	7,565	9,648	2,585	1,639	9,460	13,684
Ecuador:								
P	—	—	600	600	—	—	800	800
I	6,048	2,535	5,607	14,190	6,000	2,500	6,000	14,500
C	6,048	2,535	6,207	14,790	6,000	2,500	6,800	15,300
El Salvador:								
P	—	—	300	300	—	—	400	400
I	4,576	624	5,892	11,092	4,500	700	6,000	11,200
C	4,576	624	6,192	11,392	4,500	700	6,400	11,600
Guatemala:								
P	—	—	600	600	—	—	600	600
I	3,233	3,752	3,605	10,590	3,500	3,000	4,000	10,500
C	3,233	3,752	4,205	11,190	3,500	3,000	4,600	11,100
Haiti:								
P	—	—	—	—	—	—	—	—
I	430	400	1,800	2,630	450	400	1,900	2,750
C	430	400	1,800	2,630	450	400	1,900	2,750
Honduras:								
P	—	—	—	—	—	—	—	—
I	838	654	2,473	3,965	900	600	2,500	4,000
C	838	654	2,473	3,965	900	600	2,500	4,000

Appendix I (*continued*)

Country	1957 Newsprint	1957 Printing and writing paper	1957 Other paper and board	1957 Total	1958 Newsprint	1958 Printing and writing paper	1958 Other paper and board	1958 Total
Mexico:								
P	—	62,000	245,000	307,000	—	65,000	256,820	321,820
I	87,903	6,510	20,690	115,103	54,847	15,289	15,243	85,379
C	87,903	68,510	265,690	422,103	54,847	80,289	272,063	407,199
Nicaragua:								
P	—	—	—	—	—	—	—	—
I	1,050	284	2,392	3,726	1,300	300	2,500	4,100
C	1,050	284	2,392	3,726	1,300	300	2,500	4,100
Panama:								
P	—	—	—	—	—	—	—	—
I	2,288	1,036	8,562	11,886	2,500	1,200	9,000	12,700
C	2,288	1,036	8,562	11,886	2,500	1,200	9,000	12,700
Paraguay:								
P	—	—	400	400	—	—	500	500
I	820	350	700	1,870	900	350	700	1,950
C	820	350	1,100	2,270	900	350	1,200	2,450
Peru:								
P	—	3,200	33,069	36,269	—	3,483	32,450	35,933
I	17,798	5,317	6,101	29,216	13,031	4,878	6,500	24,409
C	17,798	8,517	39,170	65,485	13,031	8,361	38,950	60,342
Uruguay:								
P	—	11,000	25,000	36,000	—	11,800	23,000	34,800
I	29,094	1,476	1,125	31,695	27,509	341	214	28,064
C	29,094	12,476	26,125	67,695	27,509	12,141	23,214	62,864
Venezuela:								
P	—	—	18,944	18,944	—	—	23,000	23,000
I	22,392	21,146	55,963	99,501	13,560	25,792	67,858	107,210
C	22,392	21,146	74,907	118,445	13,560	25,792	90,858	130,210
TOTAL:								
P	81,196	270,061	876,479	1,227,736	118,802	299,402	961,028	1,379,232
I	540,798	140,532	213,327	894,657	485,390	141,332	217,935	844,657
C	621,994	410,593	1,089,806	2,122,393	604,192	440,734	1,178,963	2,223,889

Country	1959 Newsprint	1959 Printing and writing paper	1959 Other paper and board	1959 Total	1960 Newsprint	1960 Printing and writing paper	1960 Other paper and board	1960 Total
Argentina:								
P	6,000	86,000	254,274	346,274	9,324	65,479	215,729	290,532
I	126,815	6,000	7,000	139,815	161,732	5,027	3,904	170,663
C	132,815	92,000	261,274	486,089	171,056	70,506	219,633	461,195
Bolivia:								
P	—	—	900	900	—	—	900	900
I	1,800	1,000	900	3,700	2,100	1,480	140	3,720
C	1,800	1,000	1,800	4,600	2,100	1,480	1,040	4,620
Brazil:								
P	67,218	126,753	245,928	439,879	65,760	144,625	263,998	474,383
I	144,863	23,741	3,834	172,438	164,491	20,002	5,949	190,442
C	212,081	150,494	249,762	612,337	230,251	164,627	269,947	664,825
Chile:								
P	48,552	14,000	42,716	105,268	51,532	18,355	35,938	105,825
I	—31,956[a]	1,127	3,865	—26,965	—24,490[a]	324	4,430	—19,736
C	16,595	15,127	46,581	71,303	27,042	18,679	40,368	86,089

Appendix I (*continued*)

Country	1959 Newsprint	1959 Printing and writing paper	1959 Other paper and board	1959 Total	1960 Newsprint	1960 Printing and writing paper	1960 Other paper and board	1960 Total
Colombia:								
P	—	—	48,741	48,741	—	—	51,332	51,332
I	21,557	26,079	11,858	59,494	33,138	28,231	14,671	76,040
C	21,557	26,079	60,599	108,235	33,138	28,231	66,003	127,372
Costa Rica:								
P	—	—	—	—	—	—	—	—
I	3,400	1,500	4,800	9,700	3,620	1,300	4,500	9,420
C	3,400	1,500	4,800	9,700	3,620	1,300	4,500	9,420
Cuba:								
P	8,000	3,000	54,300	65,300	15,000	4,000	60,000	79,000
I	20,000	15,000	45,000	80,000	25,000	20,000	56,000	101,000
C	28,000	18,000	99,300	145,300	40,000	24,000	116,000	180,000
Dominican Republic:								
P	—	—	—	—	—	—	—	—
I	2,500	1,700	9,800	14,000	2,300	2,000	7,700	12,000
C	2,500	1,700	9,800	14,000	2,300	2,000	7,700	12,000
Ecuador:								
P	—	—	800	800	—	—	1,000	1,000
I	6,000	2,500	7,000	15,000	8,000	2,004	6,629	16,633
C	6,000	2,500	7,800	16,300	8,000	2,004	7,629	17,633
El Salvador:								
P	—	—	500	500	—	—	500	500
I	4,500	1,000	6,500	12,000	5,000	1,000	6,500	12,500
C	4,500	1,000	7,000	12,500	5,000	1,000	7,000	13,000
Guatemala:								
P	—	—	600	600	—	—	2,000	2,000
I	3,500	3,000	5,000	11,500	3,800	4,000	6,700	14,500
C	3,500	3,000	5,600	12,100	3,800	4,000	8,700	16,500
Haiti:								
P	—	—	—	—	—	—	—	—
I	500	500	2,000	3,000	500	500	1,000	2,000
C	500	500	2,000	3,000	500	500	1,000	2,000
Honduras:								
P	—	—	—	—	—	—	—	—
I	1,000	700	2,500	4,200	800	2,200	3,000	6,000
C	1,000	700	2,500	4,200	800	2,200	3,000	6,000
Mexico:								
P	14,000	70,000	276,892	360,892	14,000	80,000	318,393	412,393
I	90,871	9,540	16,538	116,949	89,919	10,000	41,088	141,007
C	104,871	70,540	293,430	477,841	103,919	90,000	359,481	553,400
Nicaragua:								
P	—	—	—	—	—	—	—	—
I	1,400	350	2,800	4,550	1,700	500	2,800	5,000
C	1,400	350	2,800	4,550	1,700	500	2,800	5,000
Panama:								
P	—	—	—	—	—	—	—	—
I	2,800	1,300	9,500	13,600	2,371	1,364	6,372	10,107
C	2,800	1,300	9,500	13,600	2,371	1,364	6,372	10,107
Paraguay:								
P	—	—	500	500	—	—	400	400
I	950	400	800	2,150	1,200	400	1,000	2,600
C	950	400	1,300	2,650	1,200	400	1,400	3,000

Appendix I (*continued*)

Country	1959 Newsprint	1959 Printing and writing paper	1959 Other paper and board	1959 Total	1960 Newsprint	1960 Printing and writing paper	1960 Other paper and board	1960 Total
Peru:								
P	—	5,979	39,111	45,090	—	4,840	42,360	47,200
I	16,000	3,500	5,900	25,400	18,100	6,400	4,091	28,591
C	16,000	9,479	45,011	70,490	18,100	11,240	46,451	75,791
Uruguay:								
P	—	11,200	24,400	35,600	—	12,000	27,000	39,000
I	23,364	890	634	24,888	19,956	717	850	21,523
C	23,364	12,090	25,034	60,488	19,956	12,717	27,850	60,523
Venezuela:								
P	—	—	45,000	45,000	—	—	48,801	48,801
I	31,086	21,165	62,258	114,509	23,517	19,911	45,990	89,418
C	31,086	21,165	107,258	159,509	23,517	19,911	94,791	138,219
TOTAL:								
P	143,770	316,932	1,034,662	1,495,364	155,616	329,299	1,068,351	1,553,266
I	470,949	120,992	208,487	800,428	542,754	127,360	223,314	893,428
C	614,719	437,924	1,243,149	2,295,792	698,370	456,659	1,291,665	2,446,694

P = Production.
I = Imports.
C = Apparent consumption.

* In Chile, as newsprint exports exceed imports, this figure in fact represents net exports, as explained below:

	Tons 1958	1959	1960
Exports	20,228	35,392	28,940
Imports	4,692	3,435	4,450
NET EXPORTS	15,536	31,957	24,490

Appendix II. Latin America: list of pulp and paper mills and their capacity in 1958

(Capacity in tons)

Name and address	Mechanical pulp	Long-fibre chemical pulp	Short-fibre semi-chemical and chemical pulp	All pulps	Newsprint	Printing and writing paper	Other paper and board	All paper and board
ARGENTINA								
Adamas (Rincón 3360, San Justo, Prov. Bs. As.)			1,800	1,800			6,000	6,000
Alsina Rosich SRL (Gral. Paz 170, Godoy Cruz, Mendoza)							1,800	1,800
Amorosi Hector y Cía., S.A. (J. Salguero 3361, Capital Federal)						1,400		1,400
Berti, José Suc. de (Arroyo 1075, Capital Federal)							2,400	2,400
Brandolini Alberto J. (Rioja 1066, Córdoba)							2,500	2,500
Brandolini Carlos F. (Rodríguez Peña 497, Córdoba)							4,000	4,000
Canicola y Cía. S. en C. (Cuenca 1073, Capital Federal)							2,000	2,000
Carpel SRL (Molina Arrotea 1775, L. de Zamora, Prov. de Buenos Aires)							2,000	2,000
Cartoneras Villa Adelina SRL (M. Pedroza y R. Obligado, V. Adelina, Provincia de Buenos Aires)							400	400
Celcar, SRL (Laprida 4602, V. Martelli, Prov. de Buenos Aires)							1,000	1,000
Celulosa Argentina S.A. [Cap. Bermúdez] (Av. Pte. R. S. Peña 938, Capital Federal)			35,000	35,000		50,000		50,000
Celulosa Argentina S.A. [Zárate] (Av. Pte. R. S. Peña 938, Capital Federal)	20,000			20,000	20,000		15,000	35,000

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
ARGENTINA (*continued*)								
Celulosa Argentina S.A. [Andino] (Av. Pte. R. S. Peña 938, Capital Federal)							12,000	12,000
Celulosa Argentina S.A. [Pto. Piray] (Av. Pte. R. S. Peña 938, Capital Federal)		10,000	10,000	20,000			3,000	3,000
Celulosa Argentina S.A. [Tucumán]			2,000	2,000			5,000	5,000
Celulosa Río Segundo S.A. (B. Sarmiento 564, Río Segundo, Córdoba)			4,000	4,000			5,000	5,000
CIFIVE SRL (Rivadavia 3370, Sta. Fe)							4,000	4,000
Cía. Azucarera Bella Vista (Corrientes 330, Capital Federal)							500	500
Cía. General Papelera Bs. As. (Guevara 1541, Capital Federal)						9,000		9,000
Cía. Papelera N. de Sta. Fe (Mitre 575, Rosario de Sta. Fe)			6,200	6,200			9,000	9,000
Copaca S.A.I. y C. (Centenario Uruguayo 56, V. Domínico, Prov. de Buenos Aires)							7,200	7,200
Correa Hnos. & Cía. (Alianza 888, Ciudadela, Prov. de Buenos Aires)							2,000	2,000
Chalatex, Dalis de Paola SRL (Salto, Prov. de Buenos Aires)							1,000	1,000
Chiozza Hnos. (Berlín 1000, Dock Sud, Avellaneda, Prov. de Buenos Aires)							2,000	2,000
Denti Ltda. (Directorio 5972, Capital Federal)						6,000	1,000	7,000
El Cacique (J. B. Alberdi 15, Capital Federal)							6,000	6,000
Encar SRL (A. Grandoli 3620, Rosario de Sta. Fe).							1,500	1,500
Fca. Argentina de Papeles y Cart. (Cañada de Gómez, Sta. Fe)			2,200	2,200			3,000	3,000
Fabricartón							600	600
Fabril Gral. Pacheco							1,500	1,500
Fabril Quilmes							1,000	1,000
Fibro-papel SRL (Alsina 1238, Capital Federal)							1,500	1,500
Fabro-química Argentina SRL (M. Mitre 690, San Lorenzo, Prov. de Sta. Fe)			4,000	4,000			5,000	5,000
Industrias cartoneras Litoral SRL (Av. Filippini, Rosario de Sta. Fe)							1,500	1,500
Industrial Riomartense SRL (Av. Italia 2552, Río Cuarto, Córdoba)							3,600	3,600
Industrias Argentinas del Papel S.A. (Reconquista 319, Capital Federal)							5,400	5,400
Industrias Celulósicas Regionales S.A. (Sarmiento 991, Rosario de Sta. Fe)			500	500			1,000	1,000
I.P.A.S.A. (Rivadavia 21552, Ituzaingo, Prov. de Buenos Aires)							2,500	2,500
La Cartonera Argentina (Gibraltar 1738, Avellaneda, Prov de Buenos Aires)							3,000	3,000
La Papelera Argentina (Av. Pte. R. S. Peña 938, Capital Federal)			10,500	10,500			59,000	59,000
La Papelera del Plata (Cadorna 545, Wilde, Prov. de Buenos Aires)							3,000	3,000
La Papelera del Plata (Cucha-Cucha 2754, Capital Federal)							1,500	1,500
Maranz, León e Hijo (Rioja 456, Capital Federal)							2,000	2,000
Marietta, Data y Risolta SRL (Ayacucho 3810, Rosario de Sta. Fe)							1,200	1,200
Papel Victoria S.A.C. y F. (Av. Pte. J. A. Roca 530, Capital Federal)						1,000	3,800	4,800
Papelera Berezategui (Charcas 2042, Capital Federal)							4,500	4,500
Papelera Bernal (Pringles 867, Bernal, Prov. de Buenos Aires)							1,800	1,800
Papelera Dock Sud (Irala 1563, Dock Sud, Prov. de Buenos Aires)							1,100	1,100
Papelera Don Torcuato (Quilmes 44-50, Cap. Fed.).							2,000	2,000
Papelera E. Rodríguez Canedo (Cnel. Sayos esq. Isleta, V. Alsina, Provincia de Buenos Aires)							8,000	8,000

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
ARGENTINA (*continued*)								
Papelera Hispano Argentina (Larrazábal 750, Capital Federal)							10,000	10,000
Papelera Hurlingham (Piedras 383, Capital Federal)						10,500		10,500
Papelera Mancheggiani (Cadornas 602, Wilde, Prov. de Buenos Aires)			1,000	1,000			4,000	4,000
Papelera Mitre (Moreno 876, Capital Federal)						5,600		5,600
Papelera Pedotti (Florida 671, Capital Federal)						2,000	8,000	10.000
Papelera Raffaele (Echeverría 466, Wilde, Prov. de Buenos Aires)						7,000	3,000	10,000
Papelera Río Paraná (Córdoba 890, Capital Federal)						3,000	12,000	15,000
Papelera San Isidro (Corrientes 456, Cap. Federal)			1,500	1,500			1,500	1,500
Papelera San Justo (Jujuy 1263, Capital Federal)						3,000	3,000	6,000
Papelera San Pedro (R. Valentinas 475, V. Alsina Prov. de Buenos Aires)							2,400	2,400
Papelera Sudamericana (Avda. de Mayo 776, Capital Federal)							500	500
Papelera Teitelman (Madariaga 1925, Avellaneda, Prov. de Buenos Aires)			1,000	1,000			9,500	9,500
Papelera Urquiza (Boedo 27, Capital Federal)							1,800	1,800
Papeltex Argentina (Córdoba 890, Capital Federal)							6,000	6,000
Pasianoff Gregorio (Corrientes 550, Cap. Federal)							3,600	3,600
Schcolnik S.A.I.C. (E. Castro 7598, Capital Federal)			6,000	6,000			9,000	9,000
Segal E. e hijos (Vieyles 1162, Capital Federal)							2,000	2,000
Sein y Cía. (H. de Saboya 323, Avellaneda, Prov. de Buenos Aires)							4,500	4,500
Suárez Asin S.A. (J. Bonifacio 750, Capital Federal)							2,000	2,000
Zucamor S.A. (Av. Vélez Sarsfield 1088, Cap. Fed.)							2,500	2,500
	20,000	10,000	85,700	115,700	20,000	98,500	299,100	417,600
BOLIVIA								
Fca. y Manufactura de cartones y T. litográficos (Pirrapura, La Paz)							800	800
BRAZIL								
Bahia								
Fábrica de papel da Bahia (Marques de Monte Santo 50, S. Salvador)							1,100	1,100
Guanabara								
Cía. Franco Brasileira de papel (Uruguaiara 55, Río de Janeiro)							2,300	2,300
Cía. Inbauma de papeis (Alfandega 107, Río de Janeiro)							2,000	2,000
Cía. Nacional de papel (Souza Barros 450, Río de Janeiro)						5,000	2,200	7,200
Fca. de Papelão Sao Geraldo (Conceiçao 105, Río de Janeiro)							3,000	3,000
Fca. de papel Tijuca (Senador Dantes 20, Río de Janeiro)					200	1,000	2,300	3,500
Industria de papel Tannuri (Av. Itaoca 2151, Río de Janeiro)						1,000	1,800	2,800
Minas Gerais								
Fca. de papel Cruzeiro (Río de Janeiro 651, Belo Horizonte)							2,200	2,200
Fca. de papel e papelao Mariano Procopio (Mariano Procopio 1406, Juiz de Forá)							3,100	3,100
Cía. Mineira de papeis (Catagueses, Minas Gerais)		1,000		1,000		3,000	1,000	4,000

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
BRAZIL (*continued*)								
Minas Gerais (continued)								
Fca. de papel Santa Cruz (Juiz de Forá, Minas Gerais)							2,600	2,600
Fca. de papel Santa María (Alem Paraiba, Minas Gerais)							6,600	6,600
Fca. de papel Uniao Industrial (Mariano Procopio, Minas Gerais)							1,500	1,500
Paraná								
Industrias Brasileiras de papel (Arapoiti 9, Arapoiti)		2,000		2,000	100	1,000	3,700	4,800
Industrias Klabin de Paraná (Formosa 367, San Pablo)	45,000	30,000	20,000	95,000	55,000		10,000	65,000
Fca. Paranaense de papel (Praça Santos Andrado 339, Curitiba)							1,300	1,300
Industria de papel Marunubi							500	500
Industria Teofilo Cunha (Santana 694, Paraná)							1,500	1,500
Pernambuco								
Cía. Ind. Brasileiras Portella [SACKRAFT]		3,000		3,000			12,000	12,000
Río de Janeiro								
Cía. Ind. de papeis Alcantara (Alfandega 107, Río de Janeiro)					1,000		7,000	8,000
Cía. Ind. papeis e cartonagem (Mayrink Veiga 28, Río de Janeiro)						6,000	6,000	12,000
Celubagazo Ind. e comercio (Campos)			15,000	15,000				
Celulosa e papel Fluminense (Av. Río Branco 43, Río de Janeiro)			7,000	7,000			7,200	7,200
Cía. Fábrica de papel Petrópolis (Av. Río Branco 109, Río de Janeiro)					3,000	5,000	5,000	13,000
Cía. Industrial de papel Piraki S.A. (Av. Mal Camara 350, Río de Janeiro)			2,600	2,600		6,000	7,200	13,200
Sotex S.A. Técnica de papeis (María Paula 36, San Paulo)							1,500	1,500
Río Grande do Sul								
Celulose Cambará (Traversa Fco. L. Truda 40, Porto Alegre)		13,000		13,000				
Fca. de celulose e papel (Paraiba 216, Porto Alegre)		3,600		3,600			1,500	1,500
Cía. Industrial de celulose e papel Guaiba (Conceiçao 195, Porto Alegre)			1,000	1,000		2,600	2,000	4,600
Fca. de papel e papelao Justo (Bela 1200, S. Leopoldo)			1,000	1,000			1,600	1,600
Companhia Industrial Linbeiras (Uruguai 764, Pelotao)		1,500		1,500			3,200	3,200
Cía. Fca. de papel e papelao (Traversa Fco. L. Truda 40, Porto Alegre)							1,600	1,600
Cía. de Ind. Gerais. Obras e Terras [3 Portos] (Traversa Fco. L. Truda 98, Porto Alegre)							1,700	1,700
Santa Catarina								
Celulose Irami Ltda. (Joaçcaba)	10,000	4,000		14,000			4,000	4,000
Cía. Fca. de papel Itajalú S.A. (Itajalú)		3,600		3,600		2,000	8,000	10,000
Olinkraft S.A. Celulose e papel (Av. Joao Dias 2758, San Paulo)		10,000		10,000			10,000	10,000
São Paulo								
Adanias do Brazil S.A. (María Paula 36, San Paulo)						4,500		4,500

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*News-print*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
BRAZIL (*continued*)								
São Paulo (continued)								
Agro Industrial Amalia S.A. (Pça. do Patriarca, S/N°, Sao Paulo)							3,000	3,000
Industria Americana de papel S.A. (Celso García 3045, São Paulo)	2,000			2,000	1,200		4,800	6,000
Fca. Papel Norsa Senhora Aparecida S.A. (Aparecida do Norte)	9,000		4,800	13,800			24,000	24,000
Industria de celulose e papel Bandeirantes (Mogi das Cruces)							1,800	1,800
Companhia celulose Brasileira (Aparecida do Norte, São Paulo)			3,000	3,000				
Brasital S.A. (Largo de Paissander 51, São Paulo)			1,000	1,000		1,000	3,800	4,800
Companhia Agricola e Ind. Cicero Prado (Av. Río Branco 1661, São Paulo)						6,000	6,000	12,000
Cía. Ind. de papel Cipolma (Rua do Hipódromo 1661, São Paulo)						6,000	3,000	9,000
Cía. Manuf. de papel Cimape [Ripasa] (Limeira)			6,000	6,000			6,000	6,000
Cía. Paulista Celulose (COPASE) [ex-carioca] (Rua Boa Vista 76, São Paulo)							5,000	5,000
Dianda & Cía. Ltda. (Ribeirao Pires)			3,600	3,600			8,000	8,000
Durapel (Guanulhos)							400	400
Cía. Fabricadora de papel (Rua Voluntarios da Patria 344, São Paulo)	4,000		1,800	5,800		6,000	16,000	22,000
Industria papel León Feffer (Av. Presidente Wilson 4150)					500	12,000	2,500	15,000
Industria Hapira de papel Fulgor (Eloy Cerqueira 287, São Paulo)							3,000	3,000
S.A. Gordinho Brame Ind. de papel (Rua 15 de Noviembre 244, São Paulo)			800	800		2,000	1,000	3,000
Ind. Artefactos de papeis L.A.P. S.A. (Rua Anbanguera 783, São Paulo)							2,000	2,000
I.P.S.A. Industria de papel (Rua C. Crispiniano 20, São Paulo)			3,600	3,600			12,000	12,000
Industria de papelao Limeira (Largo Sao Bento 64, São Paulo)						4,000	800	4,800
Industrias R. Francisco Matarazo (Praça do Patriarca S/N°)			7,500	7,500		10,000	8,000	18,000
Cía. Melhoramentos de S. Paulo S.A. (Rua Tito 479, São Paulo)			10,000	10,000	5,000	8,000	11,000	24,000
Cía. Industrial Paulista papeis e papelao (Rua Cavour 156, São Paulo)						3,000	800	3,800
Ribeiro Parada S.A. (Largo Sta. Cecilia 158, São Paulo)			3,000	3,000			8,400	8,400
Refinadora Paulista S.A. (Rua Formosa 367, São Paulo)			7,000	7,000		13,000	2,000	15,000
Rigesa S.A. Celulose, papel e embalagem (Rua 13 Maio 755, Valinhos)			6,000	6,000			16,000	16,000
Ind. de papel Rio Verde S.A. (Rua José de Barros 17, São Paulo)						1,000	2,000	3,000
Companhia Santista de papel (Rua 15 de Noviembre 324, São Paulo)			1,200	1,200		8,000	4,000	12,000
Fca. papel e papelao Sao Roberto (Rua Alcantara 328, São Paulo)						2,000	1,800	3,800
Industria de papel Simao (Mogi das Cruces, São Paulo)						10,000	15,000	25,000
Industria de papel Simao (Jocarer, São Paulo)			10,000	10,000				
Cía. Sugano de papel e celulosa (Av. Pte. Wilson 3963, São Paulo)			15,000	15,000		4,000	5,600	9,600
Fca. de papel Sta. Terezinha (Rua Cuacuati 275, São Paulo)			7,000	7,000			9,600	9,600
Cartonificio Valinhos S.A. (Valinhos, São Paulo)	5,000			5,000		1,000	3,800	4,800
	75,000	71,700	137,900	284,600	66,000	134,100	319,300	519,400

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
CHILE								
Barnat y Tausch Ltda. (Victor Manuel 1585, Santiago)							800	800
Condor Industria Cartonera (Sta. Rosa 3260, Santiago)							500	500
Cía. Manuf. papeles y cartones [Pte. Alto] (Agustinas 1343, Santiago)	15,000		3,000	18,000	12,000	14,000	14,000	40,000
Cía. Manufacturera de papeles y cartones [San Pedro] (Agustinas 1343, Santiago)	34,000			34,000	40,000			40,000
Cía. Manufacturera de papeles y cartones [Valdivia] (Agustinas 1343, Santiago)	4,000			4,000		8,000		8,000
Cía. Manufacturera de papeles y cartones [Talca] (Agustinas 1343, Santiago)							500	500
Elizondo y Cía. (Casilla 99, Puente Alto)							800	800
Espinoza, José (Lo Barnechea, Los Condes, Santiago)							500	500
Fca. de Cartón Bellavista (Casilla 12966)							600	600
Doris Leandro (Casilla 20, Viña del Mar)							2,000	2,000
Schorr y Concha (Casilla 185, Talca)							2,000	2,000
	53,000		3,000	56,000	52,000	14,000	29,700	95,700
COLOMBIA								
Cartón de Colombia (Apartado Aéreo 219, Cali)			3,000	3,000			45,000	45,000
Empresa Papelera S.A. (Soacha, Bogotá)							1,000	1,000
Industrias Bond S.A. (Soacha, Bogotá)						3,000		3,000
Fca. Nacional de cartón (Bogotá)							2,000	2,000
Fca. de Cartón Carbonari Hnos. (Cali)							1,800	1,800
Industria de Cartón Villa Hnos. (Medellín)							1,000	1,000
Ind. Pap. Colombiana Zipa Ltda. (Barranquilla)							1,500	1,500
			3,000	3,000		3,000	52,300	55,300
COSTA RICA								
Fca. de pulpa y papel "La Perla" (Ramal Monte Verde)			2,000	2,000			2,000	2,000
CUBA								
Bohon Trading Co. (La Habana)							2,000	2,000
Industrias de papel, cartón y envases S.A. (Real 68, La Habana)							39,000	39,000
Papelera Moderna S.A. (Casilla 549, La Habana)							15,000	15,000
Papelera Río Verde S.A. (Mercaderes 263, La Habana)						3,000		3,000
						3,000	56,000	59,000
ECUADOR								
Gándara, Artela y Cía. (Apartado 582, Quito)							500	500
Ind. Papelera Ecuatoriana IPECA (Latacunga)			3,000	3,000			3,000	3,000
			3,000	3,000			3,500	3,500
EL SALVADOR								
Papelera y cartonera Salvadoreña							1,500	1,500
GUATEMALA								
Ind. Papelera Guatemalteca			1,000	1,000			1,400	1,400

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
México								
Adamás S.A. (San Bartolo Naucalpan, Edo. de México)							3,000	3,000
Cartonajes Estrella S.A. (Calz Vallejo 1090, México 8, D.F.)							15,000	15,000
Cartonera Covadonga (Apartado 23010, México 9, D.F.)							3,000	3,000
Cartonera Industrial (Justo Sierra 26, México 1, D.F.)							2,500	2,500
Cartonera Moderna S.A. (Calzada Tacuba Naucalpan 1, Naucalpan)							12,000	12,000
Cartonera de Occidente (Guadalajara, Jalisco)							1,000	1,000
Cartón y papel de México S.A. (Tlalnepantla, Edo de México)						10,000	15,000	25,000
Celulosa de Chihuahua (Apartado Postal 530, Chihuahua)		40,000		40,000				
Cía de las Fcas. de papel, San Rafael (Tlalmanalco, Edo. de México)	18,000	23,000		41,000		20,000	30,000	50,000
Cía. de las Fcas. de papel, San Rafael (Progreso Industrial, Edo. de México)							15,000	15,000
Cía. Industrial de Atenquique (Av. Juárez 117, México 1, D.F.)		33,000		33,000			33,000	33,000
Cía. Industrial San Cristóbal (Lieja 8, México, D.F.)			20,000	20,000			10,000	10,000
Cía. Industrial papelera Poblana (Av. 11 Sur 3102, Puebla, Pue)							3,000	3,000
Cía. papelera El Fénix S.A. (Av. Jacarandas 375, México 15, D.F.)	500			500		5,000	4,000	9,000
Empaques de Cartón Titan S.A. (Av. Universidad 2071 Nte. Monterrey)			20,000	20,000			30,000	30,000
Empaques de cartón United S.A. (Etzatlan 25-A col. del Rastro, México 2, D.F.)							9,000	9,000
Fábrica de papel Coyoacán S.A. (Fernández Leal 62, Coyoacán 21, D.F.)	3,000			3,000		11,000	2,000	13,000
Fca. de Celulosa El Pilar (Km. 24.6 Carretera México-Puebla)			10,000	10,000				
Fca. de papel La Soledad (Texcoco, Edo. de México)							3,000	3,000
Fca. de papel La Aurora [Edo. de México] (Av. 1 N° 9 Naucalpan, Edo. de México)						6,000	3,000	9,000
Fca. de papel La Aurora [México D.F.] (F. Alba Ixlioxóchitl 44, México 8, D.F.)						1,000	2,000	3,000
Fca. de papel Maldonado S.A. (San Nicolás de los Garza, Nuevo León)							5,000	5,000
Fca. de papel Monterrey (Gral. C. Salazar 1821, Ote. Monterrey)							3,500	3,500
Fca. de papel San José (Km. 20.5 Carretera México, Texcoco, Edo de México)							3,000	3,000
Fcas. de papel Loreto y Peña Pobre (San Angel, D.F.)	4,000			4,000		7,000	8,000	15,000
Fcas. de papel Loreto y Peña Pobre (Tlalpam, D.F.)	6,000	15,000		21,000		10,000	10,000	20,000
Fca. de papel Tuxtepec (Benito Juárez, Tuxtepec, Oaxaca)	24,000			24,000	30,000			30,000
Impulsora de papel S.A. (Calle Norte 7-A N° 5035, México 15, D.F.)							2,400	2,400
Industrial Telaya S.A. (San Rafael, Edo de Veracruz)			3,000	3,000			4,000	4,000
Kraft S.A. (Pelícano 79, Col. Granjas Modernas, México 14, D.F.)							7,000	7,000
Manufacturera de papel Bidasoa S.A. (Av. Hidalgo 122, Azcapotzalco 16, D.F.)							4,500	4,500
Negociación Papelera Mexicana (Laguna de Mayran N° 200, México 17, D.F.)	3,000			3,000		4,000	6,000	10,000
Papelera El Chabacano S.A. (Calzada Chabacano 11, México 8, D.F.)							3,000	3,000
Papelera de Chihuahua S.A. (Plaza FF.CC. Kansas N° 1, Chihuahua, Chih.)							3,000	3,000

Appendix II (*continued*)

Name and address	*Mechanical pulp*	*Long-fibre chemical pulp*	*Short-fibre semi-chemical and chemical pulp*	*All pulps*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*All paper and board*
MÉXICO (*continued*)								
Papelera Iruña (Calz. Tulychualco N° 5921, Oxtapalapa, D.F.)							10,000	10,000
Papelera Veracruzana S.A. (Col Urbana Librado Rivera, Orizaba, Veracruz)							4,500	4,500
Papeles Faciales y Kraft (Km. 24 Carretera México-Texcoco, Edo. de México)							1,500	1,500
Productora de papel S.A. (Km. 7 FF.CC. Matamoros-Lagrange, Nuevo León)							15,000	15,000
Sonoro de México S.A. (Km. 15.5 Carretera México-Laredo, Edo. de México)							7,000	7,000
	58,500	111,000	53,000	222,500	30,000	74,000	292,900	396,900
PERU								
Cía. papelera y celulósica del Norte S.A. (Hacienda Cayalti, Chiclayo)			3,000	3,000			3,500	3,500
La papelera Peruana S.A. (Chosica)							7,000	7,000
Soc. Agrícola Paramonga Ltda. (Lampa 560, Lima)			25,000	25,000		5,000	35,000	40,000
Piedraliza S.A., Fca. de papel y Cartón (Casilla 601, Lima)							3,000	3,000
			28,000	28,000		5,000	48,500	53,500
PARAGUAY								
Papelera Paraguaya (Asunción)							700	700
URUGUAY								
Cía. Ind. y Comercial del Sur S.A. (Rincón 487, Montevideo)	3,000			3,000			10,000	10,000
Fca. Nacional de papel (Av. G. Rondeau 1799, Montevideo)			5,000	5,000		5,000	7,000	12,000
Industria papelera Uruguaya S.A. (Paraguay 1902, Montevideo)						4,000	4,000	8,000
Papelera Mercedes S.A. (A. García Morales 1319, Montevideo)						4,000	5,000	9,000
Primus del Uruguay Cía. (Av. G. Rondeau 1739, Montevideo)							1,000	1,000
Alvarez y Fernández (Colonia 1979, Montevideo)							700	700
Magarinos S.A. Carbonería (Sta. Fe 1167, Montevideo)							500	500
	3,000		5,000	8,000		13,000	28,200	41,200
VENEZUELA								
Cartón de Venezuela S.A. [Petare] (Apartado 609, Caracas)							7,000	7,000
Cía. Venezolana de pulpa y papel Venepal (Edif. Las Fundaciones, Av. A. Bello, Caracas)							35,000	35,000
Fca. de papel de Maracay (Apartado 301, Caracas)							6,000	6,000
Fca. N. de papel y cartón El Encantado (Quebrada Hondas, Caracas)							1,500	1,500
Papeles Venezolanos S.A. [Guacara] (Apartado 4640, Caracas)							5,000	5,000
							54,500	54,500
LATIN AMERICA, TOTAL	209,500	192,700	321,600	723,800	168,000	344,600	1,190,400	1,703,000

Appendix III. Latin America: number and annual capacity[a] of pulp and paper mills in 1958

(Tons)

Country	Newsprint		Other paper and paperboard										Total	
			Up to 5,000 tons a year		5,001-10,000 tons		10,001-20,000 tons		20,001-40,000 tons		Over 40,000 tons			
	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity
Argentina[b]	1	20,000	48	112,400	16	123,700	4	52,500	—	—	2	109,000	70	417,600
Brazil[b]	8[c]	66,000	38[d]	108,100	14	118,600	11	155,700	3	71,000	—	—	66	519,400
Chile[b]	2	52,000	8	7,700	1	8,000	—	—	1	28,000	—	—	11	95,700
Colombia	—	—	6	10,300	—	—	—	—	—	—	1	45,000	7	55,300
Cuba	—	—	2	5,000	—	—	1	15,000	1	39,000	—	—	4	59,000
Mexico	1	30,000	17	52,900	8	71,000	7	105,000	3	88,000	1	50,000	37	396,900
Peru	—	—	2	6,500	1	7,000	—	—	1	40,000	—	—	4	53,500
Uruguay	—	—	3	2,200	3	27,000	1	12,000	—	—	—	—	7	41,200
Venezuela	—	—	2	6,500	2	13,000	—	—	1	35,000	—	—	5	54,500
Other countries	—	—	7	9,900									7	9,900
LATIN AMERICA, TOTAL	12	168,000	133	321,500	45	368,300	24	340,200	10	301,000	4	204,000	218	1,703,000

[a] Includes mills that for various reasons have been brought to a standstill.

[b] In Argentina and Brazil the mills that produce newsprint also produce other paper and paperboard, and consequently there are duplications in the columns headed "Number" and the sum of the horizontal entries under "Number" exceeds the figures in the last column for the total number of mills by one and eight respectively; the same applies in Chile, with respect to one of the two mills that produce newsprint, and here, too, the total number of mills exceeds the sum of the horizontal entries by one. In all there are ten mills that have been included twice.

[c] There is actually only one mill with a capacity of 55,000 tons, the remaining 11,000 tons representing the output of mills that produce newsprint only sporadically.

[d] In addition there are a few dozen small mills, operating virtually on an artisan basis, that produce a heavy paperboard known in Brazil as *papelão;* because of its size and special characteristics this is not included in statistical surveys and censuses.

Appendix IV. Latin America: production, imports and apparent consumption of paper pulp, 1955-60

(Tons)

Country	1955				1956			
	Mechanical pulp	*Chemical wood-pulp*	*Other chemical pulp*	*Total*	*Mechanical pulp*	*Chemical wood-pulp*	*Other chemical pulp*	*Total*
Argentina:								
P	17,066	5,000	33,834	55,900	14,711	12,000	34,455	61,166
I	34,805	167,548	—	202,353	32,919	97,713	—	130,632
C	51,871	172,548	33,834	258,253	47,630	109,713	34,455	191,798
Brazil:								
P	89,038	84,569	13,902	187,509	92,392	94,930	21,482	208,804
I	—	102,593	—	102,593	—	99,263	—	99,263
C	89,038	187,162	13,902	230,102	92,392	194,193	21,482	308,067
Chile:								
P	17,845	—	2,206	20,051	17,432	—	2,576	20,008
I	—	38,689	—	38,689	—	23,085	—	23,085
C	17,845	38,689	2,206	58,740	17,432	23,085	2,576	43,093
Colombia:								
P	—	—	1,333	1,333	—	—	1,722	1,722
I	*	23,800	—	23,800	*	20,622	—	20,622
C	—	23,800	1,333	25,133	—	20,622	1,722	22,344
Cuba:								
I and C	—	15,444	—	15,444	—	27,460	—	27,460
Mexico:								
P	27,000	55,400	11,500	93,900	28,000	90,300	17,000	135,300
I	300	58,900	—	59,200	500	58,000	—	58,500
C	27,300	114,300	11,500	153,100	28,500	148,300	17,000	193,800
Peru:								
P	—	—	13,000	13,000	—	—	17,825	17,825
I	—	8,556	—	8,556	303	4,636	—	4,939
C	—	8,556	13,000	21,556	303	4,636	17,825	22,764
Uruguay:								
P	2,000	—	3,300	5,300	2,000	—	4,000	6,000
I	423	14,947	—	15,370	158	16,657	—	16,815
C	2,423	14,947	3,300	20,670	2,158	16,657	4,000	22,815
Venezuela:								
I and C	—	6,146	—	6,146	—	10,263	—	10,263
TOTAL:								
P	152,949	144,969	79,075	376,993	154,535	197,239	99,060	450,825
I	35,528	436,623	—	472,151	33,880	357,699	—	391,579
C	188,477	581,592	79,075	849,144	188,415	554,929	99,060	842,404

Country	1957				1958			
	Mechanical pulp	*Chemical wood-pulp*	*Other chemical pulp*	*Total*	*Mechanical pulp*	*Chemical wood-pulp*	*Other chemical pulp*	*Total*
Argentina:								
P	13,770	20,000	32,208	65,978	18,511	24,000	32,573	75,084
I	25,500	122,314	—	147,814	25,000	82,003	—	107,003
C	39,270	142,314	32,208	213,792	43,511	106,033	32,573	182,087
Brazil:								
P	90,660	106,050	24,050	220,760	90,000	108,662	32,000	230,662
I	—	117,591	—	117,591	—	95,029	—	95,029
C	90,660	223,641	24,050	338,351	90,000	203,691	32,000	325,691
Chile:								
P	20,815	—	2,981	23,733	44,250	—	2,811	47,061
I	—	22,783	—	22,783	—	29,233	—	29,233
C	20,815	22,783	2,981	46,516	44,250	29,233	2,811	76,294
Colombia:								
P	—	—	2,543	2,543	—	—	2,640	2,640
I	*	27,970	—	27,970	—	25,810	—	25,810
C	—	27,970	2,543	30,513	—	25,810	2,640	28,450
Cuba:								
I and C	—	24,111	—	24,111	—	30,193	—	30,193

Appendix IV (*continued*)

Country	1957 Mechanical pulp	1957 Chemical wood-pulp	1957 Other chemical pulp	1957 Total	1958 Mechanical pulp	1958 Chemical wood-pulp	1958 Other chemical pulp	1958 Total
Mexico:								
P	31,300	102,000	24,300	157,600	36,000	106,000	33,800	175,800
I	1,000	27,100	—	28,100	1,767	23,610	—	25,377
C	32,300	129,100	24,300	185,700	37,767	129,610	33,800	201,177
Peru:								
P	—	—	16,627	16,627	—	—	20,684	20,684
I	—	6,577	—	6,577	600	7,956	—	8,556
C	—	6,577	16,627	23,204	600	7,956	20,684	29,240
Uruguay:								
P	2,000	22,666	4,500	6,500	1,900	—	3,000	4,900
I	1,029	22,666	—	23,695	—	10,376	—	10,376
C	3,029	—	4,500	30,195	1,900	10,376	3,000	15,276
Venezuela:								
I and C	—	8,944	—	8,944	—	14,544	—	14,544
TOTAL:								
P	158,545	228,050	107,146	493,741	190,661	238,662	127,508	556,831
I	27,529	380,056	—	407,585	27,367	318,754	—	346,121
C	186,074	608,106	107,146	910,326	218,028	557,416	127,508	902,952

Country	1959 Mechanical pulp	1959 Chemical wood-pulp	1959 Other chemical pulp	1959 Total	1960 Mechanical pulp	1960 Chemical wood-pulp	1960 Other chemical pulp	1960 Total
Argentina:								
P	16,699	33,000	36,595	86,294	18,396	28,000	26,865	73,261
I	25,000	87,685	—	112,685	20,000	66,222	—	86,222
C	41,699	120,685	36,595	198,979	38,396	94,222	26,865	159,483
Brazil:								
P	90,800	145,652	34,000	270,452	91,700	198,000	40,000	329,700
I	—	88,109	—	88,109	—	81,131	—	81,131
C	90,800	233,761	34,000	358,561	91,700	279,131	40,000	410,831
Chile:								
P	49,322	8,912	2,000	60,234	51,790	50,354	2,700	104,844
I	—	40,799	—	40,799	—	7,265[c]	—	7,265[c]
C	49,322	49,711	2,000	101.033	51,790	57,619	2,700	112,109
Colombia:								
P	—	—	2,800	2,800	—	6,153	2,698	8,851
I	—	32,683	—	32,683	—	31,095	—	31,095
C	—	32,683	2,800	35,483	—	37,248	2,698	39,946
Cuba:								
P	—	—	10,000	10,000	—	—	22,000	22,000
I	—	25,000	—	25,000	—	35,400	—	35,400
C	—	25,000	10,000	35,000	—	35,400	22,000	57,400
Mexico:								
P	47,000	114,000	37,500	198,500	59,000	115,500	60,500	235,000
I	1,179	19,000	—	20,179	3,477	31,000	—	34,477
C	48,179	133,000	37,500	218,679	62,477	146,500	60,500	269,477
Peru:								
P	—	—	25,782	25,782	—	—	25,700	25,700
I	500	7,000	—	7,500	394	10,691	—	11,085
C	500	7,000	25,782	33,282	394	10,691	25,700	36,785
Uruguay:								
P	1,800	—	3,000	4,800	2,000	—	3,000	5,000
I	—	19,485	—	19,485	644	25,083	—	25,727
C	1,800	19,485	3,000	24,285	2,644	25,083	3,000	30,727
Venezuela:								
I and C	—	31,704	—	31,704	—	31,041	—	31,041
TOTAL:								
P	205,621	301,564	151,677	658,862	222,886	398,007	183,463	804,356
I	26,679	351,465	—	378,144	24,515	318,928	—	343,443
C	232,300	653,029	151,677	1,037,006	247,401	716,935	183,463	1,147,799

P = Production.
I = Imports.
C = Apparent consumption.

[a] The quantities imported were probably negligible; they are included in the column "Chemical wood-pulp".
[b] Provisional figures.
[c] Net imports (imports 20,962 minus exports 13,697 = 7,265).

Appendix V. Latin America: number and annual capacity[a] of mills manufacturing paper pulp in 1958

(Tons)

Country	Mechanical pulp		Semi-chemical and mechanical pulps											
			Up to 5,000 tons/year		5,001-10,000 tons		10,001-20,000 tons		20,001-40,000 tons		Over 40,000 tons		Total	
	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity	Number	Capacity
Argentina	1	20,000	9	18,000	2	12,200	2	30,500	1	35,000	—	—	15	115,700
Brazil[b]	6	75,000[c]	19	46,100	9	70,500	3	43,000	—	—	1	50,000	34	284,600
Chile[b]	3	53,000	1	3,000	—	—	—	—	—	—	—	—	3	56,000
Colombia	—	—	1	3,000	—	—	—	—	—	—	—	—	1	3,000
Mexico[b]	7	58,500	1	3,000	1	10,000	3	55,000	3	96,000	—	—	13	222,500
Peru	—	—	1	3,000	—		—		1	25,000	—	—	2	28,000
Uruguay	1	3,000	1	5,000	—		—		—	—	—	—	2	8,000
Other countries	—	—	3	6,000	—		—		—	—	—	—	3	6,000
LATIN AMERICA, TOTAL	18	209,500	35	87,100	12	92,700	8	128,500	5	156,000	1	50,000	73	723,800

[a] This also includes the plants that have been brought to a standstill, wherever it has been possible to establish the capacity of their equipment.

[b] The situation here is similar to that explained in footnote [b] to appendix III. In this case the duplication results from the fact that 7 mills (4 in Brazil, 1 in Chile and 2 in Mexico) have equipment for the production both of mechanical pulp and of semi-mechanical and chemical pulp. Consequently the sum of the horizontal entries under "number" for Brazil, Chile, Mexico and Latin America exceeds the corresponding figures in the "total" column by 4, 1, 2 and 7, respectively.

[c] In addition there are between 250 and 300 small mechanical pulp mills most of which have been brought to a standstill for lack of raw material; the estimated total daily capacity for the whole country is 1,000 tons, but according to the calculations made in the present report (see annex 4) actual production in 1958 amounted to only 90,000 tons, and hence the output of these small mills probably amounted to very little.

Appendix VI. Basic series and factors used to project paper and paperboard demand

1. POPULATION

TABLE A. LATIN AMERICA: PROJECTION OF POPULATION, BY COUNTRIES, 1965 AND 1975
(Estimates as at 30 June 1960, in thousands)

Country	*1965*	*1975*	*Country*	*1965*	*1975*
Argentina	22,959	27,120	Haiti	4,133	5,209
Bolivia	4,152	5,299	Honduras	2,179	2,819
Brazil	74,572	95,788	Mexico	40,635	53,561
Chile	8,581	10,800	Nicaragua	1,692	2,269
Colombia	16,985	22,702	Panama	1,206	1,587
Costa Rica	1,335	1,827	Paraguay	1,779	2,214
Cuba	7,553	9,183	Peru	12,420	16,382
Dominican Republic	3,319	4,605	Uruguay	2,896	3,143
Ecuador	4,912	6,446	Venezuela	8,081	10,779
El Salvador	2,730	3,571			
Guatemala	4,340	5,902	TOTAL	226,459	291,206

2. GROSS NATIONAL PRODUCT

TABLE B. LATIN AMERICA: TOTAL AND PER CAPITA GROSS NATIONAL PRODUCT
(Thousands of dollars at 1950 prices)

Country	*Total gross national product*				*Population in 1956 (thousands)*	*Per capita gross national product 1955-57*
	1955	*1956*	*1957*	*1955-57*		
Argentina	10,936	10,916	11,351	11,068	19,512	567
Bolivia	263	263	260	262	3,240	81
Brazil	13,276	13,676	14,296	13,749	59,905	230
Chile	2,185	2,198	2,274	2,219	6,909	321
Colombia	3,181	3,274	3,312	3,256	12,961	251
Costa Rica	237	235	253	242	983	246
Cuba	2,339	2,555	2,923	2,606	6,242	417
Dominican Republic	495	539	577	537	2,593	207
Ecuador	512	531	568	534	3,796	141
El Salvador	351	381	406	379	2,264	167
Guatemala	474	534	568	525	3,358	156
Haiti	270	281	291	281	3,351	84
Honduras	248	266	279	264	1,711	154
Mexico	7,364	7,695	8,039	7,699	30,526	252
Nicaragua	221	223	253	232	1,286	180
Panama	252	272	275	266	934	285
Paraguay	176	175	187	179	1,601	112
Peru	1,521	1,560	1,607	1,563	9,599	163
Uruguay	1,010	1,020	980	1,003	2,657	391
Venezuela	4,802	5,309	6,140	5,417	5,953	910
LATIN AMERICA, TOTAL	50,114	51,903	54,839	52,281	179,381	291

SOURCE: ECLA, on the basis of official statistics.

Appendix VI (*continued*)

2. GROSS NATIONAL PRODUCT (*continued*)

TABLE C. LATIN AMERICA: ESTIMATED FUTURE GROWTH OF GROSS PRODUCT

(Annual per capita growth rate)

Country	*Past rate*	*Estimated rate*	*Country*	*Past rate*	*Estimated rate*
Argentina	1.10	2.00	Ecuador	2.60	2.50
Bolivia	0.35	1.50	Mexico	3.10	3.00
Brazil	2.70	2.50	Paraguay	1.10	1.50
Central America	2.90	2.00	Peru	2.60	2.00
Chile	0.70	2.00	Uruguay	1.10	1.50
Colombia	2.40	2.20	Venezuela	5.00	3.00
Cuba	2.80	3.00			

NOTE: The past rate was calculated on the basis of 1945-47 for Argentina, Brazil, Chile, Colombia, Cuba, Mexico, Peru and Venezuela, whereas the years 1945-55 were used for the remaining countries. Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama were considered together, for the basic calculations as well as for the growth of the product.

As no information was available for the Dominican Republic and Haiti, it was decided to adopt the Central American projection base of 2 per cent for their projections as well.

3. ELASTICITY COEFFICIENTS

As indicated in the body of the text, the elasticity coefficients (first derivative of the function) were calculated for the levels of income corresponding to the years at either end of the projection period (1955-57 and 1975), the average of the coefficients thereafter being used in the projections, as may be seen from table D.

TABLE D. LATIN AMERICA: AVERAGE INCOME-ELASTICITY COEFFICIENTS (1955-57/1975) USED TO PROJECT DEMAND FOR VARIOUS TYPES OF PAPER AND PAPERBOARD

Country	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*Country*	*Newsprint*	*Printing and writing paper*	*Other paper and board*
Argentina	1.21	1.44	1.42	Guatemala	1.78	1.71	1.87
Bolivia	2.11	1.85	2.11	Haiti	2.07	1.83	2.08
Brazil	1.58	1.62	1.72	Honduras	1.79	1.71	1.87
Chile	1.45	1.56	1.62	Mexico	1.52	1.59	1.67
Colombia	1.55	1.60	1.70	Nicaragua	1.72	1.68	1.82
Costa Rica	1.57	1.61	1.71	Panama	1.50	1.58	1.66
Cuba	1.31	1.49	1.51	Paraguay	1.91	1.78	2.00
Dominican Republic	1.65	1.65	1.77	Peru	1.76	1.70	1.85
Ecuador	1.81	1.68	1.89	Uruguay	1.38	1.53	1.57
El Salvador	1.75	1.69	1.84	Venezuela	1.64	2.30	2.23

NOTE: The elasticity coefficients used in the case of Venezuela were those calculated during the preparation of the report on *La industria del papel y la celulosa en Venezuela* (E/CN.12/536; FAO/ETAP/IN5; TAO/VEN/12).

4. CORRELATION FUNCTIONS AND INDICES

The functions that relate the consumption of each type of paper and board with the product are as follows ("Y" representing per capita paper consumption and "X" the per capita gross national product):

(a) *Newsprint*

$$Y = 4.70726 + 4.21919 \log X - 0.53512 (\log x)^2$$

P (correlation index) = 0.91

(b) *Printing and writing paper*

$$Y = 3.24203 + 2.77368 \log X - 0.23490 (\log x)^2$$

$P^2 = 0.91$

(c) *Other paper and board*

$$Y = 3.90946 + 3.67876 \log X - 0.39801 (\log x)^2$$

$P^2 = 0.96$

CHAPTER III

REGIONAL RESOURCES

The present chapter deals mainly with Latin America's resources of fibrous raw materials. Section 1 discusses the relative importance of each of the main fibre sources: wood, other natural fibres and waste paper, giving some broad indication of economic availability for each category. Forecasts are presented of the estimated fibre requirements of the domestic industry in 1965 and 1975. Section 2 of the chapter then goes on to review briefly the regional situation with regard to the other type of resource considered in this report, namely, chemicals.

Fibre availability and supply is only one of the resource factors to be considered in establishing a new pulp and paper mill; there are many others which may be of equal importance and ultimately determine the economic feasibility of a new project. For the production of chemical and semi-chemical pulp large quantities of *chemicals* are needed. Detailed discussion of the various chemicals, their availability, market price, freight rates, etc., is outside the scope of this report, but a few general observations further on in the text serve to indicate some of the problems involved. Exceptionally large quantities of clean and fresh water are needed for the production of either pulp or paper. Water consumption may range from around 50 m^3 per ton of chemical pulp produced to 300 m^3 or more for the manufacture of one ton of fine paper in an integrated mill. A related problem is that of effluent, the satisfactory disposal of which may create a serious obstacle and involve heavy expenditure.

Reasonably inexpensive *fuel and power* need to be available in ample quantity before the erection of a pulp and paper mill can be justified. Large quantities of raw materials and finished products have to be transported into and from the mill itself. Thus a good *transport and communications* system is essential. Then there is the question of *manpower,* especially of supervisory personnel and skilled labour needed to operate a new plan, and, lastly, of one of the most important requirements—*capital.*

1. FIBROUS RAW MATERIALS

The previous chapter on consumption, production and trade indicated, in general terms, that programmes for educational and industrial advancement in the region are likely to bring about a substantial increase in Latin America's demand for paper products during the next ten to fifteen years. If this need is to be satisfied the major contribution will have to come from indigenous resources. Two particular questions immediately arise. First of all, will there be enough fibre? And secondly, which fibres offer the best prospects?

The paragraphs which follow show why the answer to the first question is certainly positive, and discuss the second, without providing a final answer, but simply attempting to bring out those considerations which need to be taken into account in trying to arrive at a satisfactory answer. The present state of knowledge in the region does not admit of hard and fast generalizations or final answers. The main purpose of this section, therefore, is to draw attention to the particular kind of data that are required and to provide some indications of the way in which the problem of making a decision may be approached.

Before discussing the availability of fibrous raw materials to meet the industrial expansion envisaged, the quantities of fibre likely to be required in the future must be considered.[1] Table 14 gives some estimates of the potential future consumption and production of dif-

[1] Appendix I to the present chapter gives the estimated composition of the furnish (i.e., consumption of different types of pulp) in 1958-59.

TABLE 14. LATIN AMERICA: ESTIMATES OF PRESENT AND FUTURE PRODUCTION AND CONSUMPTION OF DIFFERENT TYPES OF PULP AND WASTE PAPER, 1958-59, 1965 AND 1975

(Thousands of tons)

	1958-59		*1965*		*1975*	
	Consumption	*Production*	*Consumption*	*Production*	*Consumption*	*Production*
Long-fibre chemical pulp	498	195	849	609[a]	1,510	1,320
Groundwood type pulp	225	198	438	393	1,120	1,075
Semi-chemical pulp and short-fibre chemical pulp.	248	215	709	756	1,915	1,915
Waste paper	552	532	797	797	1,590	1,590
TOTAL	1,523	1,140	2,793	2,555	6,135	5,900

NOTE: For a complete breakdown see chapter V, appendices III-VI.

[a] Including 29,000 and 120,000 tons of bamboo and sisal pulp for 1965 and 1975, respectively.

ferent types of pulp and waste paper, on the basis of the projections of future demand for paper and paperboard in 1965 and 1975 presented in chapter II.[2] The data shown for 1958-59 (average) are estimates of the actual quantities of fibre being consumed by the domestic industry at that time; for 1965 they are provisional estimates—based on current information available about development plans—of what the industry is likely to be consuming by then. By 1975 it is assumed that the region will be meeting all its requirements over and above the estimated 1965 level of net imports. This should not be taken as implying that regional self-sufficiency is considered either a feasible or a desirable aim. Evidence suggests (*a*) that the optimum economic utilization of Latin American resources of fibre would entail a very much greater volume of intra-regional trade than exists at the present time, and (*b*) that even under the most optimistic assumptions there will be a continuing need for additional supplies of certain categories of pulp and paper from outside the region. Thus, the purpose of presenting the data in table 14 is simply to facilitate analysis.

On the basis of current knowledge about the availability of the various sources of fibre throughout the region, it is possible to convert the above data on future pulp requirements into quantities of fibrous raw materials. This is done in table 15.

TABLE 15. LATIN AMERICA: BREAKDOWN OF ESTIMATED FIBROUS RAW MATERIAL REQUIREMENTS FOR THE PRODUCTION OF PULP[a] IN ABSOLUTE AND RELATIVE TERMS, 1958-59, 1965 AND 1975

(Thousands of tons)

	1958-59	*Per cent*	*1965*	*Per cent*	*1975*	*Per cent*
Conifers, 1,000 m³ (solid volume without bark)	1,400	78	3,800	75	8,000	67
Broadleaved species 1,000 m³ (solid volume without bark)	400	22	1,300	25	4,000	33
WOOD, SUB-TOTAL	1,800	100	5,100	100	12,000	100
Bagasse, bone dry, 1,000 tons..	220	56	1,000	74	2,800	80
Straw, bone dy, 1,000 tons.. / Grasses, bone dry, 1,000 tons.	140	36	250	19	300	9
Bamboo, sisal, 1,000 tons ...	30	8	100	7	400	11
OTHER FIBRES, SUB-TOTAL	390	100	1,350	100	3,500	100

[a] See chapter V, appendices V and VI.

The data in table 15 show only one of the many ways in which, technically, it would be possible to meet the future pulp-fibre needs of the region. Obviously, there are a great many alternatives. Broadleaved hardwoods, bagasse and straw are often interchangeable for the production of short-fibre chemical pulp. Semi-chemical pulp may also take the place of some of the groundwood. The estimates shown therefore do not represent a prediction of how fibre needs will actually be met. Nor do they imply that all types of paper and paperboard can be manufactured economically in each country of the region from the fibre sources indicated. At the same time they do help in arriving at some overall appraisal of the order of magnitude of fibre requirements in the future, which is of special significance and value, particularly in relation to decisions of forest policy and replanting programmes.

The technical solution shown in table 15 implies the need by 1965 of 5.1 million m³ of wood (1.8 million m³ in 1958-59), about 1 million tons of dry bagasse (220,000 tons in 1958-59) and approximately 250,000 tons of straw (140,000 tons in 1958-59). These are very large quantities, representing substantial increases over the estimated amounts consumed ten years previously. Yet requirements will have expanded a great deal more by 1975: the consumption of pulpwood will rise to 12.3 million m³ and of bone-dry bagasse to about 2.6 million tons, according to the solution presented.

Are difficulties likely to arise in meeting requirements on this scale? In terms of physical availability the answer is no; the quantities indicated are small indeed when compared with the potential yield from the region's resources of forests and agricultural residues. But it is not enough to know that the quantities are physically available; what is important, and what is needed, is an answer to questions such as:

(*a*) Can the fibres be obtained in the quantities indicated and at a reasonable cost, delivered to potential pulp-mill sites?

(*b*) Are the different types of raw material needed to meet minimum requirements of long-fibre chemical pulp and groundwood-type pulps available in sufficient quantities at reasonable cost?

(*c*) Will the pulp and paper producer countries in Latin America be able to meet their own individual needs for all types of fibre?

(*d*) What are the competing claims of other uses on the various fibrous raw materials?

There is an immediate difficulty in trying to provide proper answers to the first three of these questions. Some of the basic data needed are not yet available. The Group is well aware of this fact and has plans to collect and collate the details necessary as opportunity permits in the future. This means that any assessment

[a] The assumptions and hypothesis used for estimating future production (1965 and 1975) of pulp and paper are discussed in chapter V; full details of the calculations are given in appendices I-VI to that chapter.

of availabilities of the different raw materials can only be of a very general and preliminary nature and must be regarded as no more than an indication of the prospects for satisfying the growing need for pulp and paper in the future. Such an appraisal is given for each of the three fibre categories—wood, other natural fibres and waste paper—in the remainder of this section.

The fourth question is outside the scope of the present chapter and will be referred to only in passing. However, it underlines the great importance, when estimating pulpwood supplies, of the fact that pulpwood is not the sole product of the forest; it is only one of several products competing for the raw material. For information on potential wood supplies and requirements for uses other than pulp and paper manufacture, reference is made to a joint FAO/ECLA study.[3]

(a) *Wood*

With a forest area of 1,000 million hectares, Latin America contains almost a quarter of all the world's forests. The forests in the region vary from abundant stands of pine in the mountains of northern Mexico, through dense jungle in the Amazon basin, to temperate hardwood forests in southern Argentina and Chile. Taken together they represent an enormous natural resource which *given proper management* can not only maintain its production but substantially increase it.

However, the region's resources of conifers—which are the traditional source of fibre for paper and pulp and upon which the industry over the world as a whole still depends for some 90 per cent of its virgin fibre —are by no means abundant. Precise estimates of total forest areas, growing stock and potential sustained yields are not available. Few countries have as yet carried out the necessary forest inventories. Thus the data presented in table 16 on page 38 must be considered as no more than general indications and not careful quantitative estimates.

Table 16 provides some information on the forests of the individual countries of the region and of Latin America as a whole. Among the facts made clear by an examination of these data are that: (*a*) the forests are unevenly distributed in relation to population; (*b*) in most countries broadleaved forests predominate; and (*c*) only about one-third of the total forest resources of this region are classified as accessible (notable exceptions are Argentina, Colombia and Mexico).

The most heavily forested countries are Costa Rica and Panama, over 70 per cent of whose total land area is tree-covered. At present the most poorly forested countries are Uruguay and Cuba.

However, the mere existence of forests, even those that are accessible, is not a reliable indication of their potential for paper-making purposes. The forest increment and composition, the quality of the trees and the cost of transport, together with the general economic development of the country of area and other forest uses, are all factors of paramount importance when evaluating the possibilities of these fibrous resources. Thus Chile, for example, has already begun to export newsprint and long-fibre pulp on the basis of a forest area which, though only about 225,000 hectares in extent,[4] consists of fast-growing, high-standing *Pinus radiata* plantations. On the other hand Honduras, with 1.1 hectares of coniferous forest per head, still has to import all the paper consumed in the country. In Brazil too, with its vast forest area of which approximately 140 million hectares are classified as accessible, all the wood-pulp comes either from rather depleted coniferous stands or from eucalypt plantations, and the natural deciduous forests and coniferous plantations play no part as yet in pulp manufacturing.

So far no breakdown has been made of the potential *supplies* into coniferous and broadleaved pulpwood, nor is such a breakdown possible at the present stage. All that can be given, therefore, are some general comments and facts relating to the calculations of future fibre requirements (see table 15) and bearing on the supply prospects in the various areas of the region.

As regards the wood raw materials to be used for the assumed volume of fibre production in 1965, the coniferous trees required for chemical pulp (5.0 m^3 solid green volume without bark per ton of pulp) and for groundwood (2.55 m^3 per ton) are estimated at approximately 3.8 million m^3. In the production of short-fibre chemical pulp, including semi-chemical pulp, and small amounts of short-fibre groundwood, about 350,000 tons are expected to come from broadleaved trees, and wood consumption will be approximately 1.3 m^3 (4.00, 2.90 and 2.10 m^3 solid green volume without bark per ton of chemical, semi-chemical and groundwood pulp, respectively).

As stated before, the central hypothesis for 1975 is that the region will be importing the amounts that the calculations made for 1965 showed as the net regional deficit (to be imported from the rest of the world) for that year. This assumption implies a big increase in the production of paper and paperboard, mainly of newsprint; in 1975 the estimated production of this type of paper accounts for almost 20 per cent of total production, whereas in 1965 it represents only 14 per cent.

Since it is assumed here that newsprint will be almost entirely made of long-fibre resources, an increase in the proportion of newsprint consumed will mean an increase in long-fibre requirements. However, the present tendency to use increasing quantities of short-fibred raw materials will clearly continue and acquire greater momentum in the future.[5] In the estimate of Latin America's fibre consumption in 1975, due allowance has been made for the large-scale replacement of long-fibre chemical pulp (mostly coniferous) by pulps of other types.[6] It has also been assumed that approximately 25 per cent of the groundwood-type pulp will be produced from broadleaved species (poplar and eucalypts).

As shown in table 14, on the assumption that 190,000 tons of long-fibre chemical pulp will be imported in

[3] *Study on Timber Trends and Prospects in Latin America* (E/CN.12/624; FAO/LAFC-62/5).

[4] *FAO Forestry Mission Report to the Government of Chile* (No. 1192), 1959, p. 31.

[5] Although the period up to 1965 is too short for a significant change in the respective proportions of long-fibre and short-fibre materials in wood fibre furnish, table 15 shows that the long-fibre share decreases between 1958-59 and 1965 from 78 to 75 per cent, with a corresponding increase in the proportion of short fibre.

[6] See again table 15 and chapter V, appendices III-VI.

TABLE 16. LATIN AMERICAN FORESTS

Country	Area (thousands of ha)	Forest area		Accessible forests	Forests in use	Coniferous forests	Coniferous forests in use	Forest area per capita	Area of accessible forest per capita	Population in 1958[a] (thousands)
		Thousands of ha	As percentage of land area	Thousands of hectares				Hectares		
Argentina	274,821	70,000	25	60,000	10,250	250[b]	250	3.5	3.0	20,250
Bolivia	109,858	47,000	43	6,000	...			17.9	2.3	3,311
Brazil	846,988	561,656	66	140,000	40,000	9,000[c]	6,000	8.9	2.2	62,725
Chile	73,377	20,443	28	10,077	4,641	400[d]	300[e]	2.9	1.4	7,298
Colombia	112,036	69,000	62	62,000	411			5.7	5.1	13,522
Costa Rica	5,020	3,617	72	1,691				3.4	1.6	1,072
Cuba	11,452	1,300	11	1,300	1,090	458[f]	109	0.2	0.2	6,466
Dominican Republic	4,733	2,225	47	905	200		125	0.8	0.8	2,797
Ecuador	27,179	14,845	55	4,500	300			3.7	1.1	4,007
El Salvador	1,955	275	14	275	275		25	0.1	0.1	2,434
Guatemala	10,510	5,350	51	4,460	2,650	1,600[g]	840	1.6	1.3	3,546
Haiti	3,700	700	26	600	600		100	0.2	0.2	3,424
Honduras	10,649	6,860	64	1,580	1,080	2,000[h]	700	3.8	0.9	1,828
Mexico	196,927	38,836	20	38,836	1,339	10,000[i]	2,500[j]	1.5	1.5	32,348
Nicaragua	13,700	6,450	47	1,502	1,502	800[h]	750	5.7	1.3	1,378
Panama	7,447	5,270	71	1,181	1,181			7.0	1.6	995
Paraguay	40,675	20,906	51	6,272	5,017			14.3	4.3	1,677
Peru	124,457	70,000	56	15,000	1,000			6.8	1.5	10,213
Uruguay	16,760	554	3	554	538		10	0.2	0.2	2,679
Venezuela	91,205	45,000	49	7,600	1,100			6.3	1.2	6,320
SUB-TOTAL	1,982,349	990,287	50	364,333		24,508	11,709	5.3	1.9	188,296
British Honduras	2,253	1,813	80	1,378	1,378	250[j]	178	21.6	16.4	70[j]
British Guiana	21,497	18,130	84	3,626	260			35.2	7.0	533
French Guiana	8,800	7,000	80	1,500	50			233.3	50.0	30[j]
Surinam	13,882	11,721	84	1,000	10			51.4	4.4	233
TOTAL	46,432	38,664	83	7,504	1,698	250	178	44.8	9.8	866
GRAND TOTAL	2,028,781	1,028,951	51	371,837		24,758	11,887	5.5	2.0	189,162

Source: Unless otherwise indicated, all figures are taken from FAO, *World Forest Inventory*, 1959.

[a] United Nations, *Monthly Bulletin of Statistics*, August 1959.

[b] J. Streyffert, *World Timber Trends and Prospects*, Stockholm, 1959.

[c] United Nations and FAO, *Pulp and Paper Prospects in Latin America*, op. cit.

[d] *FAO Forestry Mission Report to the Government of Chile*, 1959.

[e] Estimate.

[f] *Informe al gobierno de Cuba sobre política forestal y su ejecución*, FAO 876/1958, p. 24.

[g] J. Ignacio Aguilar, *Pinos de Guatemala*, Ministry of Agriculture, La Aurora, Guatemala, 1958.

[h] *Informe sobre los Recursos Forestales y las Posibilidades de Producción de Celulosa y Papel en Centroamérica*, FAO, 1954.

[i] *La Industria Mexicana de Papel y Celulosa* (FAO/ETAP 1 115).

[j] FAO, *Report to the Caribbean Commission on a Preliminary Pulp and Paper Survey.*

1975, production requirements of this type of fibre will be 1.32 million tons;[7] as far as groundwood is concerned, imports have been estimated at 45,000 tons, leaving 1.075 million tons to be produced in the region. No imports from outside the region are expected for either short-fibre pulp or waste paper.

From a calculation of raw material needs of the pulp industry in 1975 it appears that if the development outlined above could take place, the consumption of coniferous trees for the production of 1.2 million tons of long-fibre pulp production would be approximately 8.05 million m³ solid volume with bark. (See table 15.) It is also assumed that a certain amount of bamboo and sisal will be used to produce about 120,000 tons of long-fibre chemical pulp.

With respect to the production of short-fibre chemical pulp and semi-chemical pulp it has been estimated that about 865,000 tons (an increase of 170 per cent over estimated production for 1965) would be from broadleaved trees. The consumption of broadleaved wood for this purpose would thus be approximately 3.4 million m³. As regards groundwood, it is assumed that about 270,000 tons will be produced from broadleaved trees, mainly plantation grown, representing the entire groundwood output of Argentina, Peru and Uruguay in 1975, plus 245,000 tons from Brazil. This amounts to a consumption of 570,000 m³ solid green volume without bark. The major part of the ground-

[7] 1.2 million tons of wood-pulp, the remainder being pulp from other fibres (sisal, bamboo).

wood produced—805,000 tons—will be from coniferous trees, and consumption is estimated at 2.05 million m^3. Thus the total consumption of wood will be approximately 8.05 million m^3 of coniferous wood, and 4.0 million m^3 of broadleaved.

Comparison of these figures with those of raw material demand in 1965 indicates that in 1975 the additional requirements over and above the 1965 demand will be approximately 4.2 million m^3 of coniferous wood and 2.7 million m^3 of broadleaved.

As regards raw material for long-fibre chemical pulp, of which by far the greatest amount will come from coniferous trees, it is estimated that by the end of this decade the pine plantations in Chile could supply 3.5 million m^3 of wood for pulping purposes. It seems reasonable to assume that the growing demand for wood will stimulate interest in planting, and that by 1975 the Chilean plantations could yield 3.8 million m^3 of wood for pulping (or sufficient for, say, more than 700,000 tons of chemical pulp), even with the development of the sawmilling industry.

In Brazil it is estimated that by 1965 approximately 1.4 million m^3 of coniferous wood will be used for pulping. The Brazilian coniferous forests are rather depleted, and only the inventory now being carried out will be able to give an answer regarding their future possibilities. It is assumed, however, that with rational forest management and continuous planting it will be possible in 1975 to cover the estimated requirements of 2.2 million m^3.

In Mexico it is estimated that consumption of conifers for pulping will reach the figure of 1.0 million m^3 in 1965. Mexico has extensive coniferous stands, a large part of them being classified as inaccessible today. It is reasonable to assume that in a fast-developing country the hinterland will be opened up and that substantially larger forest areas will be exploited in the near future. The Mexican forests ought to yield about 2.1 million m^3 of coniferous wood for pulping purposes by 1975, to meet Mexico's requirements.

In Central America the coniferous forests are already capable of yielding at least 0.5 million m^3; thus there will be no problem in supplying 400,000 m^3 for the estimated production of about 80,000 tons of long-fibre pulp in 1975. In this respect it should be pointed out that the development of the pulp and paper industry in these countries is closely connected with the development of sawmilling. Owing to the nature of the Central American forests, forest industry there should consist of integrated sawmilling and pulping activities.

If the *Araucaria* stands in Argentina and the pine plantations in Argentina and Uruguay are taken into account, over 8 million m^3 of coniferous wood might be available for pulping purposes by 1975.

The supply of broadleaved trees will not present more serious problems. Of the estimated demand of 4.0 million m^3 for 1975, over 3.5 million could be supplied by the plantations in the southern countries of the region. By 1975 there will probably be mature eucalypt plantations elsewhere as well (e.g. Cuba and Venezuela), and the tropical forests too will contribute an increasing share of pulpwood.

To sum up, it may be said that, apart from the doubts expressed with respect to the supply of coniferous trees, there should be plenty of raw material available on which to base the proposed industrial development. The technico-economic factors seem to indicate that at least in the foreseeable future most of the raw material for wood-pulp produced in Latin America will come from coniferous natural forests and plantations and from broadleaved plantations, especially *Eucalyptus* and *Salicaceae*. In this respect, mention should be made of the plantation-grown pine of Chile, the pine forests of Central America and Mexico, the pine forests and eucalypt plantations of southern Brazil and the poplar and willow plantations in the Paraná delta. Interesting results have also been obtained from planting tests with some pine species in southern Brazil and eastern Argentina. Though *Pinus radiata* does not seem to thrive there, other species (*Pinus Elliotii, Caribaea, Taeda, Eunninghamia lanceolata, Cupressus lusitanica,* etc.) have shown an extremly high rate of growth.

It is estimated that by the end of this decade the forest plantations in the southern countries of the region will yield at least 11 million m^3 [8] solid volume of wood per year (approximately 4 million m^3 of Chilean *Pinus radiata,* 5 million m^3 of Brazilian *Eucalyptus saligna* and 2 million m^3 of Argentine *Salicaceae*). Approximately 7 million m^3 in all would be available for pulping.

As the plantations can yield cheap and abundant wood, and industrial wood requirements are certain to increase enormously in the future, it is important to stimulate planting, especially of coniferous species.

In Colombia, the first commercial-scale semi-chemical pulp mill based on tropical hardwoods (capacity 18,000 tons a year) came into being in 1959. The actual operation of this mill means a big step forward towards the more extensive use of tropical forests, and the vast forest resources of Latin America thus gain greatly in importance as a reservoir of pulpwood.

(b) *Other natural fibres*

(i) *Bagasse*

Wood is by no means the only fibre source which Latin America has at its disposal. The region is the world's largest producer of sugar cane, and the use of sugar-cane bagasse for pulp-making has greatly increased in Latin America over the last few years. Bagasse fibre has good paper-making characteristics, it is produced regularly in certain areas, it is available in large quantities at sugar-mill sites, and many cane-producing countries lack other fibrous raw materials for paper production.

The sugar industry uses bagasse as fuel, the heat value of fresh bagasse being approximately 1,600-1,700 kcal/kg. Though in modern raw sugar mills not all the bagasse is required for fuel, often in older mills and in small mills it is all used for steam production, and some even need wood or other fuels in addition. Moreover, many sugar mills are small and their entire

[8] For lack of information it was not possible to include an estimate of the future yield of the existing pine plantations, mainly in Brazil and Argentina, which by 1975 might add substantial amounts of long-fibre wood resources to the above-mentioned 11 million m^3.

bagasse production is not enough to supply a pulp mill of economic size.[9]

If bagasse is replaced by some other reasonably-priced fuel, the larger sugar mills could each supply the bagasse requirements of a medium-size pulp mill. In this case, the price of bagasse would be determined by the price of the substitute fuel.

If bagasse were available as a surplus from the sugar mills, its price would be low, since it would not comprise more than a bonus to the sugar mills plus baling, transport and storage costs. In such circumstances bagasse could even be transported for fairly long distances, and large enough quantities could therefore be collected at a central mill site for pulp production on an economic scale. However, it is rare to find a real surplus of bagasse available for pulping purposes. Even if it is not needed to provide energy for the sugar mills, it can be used in many cases to generate energy for sale. Thus its price is always determined by the price of energy.

During the 1957/58 crop year, the Latin American countries produced approximately 14.3 million tons of sugar, i.e., about 50 per cent of the world's cane sugar output.

Direct statistics on the volume of bagasse produced are generally non-existent, and production therefore has to be estimated on the basis of known data on sugar output, average sugar yield in relation to cane ground and average fibre content of cane. Estimates of the total quantities of bagasse produced industrially in the different countries of Latin America in 1958-59 have been prepared.[10] Table 17 gives estimates of industrial production of bagasse for 1957-58 and 1958-59.

[9] A pulp mill with a capacity of 100 tons per day requires approximately 160,000 to 180,000 tons of fresh bagasse per year (80,000 to 90,000 tons of dry bagasse), corresponding to a sugar production of 60,000 to 65,000 tons and to 600,000 to 650,000 tons of cane ground.

[10] Full details will be found in appendix I at the end of this chapter.

TABLE 17. LATIN AMERICA: ESTIMATED INDUSTRIAL PRODUCTION OF FRESH BAGASSE[a] 1957-58 AND 1958-59

(Thousands of tons)

Country	*1957-58*	*1958-59*
Argentina	2,800	4,350
Brazil	7,100	9,100
Colombia	730	750
Cuba	12,700	12,600
Dominican Republic	2,500	2,150
Ecuador	200	250
El Salvador	150	110
Guatemala	170	170
Mexico	3,800	4,300
Peru	2,100	1,950
Venezuela	400	470
Other countries	650	800
TOTAL	33,300	37,000

Source: See appendix II.

[a] 50 per cent moist.

It is quite obvious that not all the quantities indicated could be taken into account for pulp and paper manufacture. In many cases the substitution of other fuels for bagasse in the sugar mills may not be possible for economic or other reasons. Locational factors (transport costs) may limit the amounts which could be made available economically at potential pulp-mill sites.

Nonetheless, some of the countries such as Venezuela, Colombia, Peru and Mexico have cheap domestic fuels which can replace bagasse in the sugar mills, while in Cuba it may be possible to obtain surplus bagasse in considerable quantities from the large sugar mills (in 1958, seven mills produced more than 100,000 tons of sugar each, corresponding to well over 200,000 tons of fresh bagasse per mill).

In Latin America, pulp for paper-making was produced from bagasse in the following quantities in 1959: Argentina (approximately 5,000 tons), Brazil (about 16,000 tons), Peru (26,000 tons), Mexico (25,000), Colombia (3,000); Cuba, where production started in 1959, with a capacity of 60,000 tons, produced about 70,000 tons. The total output of pulp in 1959 from the eleven mills operating in the region that use bagasse amounted to about 85,000 tons; in 1958, ten mills produced about 60,000 tons of bagasse pulp. Bagasse pulp capacity is being expanded in most of the countries mentioned.

With the increasing production of sugar in the region, the growing size of the sugar mills, and the modernization of their techniques, more and more bagasse will be economically available. It seems reasonable to assume therefore that bagasse as a source of pulp for paper-making will gain in importance in Latin America, especially as more experience and knowledge are also being acquired every year on the technico-economic aspects of production.[11]

Thus, by 1965 it is estimated that the region's pulp and paper industry will be consuming about 2 million tons of fresh bagasse (1 million tons of dry bagasse), i.e., approximately five times the quantity consumed by the industry in 1958-59, or the equivalent of some 340,000 tons of pulp. By 1975 the estimated consumption of fresh bagasse by the region's pulp and paper industry is expected to have increased to about 5.6 million tons of fresh bagasse (2.8 million tons of dry bagasse). Even so, this quantity represents no more than a very small percentage of the expected production of fresh bagasse by that time.

(ii) *Other natural fibrous materials*

Straw, grasses, bamboo, sisal and banana stalks are all used to some extent as a source of pulp for paper-making.

Cereal straws and some grasses (Sudan grass, elephant grass, etc.) are pulped in Argentina, Brazil,

[11] At the ECAFE/BTAO/FAO Conference on Pulp and Paper Development in Asia and the Far East, held at Tokyo in October 1960, it was announced that the Government of India had granted an industrial licence for the establishment of a mill with an annual capacity of 60,000 tons to manufacture newsprint from bagasse. This mill, it was stated, would employ a process which has been under development by a leading pulp and paper company in the United States. To date, however, construction has not started on the proposed mill.

Chile, Mexico and Uruguay, but the difficulties of collecting and transporting them hamper the possibility of large-scale development. Once the expansion projects now under way in some countries have been completed, the mills using these raw materials will have an annual capacity of approximately 100,000 tons (57,000 in 1958-59), of which Argentina and Mexico together will have over 70,000 tons.

Bamboo is found along the river banks in the tropical and even subtropical areas of Latin America. At present it is used fairly extensively for building purposes at a rather high price. Bamboo yields a long-fibre pulp with very good characteristics, which is suitable for wrapping, printing and writing papers. Bamboo pulp can also be blended with poor types of pulp to make acceptable grades of paperboard and other papers.

Though good pulp can be produced from bamboo, the high extraction costs have proved a stumbling block to efforts to use it as raw material for the paper industry in Latin America. At present, it is pulped only in Brazil, and on a very limited scale (about 2,000 tons in 1958-59). Even though it will be used to a greater extent in the near future, it is very doubtful whether it will ever become an important source of paper pulp in the region, especially as it is in rather heavy demand for other purposes in some areas.

The leaf fibres (sisal, henequen, abaca) constitute a potential source of long-fibre pulp. Today they are used almost exclusively for making ropes and bags. The price is generally too high for paper pulp purposes, but there are signs that in some areas the costs of planting, growing and harvesting might be reduced sufficiently to enable these plants to be used for pulping. It should be pointed out that one hectare of sisal can yield 2.5 tons of pulp per year. Sisal is already used in Brazil[12] to a certain extent, and some mills are planning to use sisal fibre or bagasse. It is expected that the use of sisal fibres will increase in the future. The plantations in Central America (including Yucatán) and Cuba may also play a part in this respect in future.

With regard to banana stalks, in the big banana plantations of Central America and Ecuador the stalks are left in the soil after harvest. The fibre is long and strong. Though the moisture content of the fresh stalks is very high (up to 93 per cent), one hectare of banana plantation could probably yield 0.8 tons of pulp per year. One of the main difficulties of using banana stalks is the high moisture content, which makes it impossible to transport the stalks for long distances, and therefore entails the collection of a sufficient quantity of stalks at pulp mills—in itself a problem. Another difficulty is the tendency of the stored stalks to ferment. However, pulp from banana stalks has been produced on a limited scale in Ecuador and Mexico.

Only a very modest expansion is expected in the use of agricultural residues (other than bagasse and sisal), grasses, canes, etc., and the quantities required of these raw materials can most easily be collected in Argentina, Brazil and Mexico, which are the main producers of these types of pulp in the region, and will probably continue to be so.

[12] A new mill near Recife is now pulping sisal. By 1961 production had climbed to more than 15,000 tons, from less than 3,000 tons in 1959. The pulp is shipped to an associate company that makes bags and sacks for cement and other mineral products.

(c) *Waste paper*

The third important source of fibre is waste paper. Waste paper is one of the principal components in the fibre furnish for paper and paperboard other than newsprint, kraft and kraftliner and one or two other types. The amount that may be used in the manufacture of new products is limited by technical (quality) reasons and by availability (waste-paper recovery rate). Thus, for instance, the percentage of waste which may be incorporated in newsprint and high-strength wrapping paper is practically nil, while certain qualities of paperboard may be produced entirely from waste.

Waste paper is mainly collected in the big towns. In general, no statistics are available on the use of waste paper by the paper industry in the countries of the region, but some estimates may be made on the basis of known fibre supply, paper and paperboard production and consumption.[13] Table 18 shows the estimated average percentages of waste paper in fibre furnish and waste-paper recovery rates.

TABLE 18. LATIN AMERICA: ESTIMATED RECOVERY RATE OF WASTE PAPER AND ESTIMATED PERCENTAGE USE BY THE PULP AND PAPER INDUSTRY

(Average percentages for 1958-59)

Country	*Estimated recovery rate*[a]	*Estimate usage rate*[b]
Argentina	36	49
Brazil	18	24
Chile	20	15
Colombia	14	34
Cuba	18	48
Mexico	31	42
Peru	20	30
Uruguay	27	46
Venezuela	10	38
Other countries	3	100
Region as a whole	23.5	36.3

[a] As a percentage of total apparent consumption of all paper and paperboard.
[b] As a percentage of total fibre furnish used in domestic production.

It will be seen from the table that waste paper constituted approximately 36 per cent of the total fibre supply for paper and paperboard mills. The annual rate of collection in the region at the time indicated was estimated to be more than half a million tons. On the assumption that no waste paper is used in newsprint production the proportion of waste paper in the fibre furnish for printing and writing papers has been estimated as 13 per cent; in the case of other paper and board the proportion of waste in the fibre furnish is close to 50 per cent.[14]

[13] Such estimates have been prepared (average for the years 1958-59) and are given in appendix III at the end of the chapter.
[14] For details of the calculations see appendix III.

With respect to the recovery of paper and paperboard for re-use, the countries in the region may be divided roughly into two categories: (*a*) those which satisfy most or a substantial proportion of their paper and paperboard requirements themselves, and (*b*) those where the paper industry is not well developed in relation to the needs of the country, and which consequently have to import a good deal to cover their requirements.

In the countries belonging to the first group, the recovery rate is usually fairly high, and the paper recovered often of rather poor quality owing to the fact that the collected paper itself already contained a considerable amount of waste; the repeated beatings naturally weaken the strength of the fibres. In the countries of the second group, the needs of domestic industry are small in comparison with total paper and paperboard consumption, the recovery rate of paper is low, and the recovered paper usually consists to a great extent of originally imported paper made almost entirely of virgin fibre.

The region's average recovery rate for industrial purposes is approximately 24 per cent of paper and paperboard consumption: this approximates to the recovery rates in North America (26 per cent) and in Europe and Japan (25 per cent each).[15] Total recovery of waste paper is undoubtedly greater than it would seem from these calculations. For example, in most countries old newspapers are extensively used as wrappings, and it is rather doubtful whether any significant proportion of these directly re-used papers is recovered for industrial purposes.

Though pulp-production capacity in Latin America is growing relatively faster than that of paper and paperboard at present, it is estimated that in future the need for waste paper will keep approximately abreast of paper and paperboard consumption, partly because local pulp will replace some of the present pulp imports, and partly because the paperboard industry may be expected to grow more rapidly from now on.

Table 19 shows the estimated use of waste paper in 1965 and 1975, as compared with the actual data for 1958-59.

By 1965 it is estimated that waste paper demand for industrial purposes will be about 800,000 tons.[16] This implies a recovery rate of 23 per cent—approximately the same as during 1958-59 (23.5 per cent)—but a steep drop in the proportion of waste paper used in the total fibre furnish (from 36.3 to 28.5); by 1975, it is expected that the demand for waste paper will be as much as 1.6 million tons, which means a recovery rate of 23.9 per cent, slightly higher than in 1958-59 and 1965; the proportion of waste paper in the furnish drops as low as 26 per cent as a result of the assumption that in the manufacture of paper and paperboard other than newsprint, printing and writing paper, the proportion of waste will decrease from 44.5 per cent in 1958-59 to 38 per cent in 1965 and 35 per cent in 1975, thus making a much needed improvement in the quality of those papers. Moreover, this lower proportion of waste paper in 1965 and 1975 is possibly also a result of the increased proportion of newsprint in the total production of paper and paperboard (from 9 per cent in 1958 to 14 per cent in 1965 and 19 per cent in 1975), since in newsprint manufacture waste paper is not generally used, although one mill in the United States has recently begun the commercial manufacture of newsprint from waste.

[15] The percentages shown refer to estimated waste-paper recovery rates in 1955.

[16] See chapter V, appendix III.

(d) *Conclusions*

The tentative forecasts of paper and paperboard consumption in Latin America given in chapter II, based on specific assumptions about future economic growth and demographic trends in the region, showed an expected increase in twenty years from under 2 million tons in 1955 to about 6.7 million tons in 1975. It was also concluded that if this demand is to be satisfied, the rapidly expanding need for paper and paperboard will have to be met largely from indigenous production, one of the basic prerequisites of which is the availability of suitable fibrous raw materials at reasonable cost.

In the present chapter an attempt has been made to provide answers to the questions: "What amounts of fibrous raw materials are needed?" and "What raw materials are available in the different areas of the region?" The text also touches upon but does not answer the very important question of the extent to which the various fibres can be made available at economically attractive prices.

In seeking answers to these questions it immediately became apparent that many of the basic data required for the analysis did not exist. Such data as are available are often unreliable or contradictory. If rational decisions are to be taken, the first and most urgent need is for more and better basic information: for reconnaissance inventories of forests; for detailed inventories capable of providing data on stocking, species and growth of selected areas which appear to offer the possibility of sustaining early industrial expansion; for surveys to review the qualities and distribution of other potential fibre sources; and for economic appraisals of the data obtained in relation to potential mill sites. A few such surveys have already been or are being carried out, and plans for others are in hand. But these are only a beginning; there is still a very wide gap, and much remains to be done.

Attention has been drawn to the fact that it may prove economically advantageous in certain areas to create new resources to meet future needs. The sparse data currently available in the region on the establishment, management and cost of plantations of timber, both coniferous and broadleaved, must be properly collated and effectively expanded.

Nevertheless, present information does allow some general conclusions to be drawn about the prospects of satisfying the region's growing needs for paper-making fibres at a reasonable cost. These conclusions may be summarized as follows:

(*a*) Over-all potential supplies of fibrous raw materials for paper and paperboard manufacture in Latin America are more than ample to cover estimated requirements to 1975 and well beyond;

(*b*) However, the supply of coniferous trees is limited, and is likely to give rise to serious difficulties

TABLE 19. LATIN AMERICA: PROPORTION OF WASTE PAPER IN TOTAL FIBRE FURNISH, 1958-59, 1965 AND 1975

	1958-59						1965						1975					
	Production of paper and paperboard		Fibre furnish				Production of paper and paperboard		Fibre furnish				Production of paper and paperboard		Fibre furnish			
			Total		Waste paper component				Total		Waste paper component				Total		Waste paper component	
	Thousands of tons	Percentage of total	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage	Thousands of tons	Percentage
Newsprint	131	9	137	100	—	—	364	14	382	100	—	—	1,127	19	1,186	100	—	—
Printing and writing paper	308	21	308	100	72.5	23.5	586	22	586	100	99	17	1,218	21	1,218	100	216	18
Other paper and board	998	70	1,078	100	479.5	44.5	1,690	64	1,825	100	698	38	3,453	60	3,731	100	1,374	37
TOTAL	1,437	100	1,523	100	552	36.3	2,640	100	2,793	100	797	28.5	5,798	100	6,135	100	1,590	26

unless proper attention is paid to this problem. Though there are flourishing coniferous plantations in Chile, the other sources are either rather depleted (southern states of Brazil and the *mesa central* in Mexico) or, at present at least, inaccessible (Central America and the Mexican mountains);

(*c*) With the economic development of the region, the vast tropical forests will become more accessible and play a more important part as a source of raw material for the pulp industry; however a substantial contribution is not expected during the period under consideration;

(*d*) The most important supply sources of wood fibre which command particular attention are the plantation-grown pine in Chile, the pine forests in Central America and Mexico, the pine forests and eucalyptus plantations in southern Brazil, and the poplar and willow plantations in the Paraná delta in Argentina;

(*e*) Sugar-cane bagasse is likely to provide an increasingly large proportion of the industry's fibre supply;

(*f*) Waste paper is already used in rather large amounts by the paper industry in Latin America, but its share in the fibre furnish is likely to decrease as a consequence of the different structure of paper production and greater availability of virgin fibre.

2. Supply of chemicals

(a) *General discussion and current (1958-59) requirements*

According to the process used, the chief basic chemicals needed for pulp production are caustic soda, sodium sulphate, limestone (or quicklime) and sulphur, and, in smaller quantities, soda ash. Common salt is the raw material for the production of caustic soda and chlorine, which are used in pulp bleaching, usually in conjunction with quicklime made from limestone. Chlorine dioxide is as yet little used in pulp bleaching in Latin America. For paper-making some additional chemicals such as resin size, alum, clay, resins and dyes are needed, but in smaller amounts than the above.

The quantity of chemicals needed to produce one ton of unbleached sulphate pulp is approximately 60 kg of sodium sulphate and 30 kg of limestone, when the chemicals are recovered. Hence about 11,300 tons of sodium sulphate and 5,600 tons of limestone were probably used in Latin America's estimated production of 188,000 tons of sulphate pulp in 1958-59.

In the sulphite process (the common calcium base), some 120 kg of sulphur and 150 kg of limestone are required for one ton of unbleached pulp. This means that 9,200 tons of sulphur and 11,500 tons of limestone probably went to make the estimated 77,000 tons of sulphite pulp manufactured in 1958-59.

It is estimated that during the base period (1958-59), 85,000 tons of both kinds of chemical pulp were bleached, most of this being sulphate pulp. As about 90 kg of chlorine, 40 kg of limestone and 40 kg of caustic soda are needed to bleach a ton of sulphate pulp, the total consumption of chlorine, limestone and caustic soda must have been about 7,600, 3,400 and 3,400 tons respectively.

The production of other types of pulp (semi-chemical pulp from wood and other raw materials, chemical pulp from straw, grasses and bagasse) was almost 145,000 tons, the greater part being produced from bagasse by the soda process. It is probable that little of this caustic soda is recovered. It may therefore be estimated that 220 kg of caustic soda was used per ton of pulp, which indicates that consumption of this chemical was 31,900 tons in 1958-59.

Of the above-mentioned 145,000 tons, approximately 80,000 tons were bleached, so that 6,400 tons of chlorine, 3,200 of limestone and 1,600 of caustic soda were probably used for the purpose (80 kg of chlorine, 40 kg of limestone and 20 kg of caustic soda per ton of bleached pulp).

Thus in 1958-59 over-all requirements of basic raw materials were approximately 37,000 tons of caustic soda, 24,000 tons of limestone, 14,000 tons of chlorine, 11,000 tons of sodium sulphate and slightly over 9,000 tons of sulphur.

Limestone for the pulp industry is obtained locally. The output of caustic soda has been insufficient for industrial use generally, quite apart from the pulp industry, and most countries in the region have had to import it (in 1958-59 more than 60 per cent of Latin America's total requirements were covered by imports). The chlorine supply has been sufficient, and none has had to be imported for the pulp industry. Many pulp mills have their own electrolysis plant, some scaled according to their chlorine requirements, and sell the caustic soda surplus on the domestic market; but in most the reverse is true, and the surplus chlorine is generally wasted.

Several countries in the region have sulphur deposits. The most important—in Mexico—is large enough to provide all the sulphur required by Latin America's paper-making industry. Brazil, the principal producer of sulphite pulp, had to import nearly all the sulphur needed for the preparation of the cooking liquor.[17]

(b) *Future requirements (1965 and 1975)*

Present plans for expanding the chemical pulp industry in Latin America will raise production to nearly 1.4 million tons in 1965; about 50 per cent of this will be sulphite pulp, and most of the remainder pulp produced by the soda process. Approximately 550,000 tons will be bleached.

The volume of chemical products required in 1965 has been calculated on the basis of these figures (see table 20). Estimates of chemicals required in 1975 are

[17] Latin America has sufficient reserves of sodium sulphate, and salt is to be found in practically all countries.

Table 20. Latin America: estimate of chemicals required in 1965 and 1975
(Tons)

	1965	*1975*
Caustic soda	111,900	171,000
Limestone	64,300	160,000
Chlorine	46,700	111,000
Sodium sulphate	46,600	100,000
Sulphur	17,600	47,000

based on the hypothetical production figures arrived at in discussing the situation in 1975 in chapter V.

It will be noted that projected caustic soda requirements are about double the chlorine requirements. This ration is the reverse of North American experience, and is the result of a large projected increase in soda bagasse-pulp, from which little caustic soda is expected to be recovered.

The bulk of the caustic soda requirements have been imported, not only for the pulp industry but for a variety of other uses as well, such as the manufacture of soap, dyes, cleansers, rayon, textiles, sugar, chemical products, the refining of petroleum and vegetable oils, rubber-processing and for a number of metallurgical industries. However, projections of demand and capacity for 1965 indicates that by then only 17 per cent of requirements will need to be imported. Chlorine requirements will probably be met by domestic industry.

It is interesting to note that projections of caustic soda demand in Latin America for 1965 give the figure of 645,000 tons,[18] i.e., the requirements of the pulp and paper industry will be only just over 17 per cent of total demand.

The most important user of sodium sulphate is the pulp industry, but other users are the textile, glass, ceramics and detergents industries. The expansion of sodium sulphate production in Chile is now well under way, and together with Argentina's output it should be sufficient to meet all the requirements of the countries that are not yet self-sufficient in this respect, provided that the corresponding trade develops.

The chemicals needed for this industry have largely been imported hitherto. Many of the raw materials for these chemicals are available within the region, and it is expected that Latin American chemical industries will supply an ever-increasing proportion of their requirements, in this direction.

[18] *La industria química en América Latina* (E/CN.12/628), vol. I, annexes 1-12, page 199.

Appendix I. Latin America: estimated composition of fibrous raw materials, 1958-59

Country	*Chemical pulp, long fibre*		*Chemical and semi-chemical pulp, short fibre*		*Mechanical pulp*		*Waste paper*		*Total*	
	Tons per ton of paper	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*
Argentina										
Newsprint	0.25	2	—	—	0.80	8	—	—	1.05	10
Printing and writing paper	0.20	17	0.39	32	0.10	8	0.31	26	1.00	83
Other paper and board	0.25	65	0.13	33	0.10	26	0.60	157	1.08	281
TOTAL	0.24	84	0.18	65	0.12	42	0.52	183	1.06	374
Brazil										
Newsprint	0.20	13	—	—	0.85	55	—	—	1.05	68
Printing and writing paper	0.25	32	0.50	63	0.10	12	0.15	19	1.00	126
Other paper and board	0.47	111	0.14	34	0.10	23	0.37	88	1.08	256
TOTAL	0.36	156	0.23	97	0.21	90	0.25	107	1.05	450
Chile										
Newsprint	0.20	9	—	—	0.85	39	—	—	1.05	48
Printing and writing paper	0.35	5	0.25	3	0.15	2	0.25	3	1.00	13
Other paper and board	0.55	22	0.05	2	0.15	6	0.33	13	1.08	43
TOTAL	0.36	36	0.05	5	0.48	47	0.16	16	1.05	104
Colombia										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	—	—	—	—	—	—	—	—	—	—
Other paper and board	0.60	27	0.13	6	—	—	0.35	17	1.08	50
TOTAL	0.60	27	0.13	6	—	—	0.35	17	1.08	50
Cuba										
Newsprint	—	—	1.05	4	—	—	—	—	1.05	4
Printing and writing paper	0.34	1	0.33	1	—	—	0.33	1	1.00	3
Other paper and board	0.45	23	0.66	3	—	—	0.57	29	1.08	55
TOTAL	0.41	24	0.14	8	—	—	0.52	30	1.07	62
Mexico										
Newsprint	0.20	1	—	—	0.85	6	—	—	1.05	7
Printing and writing paper	0.25	17	0.25	17	0.20	13	0.30	20	1.00	67
Other paper and board	0.42	112	0.07	20	0.09	24	0.50	132	1.08	288
TOTAL	0.38	130	0.11	37	0.13	43	0.44	152	1.06	362

Appendix I (*continued*)

Country	Chemical pulp, long fibre		Chemical and semi-chemical pulp, short fibre		Mechanical pulp		Waste paper		Total	
	Tons per ton of paper	Total requirements (thousands of tons)	Tons per ton of paper	Total requirements (thousands of tons)	Tons per ton of paper	Total requirements (thousands of tons)	Tons per ton of paper	Total requirements (thousands of tons)	Tons per ton of paper	Total requirements (thousands of tons)
Peru										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.10	0.5	0.60	3	0.20	1	0.10	0.5	1.00	5
Other paper and board	0.18	6.5	0.55	20	—	—	0.35	12.5	1.08	39
TOTAL	0.17	7.0	0.56	23	0.02	1	0.32	13.0	1.07	44
Uruguay										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.25	3	0.35	4	0.10	1	0.30	3	1.00	11
Other paper and board	0.43	10	0.05	1	0.05	1	0.55	14	1.08	26
TOTAL	0.37	13	0.14	5	0.06	2	0.49	17	1.06	37
Venezuela										
Paper and board (other than cultural papers)	0.61	21	0.06	2	—	—	0.41	14	1.08	37
Other countries										
Paper and board (other than cultural papers)	—	—	—	—	—	—	1.08	3	1.08	3
LATIN AMERICA, TOTAL										
Newsprint	0.19	25	0.03	4	0.82	108	—	—	1.05	137
Printing and writing paper	0.25	75.5	0.40	123	0.12	37	0.23	72.5	1.00	308
Other paper and board	0.40	397.5	0.12	121	0.08	80	0.48	479.5	1.08	1,078
TOTAL CONSUMPTION	0.35	498	0.17	248	0.16	225	0.38	552	1.06	1,523
DOMESTIC PRODUCTION		195		215		198		532		1,140

Appendix II. Latin America: estimated industrial production of bagasse and of the potential equivalent in pulp, 1958-59

(*Thousands of tons*)

Country	Sugar production	Yield of sugar on cane ground (percentage)[a]	Estimated volume of cane ground	Bagasse 50 per cent moist (percentage on cane ground)[a]	Bagasse produced (50 per cent moist)	Equivalent in bone-dry bagasse	Potential equivalent in pulp[b]
Argentina	1,102	7.2	15,300	28.4	4,350	2,175	725
Brazil	3,445	10.5	32,800	27.7	9,090	4,545	1,515
Colombia	276	10.5	2,600	28.7	750	375	125
Cuba	5,964	12.7	47,000	26.8	12,600	6,300	2,100
Dominican Republic	781	10.3	7,600	28.3	2,150	1,075	360
Ecuador	95	10.5	900	28.7	260	130	40
El Salvador	46	10.6	400	28.7	110	55	15
Guatemala	64	10.5	600	28.7	170	85	30
Haiti	49	10.5	500	28.7	140	70	25
Mexico	1,375	9.1	15,100	28.3	4,270	2,135	710
Peru	706	11.3	6,200	31.4	1,950	975	325
Venezuela	188	11.0	1,700	27.6	470	235	80
Others	220	10.5	2,100	28.7	600	300	100
TOTAL	14,331		132,800		36,910	18,455	6,150

NOTE: In calculating the amount of bagasse produced, only that resulting from the production of centrifuged sugar is considered; bagasse resulting from the production of non-centrifuged sugar is not included, since the possibility of making industrial use of this material is regarded as remote.

[a] United Nations, *Pulp and Paper Prospects in Latin America* (Sales No.: 55.II.G.4), p. 251.

[b] For the purposes of the present table it is assumed that 6 tons of bagasse 50 per cent moist is the equivalent of 3 tons of dry bagasse, which represents 1 ton of pulp.

Appendix III. Latin America: estimated use of waste paper, 1958-59

Country	Total production of paper and board	Fibre requirements for newsprint[a]	Fibre requirements for printing and writing paper[a]	Fibre requirements for other paper and board[a]	Total fibre requirements (2-3-4)	Supply of virgin fibre	Estimate of waste paper used in total fibre furnish		Imports of waste paper	Collected waste paper	Waste paper in fibre furnish for manufacture of printing and writing paper		Waste paper in fibre furnish for other paper and board		Consumption of paper and board (thousands of tons)	Rate of recovery (percentage)
							Thousands of tons (5-6)	Percentage			Thousands of tons	Percentage	Thousands of tons	Percentage		
	Thousands of tons								Thousands of tons							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Argentina	352	10	83	281	374	191	183	49	—	183	26	31	157	60	509	36
Brazil	428	68	126	256	450	343	107	24	—	107	19	15	88	37	602	18
Chile	99	48	13	43	104	88	16	15	—	16	3	25	13	33	80	20
Colombia	46	—	—	50	50	33	17	34	3	14	—	—	17	35	103	14
Cuba	58	4	3	55	62	32	30	48	2	28	1	33	29	57	157	18
Mexico	341	7	67	288	362	210	152	42	15	137	20	30	132	50	443	31
Peru	41	—	5	39	44	31	13	30	—	13	0.5	10	12.5	35	65	20
Uruguay	35	—	11	26	37	20	17	46	—	17	3	30	14	55	62	27
Venezuela	34	—	—	37	37	23	14	38	—	14	—	—	14	41	145	10
Others	3	—	—	3	3	—	3	100	—	3	—	—	3	100	94	3
TOTAL	1,437	137	308	1,078	1,523	971	552	36	20	532	72.5		479.5		2,260	24

[a] Fibre requirements for the various types of paper were calculated by multiplying the production of each type by one of the following factors: newsprint 1.05, printing and writing paper 1.00, other paper and board 1.08.

NEWSPRINT

CHAPTER IV

Newsprint is the individual paper quality which is produced in the largest quantity. World output in 1960 was around 14 million tons or 19 per cent of the total production of all types of paper and paperboard. World newsprint production is heavily concentrated in the industrialized countries of the northern hemisphere, and the three principal exporting countries alone—Canada, Finland and Sweden—account for over 50 per cent of the total output but only 5 per cent of the consumption.

According to the forecasts outlined in *World Demand for Paper to 1975,* world newsprint consumption is expected to increase to almost 18 million tons in 1965 and over 27 million tons in 1975.[1] But the consumption growth rates in the different regions will probably not be the same. At present (1960 data) the regions outside North America and Western Europe consume about 22 per cent of the world total. By 1975 it is estimated that their share will have increased to 37 per cent. In Latin America the increase is expected to be spectacular and it is anticipated that consumption will almost double in each of the decades 1956-65 and 1966-75: from about 495,000 tons in 1955 to 970,000 tons in 1965 and to 1.79 million in 1975. (See table 21.)

TABLE 21. TENTATIVE FORECAST OF DEMAND FOR NEWSPRINT, 1955-75

(Thousands of tons)

	1955	*1965*	*1975*
World	11,280	17,840	27,210
Latin America	495	970	1,790
North America	6,351	8,170	10,565
Western Europe	2,648	4,600	6,515

Latin America consumption in 1960 was 698,000 tons. More recent projections place 1965 demand at 938,000 tons and 1975 at 1.7 million tons, virtually confirming the earlier projections.

Because of the heavy concentration of the productive capacity mentioned above, world trade in newsprint is large. The total annual volume of international trade in newsprint is over 7 million tons, with an approximate export value (f.o.b.) of about 1,000 million dollars. Thus slightly more than half the total production of newsprint enters the world market, and more than two-thirds of the total trade in all paper and paperboard is newsprint.

Latin America has a much higher degree of self-sufficiency in other types of paper and paper-board than in newsprint. Production in 1960 was about 155,000 tons, or only 22 per cent of consumption. There are several reasons for this anomaly.

Historically, newsprint has been accorded free entry in nearly all countries. Because it is a major cost factor in the production of newspapers, and because it has been found to be in the national interest to stimulate widespread distribution of newspapers, nearly all countries have preferred this course to that of stimulating a domestic newsprint industry through protective tariffs and similar devices. Latin American countries have generally followed this pattern, and at times have even accorded newsprint imports a preferential rate of exchange.

In the past, national markets have been too small to support a national newsprint industry in competition with free imports. Consumption has now reached the point, however, where economic-sized plants could be established in Brazil, Argentina and Mexico. In all these countries newsprint is now in fact produced, though on a modest scale.

Most Latin American countries either lack completely or are deficient in the traditional coniferous woods normally used in the manufacture of newsprint. In recent years, however, the use of low-density light-coloured hardwoods in the manufacture of the groundwood portion of the newsprint furnish has become well established commercially. Bagasse also promises to become an important raw material for newsprint manufacture, although there is no known commercial production as yet of standard quality.

Electric power is an important cost factor in the manufacture of newsprint. In most Latin American countries, electric power rates are several times those of the principal exporting countries.

Partly as a result of the foregoing, and partly as a result of tariff protection on other paper and paperboard, Latin American pulp and paper producers generally have found other products more profitable and have understandably therefore concentrated on those fields. Nevertheless, newsprint production in Latin America has more than tripled in the last decade, and the number of producing countries has grown from three to five. One of these—Chile—even produces substantial quantities for export to other Latin American countries. The growth in the last decade is illustrated in table 22.

1. REVIEW OF PRODUCING COUNTRIES

It will be noted that newsprint production in Argentina declined during the period 1955-60 to less

[1] Op. cit., table 2.29, p. 51.

TABLE 22. LATIN AMERICA: NEWSPRINT PRODUCTION, 1950-60
(Thousands of tons)

	1950	1955	1956	1957	1958	1959	1960
Argentina	—	21.6	17.2	11.9	11.4	6	9
Brazil	31	39.5	39.4	49	63	67	66
Chile	11	11.4	11.2	20.2	43.9	48.5	51.5
Cuba	—	—	—	—	—	8	15
Mexico	3.7	—	—	—	—	14	14
Othes	—	—	—	—	—	—	—
TOTAL	45.7	72.5	67.8	81.1	118.3	149.5	155.5

than one-half, whereas during the same period consumption increased about 80 per cent. This situation is probably the result of economic factors that make it difficult for the one newsprint producer in Argentina to compete with freely-entered imported newsprint. Thus, Argentina is now dependent upon imports for some 95 per cent of its newsprint supply. Furthermore, there are no known commitments for new newsprint capacity.

Brazil, the largest producer and consumer in Latin America, presents a quite different picture. During the period 1950-60 newsprint production more than doubled, while consumption increased in the same proportion. Brazil produces nearly one-third of its newsprint requirements. The one producer is installing another newsprint machine, with a capacity of 90,000 tons *per annum*. When this machine enters into production in 1962, Brazil will produce nearly two-thirds of its needs; the proportion is expected to decline to about one-half by 1965 because of rapidly growing demand. There are no known plans for additional capacity.

Chile is unique in Latin America in that it is the only exporter of newsprint. In 1960 the single producer in the country exported some 35,000 tons, principally to Argentina, Brazil and Mexico. A second producer is scheduled to begin manufacture in late 1963 at the rate of 60,000 tons per annum, all of which must be exported. Except for small quantities of special types of newsprint, Chile has been self-sufficient since 1958. There are no other plans for new newsprint capacity.

Mexico began newsprint production in 1959, and now supplies about 15 per cent of its requirements. Expansion of the present plant is contemplated; by the date of the latest report no commitments had been made. No other new capacity plans are known.

Cuba also began newsprint production in 1959, and currently supplies about one-third of its needs. There are no known plans to increase capacity.

None of the other countries has any definite plans to manufacture newsprint, probably at least in part because they do not have sufficiently large markets to justify manufacture on a scale that would enable newsprint to compete with duty-free imports.

The degree of dependence upon imports and the export potentiality of each of the producing countries, and of the region as a whole, are summarized in table 23.

2. TECHNICAL AND ECONOMIC ASPECTS

For those unfamiliar with newsprint manufacture, newsprint is nearly always made from a combination of about one-fifth long-fibre coniferous chemical wood-pulp and four-fifths short-fibre mechanical wood-pulp.

As noted briefly earlier in this study, until the Second World War newsprint manufacture developed almost exclusively in the northern countries of the northern hemisphere. Here were concentrated vast stands of light-coloured low-resin content coniferous trees (such as spruce and balsam) and low-cost hydro-electric power, two major cost elements in newsprint manufacture. Such conifers are readily pulped by the conventional sulphite and groundwood processes, and the resulting pulps are sufficiently bright, without bleaching, for newsprint manufacture, as well as being free of serious pitch deposition problems such as occur with more resinous conifers.

As the more accessible of the desirable timber stands in those northern countries became depleted, wood costs rose significantly in relation to other costs. About the same time, it was demonstrated by the kraft pulp industry that resinous conifers (principally pines) could be grown at low cost as a short-cycle crop in the temperate and semi-tropical zones of the world. This demonstration of the cost advantage of annual pulpwood yields per land unit that are ten or more times that of the traditional newsprint pulpwood sources stimulated research to overcome the technical difficulties in the use of resinous conifers for the manufacture of newsprint. Also, these coniferous forests were generally located close to major markets then still served largely from afar by the northern countries.

The research led to the establishment ot a rapidly growing newsprint industry after the Second World

TABLE 23. LATIN AMERICA: IMPORT DEPENDENCE AND EXPORT POTENTIALITY IN NEWSPRINT, 1960-65
(Percentage and tons per annum)

	1960		1965	
Argentina	95	0	95	0
Brazil	71	0	53	0
Chile	0	35,000	0	95,000
Cuba	63	0	75	0
Mexico	87	0	90	0
Latin America	78	0	67	0

War, utilizing those resinous coniferous forests and based upon semi-bleached kraft pulp for the chemical pulp portion of the furnish, and conventionally-made groundwood in which pitch is controlled by means of chemical additives and colour by means of low-cost brightening agents (mild bleaching chemicals).

Incidentally this competition has forced newsprint producers in the northern countries to revise their pulpwood harvesting methods, which have been based largely upon seasonal hand-cutting and river-driving, in the direction of nearly year-round mechanized operations in order to reduce pulpwood costs.

The use of light-coloured low-density broadleaved species (such as poplars and willows) in the manufacture of newsprint groundwood was also developed during the post-war period, albeit principally in areas lacking in conifers. Such broadleaved species generally have fibre lengths approaching those of conifers, so that broadleaved groundwood has characteristics approaching those of coniferous groundwood in desirability. The development of the chemi-groundwood and cold caustic soda processes has also stimulated the utilization of those broadleaved species in the manufacture of newsprint. Because chemi-groundwood fibres are significantly longer than those of conventional groundwood, the use of chemi-groundwood in newsprint furnish enables a reduction to be made in the proportion of long-fibre chemical pulp required, a factor of considerable importance to those countries that must spend scarce foreign exchange in order to import long-fibre chemical pulp.

After years of development, chippable wood residues are now being converted into groundwood commercially by passing chips through disc refiners at costs comparable to those of conventional groundwood. Although this process is used primarily with coniferous wood residues, it should function equally well with broadleaved species.

The foregoing technial developments have tended to decentralize the world production of newsprint. Commercial and political aspects have also encouraged the trends towards decentralization. Supply difficulties and exorbitant prices during the Second World War and the Korean crisis, scarcity of foreign exchange and the wish to safeguard at least the minimum needs of this commodity by indigenous production have no doubt encouraged the establishment in some countries of newsprint mills based upon non-traditional raw materials and methods.

In some cases the economics of these mills do not allow of free competition with newsprint imported from the large producing centres of North America and Scandinavia. Various supporting measures, such as import controls, allocations and subsidies are therefore necessary for the successful operation of these mills. It appears, however, that the high cost of production is more often the result of the small size of the operation rather than of the economics of the process employed. It is true, of course, that lower yields and the use of chemicals in the non-traditional processes mentioned above will increase the manufacturing costs over those of the conventional groundwood and newsprint manufacture. These higher costs are, however, sometimes balanced by the generally lower cost of broadleaved (as compared with coniferous) pulpwood, as evidenced by the increasing use of these new processes both in the United States and in Western Europe, where there are shortages of coniferous pulpwood in many areas.

While the chemi-groundwood, cold caustic soda, and other attrition mill methods allow the processing of a wide range of broadleaved woods, the best results are generally obtained with low density species. Thus, in order to obtain optimum results, wood from mixed tropical forests must be classified and sorted according to suitability, a procedure which involves higher costs because of the need for selective cutting. On the other hand, it has been demonstrated that pulp produced from mixed tropical species, from which only the densest have been excluded, is entirely suitable for certain purposes. In many cases, however, the optimum solution would no doubt be to establish plantations of suitable fast-growing species, coniferous or broadleaved, indigenous or exotic, near to the best potential mill sites.

The problem of selecting the most economic process or combination of processes for the production of groundwood-type pulp from even one single broadleaves species is not a simple one. The choice becomes even more difficult when the potential raw material basis is a mixture of several species. Considering the heavy investment in a newsprint mill, ample provision should therefore be made in the planning budget for such projects to include costs for laboratory tests, mill trial runs and pre-investment (economic feasibility) studies. These expenses are essential to ensure that the technically and economically most advantageous solution is reached.

The possibility of producing newsprint from all imported pulps, or from imported pulpwood, will seldom be found to be economic. It has been found to be feasible only in a few instances where the groundwood or pulpwood haul is short, and other factors are favourable. This is not likely to occur in Latin America.

Even in a brief discussion of the economics of newsprint manufacture, such as this, the question of economies of scale cannot be overlooked. The very large tonnages of newsprint consumed in North America and Western Europe in conjunction with low profit margins have in the last decade emphasized the economies of large operations in the newsprint industry. Today the minimum economic size of a modern newsprint mill in these regions, producing for export, is in the order of 200,000 tons per year. New newsprint machines are being installed that will each be able to produce 125,000 tons annually. The annual output of one such mill is thus higher than the present consumption of newsprint in any single country of Latin America except Brazil.

A Latin American newsprint producer would, of course, have some protection in a free market vis-à-vis a northern producer because of the ocean freight involved. On the other hand, if the Latin American producer were some distance from his major market because of the location of the wood supply, domestic freight costs could easily equal those of ocean freight. The comparative economics would need to be studied in detail in each case. There is one factor, however, that is difficult to assess quantitatively—that of the predilec-

tion of some North American paper manufacturers, in times of over-capacity, for selling on the export market at lower prices than on their own domestic market.

An indication of minimum economic size of newsprint manufacture in Latin America can be obtained from the plants of the two major manufacturers, one in Chile, the other in Brazil. Both produce in the range of 150 to 200 tons per day; however, they produce other papers as well in the same plants, which tends to reduce unit manufacturing and capital costs. A new newsprint mill is under construction in Chile which is expected within two years of operation to produce 200 tons per day, all of which must be exported. The small amount of newsprint made in Argentina is produced in a large plant at an unattractive return on investment, according to the manufacturer. The plant is devoted almost entirely to more profitable papers. The other two Latin American newsprint plants, in Mexico and Cuba, enjoy either natural or artificial protection, as well as the advantage of producing more profitable papers in the same plant, at least in one case.

3. Newsprint from bagasse

The possibility of producing newsprint from bagasse has long been the subject of discussion, considerable research and experimentation, and a number of controversial claims. The abundance and relatively low cost of bagasse in a number of countries, including nearly all the Latin American countries, suggested the potential use of bagasse as a substitute for groundwood in newsprint manufacture.

What was perhaps the first commercial bagasse newsprint mill in recent years was built with great fanfare some ten or fifteen years ago in the southern United States. It is understood that all chemical bagasse pulp was used. Apparently because of the poor economics of producing newsprint entirely from chemical pulp in a small plant, and possibly also because of technical difficulties in producing acceptable newsprint from all-chemical short-fibre pulp, newsprint manufacture was soon abandoned. The plant now produces printing and writing papers from a blend of bagasse pulp produced on the site and purchased long-fibre pulps.

Probably the next commercial attempt at newsprint manufacture from bagasse occurred in 1959 at a new small plant in Cuba designed for that purpose, using all-chemical bagasse pulp. Samples seen of newspapers printed in Havana on paper said to have been made at the new plant indicated that the newsprint was of acceptable quality, and was significantly brighter than standard newsprint. Shortly after starting up, the plant was expropriated, and according to the last report was still idle, although increased newsprint production was reported in 1960 from Cuba. There are no other known newsprint producers in Cuba. It is felt, however, that the economics of using 100 per cent bleached chemical pulp in the manufacture of newsprint is open to question and requires further investigation.

A major United States pulp and paper manufacturer recently announced the development of a process for the manufacture from bagasse of mechanical pulp similar to groundwood. Presumably, the process is an adaptation of the now commercial process of converting chippable wood residue into chips and then into groundwood in a disc refiner. Trial runs of newsprint made from 75 per cent mechanical bagasse pulp and 25 per cent long-fibre chemical wood-pulp have been successfully made on a commercial paper machine. The bagasse pulp, however, was made under pilot plant conditions. Samples of this bagasse newsprint indicate that it is fully comparable to standard newsprint, except that the colour is a little too dark, which indicates that mechanical bagasse pulp requires some bleaching. The newsprint is also characterized by many minute slivers, apparently from the epidermis of the sugar cane, that are, however, hardly noticeable and should not detract from its utility. The newsprint was said to have been successfully run over several high-speed newspaper presses in the United States.

In late 1960 it was announced that this American company and an Indian pulp and paper manufacturer had agreed upon the establishment of a newsprint mill in India to utilize the new mechanical bagasse pulp process, and the Indian Government granted a licence for the construction of the proposed plant. Subsequently, however, the need for further commercial tests was felt, and construction was therefore delayed. The company is satisfied with the results of the latest tests, and has decided to proceed with further licensing of the process, particularly in Latin America.

Other processes are being and have been advocated for the pulping of bagasse for newsprint manufacture, but none of these is believed to have reached commercial operation.

4. General assessment

The newsprint industry in Latin America is lagging behind the other sectors of the pulp and paper industry as the result of a combination of technical, economic, and political factors. Improvements in technology are broadening the newsprint raw material base so that fibres that are plentiful in Latin America may be used to augment the available traditional coniferous pulpwoods. As the Latin markets for newsprint grow, the economic problems lessen and the political factors diminish in importance.

That the above-mentioned influences are likely to have an effect is indicated by projections of demand growth and productive capacity for the period 1960 to 1965. Regional newsprint demand is expected to grow from 698,000 to 938,000 tons and production from 155,000 to 310,000 tons, so that the region's dependence on imports is expected to decline from 78 to 67 per cent.

CHAPTER V

DEVELOPMENT PLANS FOR THE INDUSTRY; BALANCE-SHEET OF SUPPLY AND DEMAND FOR PULP PRODUCTS IN 1965 AND 1975 AND ESTIMATE OF INVESTMENT REQUIREMENTS, 1965 AND 1975

The aim of this chapter is to investigate trends of production and trade in pulp products in Latin America during the period 1960-75. The demand projections studied in chapter II indicate that the consumption of paper and paperboard should amount to about 3.5 million tons in 1965 and slightly over 6.6 million tons in 1975. How is industry to set about meeting this striking increase in demand? It was felt that the problem of estimating the situation in 1965 called for separate treatment in this report from that of assessing the situation in 1975.

For 1965 it was considered appropriate to make a rapid inventory of the existing projects in each of the main consumer countries in the region; once the most practicable of these had been picked out, they were added to the latest figures available on the capacity of the industry, namely those for 1958. Consequently the project inventory was made to include all projects that had begun to operate since 1958, and those that seemed likely to begin operating before 1966. Thus it was possible to arrive at production estimates for 1965[1] both for end products (paper and paperboard) and for pulp, and by comparing these with demand, to estimate the probable exports or imports, as the case might be. In other words, the aim of this series of calculations was to present the closest possible estimate of what would be the balance of supply and demand for pulp products in 1965.

For 1975 a different approach was adopted. It was almost impossible to adopt the same procedure, since industrialists do not generally formulate plans to expand their capacity covering periods of as long as ten or fifteen years. Consequently it was decided to estimate production for 1975 on the assumption that it would be sufficient to maintain the same absolute figures for the net level of imports as in 1965; and both the capital and the fibrous raw materials required for this output were investigated.

1. PROBABLE SITUATION IN 1965

Appendix I gives details of the additions to existing capacity in 1958 that have either begun to operate or are likely to be in operation before the end of 1965. These additions include both entirely new plants and extensions to existing plant. As regards the latter, since most enterprises are in a state of continuing expansion, there is no doubt that for want of complete data plant expansion has been only partially accounted for, so that the estimate of capacity for 1965 is on the low side. Nevertheless, it was thought preferable not to apply any corrective factor, since some of the additional capacity taken into account will probably either not materialize or will only do so after 1965, thus counterbalancing the low estimate referred to.

The additions to capacity according to appendices I and II[2] comprise 1.21 million tons of pulp and a similar volume (1.27 million tons) of paper and paperboard. For pulp this means an increase of nearly 170 per cent over installed capacity in 1958, whereas for paper and paperboard the increase is less than 75 per cent. These few figures clearly reflect the trend prevailing over the last few years in the development of this sector and expected to be even more pronounced during the period under consideration, that is, the integration of this industry, achieved on the basis of a progressive increase in the processing of the raw pulp. In Latin America, as in many other parts of the world, the industry was founded in the large cities, as a means of using the abundant supply of waste paper to produce paperboard and low-grade paper. In time more use was made of pulp, almost entirely imported, thus improving the quality of paper and paperboard, until the current situation was reached (1958-59) in which an already well developed production of pulp covers approximately 40 per cent of the region's requirements in fibrous raw material.

By 1965 the region will be producing about 2.64 million tons of paper and paperboard and 1.76 million tons of pulp as a result of adding to the productive capacity it had in 1958[3] the further capacity described in appendix I to the present chapter.

In Argentina the emphasis in regard to development in pulp is on short-fibre pulp, especially from salicaceous species (Papelera Argentina, Celulosa Argentina) and bagasse (Ledesma, Palmas Chaco Austral)—fibrous materials that can be put to use immediately. It is not likely that other agricultural wastes, such as grain straw, which is at present a relatively important source of fibrous material, will be used on a larger scale than

[1] In the case of Brazil (mechanical pulp), Mexico (other paper and paperboard) and Uruguay (printing and writing paper, and other paper and paperboard), the stock procedure of adding the capacity existing in 1958 to the additional capacity expected during 1959-65 gave too low a production figure, implying the need to import quantities which seemed unrealistic in the light of such factors as the previous development of the industry, availability of foreign currency, etc. The figure for capacity in 1965 was therefore adjusted and increased by a given amount, the insufficient capacity referred to being attributed to lack of data (see notes to appendix II).

[2] Details of the additions are given in appendix I; appendix II gives capacity in 1965, with certain adjustments for Brazil, Mexico and Uruguay, as explained in the notes to the appendix.

[3] See chapter II, appendix II.

at present; it is even quite possible that the absolute level of pulp production from these fibres may decrease. Already a number of plants have suspended operations, or are about to do so, because of the insoluble problem of the cost of the raw material (the straw of wheat, rye, oats, etc.) and the difficulty of obtaining it, while other plants, although located close to grain-growing areas, have switched to a different raw material, and are using wood instead of straw. It was not considered feasible that in the short period between now and 1965 any of the many projects that have been announced for using the salicaceous timber resources of the Paraná delta (Delta Industrial, Pedotti, Papelcint, CEPSA, etc.) could already have begun to operate, although some of them will probably be well under way within a year or two of 1965.

Similarly, with respect to long-fibre pulps, it is not expected, because of the short time interval referred to above, that operations can begin before 1965 on the project to install a plant in Misiones for the production of pulp and kraft paper based on the conifers in that area (natural forest *Araucaria* and plantation *Araucaria* and pitch-pine); consequently in 1965 the only plant[4] that will be producing long-fibre pulp will be Celulosa Argentina, which is also in the province of Misiones. Thus the situation in 1965 is not likely to represent any improvement over the present situation, in that there will be no increase in the production of long-fibre pulp. Development in this field, which is a necessity for the Argentine paper and pulp industry, has been held up by the shortage of conifers suitable for use; however, in the last few years the emphasis in planting seems to have been on conifers and also on eucalypts, now that the stage of planting *Salicaceae* seems to have been completed. Although no information is available as to the areas planted, it may be expected, in view of the encouraging results obtained thus far with respect to the growth of the species planted, that by about 1975 the products of these plantations will begin to enter the market. This does not mean that Argentina will have to wait until 1975 before there is any increase in the present production of long-fibre pulp; it is possible that the project (Papel Misionero) whose entry into operation by 1965 was not regarded as feasible will in fact begin operating between then and 1970, on the basis of supplies of natural forest *Araucaria* and the first thinnings from the pitch-pine plantations. In addition it should be remembered that unceasing technological research in this field is continually increasing the proportion in which short-fibre resources can be used for all types of paper and paperboard, and consequently it may be expected that the traditional difference between short and long fibre will gradually become less important.

The expected increases in the production of paper and paperboard in Argentina will not result in any significant change in the situation compared with 1958. In other words, as was felt to be likely in the case of long-fibre pulp, there will be no change in the production of newsprint, apart from a small increase of 6,000 tons. Although serious efforts have been made to undertake large-scale production in this field, there is no information to indicate that the attempts have succeeded. The shortage of conifers previously referred to, and the fact that this type of paper can be imported entirely free of duty, are the main factors that have led to the present situation.[5] With respect to other paper and paperboard, the industry may reasonably be expected to produce, as it has up to now, enough to meet all consumption, save that of special types of paper, which will still have to be imported. Thus in 1965 the total capacity of the Argentine industry should amount to 225,000 tons of pulp and nearly 600,000 tons of paper and paperboard.[6]

The next question is, what will the output of these two items amount to in 1965? In other words, to what extent will this capacity be utilized. As shown in the notes to appendix II, there is no agreement in Latin America as to how the capacity of paper and pulp plants should be defined; in general it is felt that the tendency is to exaggerate the possibilities of production somewhat, especially in announcing new projects, when capacity is usually equated with the theoretical maximum possible output.

If Argentina imported about 10,000 tons of special types of paper in 1965, the production of other paper and paperboard (excluding newsprint) would amount to 464,000 tons; if this is compared with the 573,000 tons of capacity for producing these types of paper to be installed by that year, it gives a coefficient of utilization of 80 per cent. This is even lower than the estimated level for 1958, which was 85 per cent. Hence it could well be that the entry into operation of one or more projects may be delayed while the 85 per cent level of utilization of 1958 is maintained.

With respect to pulp, it was considered that with the addition of new plants, where better operating conditions could be assumed, and the closing down of others in which a good deal of the installed capacity was already obsolete, the coefficient of utilization might rise to 90 per cent. Thus production of paper and paperboard in 1965 would amount to 486,000 tons (including 22,000 tons of newsprint), and 163,000 tons would have to be imported (including 153,000 tons of newsprint). As for pulp, although output for different types can be calculated with the data available, a hypothesis must be formulated to establish the probable consumption not only of the various types of pulp, but also of waste paper, which constitutes an important fibrous raw material in Latin America.

Appendix III gives an estimate of the possible composition of fibrous raw materials in 1965 in Latin America. The difficulty of making this estimate must be emphasized, since as is well known, paper and paperboard (except for newsprint) can be produced from innumerable combinations of the various ingredients (pulp and waste paper) subject to certain technical and economic limitations. With this proviso, the aim has been to assume the largest possible proportion of types of pulp representing the fibrous raw materials that will be available in each country in the region, and at the same time in most cases to cut down the proportion of waste paper which is often too high.

[4] This plant produces long-fibre pulp (80 per cent *Araucaria* and 20 per cent eucalyptus) and short-fibre pulp (with the same materials, the proportion being the opposite way round), and also pulp for the manufacture of rayon.

[5] See chapter IV, which deals specially with the newsprint situation.

[6] See appendix II to this chapter.

Thus in Argentina it is assumed that the proportion of waste paper in the total of fibrous raw material could be reduced from 49 per cent in 1958-59 to 32 per cent in 1965, whereas chemical and semi-chemical pulps together would increase from 40 per cent in 1958-59 to nearly 60 per cent in 1965, giving a substantial improvement in the quality of the paper and paperboard produced.

Comparison of Argentina's pulp requirements as thus estimated with output gives the probable deficit in 1965, namely, 13,000 tons of mechanical pulp and 136,000 of long-fibre chemical pulp, together representing an increase of 35 per cent over the level of imports for 1958-59.

The situation in Brazil will be very different. If all the projects considered as practicable actually materialize within the time periods indicated, by 1965 Brazil will become a net exporter of pulp instead of a net importer as at present. This striking progress would be based on two species, eucalyptus (broad-leaved, short fibre) and *Araucaria* (conifer, long fibre), and to a smaller extent on sisal, bamboo (both long fibre) and sugar cane bagasse (short fibre).

The progress with eucalyptus would naturally take place in the São Paulo plantation area, especially through the projects planned by Champion, Suzano, Simão, Cicero Prado, Brasileira, Melhoramentos and Matarazzo; Champion and Brasileira would be producing solely for the market. Conifer wood-pulp would be mainly produced by Klabin, Lutchner, Cambará, Olinkraft and Champion, Lutchner and Cambará producing solely for the market.

In the North-eastern zone it is expected that Sackraft will produce about 20,000 tons of long-fibre pulp in 1965, based mainly on agave; as for bamboo, although there may be a considerable increase in its use within a relatively short time, it is not expected that by 1965 it will constitute a source of raw material for pulp comparable to the other materials referred to above.

It is estimated that the production of pulp from bagasse will increase from 16,000 tons in 1958-59 to about 50,000 tons in 1965 as the result of large-scale plant expansion at Refinadora Paulista and Rigesa, and the entry into operations of Celubagaço.

Figures for increase in production capacity for mechanical pulp amount only to 75,000 tons, probably because of incomplete data; added to the capacity existing in 1958,[7] this would give a total of 150,000 tons, whereas according to the calculations in appendix III the requirements will be 171,000 tons; as it is very unlikely that resort will be had to importing to cover the deficit, it was decided to assume that the 171,000 tons would be produced in the country, either by making use of capacity now idle, or by means of new capacity all the more likely to be installed because of the prospect of this deficit. The composition of fibrous raw material for 1965 is expected to vary little from that in 1958-59: the proportion of chemical and semi-chemical pulp will probably fall from 56 to 54 per cent, and that of mechanical pulp will probably increase from 20 to 22 per cent, whereas the proportion of waste paper should remain stable at 24 per cent.[8]

The balance-sheet of supply and demand for pulp in 1965 not only demonstrates Brazil's complete independence of imports, but even indicates the probability of an exportable surplus of 50,000 tons of chemical short-fibre pulp on the assumption that there will be 90 per cent utilization of installed capacity, the assumption made for all pulp production. In this connexion it should be mentioned that in 1961 there was already a surplus of bleached short-fibre pulp, exported mainly to Argentina. But the prospects of disposing of an exportable surplus on such a scale in 1965 are not very promising: apart from Uruguay, which appears as a net importer of 3,000 tons in 1965, the other countries of the region are self-sufficient in regard to this type of pulp, while the possibility of exports outside the region seems even more remote. Consequently it can be assumed that in view of this situation some projects will delay starting up operations.

With respect to paper and paperboard other than newsprint, the basic assumption, which is the same as in the case of Argentina, is that domestic output will keep close to demand, and that imports will consist of small amounts of special types of paper, amounting in 1965 to 21,000 tons. The balance required to meet demand, representing a domestic production of 600,000 tons, will imply a coefficient of utilization of installed capacity of about 90 per cent.

Brazil will probably continue to have a large deficit of newsprint. Despite the addition of 95,000 tons to the capacity existing in 1958, and assuming, in view of the special characteristics of production of this type of paper, a relatively high coefficient of utilization (95 per cent), the 1965 deficit is expected to amount to 181,000 tons, representing an increase of 30 per cent in the level of imports over 1958-59.

Taken as a whole, productive capacity for paper and paperboard will increase between 1958 and 1965 by about 300,000 tons, while the increase will be even greater for pulp—an estimated 390,000 tons; this would make the industry self-sufficient as regards pulp, and there would even be an exportable surplus of 50,000 tons of short-fibre pulp.

Colombia is a particularly interesting case—a country using its non-conventional fibre resources largely to develop an industry that a few years ago could be described as in its infancy. The year 1959 saw the opening of the first plant in Latin America for the production of pulp (semi-chemical and sulphate pulp) based on tropical woods, for use mainly in the manufacture of corrugating medium. The same firm, Cartón de Colombia, in association with the Colombian Industrial Development Institute and the Container Corporation of America, undertook the construction of another plant also based on tropical woods from the Buenaventura area; it is hoped that this plant will begin to operate by the end of 1964. In 1961 the new "Propal" plant began operating, with a capacity of 50,000 tons

[7] This does not include the small plants producing mechanical pulp (between 250 and 300 in number) because most of these have been brought to a standstill by lack of raw material; the available data are not sufficient to estimate how far these plants contributed to production figures in 1958-59, but it is considered that their total contribution must have been very small.

[8] See appendix III.

a year for paper and 40,000 tons a year for bagasse pulp.

In calculating the requirements of fibrous raw materials the aim was to assume the maximum use of the material that was in plentiful supply, in the case in point short-fibre pulp; thus the total output of this material, amounting to 71,000 tons, would be absorbed by the industry in 1965, in addition to 43,000 tons of imported pulp (9,000 tons of mechanical pulp and 34,000 of long-fibre pulp) and about 33,000 tons of waste paper, the latter's share in the total volume of fibrous raw material thus falling from 34 per cent in 1958-59 to 31 per cent in 1965.

Apart from 5,000 tons of special papers, all newsprint would have to be imported, demand in 1965 being estimated at 44,000 tons.

Cuba began in 1959 to develop its main pulp resource, sugar cane bagasse. In the same year the two newsprint plants of Cárdenas (Técnica Cubana) and Santa Clara (Pulpacuba), both based on bagasse pulp produced at the plant itself, began operations. If the demand in Cuba in 1965 attains the projected levels, and the data submitted in appendix I are confirmed in the sense that there are no new projects which could be operating by that date, there will be heavy imports: 60,000 tons of pulp and 108,000 of paper and paperboard, always assuming that a plant utilization coefficient of 90 per cent is attained.

Chile is the only country that according to the projections appears in 1965 as a substantial exporter. It is estimated that by then the additional capacity resulting from the vast expansion of the sulphate pulp plant at Laja will already be functioning, so that its output would be tripled, from 70,000 tons in 1959 to 220,000 in 1965, making possible exports of over 140,000 tons. By 1965 the new Industrias Forestales newsprint plant will be operating, with an estimated capacity of 70,000 tons; similarly it is estimated that the Manufacturera de Papeles y Cartones company will by then have a newsprint production capacity of approximately 72,000 tons from its two plants at San Pedro and Puente Alto, giving a total capacity for Chile of 142,000 tons. Since in this case the production units are relatively large and modern, a utilization coefficient of 95 per cent has been assumed, which means a probable production of 135,000 tons; deducting from this total the projected domestic demand of 40,000 tons, we get an exportable surplus of 95,000 tons.

Substantial increases are expected in Mexico, particularly in the production of short-fibre pulp; presumably bagasse will be the chief fibrous resource used for this purpose. It has been stated that the San Cristóbal pulp mill, whose production is based on bagasse, will expand its capacity to 50,000 tons by 1965. The Atenquique plant, which now produces kraft paper, based entirely on its own production of long-fibre sulphate pulp, intends to double its capacity, However, since it lacks adequate conifer resources for expansion it has decided to mix the pulp from coniferous species it has available with pulp based on bagasse from a sugar plant in the neighbourhood. This is a most significant development, since for some considerable time to come long fibres will be difficult to obtain in most Latin American countries, whereas it is expected that bagasse—now largely used as fuel in sugar mills—will be available to the pulp industry in rapidly increasing quantities as the installations of sugar refineries are modernized.

Another important development with respect to short fibres is taking place at the pulp mill at Monterrey, whose production is based on agricultural residues from the Titan concern; this mill has expanded its capacity to 30,000 tons. With regard to long-fibre pulp, all the enterprises producing it have plans for expansion. Chihuahua intends to install capacity of 70,000 tons of sulphate pulp for the market by 1965, while San Rafael and Loreto Peña Pobre plan to expand their plants by 18,000 tons and 15,000 tons respectively.

Total expansion of pulp mills should amount to 172,000 tons and that of paper and board mills to only 163,000 tons. By adding the latter figure (which does not include any expansion of newsprint production) to the 1958 capacity for all paper and board other than newsprint, total installed capacity for 1965 will be 530,000 tons. Assuming the same utilization coefficient as for most countries (90 per cent), production in 1965 will be about 480,000 tons as against an estimated demand of 600,000 tons. In view of the extent of the apparent deficit—120,000 tons—compared with the approximately 28,000 tons actually imported in 1958-59, it was felt that this situation would not actually arise, since there are sufficient grounds for believing that the Mexican industry will prove sufficiently dynamic to keep at any rate to the 1958-59 relative level of imports. It was therefore felt that the "shortage" of production capacity in 1965 for paper and board should rather be attributed to inadequate data, and that in 1965 imports of paper other than newsprint will have about the same incidence on consumption as in 1958-59.

The Tuxtepec newsprint manufacturing plant is considering an expansion plan to be carried out in two stages. The first, short-term stage is designed to increase its annual capacity by 10,000 tons before 1965. However, since the plant devotes part of its capacity —some 10,000 tons a year—to the production of paper for books and note-books, the expansion referred to will merely allow it to recover its original newsprint-manufacturing capacity of 30,000 tons. The second stage, which is still in the nature of a preliminary project, is designed to meet increased demand. It provides for the large-scale use of bagasse to augment conifer resources, since expansion based on the latter would seem to present difficulties in view of their distance from the plant and the fact that conditions for their development are not very suitable.

The estimates of fibrous raw material composition in 1965 (appendix III) show that, as compared with 1958-59, the proportion of short-fibre pulp will increase from 10 to 22 per cent at the expense of other fibrous raw materials, chiefly waste paper, which will drop in proportion from 42 per cent to 35 per cent, while long-fibre pulp and mechanical pulp will be reduced from 36 per cent to 34 per cent and from 12 per cent to 9 per cent respectively.

The supply and demand position with respect to pulp shows a deficit of 50,000 tons, consisting entirely of long-fibre chemical pulp, the bulk of it presumably of "sulphite" quality.

In Peru the industry will continue to develop basically along the same lines as before. Production of

bagasse pulp will increase and, in addition, production of mechanical pulp from eucalypts will begin, though on a small scale. At the moment there is no way of reducing the long-fibre pulp deficit, except by reducing requirements to a minimum, as has been done in calculating the composition of fibrous raw material.[9]

According to the announced increases in the capacity to produce paper and board other than newsprint, output should amount to 94,000 tons in 1965. If 3,000 tons or so of special paper are imported, the production needed to satisfy the balance of demand—73,000 tons—will represent only 77 per cent of installed capacity. What will probably happen is that entry into operation of part of the new capacity will be delayed and that the coefficient of utilization of the rest will fluctuate around 90 per cent. As heretofore, the bulk of the newsprint required will have to be imported.

In Uruguay, an adjustment similar to the one for Mexico had to be made, i.e., it had to be assumed that additional capacity to produce paper and board, amounting to 7,000 tons, was not taken into account because of inadequate data. In 1965, assuming the same 90 per cent equipment utilization coefficient, production of paper and board other than newsprint will amount to 43,000 tons. Imports will consist of 4,000 tons of special paper and the 35,000 tons required to meet the demand for newsprint.

Additional planned capacity to produce pulp is very small, totalling 3,000 tons of mechanical pulp and 4,000 tons of semi-chemical pulp from salicaceous species. In accordance with the estimate of fibrous raw material requirements, 13,000 tons of long-fibre and 3,000 tons of short-fibre pulp will have to be imported, the latter presumably from Brazil.

In Venezuela, development of the paper industry on a large scale was begun as recently as 1958 when Venepal, a concern which manufactures kraft paper from imported pulp, began production. In 1961 integration of this plant was started through the construction of an addition in the form of a pulp mill designed to produce 25,000 tons of bagasse pulp. This is the country's first pulp-producing mill. All the remaining projects, whether for new capacity or for the expansion of existing facilities, will manufacture paper from imported pulp or from waste paper, the bulk of the latter of domestic origin. Hence, imports of pulp in 1965 are expected to be high, amounting to some 67,000 tons of long-fibre pulp (about 23,000 tons in 1956-59) and 7,000 tons of mechanical pulp.

All the newsprint needed—44,000 tons—will presumably have to be imported, as well as 49,000 tons of printing and writing paper and a small portion of other types of paper—12,000 tons—bringing total imports to 105,000 tons.

The "other countries" group shows considerable progress in the production of paper and paperboard as a result of the inclusion of two projects. One is to be carried out in Panama (Fábrica Interamericana de Papel) and provides for the setting up of a non-integrated plant designed to produce 20,000 tons of paper and paperboard a year; and the other is a similar project in Guatemala (Industria Papelera Centroamericana) for the production of 14,000 tons of paper. Of the three small plants producing pulp (Costa Rica, Ecuador, Guatemala) operations of those in the last two countries are expected to become normal whereas the Costa Rica plant, according to information received, will remain inoperative.

The "other countries" combined are expected to produce some 4,000 tons of pulp and 40,000 tons of paper and paperboard and will have to import 22,000 tons and 96,000 tons respectively.

It is now possible to obtain a general picture of the industry's position in 1965 and to estimate the changes which will occur, as compared with conditions in 1958-59.

Table 24 shows the result of the 1965 projections relating to production, imports and apparent consumption of pulp, paper and paperboard.[10] While reference has already been made to the different growth rates of pulp production and paper and paperboard production respectively, the gradual integration of paper and paperboard manufacture and pulp production should be mentioned again, since it is a major feature of the industry's probable development. Thus, in 1958-59 production of pulp was only 42 per cent of the figure for paper and paperboard, but it is estimated that the percentage will rise to 57 per cent in 1965. The industry should thus be less dependent upon imports of raw materials which should, in turn, drop from some 360,000 tons in 1958-59 to less than 240,000 tons in 1965.

The anticipated composition of pulp consumption in 1965 shows an important change: a drop in the percentage of long-fibre wood pulp and a corresponding increase in short-fibre chemical pulp, consisting of bagasse and, to a lesser extent, wood-pulp. This change derives not only from the expected increase in the supply of short-fibre resources but also from an extension of the range of utilization of these resources. In this connexion, it has already been pointed out that continuous technical research in this field is tending to narrow the traditional gap between long-fibre and short-fibre resources, thus broadening the possible field of utilization of the latter.

The percentage of waste paper is experiencing a sharp drop, from 36 per cent to 29 per cent of the fibrous material total, as a result of the more plentiful supply of virgin fibre—which should improve the quality of paper and paperboard—and of changes in the production structure (an increase in the relative percentage of newsprint, for the manufacture of which waste paper is not used). Imports of paper and paperboard should remain at approximately the 1958-59 level, and no major change in the consumption pattern of these products is expected.

To sum up, it is likely that between now and 1965 the industry will make substantial progress, particularly in the production of pulp, and that the chief increase will be in the output and use of short-fibre pulp, especially bagasse.

2. An assumption as to the position in 1975

The plans and projects of enterprises considered feasible were the starting-point of the analysis and

[9] See appendix III to this chapter.

[10] For further details, see appendix III.

TABLE 24. LATIN AMERICA: PRODUCTION, IMPORTS AND APPARENT CONSUMPTION OF PULP, PAPER AND PAPERBOARD, 1958-59 AND 1965

(Thousands of tons and percentage)

	Production		*Imports*		*Apparent consumption*			
	1958-59	*1965*	*1958-59*	*1965*	*1958-59*	*Percentage*	*1965*	*Percentage*
Pulp								
(a) *Wood*								
Long-fibre chemical	185	580	303	240	488	32	820	29
Short-fibre chemical and semi-chemical	86	320	33	—47	119	8	273	10
Mechanical	198	393	27	45	225	15	438	16
SUB-TOTAL	469	1,293	363	238	832	55	1,531	55
(b) *Other fibres*								
Long-fibre chemical	10	29	...	...	10	1	29	1
Bagasse chemical	72	334	...	...	72	4	334	12
Other	57	102	...	...	57	4	102	3
SUB-TOTAL	139	465	...	...	139	9	465	16
PULP, SUB-TOTAL	608	1,758	363	238	971	64	1,996	71
Waste paper	532	797	20	...	552	36	797	29
FIBROUS MATERIAL, TOTAL	1,140	2,555	383	238	1,523	100	2,793	100
Paper and board								
Newsprint	131	364	478	574	609	27	938	27
Printing and writing paper	308	586	131	122	439	19	708	20
Other paper and board	998	1,690	213	165	1,211	54	1,855	53
TOTAL	1,437	2,640	822	861	2,259	100	3,501	100

projections of the position in 1965, the results of which are tabulated in this study.[11]

The plans of the enterprises relate, of course, to projects which can be carried out within a period of not more than five or six years, and only exceptionally are longer periods considered. The approach to the position in 1975 was therefore different from that adopted for 1965, the aim being to show what would be the pulp supply and demand position if the same absolute level of net imports as was estimated for 1965 were maintained in the region. In other words, this is an entirely hypothetical situation the chief purpose of which is to calculate the effect of the development of the industry on such a vast scale on the available supply of fibrous raw material and capital resources.[12]

The results of the projections for 1975, set out in detail in appendices IV, V and VI of the present chapter, are summed up in table 25.

It was assumed that the trends noted between 1958-59 and 1965 would be more or less maintained for the period between 1965 and 1975. It was thus considered that the percentage of long-fibre pulp in the fibrous raw material total would continue to drop, from one-third in 1958-59 to 30 per cent by 1965 and to 25 per cent by 1975, and that this would also be the case for waste paper which, in 1975, is expected to amount to only a little over a quarter of the total.

This decrease is offset by the spectacular rise of chemical and semi-chemical short-fibre pulp which, it is estimated, will be as high as 31 per cent in 1975 (as against 16 per cent in 1958-59 and 25 per cent in 1965) thanks to the steady increase in the use of bagasse and eucalypts as sources of pulp material. The assumption for 1975 implies a considerable increase in the estimated output of pulp for 1965—145 per cent or an annual cumulative growth rate of nearly 10 per cent. This increase, large as it is, falls short of the estimate for the period 1958-59 to 1965, which assumes that production will rise at an annual rate of nearly 18 per cent; and it is also below the actual rate of increase of over 16 per cent registered between 1955 and 1960.

The position with respect to paper and paperboard output is similar to that of pulp, since the assumed rate of increase between 1965 and 1975 (8 per cent) is below that of the projections for the period between 1958-59 and 1965, but is the same as the rate recorded between 1955 and 1960, whereas the rate estimated for pulp between 1965 and 1975 is also higher than the actual rate for the period 1955-60. The broad statement may be made that the working assumption applied—imports in 1975 at the same level as in 1965—means that the industry must develop rapidly but at a rate lower than was thought feasible for the period

[11] See appendices I-III, V and VI.

[12] The question of the availability of fibrous raw material for the expansion programme referred to has already been dealt with in chapter III in connexion with the question of wood and other fibres.

TABLE 25. LATIN AMERICA: PRODUCTION, IMPORTS AND APPARENT CONSUMPTION OF PULP, PAPER AND PAPERBOARD, 1958-59, 1965 AND 1975

(Thousands of tons and percentage)

	Production			*Imports*			*Apparent consumption*					
	1958-59	*1965*	*1975*	*1958-59*	*1965*	*1975*	*1958-59*	*Per-centage*	*1965*	*Per-centage*	*1975*	*Per-centage*
Pulp												
(a) *Wood*												
Long-fibre chemical	185	580	1,201	303	240	190	488	32	820	29	1,391	23
Short-fibre chemical and semi-chemical	86	320	866	33	—47	...	119	8	273	10	866	14
Mechanical	198	393	1,075	27	45	45	225	15	438	16	1,120	18
SUB-TOTAL	469	1,293	3,142	363	238	235	832	55	1,531	55	3,377	55
(b) *Other fibres*												
Long-fibre chemical	10	29	118	...	...	...	10	1	29	1	118	2
Bagasse chemical	72	334	920	...	...	...	72	4	334	12	920	15
Other	57	102	130	...	...	...	57	4	102	3	130	2
SUB-TOTAL	139	465	1,168	...	...	...	139	9	465	16	1,168	19
PULP, SUB-TOTAL	608	1,758	4,310	363	238	235	971	64	1,996	71	4,545	74
Waste paper	532	797	1,590	20	...	...	552	36	797	29	1,590	26
FIBROUS MATERIAL, TOTAL	1,140	2,555	5,900	383	238	235	1,523	100	2,793	100	6,135	100
Paper and board												
Newsprint	131	364	1,127	478	574	574	609	27	938	27	1,701	26
Printing and writing paper	308	586	1,218	131	122	122	439	19	708	20	1,340	20
Other paper and board	998	1,690	3,453	213	165	165	1,211	54	1,855	53	3,618	54
TOTAL	1,437	2,640	5,798	822	861	861	2,259	100	3,501	100	6,659	100

1958-59 to 1965 and lower than the actual rate registered between 1955 and 1960.

With respect to the impact of increased pulp production—in 1965 as in 1975—on fibre resources,[13] reference need merely be made to the general considerations advanced in chapter III. Short-fibre resources, both of wood and of other material, will be plentiful in 1965 and 1975. Bagasse, eucalypts, *Salicaceae* and, to a lesser extent, agricultural residues other than bagasse, and tropical woods, in that order, will be the chief sources of raw material for pulp.

The supply of fibrous resources for long-fibre pulp production is not likely to present any serious problems around 1965. The countries expected to be the largest producers of this type of pulp should not find it difficult to meet requirements for conifers and agaves.[14]

Around 1975 the situation may change with respect to coniferous wood resources. It is questionable whether Mexico and Brazil, two of the countries hypothetically among the major producers, will have sufficient resources to meet the substantial need for coniferous wood for pulp.[15] This is not so in the case of Chile and Honduras,[16] countries which are not expected to have any supply problems, nor of Argentina, where output of long-fibre pulp is expected to drop in 1975.

In view of the uncertainly as to the supply situation in Brazil and Mexico and the lack of data which could provide an answer, no categorical statement can be made as to whether the available supply of coniferous wood for pulp will be such as to permit production on the scale assumed for 1975.

3. INVESTMENT REQUIREMENTS FOR THE PERIOD 1959-75

An estimate of the investment required, made simply to provide some idea of its size, shows that 685 million dollars or so will have to be invested during the seven-year period 1959-65.

This figure—representing investment in plant only[17] —was arrived at by means of individual estimates based on 1958 increases in installed capacity. In other words, the 685 million dollars only cover investments relating to the additional capacity expected to be achieved between 1959 and 1965.[18] In some cases, usually for the larger projects, the investment figures used were taken from specialized publications or press releases published by banks or other financing agencies. In estimating the remaining capacity increases, close attention was paid to the question whether expansion of an existing plant or an entirely new project was involved.

[13] See appendix V, which provides details on fibrous raw material requirements for pulp production.

[14] See appendix VI.

[15] While conifers are being planted rapidly in Brazil, most of the trees are not likely to have reached optimum development age by 1975, although wood from thinnings will be available.

[16] It is assumed that a plant with an annual capacity of 85,000 tons of long-fibre will be operating by 1975.

[17] Equipment, machinery, civil engineering works, generally speaking the investment included within the physical limits of the plant, and also the corresponding working capital in the factory and the interest accruing during the period of its construction.

[18] The list is given in appendix I to this chapter.

TABLE 26. LATIN AMERICA: ESTIMATED INVESTMENT REQUIRED FOR THE PROPOSED DEVELOPMENT OF THE PULP AND PAPER INDUSTRY, 1959-65 AND 1966-75

(Millions of dollars)

Country	*Paper and paperboard*				*Pulp*				
	Newsprint	*Printing and writing paper*	*Other paper and board*	*Total*	*Mechanical*	*Long-fibre chemical*	*Short-fibre chemical and semi-chemical*	*Total*	*Total*
1. *1959-65*									
Argentina	1	17	44	62	4	—	31	35	97
Brazil	15	27	50	92	12	48	64	124	216
Chile	15	3	12	30	11	49	—	60	90
Colombia	—	11	19	30	—	—	19	19	49
Cuba	8	5	13	26	—	—	15	15	41
Mexico	—	22	52	74	2	21	21	44	118
Peru	—	2	15	17	2	—	2	4	21
Uruguay	—	1	2	3	2	—	1	3	6
Venezuela	—	—	33	33	—	—	3	3	36
Other countries ..	—	—	11	11	—	—	—	—	11
TOTAL, 1959-65	39	88	251	378	33	118	156	307	685
2. *1966-75*									
TOTAL, 1966-75	140	173	657	970	103	184	354	641	1,611
GRAND TOTAL, 1959-75	179	261	908	1,348	136	302	510	948	2,296

Applying the resulting unit investment for the previous period to the capacity increases for 1965-75, the investment figure for this ten-year period would amount to over 1,600 million dollars.

Investment estimates for the periods 1959-65 and 1966-75 respectively are shown in table 26. The figures indicate that the industry's expected development, based on the hypotheses selected, would require an average annual investment of 135 million dollars during the seventeen years between 1959 and 1975.

These figures, high though they are, relate only to investment in plant, and must be supplemented by expenditure in respect of roads, power, housing, etc., although in many cases Governments can reasonably be expected to assume responsibility for at least the bulk of these investments in infrastructure.

Table 27 has been prepared as a factor for use in an economic evaluation of the industry's development programme presented in this chapter. Its purpose is to show the extent to which imports of pulp products can be reduced if the development plans for 1965 are carried out and hypotheses selected for 1975 are fulfilled. In order to determine this, a comparison had to be made between import requirements based on development of the industry as assumed earlier in this chapter, and the situation—equally hypothetical—as it will exist if the industry maintains its minimum productive capacty of 1958 throughout the period 1959-75, i.e., if capacity fails to increase in any year and the additional demand must be met through imports. The difference between imports based on either hypothesis —290 million dollars in 1965 and 960 million dollars in 1975—gives a rough idea of the gross savings in foreign exchange which could be effected if the plans and hypotheses referred to are fulfilled.[19]

4. MANUFACTURE OF EQUIPMENT AND MACHINERY FOR THE INDUSTRY

A few years ago all Latin American countries relied on foreign suppliers to meet the machinery and equipment needs of the paper and pulp industry. However, the progress made in the metallurgical and metal-transforming industries, as part of the rapid process of industrialization, went side by side in some countries with the development of the manufacture of equipment for the production of pulp and paper, encouraged by the steady increase in the demand for pulp and paper products and also to a considerable extent by the more or less chronic shortage of foreign currency for imports.

Thus the machine works that until then had concentrated mainly on repair and modernization work began to manufacture equipment parts, even the most complicated types, such as paper machines, and this development culminated in the production of complete units of machinery for both paper and pulp production. At this stage of the industry's development there was increasing co-operation with foreign enterprises of international repute in the same field usually associated with existing machine works either through direct investment or through the granting of patents and licences, However, imports still supply the bulk of the region's needs for machinery and equipment, since domestic industry has not attained significant levels of production except in Argentina and Brazil, and to some extent in Mexico and Chile.

[19] In order to calculate the net savings in foreign exchange, additional hypotheses had to be postulated, particularly on the proportion of the investments presented in table 26 which would imply flight of foreign exchange, as well as on factors related to the financing of the capital required, a subject which is felt to be beyond the purview of this study.

TABLE 27. LATIN AMERICA: FOREIGN EXCHANGE REQUIREMENTS FOR IMPORTS OF PULP, PAPER AND PAPERBOARD ACCORDING TO WHETHER THE INDUSTRY EXCEEDS THE 1958 PRODUCTION LEVELS OR NOT

(Millions of dollars)

Country	Value of 1958 imports			I. If there is no increase over 1958 production						II. If the industry should develop as planned in this report						Difference (I-II)	
				1965			1975			1965			1975				
	Pulp	Paper and paper-board	Total	Pulp	Paper and paper-board	Total	Pulp	Paper and paper-board	Total	Pulp	Paper and paper-board	Total	Pulp	Paper and paper-board	Total	1965	1975
Argentina	14.8	29.4	44.2	14.8	55.9	70.7	14.8	132.0	146.8	21.7	26.8	48.5	27.3	26.8	54.1	22.2	92.7
Brazil	14.3	31.0	45.3	14.3	105.6	119.9	14.3	289.8	304.1	—7.5	33.9	26.4	—	33.9	33.9	93.5	270.2
Chile	4.4	—1.5	2.9	4.4	9.3	13.7	4.4	29.0	33.4	—21.3	—13.6	—34.9	—39.0	—44.8	—83.8	48.6	117.2
Colombia	4.0	11.1	15.1	4.0	31.5	35.5	4.0	63.8	67.8	6.0	8.2	14.2	10.0	13.5	23.5	21.3	44.3
Cuba	4.6	24.1	28.7	4.6	43.1	47.7	4.6	91.4	96.0	8.4	22.3	30.7	10.7	27.7	38.4	17.0	57.6
Mexico	3.6	15.9	19.5	3.6	84.7	88.3	3.6	258.5	262.1	7.5	27.9	35.4	—	28.2	28.2	52.9	233.9
Peru	1.3	4.7	6.0	1.3	14.2	15.5	1.3	33.4	34.7	2.4	5.4	7.8	4.0	9.7	13.7	7.7	21.0
Uruguay	1.4	4.5	5.9	1.4	8.4	9.8	1.4	13.4	14.8	2.4	6.5	8.9	2.7	8.1	10.8	0.9	4.0
Venezuela	2.2	23.4	25.6	2.2	49.8	52.0	2.2	134.8	137.0	10.7	22.0	32.7	22.2	30.2	52.4	19.3	84.6
Other countries	—	18.6	18.6	—	27.4	27.4	—	51.9	51.9	3.1	19.2	22.3	—4.9	25.3	20.4	5.1	31.5
TOTAL	50.6	161.2	211.8	50.6	429.9	480.5	50.6	1,098.0	1,148.6	33.4	158.6	192.0	33.0	158.6	191.6	288.5	957.0

On the basis of the information given in table 28, it can be estimated that in the year 1959-60 the region as a whole imported between 20 and 25 million dollars' worth of machinery for this industry. The low level of imports for Brazil is significant, and although two years is too short a period for drawing definite conclusions, it can be said that this low level of imports for the years when the Brazilian paper industry was developing rapidly is due to the increasing domestic production of equipment.

Although in the next few years the demand for equipment in the region as a whole is likely to attain a level close to 70 million dollars, if each country is considered separately, the smallness of the market may constitute one of the most serious obstacles to the development of the equipment-producing industry, as in most cases it has in the past. In this connexion it is to be hoped that the systems of multilateral economic co-operation now existing in the region (the Latin American Free-Trade Association and the Central American common market) may prove to be the vital factors in removing this obstacle.

Another brake on the development of the manufacture of equipment is the difficulty in competing with foreign suppliers with respect to the granting of long-term and short-term credit and financing facilities. This is part of the more general problem of promoting exports of capital goods, which is giving the banking organizations concerned a good deal to think about.[20]

In Argentina the equipment industry consists of about ten firms, most of them small, though there is one large producer, also producing equipment for agriculture and the textile industry. In 1961 the estimated total annual output was 2,200 tons, with a sales value of about 4.3 million dollars.[21]

In the study on the manufacture of basic industrial equipment in Argentina it is estimated that the domestic industry, if properly expanded and modernized, could meet about 85 per cent of the total demand for mechanical and electrical equipment for the 1962-71 decade; the remaining 15 per cent, consisting wholly of mechanical equipment, would have to be supplied by importing, since for technical reasons, and because of the size of the market, it will be advisable to continue importing certain equipment, mainly equipment whose manufacture is highly specialized.

In Brazil[22] the manufacture of machinery has developed considerably in the last decade, and almost all types of machinery and equipment can be produced domestically, except for the largest paper machines, control gear, and highly specialized equipment. There are four large firms in the country equipped to produce complete plants, and about ten others that can produce certain individual items of equipment. Total productive capacity is in the neighbourhood of 4,100 tons a year, and it is estimated that this capacity, with the addition of certain imported material (representing a proportion which fluctuates between 12 and 20 per cent of the total value), would be sufficient to meet the estimated demand for equipment up to 1965; between then and 1970 plants would have to be considerably expanded.[23]

The scale now attained by the Brazilian industry, and its future potential, are made clear by studying the list of firms of international repute operating in the country, generally in association with well-known metallurgical and metal-transforming concerns. Thus complete industrial plants are produced by the Companhia Federal de Fundição (Black Clawson), Indústria Mecânica Cavallari (Millspaugh), Bardella S.A. (Voith) and Mecânica Pesada S.A. (Escher Wyss, Kamyr, Batignolles), while a number of other firms produce specific items or equipment for particular processes.

In 1959-60 Brazil exported machinery and equipment for the pulp and paper industry valued at about 47,000 dollars, to Argentina, Chile, Paraguay, Peru and Uruguay. Although these exports were small, the fact itself is significant especially in view of the problems, as referred to above, that confront the Latin American capital goods industry in competing with its rivals in the United States and Europe.

In Chile the capacity of the industry is still very limited; it is concerned mainly with repair work and the production of auxiliary equipment such as certain types of pump. Broadly speaking, it can be said that the pulp and paper industry depends on imported machinery and spare parts.

Despite the steady progress of the metallurgical and metal-transforming industries in Mexico, the bulk of the equipment for the pulp and paper industry is still imported, with certain notable exceptions; in the latter cases, the plants themselves have produced major machinery items in their own workshops or have had them manufactured under contract. Recently it was announced that the production of felts and wires had been undertaken; thus Mexico has joined Brazil and Argentina as the third country to manufacture these items.

[20] Appendix VII gives a list of the main producers of mechanical equipment specifically for the paper and pulp industry.

[21] See *The Manufacture of Basic Industrial Equipment in Argentina. VI. Pulp and Paper Production* (E/CN.12/629/Add.5).

TABLE 28. LATIN AMERICA: IMPORTS OF MACHINERY AND EQUIPMENT FOR THE PULP AND PAPER INDUSTRY, 1959 AND 1960[a]

(Millions of dollars)

Country	*1959*	*1960*
Argentina	7.2	7.4
Brazil	1.2	3.2
Chile	...	...
Colombia	0.9	5.3
Cuba	2.8	...
Mexico	3.3	1.4
Peru	...	...
Uruguay	...	...
Venezuela	1.9	5.8
Other countries	...	...
TOTAL	17.3	23.1

[a] In view of the extensive changes that can take place from year to year as the result, for example, of importing a complete plant, it would have been preferable to present a series covering a longer period; this was not possible, however, because in some countries, such as Argentina, imports of such equipment have been shown separately only since 1959.

[22] See *The Manufacture of Industrial Machinery and Equipment in Latin America. I. Basic Equipment in Brazil* (E/CN.12/619), section VI, Equipment for pulp and paper production.

[23] *Ibid.*, pp. 134-136.

Appendix I. Latin America: estimated increases over 1958 level in production capacity for pulp, paper and paperboard, due to be installed 1959-65

(*Thousands of tons per year*)

Name and location	Paper and board				Paper pulp				Fibrous raw material used in pulp manufacture	Semi-chemical and chemical pulp production process	Remarks
	Newsprint	Printing and writing paper	Other paper and board	Total	Mechanical	Chemical (long fibre)	Semi-chemical and chemical (short fibre)	Total			
Argentina											
Fabril Papelera:											
Quilmes (Province of Bs. Aires)	—	—	22	22	—	—	—	—	—	—	Began operations in 1960 with 7,000 tons capacity; expansion plans well under way
Sein:											
Ranelagh (Province of Bs. As.)			9	9							Expansion of present plant of 4,500 tons capacity
Ledesma Industrial:											
Ledesma (Jujuy)		25	5	30			25	25	Bagasse	Chemical, sulphate	Construction began recently
Celulosa Jujuy:											
San Pedro (Province of Bs. As.)			4	4			4	4	Salicaceae	Semi-chemical	Project for new plant under study
Delta Industrial; Papelera Pedotti; Papelcint; C.E.P.S.A.:											
Paraná river area, Province of Buenos Aires									Salicaceae	Semi-chemical, sulphate	It is not thought likely that any of these projects will be functioning by 1965
Papelera Argentina:											
Bernal (Province of Bs. As.)			30	30			16	16	Salicaceae	Semi-chemical, cold soda	Pulp plant under construction; new paper-making machine ordered
Papelera Hurlingham:											
Campana (Province of Bs. As.)			12	12							New paper-making plant began to operate in 1962
Las Palmas Chaco Austral:											
Las Palmas (Chaco)			6	6			4	4	Bagasse		New plant in operation since 1961
Celulosa Argentina:											
Cap. Bermúdez (Sta. Fe)		10		10			15	15	Salicaceae eucalypts	Chemical, sulphate	Expansion of paper-making plants (50,000 tons capacity) and sulphate pulp plants (10,000 tons)
Celulosa Argentina:											
Zárate (Province of Bs. As.)	6	24		30	10		25	35	Salicaceae	Semi-chemical, cold soda	Both the semi-chemical plant and the new paper-making machine (30,000 tons) were in operation in 1962. Expansion plans for newsprint and mechanical pulp production far advanced
Villa Constitución (Sta. Fe)			3	3			3	3	Grain straw	Semi-chemical	New plant in operation since December 1960
Scholnik			—	—			—6	6	Grain straw	Semi-chemical	The plant closed down in 1960
Celulosa Bell Ville:											
Bell Ville, Córdoba			3	3			2	2	Grain straw	Semi-chemical	New plant in operation since 1959
Mancusso y Rossi:											
San Justo, Province Bs. As.			5	5							New plant in operation since 1960
Papelcynt:											
Quilmes, Province Bs. As.			3	3							New plant in operation since 1959
Papelera M. del Plata:											
M. del Plata (Province of Bs. As.) ..			3	3							New plant in operation since 1961

Papelera Tan i :										
Tandil, Province Bs. As.			2	2						New plant in operation since 1960
Industrias Arg. del papel:										
Córdoba			6	6			5	5	Eucalypts and pine	Semi-chemical	Expansion of paper-making plant (5,400 tons) and new pulp section
Tertelman:										
Avellaneda, Province Bs. As.			3	3	7		—1	6			Expansion of paper-making plant (9,500 tons) and new mechanical pulp section The present semi-chemical pulp plant based on straw is to be closed down
	6	59	116	181	17	—	92	109			
Brazil:										
Fabricadora de Papel:										
São Paulo		3	5	8							Expansion of paper-making plant of 22,000 tons capacity
Champion Celulose:										
Mogi Guaçu, São Paulo			—	—		8	37	45	Araucaria and eucalypts	Chemical, sulphate	New plant in operation since 1960
Suzano:										
Suzano, São Paulo		25	10	35			25	25	Eucalypts	Chemical, sulphate	Expansion of paper-making (9,600 tons capacity) and pulp plants (15,000 tons)
Papirus:										
Av. Cascalhos, São Paulo		5		5							New plant in operation since 1959
Mari Kraft:										
Suzano, São Paulo			2	2							New plant in operation since 1961
Simão S.A.:										
Jacarey, São Paulo							15	15	Eucalypts	Chemical, sulphate	Expansion of plant of 10,000 tons capacity
Simão S.A.:										
Mogi das Cruces, São Paulo		10		10					—		Expansion of plant of 25,000 tons capacity
Macuco:										
Limeira, São Paulo			2	2							New plant
Rigesa:										
Valinhos, São Paulo							10	10	Bagasse	Semi-chemical, soda	Expansion of plant of 6,000 tons capacity
Refinadora Paulista:										
Piracicaba, São Paulo		3	—	3			5	5	Bagasse	Chemical, Pomilio-Celdecor	Expansion of paper-making plant (15,000 tons capacity) and pulp plant (7,000 tons)
Cicero Prado:										
Pindamonhangaba, São Paulo		10		10			20	20	Eucalypts	Chemical, sulphate	Expansion of paper-making plant of 12,000 tons capacity; new pulp plant began operations in 1962
Celulose Brasileira:										
Aparecida do M. São Paulo							17	17	Eucalypts	Chemical	Expansion of plant of 3,000 tons capacity
Melhoramentos:										
Caieiras, São Paulo		2	4	6			5	5	Eucalypts	Chemical	Expansion of paper-making plant (24,000 tons capacity) and pulp plant (10,000 tons)
Mattarazzo:										
São Paulo		8		8			5	5	Eucalypts		Expansion of paper-making plant (18,000 tons capacity) and pulp plant (7,500 tons)
Sta. Helena:										
Rua Marures, São Paulo			5	5							New plant began operations in 1962
Rio Claro:										
Rio Claro, São Paulo			3	3							New plant under construction

Appendix I (*continued*)

Name and location	*Paper and board*				*Paper pulp*				*Fibrous raw material used in pulp manufacture*	*Semi-chemical and chemical pulp production process*	*Remarks*
	Newsprint	*Printing and writing paper*	*Other paper and board*	*Total*	*Mechanical*	*Chemical (long fibre)*	*Semi-chemical and chemical (short fibre)*	*Total*			
Brazil (continued)											
Klabin: Montealegre, Paraná						10		10	Araucaria	Chemical, sulphite	Expansion of long-fibre pulp plant of 30,000 tons capacity
Klabin: Montealegre, Paraná			15	15			10	10	Eucalypts and broadleaved species in the area	Chemical, sulphate	Expansion of short-fibre pulp plant of 20,000 tons capacity and paper-making plant of 10,000 tons
Klabin: Montealegre, Paraná	95			95	75			75	Araucaria		Expansion of newsprint plant of 55,000 tons capacity
Klabin: Lagos, Sta. Catarina			44	44		44		44	Araucaria and pine	Chemical, sulphate	Project for new plant far advanced
Lutcher: Guarapuava, Paraná						45		45	Araucaria	Chemical, sulphate	Plant under construction; financial assistance from IDB
Cambará: Cambará, Rio Grande						15		15	Araucaria	Chemical, sulphite	Expansion of plant of 15,000 tons capacity
Celulose e papel: Canela, Rio Grande						5		5	Araucaria	Chemical, sulphite	Expansion of plant of 3,600 tons capacity
Olin Kraft: Canoas, Sta. Catarina			15	15		15		15	Araucaria	Chemical, sulphite	Expansion of plant of 10,000 tons capacity
Portella: Jaboatao, Pernambuco			18	18		—3		—3	Agave	Semi-chemical	Expansion of paper-making plant of 12,000 tons capacity; the equipment for pulp processing was transferred to Sackraft
Sackraft: Jaboatao, Pernambuco						20		20	Agave	Chemical, sulphate	New plant in operation since 1959; replacing Portella
Industria de Celulose: Salvador, Bahia		8		8		3		3	Bamboo		New plant at advanced stage of study
Cia. Ind. Celulose e Papel: Cidade Industrial, Sergipe			10	10		4		4	Bamboo	Semi-chemical	New plant in operation since 1960
	95	74	133	302	75	166	149	390			
Chile											
Manufacturera Papeles y Cartón: Laja, Bio Bio			20	20		220	—	220	Pine (90 per cent) and eucalypts	Chemical, sulphate	New plant began operations in 1959 with 70,000 tons pulp capacity and 12,000 tons paper-making capacity; in 1961 pulp capacity increased to 80,000 tons; plans for expanding to 220,000 and 20,000 tons respectively are far advanced
Manufacturera Papeles y Cartón: San Pedro, Concepción	20		3	23	15			15	Pine		Expansion of newsprint plant of 40,000 tons capacity already carried out and working

Manufacturera Papeles y Cartón:											
Pte. Alto, Santiago		12	3	15			—3	—3	Wheat straw	Chemical, Pomilio-Celdecor	Expansion of plant of 40,000 tons; Pomilio-Celdecor pulp plant closed down
Industrias Forestales:											
Nacimiento, Bio Bio	70			70	60	15		75	Pine	Chemical, sulphite	New plant under construction
Fanapel:											
Santiago			2	2							New plant in operation since 1961
Schorr & Concha:											
Talca			3	3							Expansion of plant of 2,000 tons capacity
Leandro Pons:											
Viña del Mar			2	3							Expansion of plant of 2,000 tons capacity
	90	12	34	136	75	235	—3	307			
Colombia											
Papeles Nacionales (Kruger):											
Pereira (Caldas)			3	3							New plant in operation since 1962
Papeles Finos S.A.:											
Bogotá		4	2	6			4	4	Straw	Soda	Plant under construction
Cartón de Colombia:											
Yumbo, Calí			44	44			—3	—3	Bagasse	Semi-chemical	Expansion of plant of 45,000 tons; small pulp plant closed down
Cartón de Colombia:											
Yumbo, Calí							18	18	Tropical woods	Semi-chemical	New pulp plant in operation since June 1959
Celulosa y Papel de Colombia:											
Pto. Isaacs, Calí							17	17	Tropical woods	Chemical, sulphate	Project for new pulp plant far advanced; financial assistance from IDB
Propal (Grace, International):											
Yumbo, Calí		40	10	50			40	40	Bagasse	Chemical, sulphate	New plant in operation since end of 1961
		44	59	103			76	76			
Costa Rica											
Fca. La Perla:											
Ramal Monte Verde			—2	—2			—2	—2	Abaca	Chemical	Plant closed down; equipment unusable
Cuba											
Técnica Cubana:											
Cardenas, Matanza	30			30			30	30	Bagasse	Chemical, sulphate	New plant in operation since 1959
Pulpacuba:											
Sta. Clara, Las Villas		20	10	30			20	20	Bagasse	Chemical, soda	New plant in operation since 1960
Damuji:											
Trinidad, Las Villas			20	20			15	15	Bagasse	Chemical, soda	New plant; according to the latest information (1960) it was then under construction
Papelera Moderna:											
La Habana			28	28			—	—			Expansion of paper-making plant
	30	20	58	108			65	65			

Appendix I (*continued*)

Name and location	*Paper and board*				*Paper pulp*				*Fibrous raw material used in pulp manufacture*	*Semi-chemical and chemical pulp production process*	*Remarks*
	Newsprint	*Printing and writing paper*	*Other paper and board*	*Total*	*Mechanical*	*Chemical (long fibre)*	*Semi-chemical and chemical (short fibre)*	*Total*			
Ecuador											
Grace y Cía.	—		2	2							Project at initial stage
Guatemala											
Industria Papelera Centroamericana: Esquintla	—		14	14							Project for expansion of plant of 1,000 tons capacity far advanced
Mexico											
Empaques Titán: Monterrey, N. León			20	20			20	20	Wheat straw	Chemical, sulphate	Expansion of paper-making plant (30,000 tons capacity) and pulp plant (10,000 tons) in operation since 1961
Maldonado: Monterrey, N. León			3	3							Expansion of plant of 3,500 tons capacity which began operations in 1962
Atenquique: Atenquique, Jalisco			30	30			30	30	Bagasse	Chemical	Project under study for expanding paper-making plant (30,000 tons capacity) and pulp plant (30,000 tons)
Chihuahua: Anahuac, Chihuahua					30			30	Pine	Chemical, sulphate	Project under study for expanding plant of 40,000 tons capacity
El Carmen: Ing. Del Carmen, Veracruz							1	1	Bagasse	Chemical, soda	New plant in operation since 1961
Celfinex: Apizaco, Tlaxcala							3	3	Straw and rags	Chemical, soda	New plant in operation since 1961
Cartonera Sago: Atizapán de Zaragoza, State of Mexico			5	5							New plant in operation since 1961
San Rafael: San Rafael, State of Mexico					18			18	Pine	Chemical, sulphate	Expansion of sulphate pulp section of 15,000 tons capacity which began operations in 1962
San Rafael: Progreso Industrial, State of Mexico	3	5	8								Expansion of plant of 15,000 tons capacity
Fca. Papel México: Ayotla, State of Mexico	18		18								New plant in operation since 1959
Cía. Ind. de Ayotla: Ayotla, State of Mexico							10	10	Bagasse	Chemical, soda	New plant in operation since 1961
San Cristóbal: Km. 22 Carretera Laredo, State of Mexico	10		10				30	30	Bagasse	Chemical, soda	Expansion of paper-making plant (10,000 tons capacity) and pulp plant (20,000 tons)

Kimberley Clark (La Aurora):										
S. Bartolo Naucalpan, State of Mexico	4	2	6		3		3	Flax	Chemical, soda	Expansion of paper-making plant (9,000 tons capacity) to take effect in 1963; new pulp plant to start operations in 1963
Empaques Modernos San Pablo:										
Mexico D.F.		30	30							New plant in operation since 1961
Loreto y Peña Pobre:										
Tlalpan, Mexico D.F.	10	5	15		15		15	Pine	*Chemical*, sulphate	*Expansion of paper-making plant (20,000* tons capacity) and pulp plant (15,000 tons) to be operative by 1964
La Sobana:										
Carretera Laredo, State of Mexico ...		3	3			2	2	Banana stalks		New plant in operation since 1959
Fca. Santa Clara:										
Carretera Laredo, State of Mexico ...		5	5							New plant in operation since 1959
Celulosa Mairó:										
Carretera Puebla, State of Mexico						2	2	Bagasse		New plant in operation since 1960
Tuxtepec:										
Textepec, Oaxaca	10		10	8		8	8	Pine		Part of the capacity (10,000 tons) in 1958 was used from 1959 onwards to manufacture printing and writing paper; a project is also under way to expand newsprint capacity by 10,000 tons
	55	108	163	8	66	98	172			
Panama										
Fca. Interamericana de Papel		20	20							Project for new plant under study (at initial stage)
Peru										
Paramonga:										
Paramonga	10	20	30			15	15	Bagasse	Chemical, soda	Expansion of paper-making plant (40,000 tons capacity) and pulp plant (25,000 tons)
Papelera Peruana:										
Chosica		5	5							Expansion of paper-making plant of 7,000 tons capacity
Papeles y Derivados:										
Atocongo		3	3							New plant under construction
Sanitaria Peruana:										
Atocongo		2	2							New plant under construction
Pasta Mecánica del Perú:										
Atocongo				6			6	Eucalypts		New plant under construction
	10	30	40	6		15	21			
Uruguay										
Pamer:										
Mercedes						4	4	Salicaceae	Semi-chemical neutral sulphite	In operation since 1960
Pamer:										
Mercedes				2			2	Pine		In operation since 1960
I.P.U.S.A.:										
Pando	—	—		1			1	Pine		In operation since 1961
				3		4	7			

Appendix I (*continued*)

Name and location	*Paper and board*				*Paper pulp*				*Fibrous raw material used in pulp manufacture*	*Semi-chemical and chemical pulp production process*	*Remarks*
	News-print	*Printing and writing paper*	*Other paper and board*	*Total*	*Mechanical*	*Chemical (long fibre)*	*Semi-chemical and chemical (short fibre)*	*Total*			
Venezuela											
Venepal:											
Morán			48	48			25	25	Bagasse	Chemical, soda	Expansion of paper-making plant (35,000 tons capacity) and new pulp section in operation since 1961
Fca. Papel Maracay:											
Maracay			20	20							Expansion of paper-making plant of 6,000 tons capacity
Papeles Venezolanos (Kruger):											
Guacara			6	6							Expansion of paper-making plant of 5,000 tons capacity
Cartón de Venezuela:											
Petare, Caracas			4	4							Expansion of paper-making plant of 7,000 tons capacity
Cartones Nacionales (C. Corp.):											
Valencia			22	22							New plant began operations in 1962
Papelera Continental:											
Valencia			3	3							New plant under construction
Manufacturas de Papel:											
Maracay			9	9							New plant under construction
SUB-TOTAL	—	—	112	112			25	25			
LATIN AMERICA, TOTAL	221	274	684	1,179	184	467	519	1,170			

Appendix II. Latin America: estimated balance-sheet of supply and demand in respect of pulp, paper and paperboard, 1965

(Thousands of tons annually)

Country	Pulp				Paper and board			
	Mechanical	*Long-fibre chemical*	*Short-fibre chemical and semi-chemical*	*Total*	*News-print*	*Printing and writing paper*	*Other paper and board*	*Total*
Argentina								
Capacity in 1958	20	10	86	116	20	99	299	418
Additions 1959-65	17	—	92	109	6	59	116	181
Capacity in 1965	37	10	178	225	26	158	415	599
Estimated production in 1965	33	9	160	202	22	130	334	486
Projected demand	46	145	160	351	175	134	340	649
Deficit (—) or surplus for export	—13	—136	—	—149	—153	—4	—6	—163
Brazil								
Capacity in 1958	75	72	138	285	66	134	319	519
Additions 1959-65	75	166	149	390	95	74	133	302
Capacity in 1965	190[a]	238	287	715[a]	161	248[a]	412[a]	821[a]
Estimated production in 1965	171	218	257	646	153	225	375	753
Projected demand	171	218	207	596	334	235	386	455
Deficit (—) or surplus for export	—	—	+50	+50	—181	—10	—11	—202
Chile								
Capacity in 1958	53	—	3	56	52	14	30	96
Additions 1959-65	75	235	—3	307	90	12	34	136
Capacity in 1965	128	235	—	363	142	26	64	232
Estimated production in 1965	122	223	—	345	135	25	60	220
Projected demand	122	81	—	203	40	28	64	132
Deficit (—) or surplus for export	—	+142	—	+142	+95	—3	—4	+88
Colombia								
Capacity in 1958	—	—	3	3	—	3	52	55
Additions 1959-65	—	—	76	76	—	44	59	103
Capacity in 1965			79	79		47	111	158
Estimated production in 1965	—	—	71	71	—	43	100	143
Projected demand	9	34	71	114	44	46	102	192
Deficit (—) or surplus for export	—9	—34	—	—43	—44	—3	—2	—49
Cuba								
Capacity in 1958	—	—	—	—	—	3	56	59
Additions 1959-65	—	—	65	65	30	20	58	108
Capacity in 1965			65	65	30	23	114	167
Estimated production in 1965			60	60	27	21	103	151
Projected demand	12	48	60	120	59	34	166	259
Deficit (—) or surplus for export	—12	—48	—	—60	—32	—13	—63	—108
Mexico								
Capacity in 1958	59	111	53	223	30	74	293	397
Additions 1959-65	8	66	98	172	—	55	108	163
Capacity in 1965	67	177	151	395	30	129	487[a]	646[a]
Estimated production in 1965	57	159	134	350	27	116	438	581
Projected demand	57	209	134	400	135	132	468	735
Deficit (—) or surplus for export	—	—50	—	—50	—108	—16	—30	—154
Peru								
Capacity in 1958	—	—	28	28	—	5	49	54
Additions 1959-65	6	—	15	21	—	10	30	40
Capacity in 1965	6	—	43	49	—	15	79	94
Estimated production in 1965	5	—	39	44	—	13	60	73
Projected demand	5	16	39	60	30	14	62	106
Deficit (—) or surplus for export	—	—16	—	—16	—30	—1	—2	—33
Uruguay								
Capacity in 1958	3	—	5	8	—	13	28	41
Additions 1959-65	3	—	4	7	—	—	—	—
Capacity in 1965	6	—	9	15	—	15[a]	33[a]	48[a]
Estimated production in 1965	5	—	8	13	—	13	30	43
Projected demand	5	13	11	29	35	15	32	82
Deficit (—) or surplus for export	—	—13	—3	—16	—35	—2	—2	—39

Appendix II (*continued*)

Country	Pulp				Paper and board			
	Mechanical	*Long-fibre chemical*	*Short-fibre chemical and semi-chemical*	*Total*	*Newsprint*	*Printing and writing paper*	*Other paper and board*	*Total*
Venezuela								
Capacity in 1958	—	—	—	—	—	—	55	55
Additions 1959-65	—	—	25	25	—	—	112	112
Capacity in 1965	—	—	25	25	—	—	167	167
Estimated production in 1965	—	—	23	23	—	—	150	150
Projected demand	7	67	23	97	44	49	162	255
Deficit (—) or surplus for export	—7	—67	—	—74	—44	—49	—12	—105
Other countries								
Capacity in 1958	—	—	6	6	—	—	10	10
Additions 1959-65	—	—	—2	—2	—	—	34	34
Capacity in 1965	—	—	4	4	—	—	44	44
Estimated production in 1965	—	—	4	4	—		40	40
Projected demand	4	18	4	26	42	21	73	136
Deficit (—) or surplus for export	—4	—18	—	—22	—42	—21	—33	—96
Latin America: total								
Capacity in 1958	210	193	322	725	168	345	1,191	1,704
Additions 1959-65	184	467	519	1,170	221	274	684	1,179
Capacity in 1965	434	660	841	1,935	389	661	1,926	2,976
Estimated production in 1965	393	609	756	1,758	364	586	1,690	2,640
Projected demand	438	849	709	1,996	938	708	1,855	3,501
Deficit (—) or surplus for export	—45	—240	+47	—238	—574	—122	—165	—861

NOTES: No agreement has been reached in Latin America on how to define the capacity of pulp and paper plants. However, it is generally believed that there is a tendency to exaggerate production possibilities somewhat. For this reason, and also because of certain factors having an adverse effect on the operating conditions of the industry in Latin America, such as the antiquated state of machinery and equipment in both pulp and paper plants, shortcomings in the fibrous raw material used by pulp plants, especially in the case of agricultural residues, frequent changes in the paper production lines, etc., it was decided to take 90 per cent as the average future coefficient of utilization, since it will be difficult to eliminate the unfavourable effect of those factors in the short time that remains before 1965. Moreover, in announcing new projects, capacity is usually allotted on the basis of the maximum theoretical production possibilities. Whenever a different hypothesis has been adopted, this is indicated in the notes for the individual countries, as given below.

Argentina:

(a) *Pulp:* it has been assumed that, with the addition of new plants and the closure of others, operating conditions will improve and utilization of capacity will be 90 per cent.

(b) *Paper and board:* if capacity in 1965 is utilized to the same extent as in 1958—approximately 85 per cent—and 10,000 tons of special papers have to be imported, paper and board production (excluding newsprint) will exceed demand by about 23,000 tons. As it is highly unlikely that such a surplus could be exported, it has been assumed that production will continue more or less in line with demand, as it has been up to now, and that only a small quantity of special papers will be imported. This implies either that the already low utilization coefficient will drop from 85 to 81 per cent or that the entry into operation of some additional capacity will be postponed.

Brazil:

(a) *Pulp:* according to the data recorded, installed capacity for mechanical pulp will be only 150,000 tons whereas demand will amount to 171,000 tons. It has been estimated that imports will not be necessary, since there is a large amount of capacity lying idle or scarcely utilized that could easily supply the deficit. On the assumption of 90 per cent utilization for all pulps, it has been estimated that installed capacity for mechanical pulp will be 190,000 tons, instead of 150,000 as indicated in the table.

(b) *Paper and board:* ninety-five per cent utilization of capacity has been assumed for newsprint, the same as in 1958. In the case of other paper and board, it has been assumed that production will utilize 90 per cent of installed capacity, and that about 21,000 tons of special papers will therefore have to be imported. The figures for capacity in 1965 presented in the table under the head of "Printing and writing paper" and "Other paper and board" seem to indicate that there will be a shortage of capacity for the former and a surplus for the latter. The disparity is probably due to shortcomings in the data, since the most likely assumption is that capacity will match demand in both cases, and that the only imports required will be a limited quantity of special papers, 10,000 tons of printing and writing paper and 11,000 of other paper and board. The 208,000 tons capacity allotted to printing and writing paper would thus rise to 248,000, and the 452,000 tons for other paper and board would drop to 412,000 tons. In other words, this adjustment leaves total capacity the same as it would be according to table 7—821,000 tons.

Chile: In view of the conditions in which the pulp and paper industry is developing and the prevailing definition of capacity, a utilization coefficient of 95 per cent has been adopted.

Cuba and Colombia: Utilization coefficients of 90 per cent have been adopted for pulp and paper.

Mexico:

(a) *Pulp:* owing to the particular conditions in which the mechanical pulp plants are operating (e.g. insufficient wood) a utilization coefficient of 85 per cent has been assumed. For other pulps, 90 per cent has been generally assumed.

(b) *Paper and board:* for newsprint, and printing and writing paper, 90 per cent. In the case of "Other paper and board" it has been assumed that capacity will increase in step with demand, and that the apparent shortage of capacity is due to deficiencies in the data. It has accordingly been estimated that capacity in 1965 will be 487,000 tons instead of 401,000 tons, as the table indicates.

Peru:

(a) *Pulp:* ninety per cent utilization assumed.

(b) *Paper and board:* the figure for installed capacity paper and board in 1965, namely 94,000 tons, is far above the 73,000 tons representing the output required to cover demand, except for 3,000 tons of special papers which will have to come from

abroad as before. This means that the utilization coefficient will have to be kept very low (78 per cent) or else that the entry into operation of some of the additional capacity will have to be deferred.

Uruguay:

(a) *Pulp:* ninety per cent utilization assumed.

(b) *Paper and board:* although no information has been received on plans to expand capacity between 1959 and 1965, it has been estimated that in 1965 only 4,000 tons of special papers will be imported, apart from the newsprint required. This is tantamount to assuming that capacity for producing 15,000 tons of printing and writing paper and 47,000 tons of other paper and board will be installed provided that utilization is 90 per cent. The increases in other categories would be 2,000 and 5,000 tons respectively.

Venezuela: The degree of utilization assumed in all cases is 90 per cent.

Other countries: As for Venezuela.

[a] The figures for "capacity in 1965" do not coincide with the sum of capacity in 1958 plus additions in 1959-65, since the following adjustments have been made, the reasons being given in the comments on individual countries:

Brazil:

(i) *Mechanical pulp.* Capacity in 1965, which according to the figures in the table should be 150,000 tons, has been increased to 190,000 tons (increment of 40,000).

(ii) *Printing and writing paper.* Capacity in 1965, which according to the figures in the table should be 208,000 tons, has been increased to 248,000 tons (increment of 40,000).

(iii) *Other paper and board.* Capacity in 1965, which according to the figures in the table should be 452,000 tons, has been reduced to 412,000 tons (decrease of 40,000).

In other words, total pulp capacity in 1965 has been increased by 40,000 tons.

Mexico: Other paper and board. Capacity in 1965, which according to the figures in the table should be 401,000 tons, has been increased to 487,000 tons (increment of 86,000).

In other words, total paper and board capacity in 1965 has been increased by the same amount—86,000 tons.

Uruguay:

(i) *Printing and writing paper.* Capacity in 1965, which according to the figures in the table should be 13,000 tons, has been increased to 15,000 tons (increment of 2,000).

(ii) *Other paper and board.* Capacity in 1965, which according to the figures in the table should be 28,000 tons, has been increased to 33,000 tons (increment of 5,000).

In other words, total paper and board capacity in 1965 has been increased by 7,000 tons.

Total: Latin America: Mechanical pulp and total pulp capacity in 1965 has been increased by 40,000 tons in each case, capacity for printing and writing paper by 42,000 tons, for other paper and board by 51,000 tons and for total paper and board by 93,000 tons.

Appendix III. Latin America: estimated composition of fibrous raw material by countries, 1965

Country	*Long-fibre chemical pulp*		*Short-fibre chemical and semi-chemical pulp*		*Mechanical pulp*		*Waste paper*		*Total*	
	Tons per ton of paper	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*
Argentina										
Newsprint	0.10	2	0.20	4	0.75	17	—	—	1.05	23
Printing and writing paper	0.20	26	0.55	72	0.10	13	0.15	19	1.00	130
Other paper and board	0.35	117	0.25	84	0.05	16	0.43	144	1.08	361
Total paper and board	0.30	145	0.33	160	0.09	46	0.34	163	1.06	514
Brazil										
Newsprint	0.20	31	—	—	0.85	130	—	—	1.05	161
Printing and writing paper	0.25	56	0.50	113	0.10	32	0.15	34	1.00	225
Other paper and board	0.35	131	0.25	94	0.05	19	0.43	161	1.08	405
Total paper and board	0.29	218	0.28	207	0.23	171	0.26	195	1.06	791
Chile										
Newsprint	0.20	27	—	—	0.85	115	—	—	1.05	142
Printing and writing paper	0.60	15	—	—	0.15	4	0.25	6	1.00	25
Other paper and board	0.65	39	—	—	0.05	3	0.38	23	1.08	65
Total paper and board	0.37	81	—	—	0.55	122	0.13	29	1.05	232
Colombia										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.20	9	0.60	26	0.10	4	0.10	4	1.00	43
Other paper and board	0.25	25	0.45	45	0.05	5	0.33	33	1.08	108
Total paper and board	0.24	34	0.50	71	0.06	9	0.26	37	1.06	151
Cuba										
Newsprint	—	—	1.05	28	—	—			1.05	28
Printing and writing paper	0.30	6	0.45	10	0.10	2	0.15	3	1.00	21
Other paper and board	0.40	42	0.22	22	0.10	10	0.36	37	1.08	111
Total paper and board	0.32	48	0.40	60	0.08	12	0.26	40	1.06	160

Appendix III (*continued*)

Country	*Long-fibre chemical pulp*		*Short-fibre chemical and semi-chemical pulp*		*Mechanical pulp*		*Waste paper*		*Total*	
	Tons per ton of paper	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*
Mexico										
Newsprint	0.20	5	—	—	0.85	23	—	—	1.05	28
Printing and writing paper	0.25	29	0.40	46	0.10	12	0.25	29	1.00	116
Other paper and board	0.40	175	0.20	88	0.05	22	0.43	188	1.08	473
Total paper and board	0.36	209	0.23	134	0.09	57	0.38	217	1.06	617
Peru										
Printing and writing paper	0.10	1	0.65	9	0.15	2	0.10	1	1.00	13
Other paper and board	0.20	15	0.50	30	0.05	3	0.33	17	1.08	65
Total paper and board	0.18	16	0.53	39	0.07	5	0.29	18	1.07	78
Uruguay										
Printing and writing paper	0.25	3	0.40	5	0.15	2	0.20	3	1.00	13
Other paper and board	0.35	10	0.20	6	0.10	3	0.43	13	1.08	32
Total paper and board	0.30	13	0.26	11	0.12	5	0.37	16	1.05	45
Venezuela										
Paper and board (excluding paper for cultural uses)	0.45	67	0.15	23	0.05	7	0.43	65	1.08	162
Other countries										
Paper and board (excluding paper for cultural uses)	0.45	18	0.10	4	0.10	4	0.43	17	1.08	43
TOTAL: LATIN AMERICA										
Newsprint	0.18	65	0.09	32	0.78	285	—	—	1.05	382
Printing and writing paper	0.25	145	0.48	281	0.10	61	0.17	99	1.00	586
Other paper and board	0.38	639	0.24	396	0.05	92	0.41	698	1.08	1,825
Total paper and board	0.32	849	0.27	709	0.17	438	0.30	797	1.06	2,793

Appendix IV. Latin America: estimated composition of fibrous raw material by countries, 1975

Country	*Long-fibre chemical pulp*		*Short-fibre chemical and semi-chemical pulp*		*Mechanical pulp*		*Waste paper*		*Total*	
	Tons per ton of paper	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*
Argentina										
Newsprint	0.15	17	0.15	16	0.75	83	—	—	1.05	116
Printing and writing paper	0.20	41	0.55	114	0.10	21	0.15	31	1.00	207
Other paper and board	0.35	185	0.25	133	0.05	26	0.43	227	1.08	571
Total	0.29	243	0.31	263	0.15	130	0.31	258	1.06	894
Brazil										
Newsprint	0.15	68	0.15	69	0.75	341	—	—	1.05	478
Printing and writing paper	0.20	88	0.50	221	0.10	44	0.20	88	1.00	441
Other paper and board	0.35	262	0.25	187	0.05	37	0.43	321	1.08	807
Total	0.25	418	0.30	477	0.26	422	0.24	409	1.05	1,726

Appendix IV (*continued*)

Country	*Long-fibre chemical pulp*		*Short-fibre chemical and semi-chemical pulp*		*Mechanical pulp*		*Waste paper*		*Total*	
	Tons per ton of paper	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*	*Tons per ton of paper*	*Total requirements (thousands of tons)*
Chile										
Newsprint	0.20	72	—	—	0.85	303	—	—	1.05	375
Printing and writing paper	0.60	27	—	—	0.20	9	0.20	9	1.00	45
Other paper and board	0.65	70	—	—	0.10	11	0.33	35	1.08	116
Total	0.33	169	—	—	0.63	323	0.09	44	1.05	536
Colombia										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.15	12	0.60	47	0.05	4	0.20	15	1.00	78
Other paper and board	0.25	46	0.45	83	0.05	9	0.33	60	1.08	198
Total	0.22	58	0.50	130	0.07	13	0.27	75	1.06	276
Cuba										
Newsprint	—	—	1.05	42	—	—	—	—	1.05	42
Printing and writing paper	0.15	8	0.70	36	—	—	0.15	8	1.00	52
Other paper and board	0.25	63	0.40	101	—	—	0.43	109	1.08	273
Total	0.20	71	0.52	179	—	—	0.34	117	1.06	367
Mexico										
Newsprint	0.10	17	0.20	33	0.75	125	—	—	1.05	175
Printing and writing paper	0.25	64	0.50	129	0.10	26	0.15	39	1.00	258
Other paper and board	0.25	240	0.40	386	0.05	48	0.38	368	1.08	1,042
Total	0.23	321	0.39	548	0.14	199	0.30	407	1.06	1,475
Peru										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.15	4	0.60	15	0.10	2	0.15	4	1.00	25
Other paper and board	0.20	23	0.45	51	0.05	6	0.38	43	1.08	123
Total	0.19	27	0.43	66	0.06	8	0.38	47	1.06	148
Uruguay										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.20	4	0.50	9	0.10	2	0.20	3	1.00	18
Other paper and board	0.35	14	0.25	10	0.10	4	0.38	15	1.08	43
Total	0.28	18	0.36	19	0.10	6	0.31	18	1.05	61
Venezuela										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.25	21	0.45	36	0.10	8	0.20	16	1.00	81
Other paper and board	0.30	122	0.40	163	—	—	0.38	155	1.08	440
Total	0.29	143	0.41	199	0.02	8	0.35	171	1.07	521
Other countries										
Newsprint	—	—	—	—	—	—	—	—	—	—
Printing and writing paper	0.25	3	0.55	7	—	—	0.20	3	1.00	13
Other paper and board	0.35	38	0.25	28	0.10	11	0.38	41	1.08	118
Total	0.33	41	0.29	35	0.09	11	0.36	44	1.07	131
LATIN AMERICA: TOTAL										
Newsprint	0.15	174	0.14	160	0.76	852	—	—	1.05	1,186
Printing and writing paper	0.22	272	0.50	614	0.10	116	0.18	216	1.00	1,218
Other paper and board	0.31	1,063	0.33	1,142	0.04	152	0.40	1,374	1.08	3,731
Total	0.26	1,509	0.33	1,916	0.19	1,120	0.28	1,590	1.06	6,135
Domestic production		1,319		1,916		1,075		1,590		5,900

Appendix V. Latin America: estimated fibrous raw material requirements for production of paper pulp, 1958-59, 1965 and 1975

Type of pulp	Pulp production (thousands of tons) 1958-59	1965	1975	Proportion of each type (percentage) 1958-59	1965	1975	Fibrous raw material requirements: Per ton of pulp produced (cubic metres of roundwood) 1958-59	1965	1975	Total amount (thousands of cubic metres of roundwood) 1958-59	1965	1975	Type of raw material
1. *From wood*													
Mechanical	181	360	805	33	23	25	2.55	2.55	2.55	460	920	2,050	Coniferous
	17	33	270				2.10	2.10	2.10	35	70	570	Broadleaved species
Chemical, long fibre	185	580	1,200	30	33	28	5.00	5.00	5.00	925	2,900	6,000	Coniferous
Chemical, short fibre	80	244	765	13	14	18	4.00	4.00	4.00	320	980	3,100	Broadleaved species, especially eucalypts
Semi-chemical	6	76	100	1	4	2	2.90	2.90	2.90	20	220	300	Broadleaved species
TOTAL	469	1,293	3,140	77	74	73	3.80	3.90	3.80	1,760	5,090	12,020	
										1,385	3,820	8,050	Coniferous
										375	1,270	3,970	Broadleaved species
							Tons, bone dry			*Thousands of tons, bone dry*			
2. *From other fibres*													
Chemical, long fibre	10	29	120	2	2	3	3.00	3.00	3.00	30	90	360	Agave and bamboo
Chemical, bagasse	72	334	920	12	19	21	3.00	3.00	3.00	220	1,000	2,800	Bagasse
Chemical, other short fibres	44	79	100	7	4	2	2.50	2.50	2.50	110	200	250	Straw, grasses, etc.
Semi-chemical	13	23	30	2	1	1	2.00	2.00	2.00	30	50	60	Straw, grasses, etc.
TOTAL	139	465	1,170	23	26	27	2.80	2.90	3.00	390	1,340	3,470	
GRAND TOTAL	608	1,758	4,310	100	100	100							

Appendix VI. Latin America: estimated production of paper pulp by types and countries, 1958-59, 1965 and 1975

(*Tons*)

Type	*Argentina*	*Brazil*	*Chile*	*Colombia*	*Cuba*	*Mexico*	*Peru*	*Uruguay*	*Venezuela*	*Other countries*	*Total*
1958-59											
1. *Wood-pulp*											
Chemical, long fibre	8,000	63,000	4,000	—	—	110,000	—	—	—	—	185,000
Mechanical	17,000	90,000	47,000	—	—	42,000	—	2,000	—	—	198,000
Chemical, short fibre	20,000	60,000	—	—	—	—	—	—	—	—	80,000
Semi-chemical	1,000	5,000	—	—	—	—	—	—	—	—	6,000
TOTAL	46,000	218,000	51,000	—	—	152,000	—	2,000	—	—	469,000
2. *Pulp from other fibres*											
Chemical, long fibre	—	2,000 8,000	—	—	—	—	—	—	—	—	10,000
Chemical, bagasse	5,000	16,000	—	3,000	5,000	20,000	23,000	—	—	—	72,000
Other chemical, short fibre	20,000	4,000	2,000	—	—	15,000	—	3,000	—	—	44,000
Semi-chemical	10,000	3,000	—	—	—	—	—	—	—	—	13,000
TOTAL	35,000	33,000	2,000	3,000	5,000	35,000	23,000	3,000	—	—	139,000
GRAND TOTAL	81,000	251,000	53,000	3,000	5,000	187,000	23,000	5,000	—	—	608,000
1965											
1. *Wood-pulp*											
Chemical, long fibre	9,000	191,000	223,000	—	—	157,000	—	—	—	—	580,000
Mechanical	33,000	171,000	122,000	—	—	57,000	5,000	5,000	—	—	393,000
Chemical, short fibre	39,000	190,000	—	15,000	—	—	—	—	—	—	244,000
Semi-chemical	51,000	4,000	—	16,000	—	—	—	5,000	—	—	76,000
TOTAL	132,000	556,000	345,000	31,000	—	214,000	5,000	10,000	—	—	1,293,000
2. *Pulp from other fibres*											
Chemical, long fibre	—	9,000 18,000	—	—	—	2,000	—	—	—	—	29,000
Chemical, bagasse	34,000	50,000	—	36,000	60,000	92,000	39,000	—	23,000	—	334,000
Other chemical, short fibre	21,000	5,000	—	4,000	—	42,000		3,000	—	4,000	79,000
Semi-chemical	15,000	8,000	—		—	—					23,000
TOTAL	70,000	90,000	—	40,000	60,000	136,000	39,000	3,000	23,000	4,000	465,000
GRAND TOTAL	202,000	646,000	345,000	71,000	60,000	353,000	44,000	13,000	23,000	4,000	1,758,000
1975											
1. *Wood-pulp*											
Chemical, long fibre	70,000	300,000	429,000	—	—	321,000	—	—	—	81,000	1,201,000
Mechanical Chemical, short fibre Semi-chemical	270,000	779,000	323,000	60,000	20,000	370,000	8,000	22,000	69,000	20,000	1,075,000 766,000 100,000
TOTAL	340,000	1,079,000	752,000	60,000	20,000	691,000	8,000	22,000	69,000	101,000	3,142,000
2. *Pulp from other fibres*											
Chemical, long fibre	—	118,000	—	—	—	—	—	—	—	—	118,000
Chemical, bagasse Other chemical, short fibre Semi-chemical	110,000	120,000	—	70,000	159,000	377,000	66,000	3,000	130,000	15,000	920,000 100,000 100,000
TOTAL	110,000	238,000	—	70,000	159,000	377,000	66,000	3,000	130,000	15,000	1,168,000
GRAND TOTAL	450,000	1,317,000	752,000	130,000	179,000	1,068,000	74,000	25,000	199,000	116,000	4,310,000

Appendix VII. Latin America: manufacturers of equipment for the pulp and paper industry

Name of firm	*Address*	*Main types of equipment manufactured*				*Approximate production capacity (tons/year)*	*Manufacturing licence*
		For pulp processing	*For pulp preparation*	*Paper-making machinery*	*Other paper-making equipment*		
Argentina							
Alco Suizmetal SRL	P. E. Rivera 5286, Bs. Aires	Stainless steel parts				20	
Talleres Coghlan S.A.	Av. Velez Sarsfield 5700, Bs. As.		X	X (4.00m)	X	1,250	Escher Wyss
Fontana Hnos.	Isabel la Católica 70, Bs. Aires	X	X		X	90	
Lipka & Cia.	Av. R. S. Peña 832 (R.26), Bs. As.	X	X		X	65	
Maq-pel SRL	Gazcón 450, Banfields, Bs. Aires		X	X (3.30m)	X	100	
Talleres Met. Parise	Azara 960, Bs. Aires	X	X			30	
Rainoldi S.A.	Balcarce 54, Rosario, Sta. Fe	X	X	X (3.00m)	X	400	
Talleres Sein	M. Acosta 340, Avellaneda, Bs. As.		X	X (2.20m)	X	160	
Est. Ind. Febo SRL	Av. Alcorta 2555, Bs. Aires						
Tamet S.A.	Chacabuco 132, Bs. Aires						
Saglio S.A.	Bdo. de Irigoyen 1470, Bs. Aires					85	
Talleres Nahuel Huapi	N. Huapi 3268, Bs. Aires						
Esswein y Hunter S.A.	D. Taborda 1546, Bs. Aires						
Brazil							
Bardella S.A. Ind. Mec.	Avda. Rudge 500, São Paulo	X	X	X	X	600	Voith
Ind. Mec. Cavallari S.A.	Rua Canindé 234, São Paulo	X	X	X	X	800	Millspaugh
Ga. Federal de Fundiçao	Rua Nery Pinheiro 240, Rio Janeiro	X	X	X	X	1,500	Black Clawson, Nash
Mecanica Pesada S.A.	Av. Ipiranga 1100, São Paulo	X	X	X	X	1,000	Escher Wyss, Batignolles, Kamyr
Estamparia Caravellas S.A.	Rua Caravellas 138, São Paulo						Doerris
Industrias Maquinas D'Andrea S.A.	Rua J. Bonifacio 29, São Paulo				X		
Interaço Ltda.	Rua Washington Luiz 236, São Paulo						
Maquinas Ikemori Ltda.	Rua 15 Novembre 269, São Paulo						
Metalurgica Piracicabana	Rua Riachuelo 1184	X	X			300	Pomilie-Celdecor
Soc. Tecnica I.C. Dorr Oliver Ltda.	Rua 15 Novembre 164, São Paulo	X	X				Dorr-Oliver
Mausa S.A.	Rua Sta. Cruz 1421, São Paulo				X		Metex
Mecanica Jaragua S.A.	Rua da Consolaçao 65, São Paulo	X					
Mueller Irmaos Ltda.	Av. C. de Abreu 127, Curitiba	X			X		
Industrias Mecánicas Do Pari Ltda.	Rua Paganini 190, São Paulo				X		
M. Dedini S.A.	Av. M. Dedini 201, Piracicaba	X					
Mecanica Moderna Ltda.	Rua J. Ribeiro 66				X		

NOTE: This list does not pretend to be exhaustive. It certainly contains the names of the manufacturing firms that devote all or most of their capacity to producing equipment expressly for the pulp and paper industry; but it has not been possible to include more than a few of the many firms that manufacture sporadically for the industry or that do so regularly, though the equipment they produce is not specifically for pulp and paper-making.

CHAPTER VI

LATIN AMERICAN FREE-TRADE AREA

Early in 1960, Argentina, Brazil, Chile, Mexico, Paraguay, Peru and Uruguay established the Latin American Free-Trade Area (LAFTA) by signing the Treaty of Montevideo. Towards the end of 1961, Colombia and Ecuador joined the Association. The possibility of Venezuela joining is now under study by the Association.

Thus we find, brought together in an embryonic customs union, all the significant Latin American pulp and paper producers and consumers, save Cuba and Venezuela—which are of minor importance in relation to Argentina, Brazil and Mexico, and to Chile as the only net exporter of pulp and paper.

It is the intention of the members of the Free-Trade Area to eliminate gradually, over a ten-year period, all restrictions on trade between member countries. At the moment, however, all concessions must still be negotiated individually. A number of such concessions have already been negotiated, including several in the pulp and paper field. Negotiations are now under way with a view to establishing a mandatory time-table for automatic reductions in tariffs, along the lines of the European Economic Community.

1. CUSTOMS DUTIES

Customs duties and other similar charges levied on imports of paper pulp, paper and paperboard now in effect in the major importing countries are summarized in table 29.

2. PROSPECTS FOR INTRA-REGIONAL TRADE

Present trade within the region is largely in sulphate wood-pulp and in newsprint. Brazil exports anually some 5,000 tons of short-fibre bleached sulphate wood-pulp, primarily to Argentina. Chile exports annually about 35,000 tons of long-fibre unbleached and bleached sulphate pulp and 35,000 tons of newsprint, primarily to Argentina, Brazil, and Mexico, but also to other Latin American countries.

The next significant increase in intra-regional trade in pulp and paper can already be foreseen because of new construction under way and a loan about to be granted in Chile. It is estimated that in 1965 Chile will have an annual exportable surplus of 140,000 tons of long-fibre unbleached and bleached sulphate pulp and 95,000 tons of newsprint, after due allowance has been made for expected growth in domestic demand. It is

TABLE 29. LATIN AMERICA: CUSTOMS DUTIES AND OTHER SIMILAR CHARGES LEVIED ON IMPORTS OF PAPER PULP, PAPER AND PAPERBOARD

(Percentage of c.i.f. value)

	Argentina	*Brazil*	*Chile*	*Colombia*	*Ecuador*	*Mexico*	*Peru*	*Uruguay*	*Venezuela*
Mechanical pulp:									
A	28.5	316.0	39.1	31.0	...	5.6	15.7	48.6	16.8
B	0.3	316.0	39.1	5.0	...	5.6	Free	8.6	16.8
Chemical pulp:									
A	28.5	36.0	39.1	28.0	...	21.1[a, b]	15.9	8.6	16.8
B	0.3	7.0	39.1	5.0	...	21.1[a, b]	Free	2.5	16.8
Newsprint:									
A	1.3	1.0	90.0	3.0	18.7	31.5[b]	11.5	2.5	Free
B	1.3	1.0	90.0	1.0	18.7	8.2[b]	Free	Free	Free
Printing and writing paper:									
A	67.5	221.0	90.0	35.8[c]	49.0	79.5[b]	65.1	...	35.1[c]
B	47.5	221.0	90.0	35.8[c]	49.0	79.5[b]	65.1	...	35.1[c]
Kraft paper:									
A	142.5	316.0	Imports	46.3	44.0	82.1	60.7	...	169.0
B	142.5	316.0	forbidden	46.3	44.0	82.1	60.7	...	169.0

NOTE:
A—duties applicable to imports from the rest of the world.
B—duties applicable to the countries members of the Free-Trade Area.

[a] Pulp which is not produced in the country.
[b] An import permit is required.
[c] Writing paper.

TABLE 30. LATIN AMERICA: BALANCE-SHEET OF DOMESTIC NEWSPRINT SUPPLY
(Thousands of tons)

Country	1965		1975	
	Deficit	Surplus	Deficit	Surplus
Argentina	153		153	
Brazil	181		181	
Chile		95		290
Colombia	44		77	
Cuba	32		66	
Mexico	108		110	
Peru	30		57	
Uruguay	35		45	
Venezuela	44		95	
Other countries	42		80	
TOTAL	669	95	864	290
Net regional deficit	574		574	

anticipated that Chile will be able to dispose of this increment within the region by displacement of imports from outside the region and with the help of normal growth in demand within the region, without any further concessions by the members of the Free-Trade Area. New pulp and paper construction under way in the other countries is not expected to do much more than keep up with growth in demand, so that most other countries are likely to continue to be net importers for the foreseeable future.

The projected balance-sheet by countries in 1965 and 1975 for the supply of newsprint and long-fibre wood-pulp is presented in tables 30 and 31. It will be noted that in newsprint, Chile's exportable surplus is a relatively small factor in relation to the deficit anticipated in the other countries. This situation should tend to make Chile's newsprint easy to market. On the other hand, the exportable surplus in long-fibre wood-pulp is expected to grow by 1975 to be a major part of the deficit in the other countries, so that the net regional deficit is projected to be relatively small. This situation would tend to force the exporters within the region to be fully competitive with those outside, unless, of course, an external tariff is placed on wood-pulp by the Free-Trade Area, although this is not expected at present.

Beyond 1965, major concessions by the members of the Free-Trade Area, while external tariffs on other paper and paperboard are kept fairly high, will be needed to stimulate intra-regional trade significantly. It is felt that Chile could well become a major regional supplier of paper and paperboard which require a high percentage of long fibre, such as kraft papers. It is believed that the other producing countries with a long-fibre potential will be hard pressed to keep up with growth of demand in their own countries.

If and when all barriers to free pulp and paper trade among the members of the Free-Trade Area are removed, increased trade in mass-produced paper and paperboard within the region can be expected. Certainly, the least efficient producers, particularly in those countries which now have high protective tariffs, will fall by the wayside. On the other hand, it as been amply demonstrated in other regions that many of the better-managed and equipped small firms can profitably convert their plants to the manufacture of special types of paper and board that are required in relatively small quantities. Competitive influences, which are now little felt, and the effect of broader markets, can be expected to reduce the real cost of all paper and paperboard except perhaps newsprint, thereby contributing to an increase in the region's standard of living.

TABLE 31. LATIN AMERICA: BALANCE-SHEET OF DOMESTIC LONG-FIBRE WOOD-PULP SUPPLY
(Thousands of tons)

Country	1965		1975	
	Deficit	Surplus	Deficit	Surplus
Argentina	136		173	
Brazil	In balance		In balance	
Chile		142		260
Colombia	34		58	
Cuba	48		71	
Mexico	50		In balance	
Peru	16		27	
Uruguay	13		18	
Venezuela	67		143	
Other countries	18			40
TOTAL	382	142	490	300
Net regional deficit	240		190	

ANNEXES

ANNEX I

Trade associations of manufacturers of paper and pulp in Latin America

Country	*Association*	*Address*	*Function*
Argentina	Asociación de fabricantes de papel	Avenida Belgrano 2852 Buenos Aires	To represent the interests of the pulp, paper and board industry
Brazil	Associaçao nacional dos fabricantes de papel	Praça da Republica 386 5° andar—Conjunto 54 São Paulo	To bring together the various branches of the paper industry and to strive for the industry's development by carrying out studies, spreading technical knowledge, co-operating with the public authorities and organizing and maintaining statistical, library, laboratory and other services
Mexico	Cámara nacional de las industrias del papel	Manuel Ma. Contreras N° 133 - 305 Mexico, D.F.	Consists of all the manufacturers of paper, board and pulp in the country
Uruguay	Asociación de Fabricantes de Papel, which is a member of the Union Industrial Uruguaya	Calle treinta y tres N° 1325 Montevideo Uruguay	(*a*) To ensure and protect the development of paper industry and related enterprises and to defend the interests of its members in matters of common concern; (*b*) To undertake such action or negotiations with the public authorities or private individuals as it may deem appropriate in the fulfilment of its aims; (*c*) To develop and promote among paper manufacturers a spirit of solidarity for the defence of their common interests

ANNEX II

Latin America: list of government laboratories conducting technological research on pulp, paper and paperboard

Name	*Address*	*Aims and function*	*Research facilities available*
		ARGENTINA	
Laboratorio Tecnológico, Facultad de Ingeniería Química de La Universidad del Litoral	Stgo. del Estero 2829 Santa Fe, Pcia. de Santa Fe, República Argentina	To undertake technological research (preparation of pulp, study of raw materials, study of processes, analysis of manufacturing costs, etc.) and carry out routine tests for teaching purposes. The research may be carried out either as part of the faculty curriculum or at the request of the industry	Rotary spherical autoclave with direct steam heat and a capacity of 10-15 kg of chips. Alkaline and neutral treatments can be carried out, including the sulphate method Kollergang Hollander beater cylinder paper machine with drying cylinder, with a trim of 0.30 metres and a speed of 3m. per minute Calender Auxiliary equipment enabling the various processes to be carried on continuously, and control equipment e.g. for measuring the degree of refining, a sheet mould, equipment for determining tearing resistance, etc.
Laboratorio de Ensayos de Materiales e Investigaciones tecnológicas de la Provincia de Buenos Aires (L.E.M.I.T.)	Ministerio de Obras Públicas de la Provincia de Buenos Aires, La Plata, Rep. Argentina	To supervise the quality of the materials, structures, machinery, apparatus, instruments, etc., used or consumed in public works or services or by government agencies; and on request to perform the same service for individuals	Special micrometer for measuring the thickness of paper. board, etc. Mullen tester (bursting strength) Tabor-Abraser (abrasion resistance) Amsler horizontal axis tester (tensile strength and stretch) Elmendorf tester (tearing resistance) Schopper tester (folding endurance) Atlas Fadeometer (accelerted aging tests)

ANNEX II (*continued*)

Name	*Address*	*Aims and function*	*Research facilities available*
		ARGENTINA (*continued*)	
		To conduct research, especially on technological processes and operations, aimed at industrial development, and at improvement in the quality of production and in the use made of internationally produced materials and machinery	Koermer type pulper for preparing samples for chemical and physical analysis and the necessary material for chemical tests
		BRAZIL	
Instituto de Pesquisas Tecnológicas	Caixa Postal 7141, São Paulo	(*a*) Study and research on pulp production	Laboratory for chemical analysis of wood and pulp
		(*b*) Study and research on paper manufacture	Laboratory for structural and micrographical studies of wood
		(*c*) Study and research on testing methods and specifications	Equipment for studying cooking methods, including rotating digester, pulper, flat screen, Voith type refiner with bronze or lava fillings, Jokro type grinder, Schopper-Riegler apparatus, Köthen-Rapid type combined sheet forming and drying apparatus, Brecht-Holl fibre classifier. Constant temperature and humidity room, and apparatus for testing tensile strength, bursting strength, folding endurance and tearing resistance
		(*d*) To provide opportunities for specialization to pupils and graduates from the higher technical schools and to technicians from private organizations	
		(*e*) To promote courses of advanced training in special fields for technicians in government departments and in industry	Fourdrinier type Brueder-Kammerer laboratory paper machine
		(*f*) To conduct tests and analyse materials of interest to engineers, industry and public bodies	
		MEXICO	
Instituto Mexicano de Investigaciones Tecnológicas, A.C.	Calz. de Legaria N° 694 Mexico (10) D.F.	(*a*) To contribute to the better use of lignocellulose resources and the manufacture of pulp and cellulose derivatives, by improving knowledge of the nature of the raw materials, studying how to make the best use of existing processes, and developing new processes	Stainless steel rotating digester with a capacity of 22 litres and direct or indirect steam heat at a pressure of 200 lb, equipped with pressure and temperature gauges and a relief valve for taking off gases and liquids for sampling
			Oil bath for eight stainless steel autoclaves with a capacity of 500 ml each, for small-scale digestions
		(*b*) To help promote industrial development, either through research on general technical problems relating to the pulp and paper industry, or by solving the specific problems of a particular enterprise	Weberk stainless steel pulper with a capacity of 7 litres
			Flat screen for pulp, single sheet, with slots of 0.28 mm.
			Two stainless steel vessels for mixing or bleaching pulp, capacity 200 litres
		(*c*) To contribute by means of professional scholarships to the training of technicians and professionals in the cellulose field	Sprout Waldrom stainless steel disc refiner, diameter 30 cm with six sets of discs of different patterns
			Two water baths for bleaching studies and a collection of glass vessels, also for bleaching
			Valley beater, capacity 23 litres
			Freeness tester (Canadian standard)
			Two hand sheet machines with press, rings and discs (TAPPI standard)
			Constant temperature and humidity room

Name	*Address*	*Aims and function*	*Research facilities available*
			Collection of apparatus for physical tests, such as: tensile strength and stretch tester, Mullen bursting strength tester, Elmendorf tearing resistance tester, MIT folding endurance tester, Gurley tester for measuring smoothness and porosity, Clark stiffness tester. Beckman spectrophotometer for measuring brightness and opacity. Scales for determining ream weight
			Microscope
			Paper and pulp laboratory equipped for all types of analysis in this field
			Pilot plant for manufacturing different types of pulp (sulphate, sulphite, soda and mechanical), consisting of: Three tanks for liquor preparation, with a capacity of 2,800 litres each Stainless steel digester with heat exchanger and stainless steel pump with a capacity of 1.5 cubic metres and with temperature and pressure gauge Blow tank Bauer refiner, 90 cm diameter, with six sets of discs of different patterns Pulp dilution tank with a capacity of 9 square metres Horizontal screen, with six sheets with 0.22 mm slots Four centrifugal cleaners Inclined screen Retention tower with a capacity of 3 square metres Three bleaching towers, one with a chlorine injector of 9 square metres capacity Sandy Hill stainless steel washer-thickener Stainless steel mixer coupled to the washer for blending stock with chemical reagents (soda, hypochlorite, peroxide, etc.) Four stock circulating pumps Belt conveyer for feeding Bauer refiner
		VENEZUELA	
Laboratorio Nacional de Productos Forestales	Apartado 220 Mérida, Venezuela	(*a*) To conduct applied research into the economic use of Venezuela's natural resources for pulp and paper (*b*) To give courses of instruction for the specialized training of personnel either entering or already in the pulp and paper industry in Latin America (*c*) To publish such results of studies carried out in the laboratory as may be considered useful for the paper and pulp industry generally in Latin America (*d*) To offer facilities for research into the pulping properties of raw materials from countries which do not possess such facilities (*e*) To maintain contact and co-operate with other similar laboratories in Latin America	Complete equipment for the preparation of pulps by the sulphate, sulphite, semi-chemical and soda processes Bleaching equipment, including chlorine metering apparatus Complete pulp evaluation equipment acccording to both TAPPI and British standards Experimental paper machine of 8-inch width complete with preparatory equipment consisting of beater, conical refiner and storage chests Physical testing apparatus, including thickness, burst, tear, tensile, porosity, opacity, brightness, formation and smoothess

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