

THE PULP AND PAPER INDUSTRY IN BRAZIL

"If you don't like something, change it. If you can't change it, change your attitude."

Maya Angelou (Marguerite Ann Johnson) 1928-2014
 American writer, poetess and civil rights activist

By:

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Current Situation

2015 has proven to be an agitated year. Abroad, the world faces a new order dictated by low oil prices (at least for now) and by the European Union and its economic recovery process threatened by new developments in the Greek crisis. On top of this, there's the slowdown in China's growth and a worrisome environment in the Middle East and Eastern Europe.

Such situation impacts Brazil in two different, but interconnected, ways: in the domestic market, it affects paper production; globally, it directly affects pulp production for export, which has been the sector's main driver of growth.

The global paper market has been mainly influenced over the last decade by three key factors:

- globalization in terms of consumption habits and greater permeability in international trade;
- the "dematerialization" of information means, given the progress of digital media; and
- the increase in purchasing power on the part of large masses of population residing in developing countries and the resulting ascension to a new middle class with more sophisticated and demanding habits.

This landscape has catalyzed the development of the following trends:

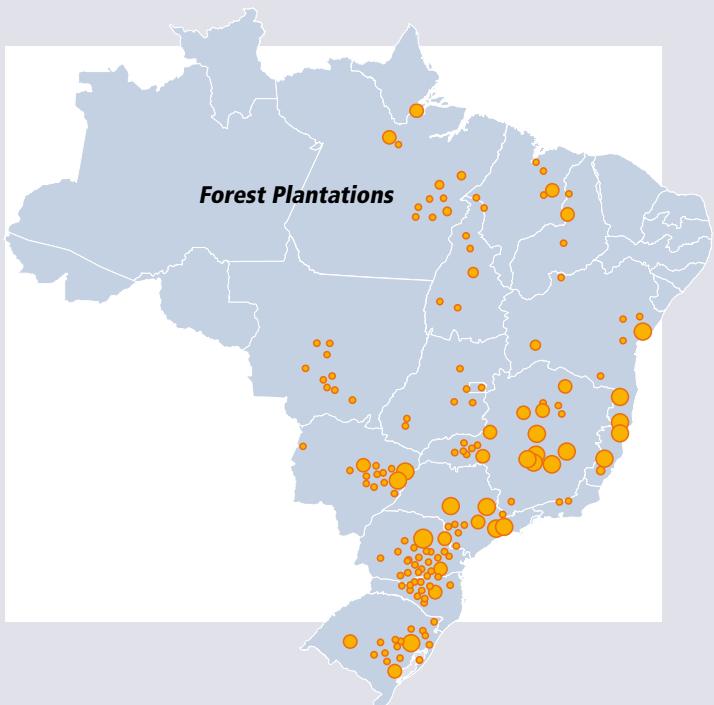
- growing importance of the Asian region as a big paper producer and consumer;
- accelerated advancement of electronic information transmission and disclosure technologies;
- slow and bumpy recovery of the European Union;
- United States' economic recovery based on innovation and disruptive technologies, such as shale gas; and
- changes in the political scenario, such as the suspension of sanctions on Cuba and Iran.

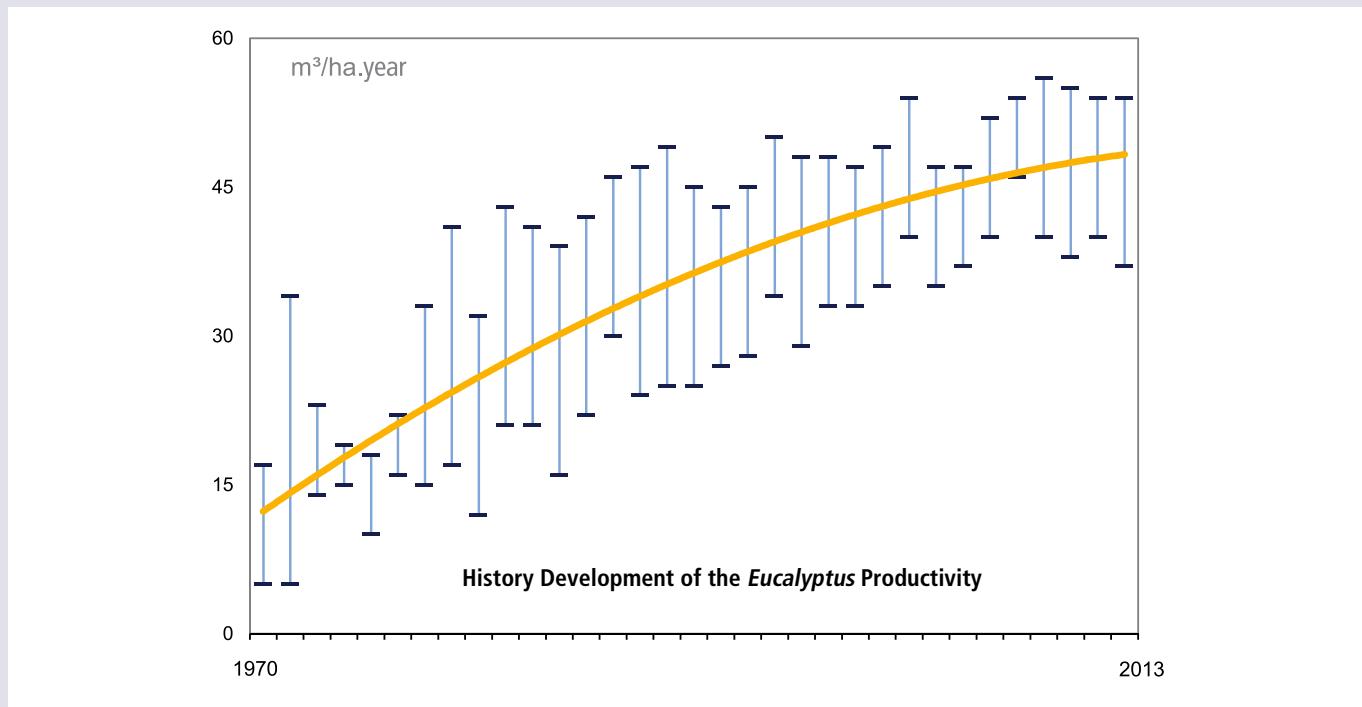
Silviculture in Brazil

Brief history

The history of Brazil's silviculture is intimately associated to the development of the country's forest base industry. At the end of the 1950s, the government's planning effort to promote economic development was materialized in a Plan of Targets, which listed five priority areas for earmarking investments and established objectives to be achieved in five years. The pulp and paper industry was one of the sectors contemplated in the Plan. The annual production target was set at 200 thousand tons of pulp and 450 thousand tons of paper, which included 130 thousand tons of newsprint. As a result, the National Bank of Economic and Social Development (BNDES), despite not having given special priority to the sector, began supporting it more constantly as of 1957, including through several emblematic projects involving eucalyptus pulp production.

The government's second movement that leveraged Brazil's forest





base was a 1966 tax incentive policy (Law #5,106), which, by allowing to deduct from income taxes investments in forest plantations, allowed for the creation of Brazil's forest base, which was to first supply the steel industry with coal and the pulp industry with wood.

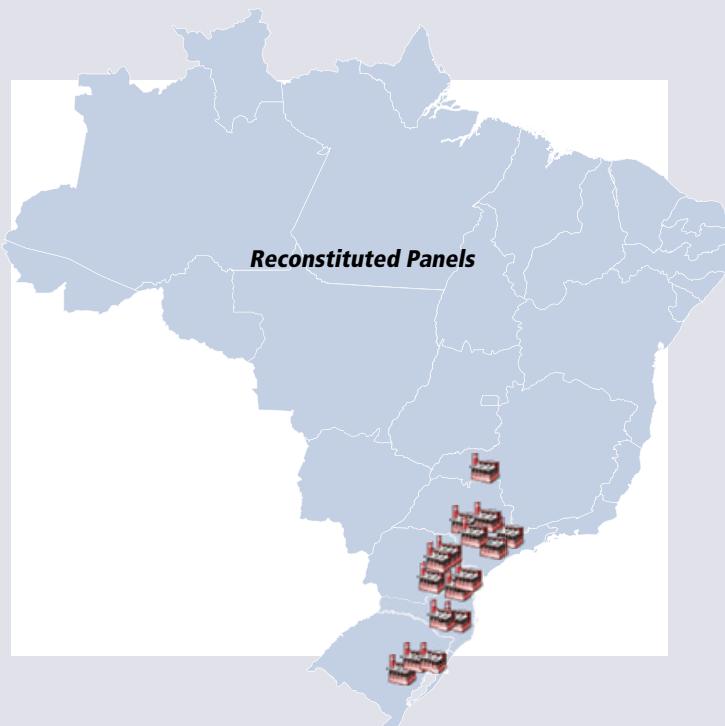
As a result of the tax incentive program, between 1965 and 1985, the area of forest plantations in Brazil, especially of *Eucalyptus* and *Pinus*, jumped from 500 thousand to approximately 4.5 million hectares distributed in the so-called forest districts, target regions for the forest base industry.

The learning curve during these 20 years was long and arduous, especially in the silviculture, management and genetics areas. To support

development of silviculture, the federal government created autarchies: the Brazilian Institute of Forestry Development (IBDF), with the mission of planning and coordinating the forestry policy, and the National Center of Forest Research (CNPF), within the Brazilian Agribusiness Research Company (Embrapa), with the objective of developing technologies for implementing and managing forest plantations.

Once plantations reached a significant amount of area and began producing, the consolidation phase of Brazil's forestry business kicked off.

During this period, with the technological development of silviculture, management and genetics, it was possible to increase average productivity of *Eucalyptus* plantations from 15 to 43 m³/ha per year. In relation to *Pinus*



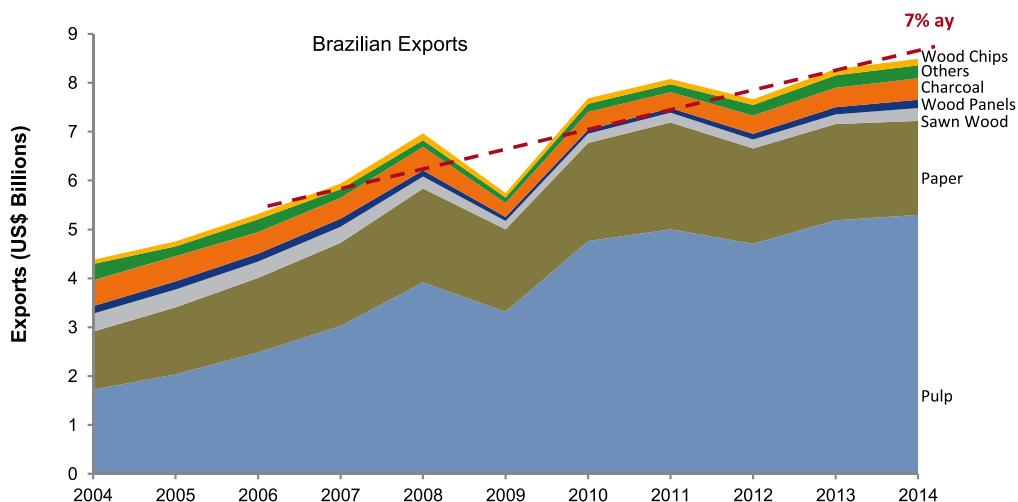


Figure 1 – Brazilian exports

Source: Pöyry

plantations, managed for multiple products, annual productivity grew from 15 to 32 m³/ha. In the case of managed plantations for producing fine wood, productivity increased from 15 to roughly 40 m³/ha.

Also during the maturation phase of Brazil's forestry business, rapid expansion and diversification of the forest base industry was observed, such as the growth of pulp/paper and coal-based steel industries, as well as the development of reconstituted panels industry. Additionally, the production of sawn and laminated timber from planted forests substituted the use of wood from native forests.

In the beginning of the 2000 decade, the forest base industry faced socioenvironmental forces, a phenomenon that surfaced in the early 1970s and consolidated in the 2000s, questioning its development model. In response, the industry made a significant effort towards socioenvironmental sustainability, leading the sector to certify practically all its forest plantations.

As shown in **Figure 1**, between 2004 and 2014, Brazil's forest base industry became a highly competitive world-class business in the international market, mainly due to the high productivity of its planted forests. During the period, planted areas grew at an average rate of 7% a year. Silviculture adapted to new frontiers in the midwest and north regions of the country, due to the limited availability of land for expanding the planted area in traditional clusters along the coastal region.

Maturity of the forestry business attracted international investors with a focus on the pulp and reconstituted panels industry, as well as silviculture. In the case of silviculture, Timber Investment Management Organizations (TIMOS) became an important lever for the growth of Brazil's planted

area, also contributing to the important shift from the integrated model (forest-industry) to a market model (industry-tree growers). Without a doubt, forestry development programs also contributed significantly to this change.

In the pursuit of greater profitability in the activity, a significant technological advancement also occurred in biotechnology, with the development of clones that were more productive and resistant to diseases/pests; in silviculture and harvesting processes, with intensive mechanization; and in information technology and management processes. Progress was also observed in the development of new industrial processes and products with the more recent arrival of the biorefinery concept.

Figure 2 presents a short history of Brazil's silviculture commented in this article.

Context and Trends

In spite of the globally undeniable technological leadership of Brazil's planted tree sector, a significant increase has been observed in wood production costs in the country over the last 14 years.

In 2000, these costs in Brazil were 40% lower than the U.S. industry, but by the end of 2014 the Brazilian advantage amounted to less than 10%. During this period, the Brazilian real (R\$) increased 20% in value in relation to the U.S. dollar, but the factor of greatest weight was a combination of a real wage increase (12% p.a.) with a labor productivity increase of less than 1% a year. In 2014 alone, inflation in the planted trees sector, as measured by INCAF-Pöyry, was 7.9%, while the national inflation rate measured by IPCA amounted to 6.4%. It is a consensus that the path for reducing production costs involves investments in technology

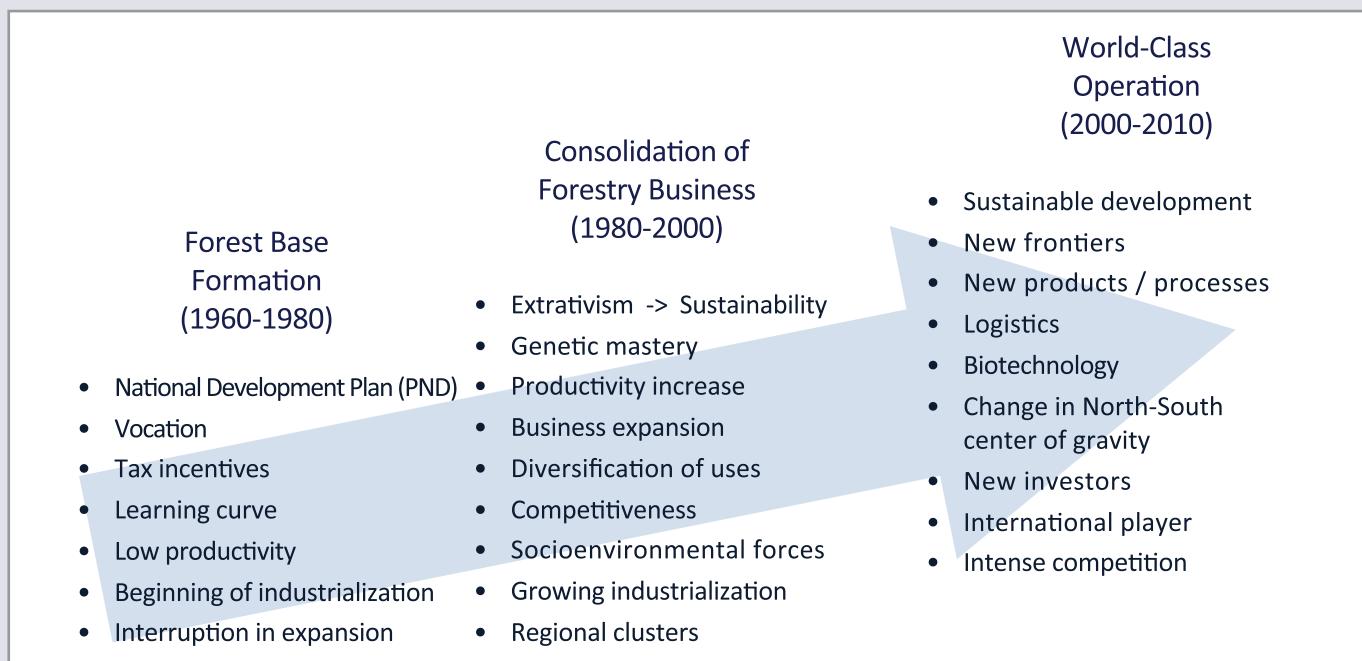


Figure 2 – Brief history of Brazil's silviculture

Source: Pöyry

and improvements in operating and management processes, with a focus on human resources.

A second issue to be tackled consists in the productivity stagnation of Brazilian plantations, as a result of government investments in the sector and also the threat brought on by climate changes.

In order to adapt to this new context, companies in the sector are focusing on improving techniques regarding the use of land, water, energy and other resources, reconciling the sustainable production of the so-called 4Fs (Food, Fiber, Fuels and Forests). In this sense, biotechnology, combined with conventional genetic improvement techniques, has stood out as an important tool for overcoming this challenge, since it can be used to obtain trees with specific characteristics, such as tolerance towards herbicides and abiotic stress (drought, heat, cold, acidity of soil), resistance to insects and diseases, better photosynthetic capacity (and, consequently, plant growth), better form, greater density or greater amount of fiber.

The third challenge to be mastered: reduce operating costs of implementing forests, harvesting and transporting wood. For this, companies in the sector are developing new processes and technologies to make the so-called precision silviculture feasible. Within this context, one of the objectives is to increase the mechanization level of forest operations.

Nonetheless, Brazil, thanks to its soil and climate conditions for planting, availability of land and the technology developed by Brazilian companies, ranks among the few countries capable of supplying the world clean commodities, energy and a wide variety of bioproducts currently in development phase, which makes it important to not only analyze obstacles for boosting the sector, but also strive to continuously pursue viable solutions.

General considerations on the global pulp market

The global production of paper increased from roughly 50 million tons in 1950 to 398 million in 2013. By 2030, this volume will grow to around 482 million tons, representing a 1.1% annual growth rate as shown in **Figure 3**. This rate comprises a consumption decrease in the developed world – Japan, Western Europe, North America and Oceania –, with a CAGR (Compound Annual Growth Rate) of -0.7% and 1.0%.

The developing world presents healthier growth rates, especially in Asia, where consumption is expected to increase from 189 million tons in 2013 to nearly 286 million by 2030.

In terms of growth according to type, **Figure 4** shows that the trend continues with a significant growth in packaging, tissue and paperboard. The driving forces behind these trends are the increase in the growing middle class's purchasing power in developing countries, increase in the transport of goods leveraged by international trade and the increase in production means in developing regions.

In developed countries, consumption is expected to decrease mainly on account of a reduction in newsprint and printing/writing paper consumption.

Brazilian paper market (2004 - 2014)

Introduction

In the period contemplated (2004 - 2014), paper production in Brazil grew roughly 3% p.a., in consonance with the increase in demand in the domestic market. In these last 10 years, the biggest growth observed in the Brazilian industry was in packaging and tissue paper.

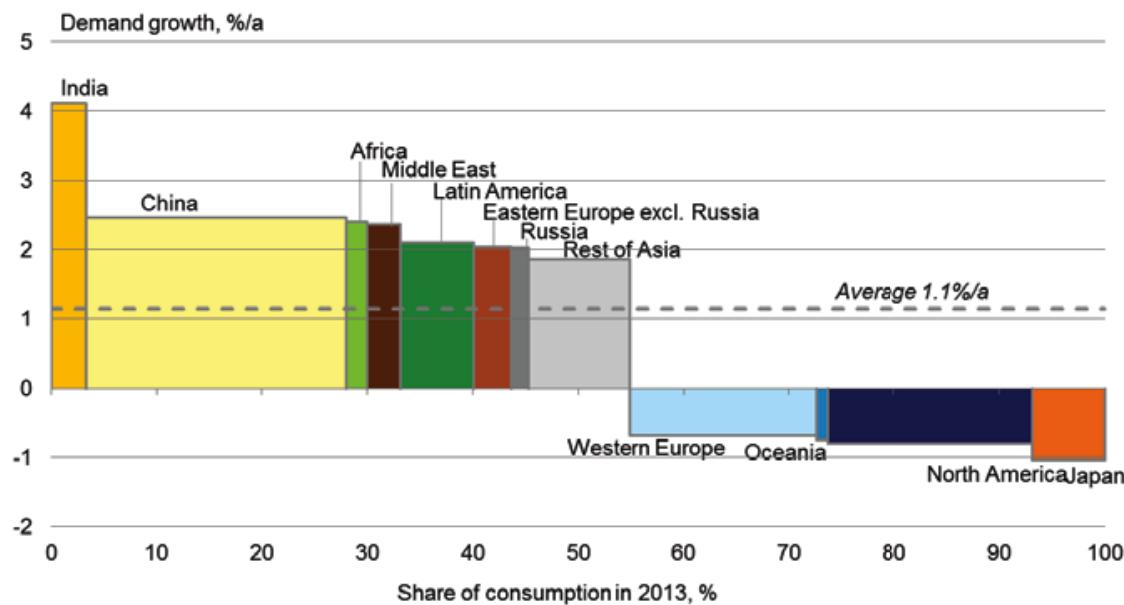


Figure 3 – Paper and paperboard consumption growth in the long term, per region

Source: Pöyry

Due to better health and hygiene conditions worldwide and the growing number of people coming out of absolute poverty, tissue paper consumption shall continue growing throughout the world, especially in Latin America. Such fact will cause a positive impact on the consumption growth of BHKP. Despite the little growth in

Brazil's industrial production, paperboard packaging has remained a promising market over the last years, attracting investments in production and development, as well as increasing competitiveness in relation to other materials used for packaging.

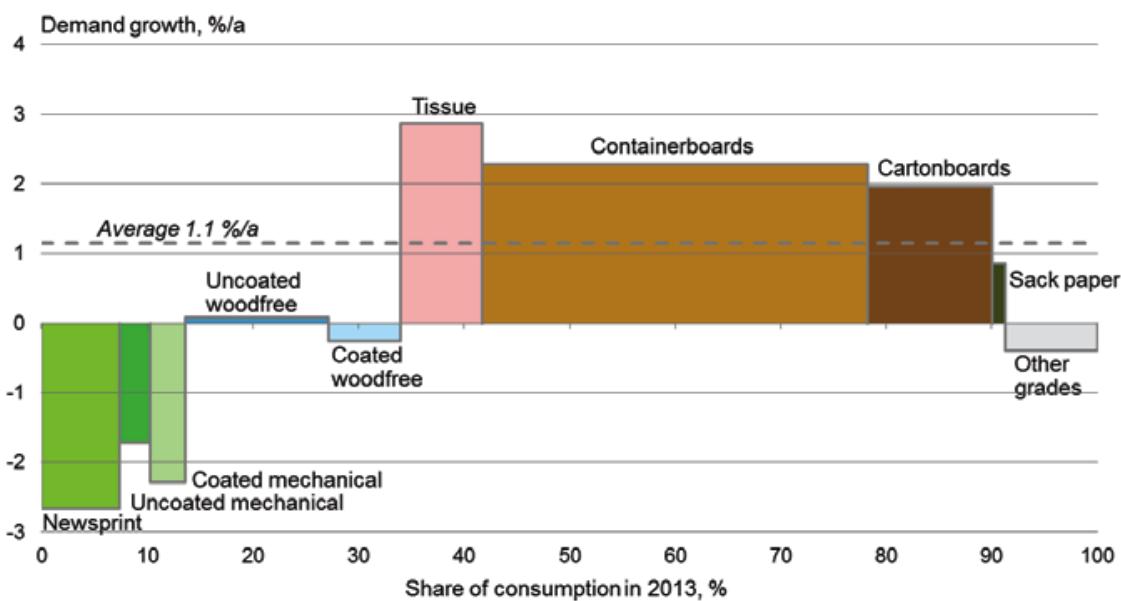


Figure 4 – Long term growth in global demand for paper and paperboard, by types

Source: Pöyry

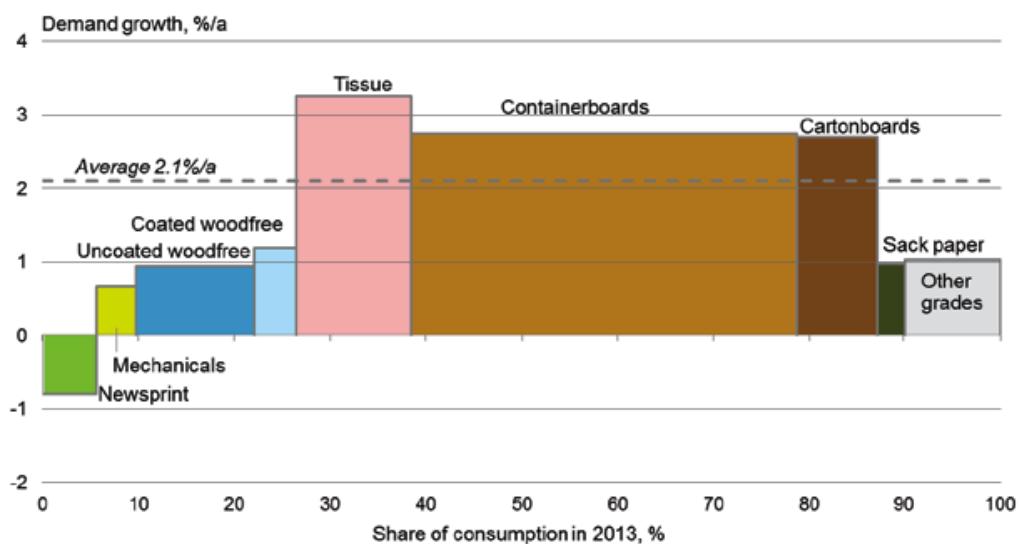


Figure 5 – Growth estimate for paper demand in Latin America

Source: Pöyry

Outlook of the Paper Industry in South America

It is estimated that the paper market in South America will grow 2% a year between 2014 and 2030. **Figure 5** presents the growth estimate for paper demand in Latin America.

Paper production capacity in South America

Brazil is the biggest producer of paper in the region, and the biggest volume produced is containerboard. The biggest paper producers in South America are Klabin, Suzano, CMPC and International Paper, all present in the Brazilian market. **Figure 6** shows paper production capacity according to type and country, and according to type and company.

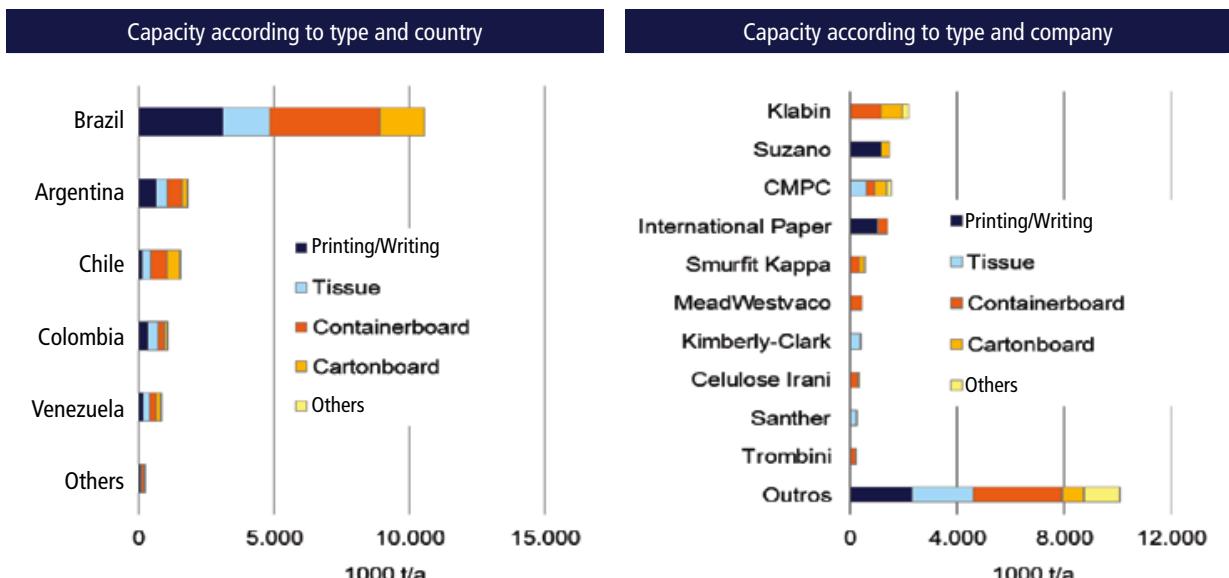


Figure 6 – Paper production, according to type and country, and according to type and company

Source: Pöyry

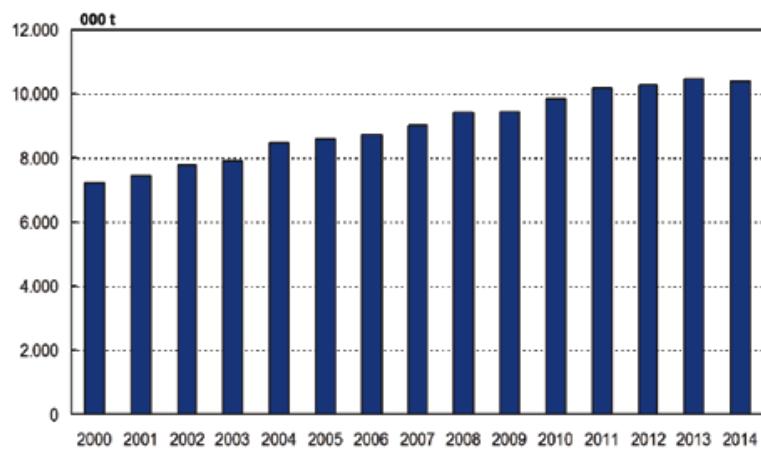


Figure 7 – Paper production in Brazil (2000 – 2014)

Source: Bracelpa/Ibá

Paper production in Brazil (2000-2014)

Brazil's paper production in 2014, presented in Figure 7, amounted to 10.4 million tons, having grown, 1.8% p.a. between 2012 and 2013. In 2014, however, production dropped 0.5%. The average growth rate of paper production in Brazil between 2000 and 2014 was 2.7% p.a.

Paper production in Brazil according to type (2000-2014)

Paper production in Brazil totaled 10.4 million tons in 2014. Of this volume, containerboard is the main type produced in Brazil, accounting for 52% of the total. The second most popular paper product is printing/writing paper, with 29% of the total. **Figure 8** shows production of paper according to type during the period.

Figure 9 shows the breakdown of paper production capacity per company in Brazil.

Packaging and printing/writing paper are the most relevant product groups in Brazil's paper industry. Containerboard in Brazil has grown slightly above GDP during this period. **Table 1** shows the production and growth of Brazil's paper industry.

In the last 10 years, newsprint production has been dropping year-by-year. Production of printing/writing paper has posted a slight annual growth rate (1.6% p.a. over the last 15 years).

Packaging and tissue paper show the highest growth perspectives for

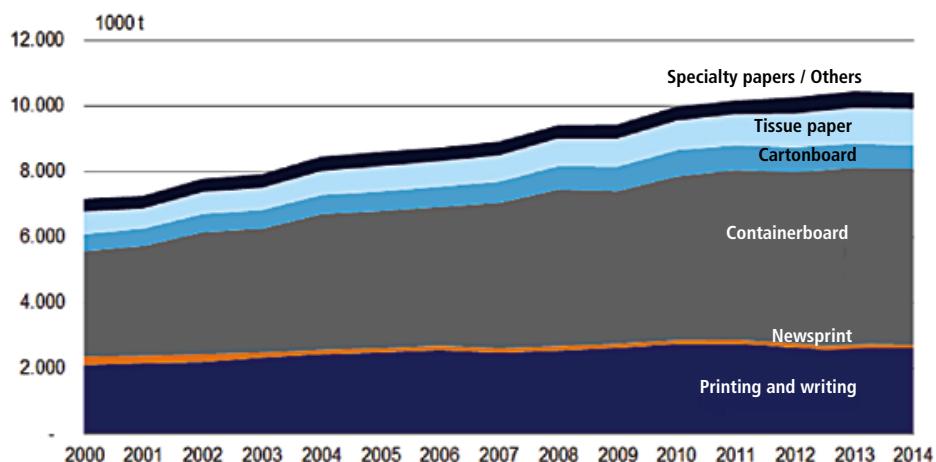


Figure 8 – Paper production in Brazil according to type (2000 – 2014)

Source: Bracelpa/Ibá

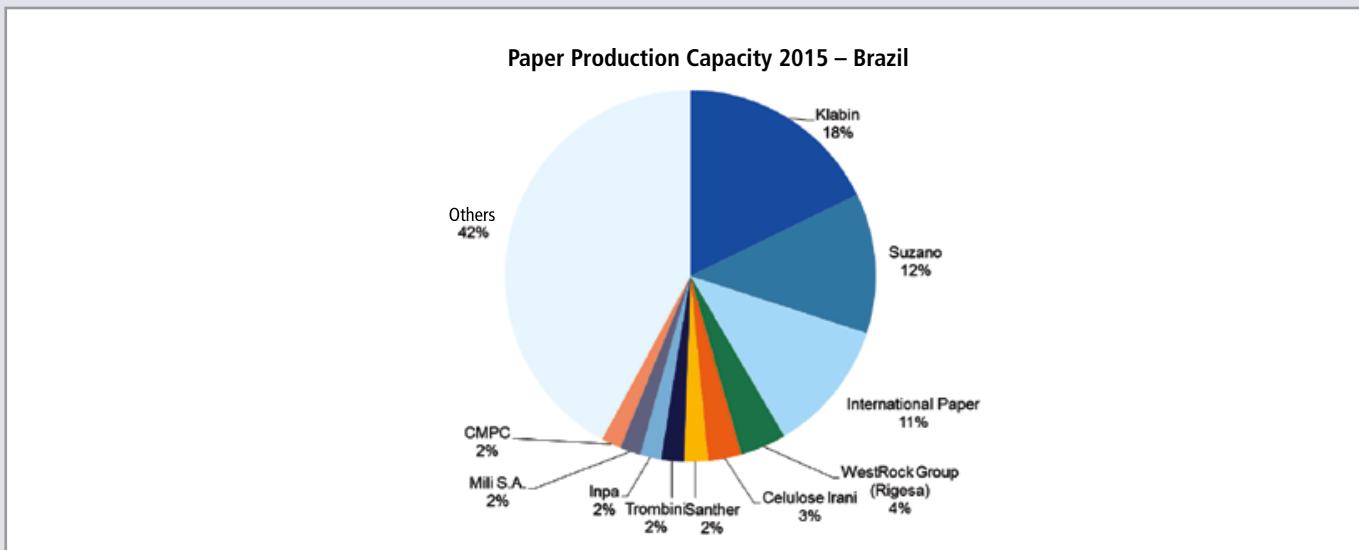


Figure 9 – Paper production in Brazil, according to company (2000 – 2014)

Source: Bracelpa/Ibá

Table 1 – Production and average annual growth rate – Brazil's paper industry

Paper	2000	2013	2014	Annual growth rate (%)
Packaging PO	3,209	5,364	5,373	3.8%
Printing and Writing	2,093	2,621	2,616	1.6%
Newsprint	266	128	105	-6.4%
Paperboards	519	739	702	2.2%
Tissue	697	1,096	1,122	3.5%
Specialty Papers	378	496	479	1.7%
Total	7,162	10,444	10,397	2.70%

Source: Pöyry

the 2014-2020 period. Pöyry projects an annual growth rate of roughly 4% for tissue paper and 3% for packaging paper through 2020.

Brazil possesses a medium-sized specialty papers industry (thermal, carbonless, glassine, etc.) with an installed capacity of roughly 600 thousand tons/year.

Production and apparent consumption of paper in Brazil (2000-2014)

Traditionally, apparent consumption of paper in Brazil is very similar to local production, indicating little openness to the international market.

Figure 10 shows the production and apparent consumption of paper over the 2000-2014 period.

Consumption per capita of paper in Brazil is still much inferior to that of Europe, United States, Canada, Japan and Korea. Therefore, there's room for significant growth over the next years.

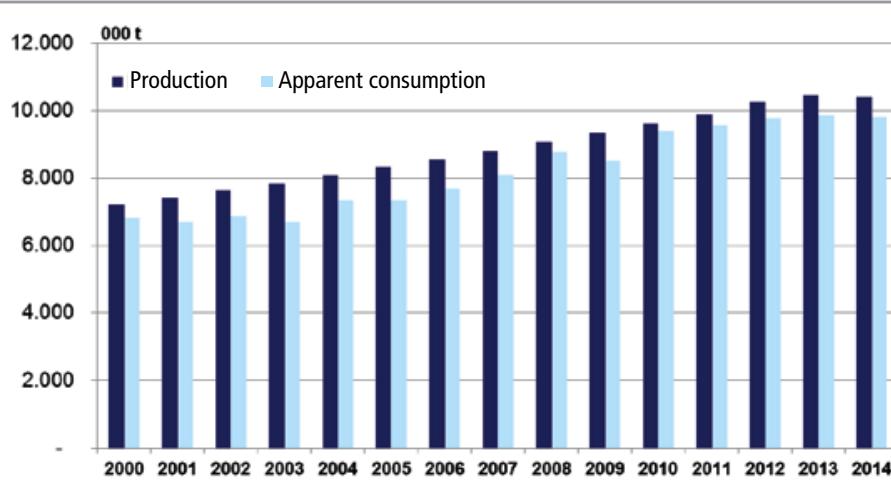


Figure 10 – Production and apparent consumption of paper in Brazil (2000 – 2014)

Source: Bracelpa/Ibá

Table 2 – Production and apparent consumption of paper in Brazil (000 t)

	(000 t)										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Production	8.315	8.558	8.807	9.065	9.329	9.602	9.882	10.260	10.444	10.397	
Apparent consumption	7.328	7.702	8.099	8.755	8.505	9.406	9.562	9.781	9.852	9.813	
Imports	770	967	1.097	1.328	1.085	1.502	1.455	1.396	1.274	1.262	
Exports	2.039	1.990	2.006	1.982	2.008	2.074	2.052	1.875	1.866	1.846	
Per capita consumption (kg/inhab.)	39	41	44	46	44	49	50	50	51	51	

Source: Bracelpa/Ibá

Apparent consumption of paper in Brazil (1,000t)

Brazil mainly exports printing/writing paper and kraftliner, and imports newsprint, LWC, SC, CWF and other types of specialty papers. Consumption per capita in Brazil grew 10 kg between 2005 and 2014, remaining practically stable over the last five years. **Table 2** shows the evolution in consumption.

Brazilian exports per region

In the paper market, Latin America is the destination for more than half of Brazilian exports. From January to December 2014, the country exported 1.846 million tons. **Figure 11** shows the participation of each region in global exports.

Main containerboard producers – 2014

Total installed capacity for containerboard in Brazil amounted to 3.9 million tons in 2014. Klabin is the biggest containerboard producer in Brazil, followed by Rigesa, International Paper, and Celulose Irani. **Figure 12** shows the main producers of containerboard in 2014.

Biggest tissue producers in Brazil – 2014

In Brazil, the top 10 producers account for 60% of installed capacity, with the 15 biggest producers accounting for 80% of total capacity. Such

fact demonstrates that there is not much concentration in the market, as observed in other Latin American countries.

The top two producers, Mili and Santher, each represent roughly 13% of total installed capacity (roughly 1.6 million tons/year), followed by CMPC-Melhoramentos (9%), Sepac (9%) and Kimberly-Clark (8%). **Figure 13** shows the main tissue producers in Brazil in 2014.

The main challenges and opportunities for Brazil's paper industry over this next decade include:

- sustainable growth of the domestic tissue paper market (especially in the Northeast and Midwest of Brazil);
- new tissue plants nationwide, with a potential consolidation process;
- sustainable growth and consolidation of the containerboard market;
- greater presence of Brazil in global companies in the tissue and containerboard markets;
- consolidation of packaging paper units in the Northeast and Midwest regions;
- growth of the cartonboard market; and
- increase in kraftliner and Liquid Packaging Board (LPB) exports.

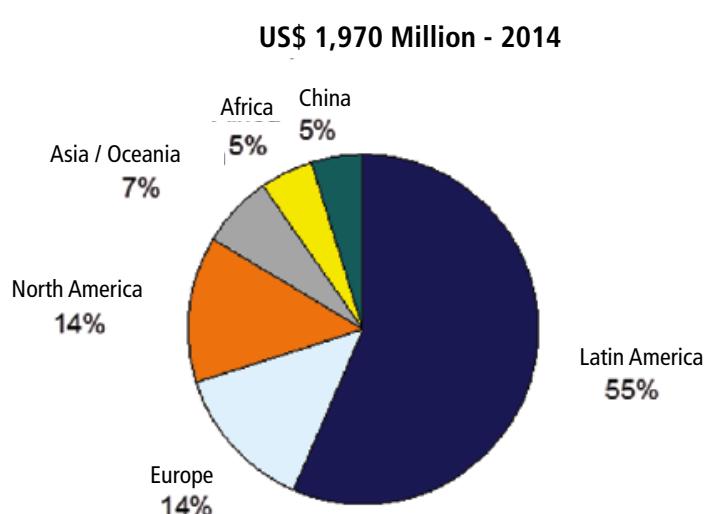


Figure 11 – Participation of regions in global paper exports (%)

Source: Bracelpa/Ibá

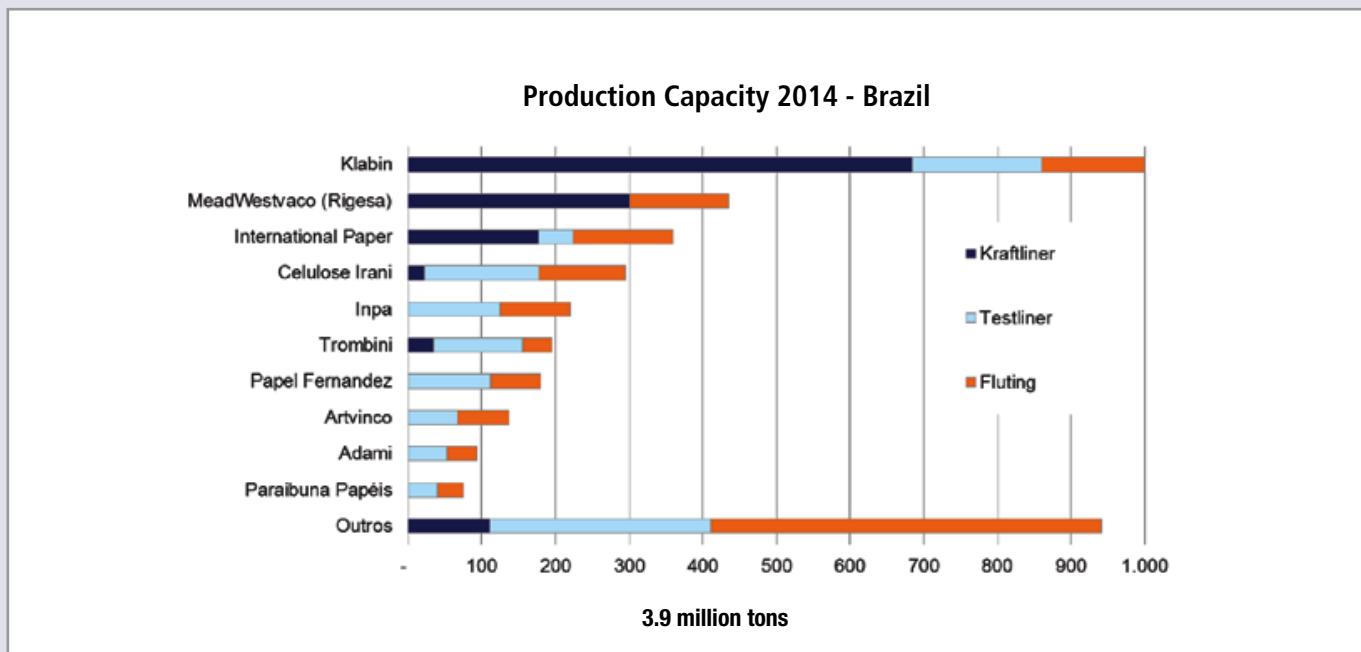


Figure 12 – Main producers of containerboard in 2014

Source: Pöyry

Overview of Brazil's pulp market

The scenario of Brazil's pulp industry is very different to that of its paper industry. The pulp industry is export-oriented, while the paper industry focuses on the internal market.

Table 3 shows the evolution in production, exports, imports, and apparent consumption between 2005 and 2014.

In 2014, the sector exported approximately US\$ 7.3 billion, of which US\$ 5.3 billion corresponded to pulp exports and US\$ 2.0 billion to paper exports, resulting in a positive export balance of US\$ 5.5 billion, according to Secex/MDIC. Practically all of the pulp exported is BEKP. **Figure 14** shows 2014 production according to product type.

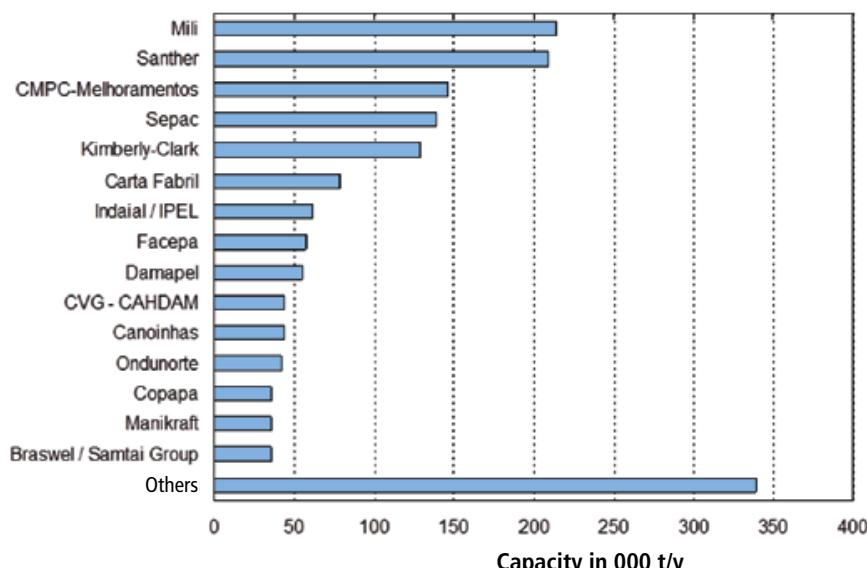


Figure 13 – Main tissue producers in Brazil in 2014

Source: Pöyry

Table 3 – Evolution in production, exports, imports and apparent consumption (2005 – 2014)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Production	10,352	11,180	11,998	12,697	13,315	14,164	13,992	13,977	15,129	16,461
Imports	310	326	292	325	359	412	392	411	430	416
Exports	5,441	6,161	6,484	7,040	8,229	8,375	8,478	8,513	9,430	10,614
Apparent Consumption	5,221	5,345	5,906	5,982	5,445	6,201	5,906	5,897	6,129	6,263

Source: Bracelpa/Ibá (incluir pasta mecânica)

Data available at this moment for pulp production shows that:

- Brazil's pulp production has increased, especially in terms of exports, with a slight increase in internal consumption, whereby 86% of the total produced is BHKP; and
- main pulp export destinations in 2014 were Europe (39%), North America (18%), Asia – excluding China (8%), China (32%) and others (3%).

Figure 15 shows the capacity per producer. Fibria and Suzano correspond to 53% of total capacity. Fibria produces pulp for market, and Suzano produces pulp for market and integrated for paper production.

In terms of unbleached softwood kraft pulp, the biggest producers are Klabin and Rigespa (MeadWestvaco).

Pulp production points to a reasonably concentrated production, where the top five companies account for roughly 76%. This concentration originates in the fact that most of the production is produced by large modern units earmarked for BHKP exports.

Pulp imports are small, occurring mainly for types that Brazil has little competitiveness, such as fluff pulp.

Due to the cost competitiveness of eucalyptus pulp produced in Brazil, there exists a technological effort towards substituting imported pulp for national production, including in the containerboard market.

Prior figures showed strong production/export growth (4.8% p.a.) and smaller apparent consumption growth (2.2% p.a.).

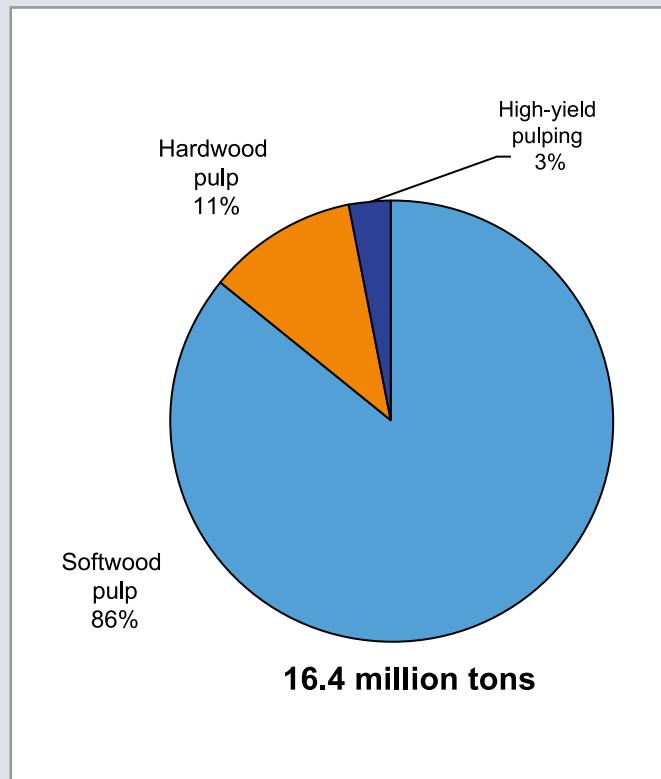


Figure 14 – Pulp production in Brazil in 2014

Source: Bracelpa/Ibá

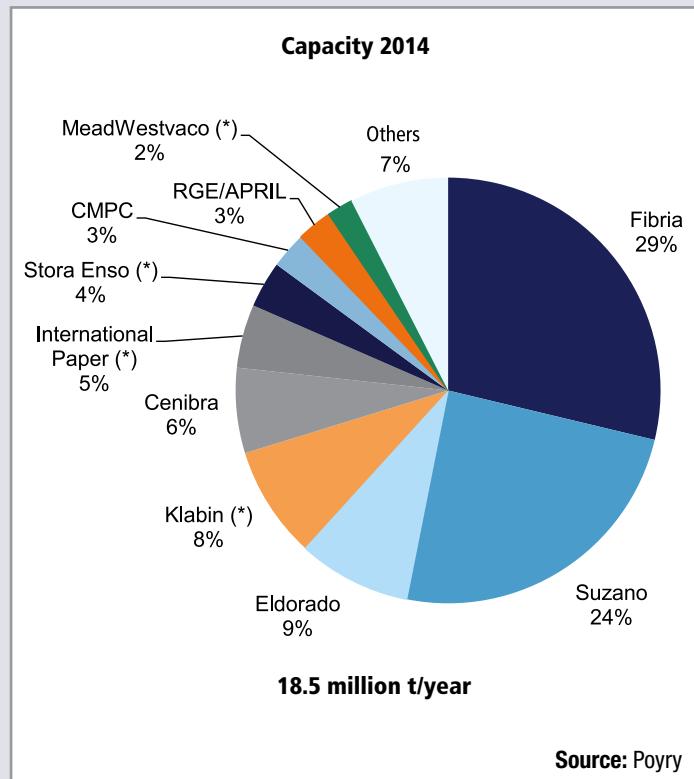


Figure 15 – Capacity per producer. (*) Unbleached softwood kraft pulp producers

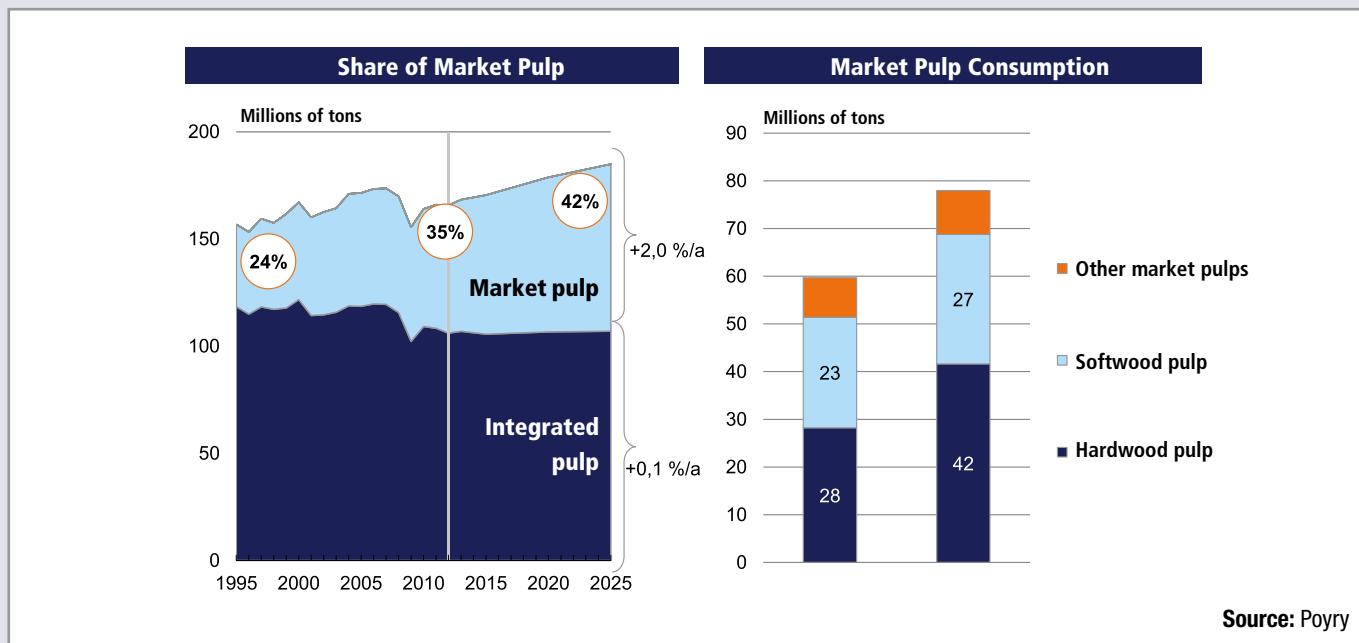


Figure 16 – Participation and consumption of market pulp within the global context

The growing importance of market pulp within the global context. The Brazil case

One of the consequences of the mass transfer of production means for manufactured goods, especially consumer goods, from developed regions to countries with cheap labor was, as already pointed out, the increase in purchasing power of large population masses, especially Asian, and the significant improvement in living standards. China has been the most relevant case, however, this same evolution is becoming very clear in Southeast Asian countries and India. Latin America and Africa have stood out as major sources of commodities, providing support to this boom.

Over the last decade, most of the increase in paper production occurred in Asia, particularly China, to the point of now facing a capacity problem, especially for printing/writing and packaging paper.

Even though the main source of fiber worldwide is – and will continue to be in the near future –, waste paper, the participation of market pulp has grown quickly, increasing from roughly 24% in 1995 to 35% in 2013, and is expected to reach approximately 42% in 2025.

The drivers behind this fact are based on the deficit in the supply of fiber in Asia. Even though the participation of waste paper will still grow marginally, since paper production has been concentrated in Asia without the offsetting increase in equivalent pulp production availability due to lack of adequate raw material (wood), this deficit have been resolved via virgin pulp imports.

The supply of recycled paper, which still lacks adequate collection sites, as well as quantity and quality of the portion imported (the majority), has not been able to satisfy this deficit. Additionally, due to environmental reasons, a large number of small units based on annual plants like bagasse, rice straw, bamboo, etc., were closed

down. In developed markets, old and obsolete units are being closed down due to lack of competitiveness.

Figure 16 shows this growing participation, which in Brazil mainly consists of Bleached Eucalyptus Kraft Pulp (BEKP).

Over the last years, the high productivity of Brazilian eucalyptus plantations has led to the development of state-of-the-art, high-capacity, export-oriented pulp mills.

The incremental production of most market pulp, coming from units that will begin operating by 2020, is earmarked for Asia, particularly China, which is expected to increase its purchases by roughly 65% between 2013 and 2020. Most of China's demand for pulp will be satisfied through imports from Latin America and neighboring Asian countries.

The growing consumption of tissue in Asia leverages Brazilian pulp exports, but posts smaller increases in amounts earmarked for printing/writing paper and paperboard. Eucalyptus pulp has proven to be an excellent fiber for producing tissue paper, given its softness, volume (bulk) and absorption capacity. For such reasons, it has been substituting softwood pulp in this application in the North American market and, to a lesser extent, in Europe.

The scarcity of quality recycled paper for export (good quality waste paper) appropriate for producing tissue paper is worsening due to a reduction in print paper consumption in developed countries (the main source of exports to Asia), thus leveraging the consumption of market virgin pulp.

At present, Brazil is the leading producer and exporter of BHKP, as shown in **Figure 17**. This importance tends to increase with the future entry of projects already underway, such as CMPC Celulose Riograndense's expansion in Guaíba (RS), now in a production ramp up process; Klabin's new unit in Ortigueira (PR), and Fibria's second production line in Três Lagoas (MS).

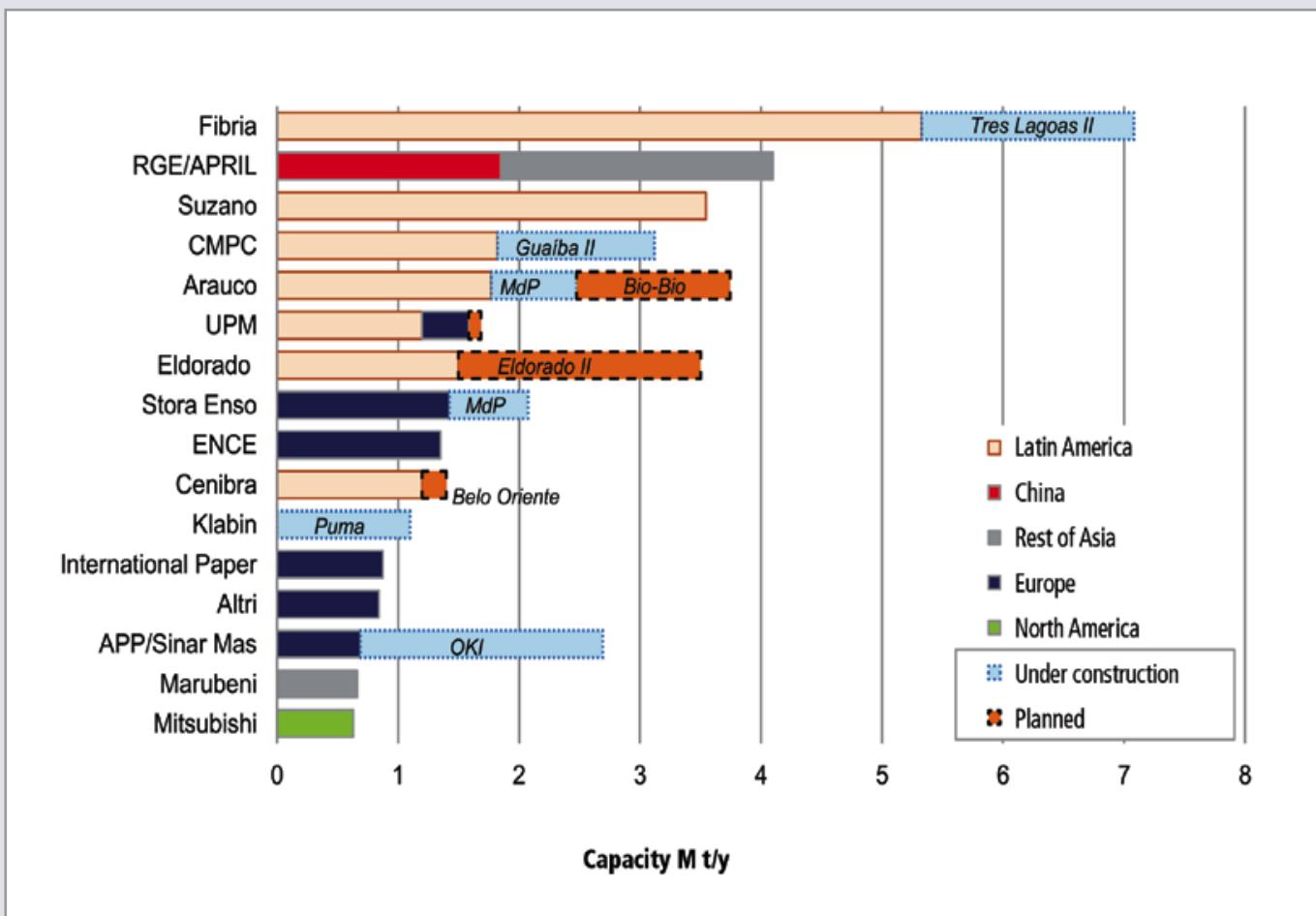


Figure 17 – Top global producers of hardwood pulp and their investment plans

Source: Pöyry

It is important to point out that in the last years the global pulp and paper industry has witnessed an unprecedented movement towards production diversification. As such, we see new impulse in the development of products encompassing not only paper and boards, but also focusing outside the limits of the production nucleus, like biofuels based on forest biomass and pulp byproducts, lignin, hemicelluloses, etc.

Brazil is a leader in biotechnology, especially in genetic engineering and silviculture, as well as in the development of selective cloning techniques.

Today, advancements are headed into the transgenic area, with the utilization of cutting-edge equipment and methodologies. Large groups possess advanced research facilities. This research effort is now being oriented to seek new products originating throughout the entire production chain.

Context and trends

Brazil's market pulp production continues showing a strong expansion movement, leveraged by exports on the part of large paper producers to emerging regions. For the time being, softwood

pulp does not seem that it will emulate this trend, despite Brazil's competitive conditions – except for, perhaps, fluff pulp production. It is important to note that the same driving forces that leverage tissue paper consumption also support fluff consumption for diapers, female sanitary pads and other smaller uses. Nonetheless, we are talking about much smaller volumes.

Even though the unbleached softwood pulp market used for packaging is regionally leveraged, due to the lack of recycled paper availability, the volume transacted on a global level has not yet reached significant levels.

Brazil's market pulp industry faces a few challenges such as the growing cost of land and rural labor, deficient infrastructure, volatile economic landscape, slowdown in the global economy, and polarization of demand and incremental supply, with China as a big buyer and Brazil as a big supplier.

The industry has reacted to these challenges through optimized governance practices, mechanization of forestry activities, improvement of the genetic base of plantations, better logistics (where possible), and through the installation of research and development facilities. ■