THE BRAZILIAN PULP AND PAPER INDUSTRY INVESTMENT REQUIREMENTS

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INDEX

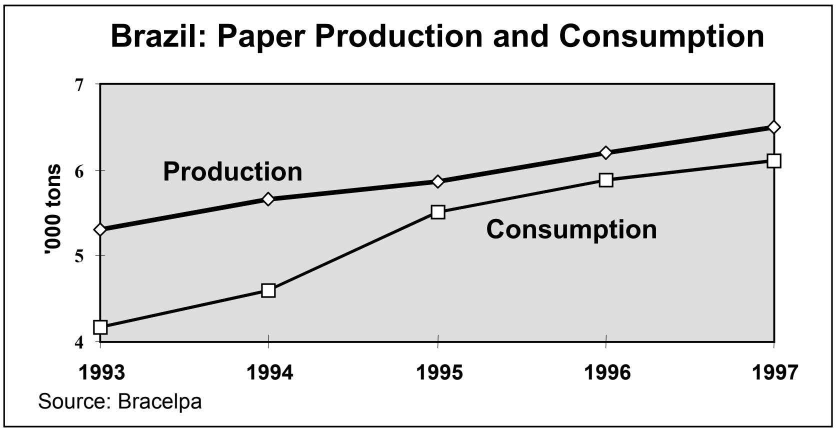
1 - Introduction

The information presented in this study constitutes an update and revision of the study **''The Third Investment Cycle in the Brazilian Pulp and Paper Industry''**, published in the No. 4 issue of the publication ***BNDES Setorial*** of September 1996. In the light of the effects of the Asian crisis on the Brazilian economy, we have made new estimates of domestic paper consumption over the next few years, that take into account lower growth rates. We have also optimized our model, for which the projections now incorporate a component of supply growth resulting from an increase in the productivity of existing equipment. Finally, estimates of production, imports, exports and consumption for the years 1996 and 1997 have been replaced by historic figures.

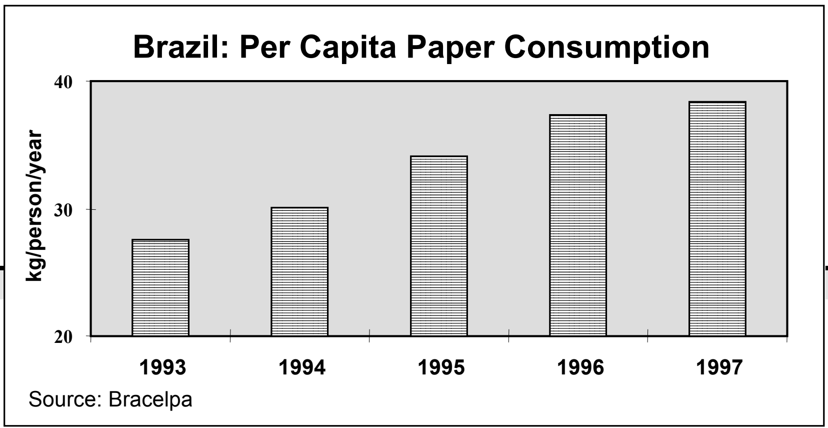
This study aims, therefore, to revise estimates of the domestic pulp and paper production necessary to meet internal demand in the period from 1998 to 2005, assuming that the proportion of production held by exports remains the same. The study further seeks to estimate the amount of investment required to achieve this increase in production.

2 - Brazilian Paper Consumption - 1993/1997

Immediately after the introduction of the Real Plan, there was a sharp rise in domestic paper consumption. During the period from 1993 to 1997, apparent paper consumption grew at an average annual rate of 10%, reaching a total of 6.125 million metric tons in 1997 (4% higher than in 1996).



Annual *per capita* consumption rose from 27.3 kg in 1993 to 38.4 kg in 1997.



Over the period from 1993 to 1997, the categories showing the highest rates of increase in consumption were specialty/other paper and newsprint. Table 1 shows the differences, in terms of growth rates, in consumption of different categories of paper for the periods 1987-92 and 1993-97.

Table 1
Brazil: Average Growth Rates for Paper Consumption

% per year

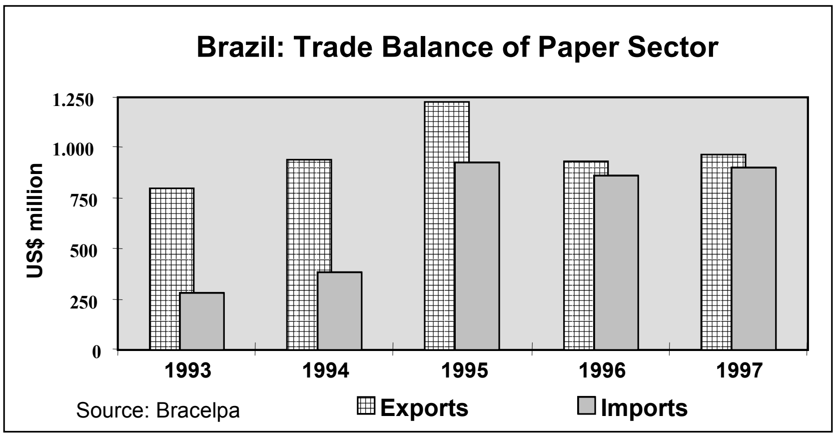
Category	1987-97	1987-92	1993-97
Packaging	2.9	-2.0	8.2
Printing/Writing	3.0	-3.3	9.9
Newsprint	6.1	-1.2	14.1
Cartonboard	2.4	-4.1	9.6
Tissue	4.9	5.1	9.9
Specialty/Other	4.4	-7.9	25.6
TOTAL	**3.4**	**-2.0**	**10.0**

Source: BNDES

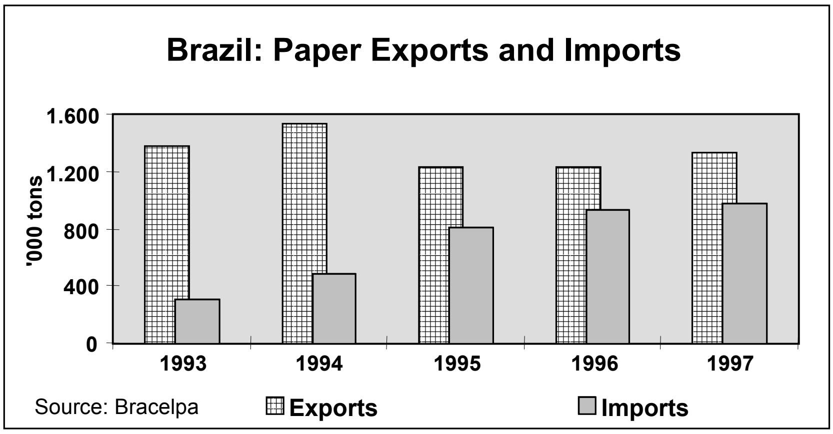
3- Brazilian Paper Imports and Exports - 1993/1997

Since the paper industry requires between two to three years to respond to increases in demand, the rises that occurred in paper consumption were initially satisfied by raising imports and by lowering exports.

This tendency put pressure on the sector trade surplus, which until 1995 had fluctuated between US$ 300 million and US$ 550 million, but which fell to US$ 73 million in 1996 and to US$ 63 million in 1997.



In the period 1993/97, Brazilian paper export volumes fell from a peak of 1.5 million tons in 1994, to around 1.33 million tons in 1997. Over the same period, import volumes grew by an average of 33.6% a year, to reach 978,000 tons in 1997.



A comparison between the previous graphs shows that the average unit price of imported paper is higher than the corresponding figure for exported paper. In 1997, the average price for exported paper (principally uncoated printing and writing paper, and kraftliner) was US$ 727 per ton, while the corresponding figure for imported paper (mainly newsprint and coated printing and writing paper) was US$ 923 per ton.

The rise in imports of newsprint and printing/writing paper accounted for 67% of import volume growth over the period 1993/97. With regard to paper exports, the sharp fall in exports in the packaging category is of note, and is due to the redirection of production to meet domestic demand (Table 2).

Table 2

Brazil: Paper Imports and Exports - 1993/97

'000 tons

Category	**Imports**			**Exports**		
	1993	**1997**	**Chang**	**1993**	**1997***	**Change**
Packaging	406	286	-120	11	33	22
Printing/Writing	758	837	79	112	230	118
Newsprint	33	13	-20	142	471	329
Cartonboard	92	53	-39	10	61	51
Tissue	80	29	-51	4	2	-2
Specialty/Other	55	111	56	28	181	153
TOTAL	**1.424**	**1.329**	**-95**	**307**	**978**	**671**

Source: Bracelpa
preliminary data

4 - Brazilian Pulp Production and Exports - 1993/97

Between 1993 and 1997, pulp production grew by 889,000 ton, principally as a result of production increases by Cenibra and Votorantim, which together amounted to 613,000 tons per year (Table 3).

Table 3

Brazil: Pulp Production - 1993/97

'000 tons

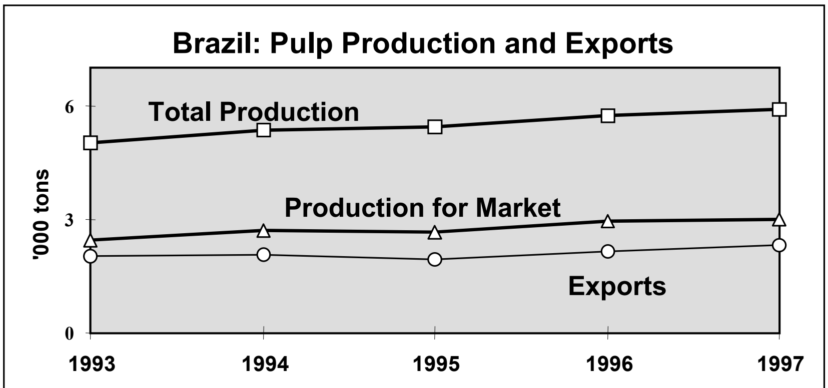
Company	1993	1997*	Change
Aracruz	990	1.058	68
Klabin Group	766	796	30
Cenibra	339	720	381
Votorantim	380	612	232
Cia. Suzano	345	429	84
Bahia Sul	392	527	135
Champion	303	315	12
Ripasa	272	296	24
Igaras	266	286	20
Others	957	861	-96
TOTAL	**5.010**	**5.899**	**889**

Source: Bracelpa

** preliminary data*

It should also be noted that production of 150,000 tons per year was withdrawn from the market, due to the shutdown of Jari Celulose S/A.

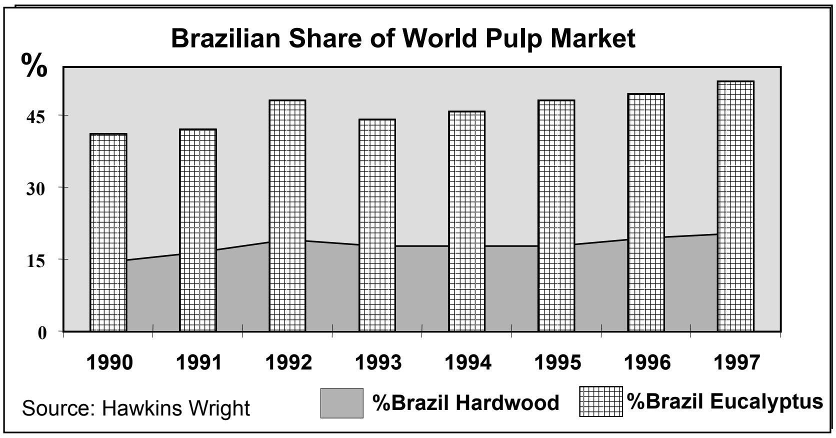
Pulp exports grew from 2.015 million tons in 1993 to 2.336 million tons in 1997, an increase of 16% over the period.



Source: Bracelpa

Pulp export revenues grew from US$ 718 million in 1993 to US$ 1.023 billion in 1997, a 42% increase, due principally to a rise in average price from US$ 385 per ton in 1993 to US$ 521 per ton in 1997.

Upon completing various capacity expansion projects, Brazil regained its share of the international short-fiber pulp market, and gained share in the eucalyptus fiber market. In 1997, domestic production accounted for 20% of world production of short-fiber pulp, and 52% of world production of eucalyptus pulp.



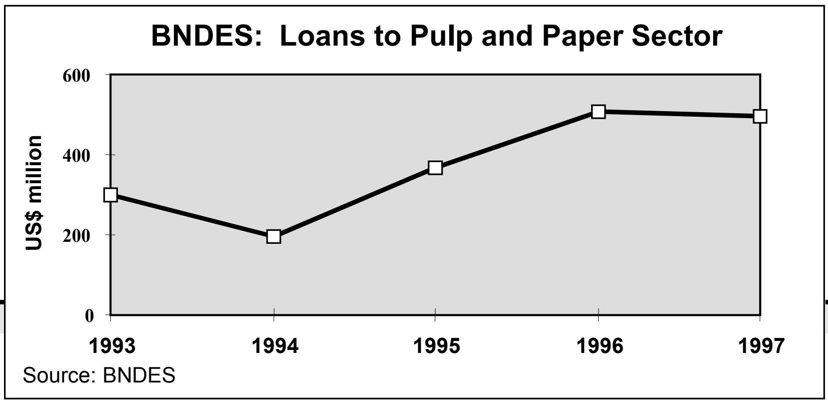
5 - Investments Made by the Pulp and Paper Industry - 1993/97

Between 1993 and 1997, the Brazilian pulp and paper industry invested an estimated US$ 3 billion in such areas as optimization of production capacity, upgrading of product quality, cost reduction and forestry.

The most significant investments in pulp production were made by Cenibra (a new 400,000 ton/year line), Votorantim (a 280,000 ton/year expansion), and Aracruz (a 215,000 ton/year expansion). With regard to paper production, the most notable investments were made by the Klabin, Votorantim and Orsa groups, which accounted for 27% of the increase in production registered between 1993 and 1997.

The main sources of funding for such investments were internal cash flow generation, foreign issues of securities (some US$ 1.5 billion made between 1993 and 1997), and credit lines from the BNDES.

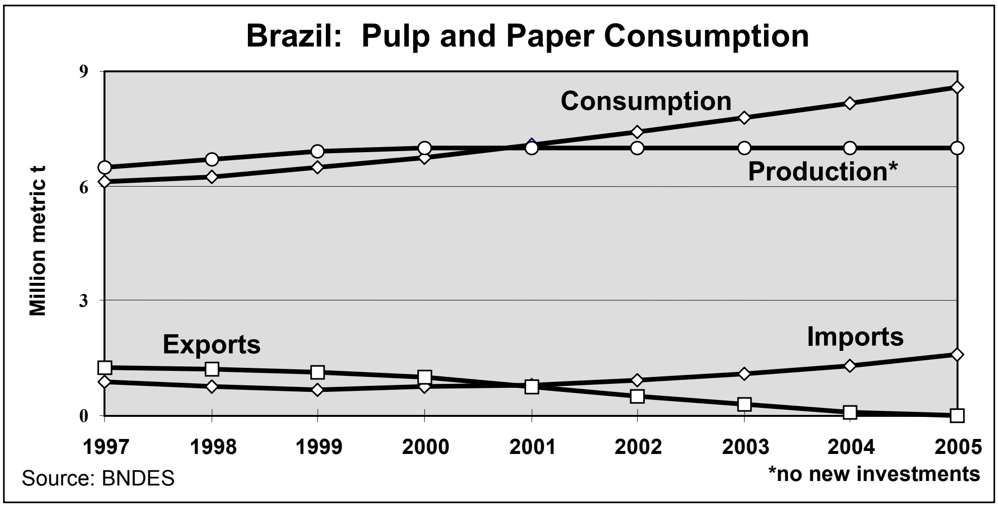
BNDES/FINAME/BNDESPAR loans to companies in the sector over the period 1993/97, amounted to US$ 1.87 billion, accounting for some 60% of total investments within the sector.



6 - Brazilian Paper Consumption - 1998/2005

Taking 1997 as a base year for Brazilian paper consumption and assuming annual demand growth for all categories of paper of 2% in 1998, 4% for 1999 and 2000, and 5% for the period 2001/2005, we project annual consumption at end 2005 of 8.6 million tons per year.

The following graph shows what will happen to aggregate production, consumption, imports and exports if the domestic sector fails to make the investments required to increase production and maintain competitiveness, both in the domestic and export markets.



It can be seen from this that a model which gives priority to satisfying domestic demand implies that imports will exceed exports from 2001 onwards, and that by 2005, exports will have fallen to zero.

The following sections outline the projections of increases in production, and detail the investments that the Brazilian pulp and paper industry must make in order to guarantee capacity levels that are sufficient to meet both domestic and foreign demand growth, as well as to at least maintain Brazil’s share of world trade in these products.

7 - Required Increase in Paper Production - 1998/2005

Assuming the growth rates for paper consumption in all categories described above results in the following numbers shown in Table 4.

Table 4
Brazil: Paper Consumption by Category

'000 tons

Category	1997*	2005	Increase
Packaging	2,599	3,664	1,065
Printing/Writing	1,389	1,958	569
Newsprint	722	1,018	296
Cartonboard	646	911	265
Tissue	538	759	221
Specialty/Other	229	323	94
TOTAL	**6,123**	**8,633**	**2,510**

Source: Bracelpa/BNDES
** preliminary data*

The above data were used as a basis for determining the increase in production by the Brazilian pulp and paper industry that will be required to meet domestic demand, as well as to at least maintain Brazil's current share of the international market.

There are also grounds for assuming that the ratio of exports to production will remain stable, given the projected growth of the world market and the distribution structures that companies have already established. Table 5 shows the projected situation in 2005.

Table 5
Brazil: Paper Production, Imports, Exports and Consumption in 2005

'000 tons

Category	Production	Imports	Exports	Consumption
Packaging	4,114	50	500	3,664
Printing/Writing	2,713	195	950	1,958
Newsprint	715	338	35	1,018
Cartonboard	1,019	45	153	911
Tissue	789	15	45	759
Specialty/Other	323	100	100	323
TOTAL	**9,673**	**743**	**1,783**	**8,633**

Source: BNDES

The additional paper production required by the year 2005 will thus reach a total of 3.198 million tons, broken down as shown in Table 6.

Table 6
Brazil: Required Increases in Paper Production

'000 tons

Category	1997*	2005	Increase
Packaging	2,851	4,114	1,263
Printing/Writing	1,996	2,713	717
Newsprint	265	715	450
Cartonboard	638	1,019	381
Tissue	565	789	224
Specialty/Other	160	323	163
TOTAL	**6,475**	**9,673**	**3,198**

Source: BNDES
**preliminary data*

The additional production that will be obtained from additional productivity gains was calculated taking into account the possibility of incremental increases in the existing plant of the principal companies in the sector, with the remainder due to the introduction of new machines, as shown in Table 7.

Table 7

Brazil: Required Increases in Paper Production - 1998/2005

'000 tons

Category	Productivity	New Plants	Total
Packaging	363	900	1,263
Printing/Writing	217	500	717
Newsprint	0	450	450
Cartonboard	81	300	381
Tissue	44	180	224
Specialty/Other	13	150	163
TOTAL	**718**	**2,480**	**3,198**

Source: BNDES

8- Required Increase in Fiber Production - 1998/2005

In order to increase paper production by the amounts shown above, it will be necessary to increase the supply of fibers, whether virgin or recycled.

This additional amount of fiber was calculated on the basis of the table of consumption by category. Table 8 provides a summary of the mix of fibers under consideration.

Table 8

Fiber Furnish Associated with the Growth in Paper Production - 1998/2005

'000 tons

Category of Paper	Expected Increase	Fiber Content (%)	Long Fiber	Short Fiber	Pastes	Recycled Fiber
Packaging	1,263	98				
• *Kraft*	700	100	595	35		70
• Other	563	95	28	28		479
Printing/Writing	717	79				
• *LWC*	250	80	63		138	
• Other Coated	145	75		109		
• Uncoated	322	80		216		42
Newsprint	450	100	113		338	
Cartonboard	381	85		210		114
Tissue	224	100		134		90
Specialty	163	90	49	63		35
TOTAL	**3,198**	**92**	**848**	**795**	**476**	**830**

Source: BNDES

9- Required Increase in Supply of Market Pulp - 1998/2005

Assuming that world demand for eucalyptus fiber grows at an average annual rate of 3.5% between 1998 and 2005, Brazilian exports of pulp will have to grow from the level of 2.3 million metric tons registered in 1997, to 3.1 million metric tons in 2005, merely to hold Brazil's share of the world market at current levels. This implies additional production of 792,000 tons of short-fiber pulp.

10- Required Increase in Total Fiber Production - 1998/2005

As with the required increases in paper production (item 7), we estimate that part of the increase in fiber supply will be provided by improvements in the productivity of existing plant.

The additional fiber production volumes that are required to supply both domestic and export markets are presented in Table 9.

Table 9

Brazil: Increases in Fiber Production - 1998/2005

'000 tons

Fiber Type	Productivity Increases	New Plants	Total
Long Fiber	100	748	848

Short Fiber	460	1,127	1,587
GW/TMP/CTMP	0	476	476
Recycled Fiber	0	830	830
Total	**560**	**3,181**	**3,741**

Source: BNDES

11- Required Increase in Reforested Areas - 1998/2005

We estimate that the additional production of fiber mentioned above will entail the development of 283,000 hectares of new plantations, with a corresponding gross area of 425,000 hectares. The planting of these additional areas represents a 41% increase in the reforesting rate for the pulp and paper sector, which averaged some 85,000 hectares/year over the last 5 years. Part of these new areas will be planted with pine.

Our calculation of investments in land and forests were based on the following assumptions:

- Average forest productivity - 400 st/ha;
- Eucalyptus trees cut every 7 years, and pine trees every 12 years;
- Average yield index - 5 st/t of fiber;
- Forest safety reserve - 12% of planted area.

12- Total Required Investments - 1998/2005

The values shown in Tables 10 and 11 provide a summary of the investments related to the projected increase in production for the period 1998-2005. This calculation was based on the following parameters:

- US$ 1,100/ton/year - investments in new paper plants;
- US$ 2,000/ton/year - investments in new pulp plants;
- US$ 600/ton/year - investments in new GW/TMP/CTMP and recycled fiber plants;
- US$ 800/ha - investments in forestry;
- US$ 500/ha - investments in land.

It is also important to consider investments to remove bottlenecks, as well as in the modernization and optimization of the main industrial plants that are currently in operation. We have set the amount of such investments at **US$ 500 per ton per year for paper plants**, and at **US$ 1,400 per ton per year for pulp plants**. It should be remembered that such figures are likely to vary considerably, depending on the characteristics of each project. The above figures thus represent average values, and are an attempt to reconcile the assumptions made above with the realities of the pulp and paper sector.

Table 10

Brazil: Required Investments in Paper Production - 1998/2005

US$ million

Category	Increase in Productivity	New Plants	Total
Packaging	181	990	1,171
Printing/Writing	109	550	659
Newsprint	0	495	495
Cartonboard	40	330	370
Tissue	22	198	220
Specialty/Other	6	165	171
TOTAL	**358**	**2,728**	**3,086**

Source: BNDES

Table 11

Brazil: Required Investments in Fiber Production - 1998/2005

US$ million

Category	Increase in Productivity	New Plant	Total
Long Fiber	140	1,496	1,636
Short Fiber	644	2,254	2,898
GW/TMP/CTMP	0	285	285
Recycled Fiber	0	498	498
TOTAL	**784**	**4,533**	**5,317**

Source: BNDES

With regard to new paper plant, we estimate that the following new paper machines will be installed: five new packaging machines, including one 300,000 ton/year machine, and four 150,000 ton/year machines; two printing/writing paper machines (250,000 ton/year each); two newsprint machines of 225,000 ton/year; three 100,000 ton/year cartonboard machines; five tissue paper machines, including one 60,000 ton/year machine and four 30,000 ton/year machines, as well as five 30,000 ton/year specialty/other paper machines.

Table 12 provides a breakdown of the estimated total funding of US$ 8.8 billion that is necessary to implement these projected investments within the Brazilian pulp and paper industry.

Table 12

Brazil: Required Investments in the Pulp and Paper Sector - 1998/2005

US$ million

Activity	Increase in Productivity	New Units	Total Investments
Paper plants	358	2,728	3,086
Fiber plants	784	4,533	5,317
Forestation	0	227	227
Land Purchases	0	213	213
TOTAL	**1,142**	**7,701**	**8,843**

Source: BNDES

13- Conclusion

Between 1993 and 1997, the international hardwood pulp market registered a 23% increase in volume sales, reaching 14.4 million tons in 1997. Over the same period, Brazil's share of this market rose from 17.8% to 20.3%, as a result of additional output by Cenibra, Votorantim, Bahia Sul and Aracruz. World eucalyptus pulp demand is expected to grow at an average rate of 3.5% per year over the next 8 years. Merely to maintain its current market share, Brazil will be obliged to export an additional 792,000 tons of eucalyptus pulp.

The world paper market is set to grow at an average annual rate of 2.8%. While this rate is slightly below the average for the last two decades, due to the cancellation and/or postponement of various new projects planned by several Asian countries, Brazil satisfies all of the conditions for at least maintaining its share of this market.

Brazilian paper consumption, for its part, grew by 46% between 1993 and 1997 (10% per year), driven by economic stability, as well as by an improvement in wealth distribution. Over the same period, domestic production increased by 22%, entailing a fall in exports and a rise in imports. For the period from 1998 to 2005, domestic paper consumption is expected to grow in a sustained manner, at an average annual rate of 4.4%, in line with the overall projected growth of the Brazilian economy.

As a consequence, the Brazilian paper sector will be obliged to produce an additional 3.2 million metric tons in order to satisfy domestic and export demand over the period 1998-2005, which will entail production of an additional 2.9

million tons of fiber, requiring a corresponding increase in reforested areas.

An estimated US$ 8.8 billion of investments will be necessary over the period 1998/2005, corresponding to an annual average of around US$ 1.1 billion. In conjunction with this rise in investment, the domestic pulp and paper industry should also increase its restructuring efforts in search of greater gains in productivity, and reductions in costs.

This new investment cycle will be characterized by major interest in the sector on the part of international groups. In the pulp segment of the market this process has already begun with the association of the Odebrecht and Stora groups to install a new 750,000 ton per year plant at an estimated cost of US$ 1.6 billion.

With regard to investments in increasing paper production, no new projects to install machines have been announced, nor have either domestic or foreign groups made a firm declaration of interest. If this situation persists, then domestic paper consumption growth will both hurt export performance and be increasingly supplied by imports, given that new supply takes an average of three years to reach the market.

The BNDES will continue to play a role of vital importance, and should expand its traditional form of support for the sector, in the form of credit lines, also becoming an important point of reference for foreign investors. At the same time, it will be necessary to form partnerships with other domestic and foreign banks in order to raise the funding necessary to realize new investments.