

YEARBOOK  
STATISTICAL  
ABRAF

2013

BASE YEAR 2012

2006

2007

2008

2009

2010

2011

2012



**A B R A F**  
Brazilian Association  
of Forest Plantation  
Producers

**Preparation**

Pöyry Silviconsult Engenharia Ltda.

**Supervision**

ABRAF

**Technical Support**

Alexandre Valladares Mello

João Batista Rezende

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Setor de Autarquias Sul, Quadra 1, Bloco N, Lotes 1 e 2, Edifício Terra Brasilis, Salas 503 e 504

CEP 70070-010 – Brasília-DF – Fones: (61) 3224-0108 / 3224-0109 – Fax: (61) 3224-0115

[www.abraflor.org.br](http://www.abraflor.org.br) – e-mail: [abrafl@abraflor.org.br](mailto:abrafl@abraflor.org.br)

Wood, and the use of wood, has marked the quality of life of civilizations throughout human history. The mastery of fire invented firewood. Stone was chipped, polished, and later substituted with wood as the raw material for utensils in nearly all applications. Pressure from growing populations made it necessary to plant trees in order to guarantee harvests and, in some cases, continued use in various parts of the world. In Brazil it is no different. The forest sector has a history of contributions with a reach and coverage which are as significant as they are old. What is really modern is the primary motivation: regardless of the final product, everything comes down to guaranteeing quality in people's lives.

Between then and now, we have evolved in the areas of technology and forest management. Sustainability began as a trend and now is a business strategy. We plant, we preserve, we reforest, and we transform fiber into thousands of products that make Brazil a reference for the world. Certainly, not everything is roses, but ABRAF, in this 8th Edition of the Statistical Yearbook, brings visibility and transparency to one more chapter of the history of this sector, the roots of which are interlaced with the nation's history.

In this spirit, I invite you to peruse the ABRAF Statistical Yearbook, where you can find the main indicators of the planted forest sector for 2012. Among the main headlines are the increase in planted area, gross production value and consumption of products from the forest base. In this edition, we also present articles on topics fundamental to the sector, such as competitiveness and profitability, bioenergy, climate change and prices of forest products.

It is important to mention the modest increase in planted area, a reflection of competitiveness the slow recovery of world commerce and international prices for forest-based products, which, together with the limits imposed to restrict land acquisition by Brazilian companies with majority foreign capital, have resulted in delays of projects planned by forest-based industry and independent investors.

Nevertheless, although the limits on growth have persisted, in 2012 it was possible to increase gross production value and consumption, reinforcing the relevance of contributions to the economic development of the country. Investments in social programs which were made by associated companies also consolidated the role of the sector as a driver of development.

Despite the country's limitations in infrastructure and logistics, and the instability of the international economy, the current perspective allows opportunities for Brazil to consolidate its role as one of the main powers in forest-based industry. However, for this to happen, it is important that companies articulate the removal of barriers to the sector's development and prioritize the improvement of industrial and forestry processes, as well as investments in technical innovation. The results of this process will be an increase in competitiveness, reduced production costs and a new round of investments in the sector.

We believe in the resumption of growth through, among other measures, the establishment of a sector-wide policy aimed at current needs and the productive potential of the forest-based sector, and we are fully conscious of our responsibility to produce while complying with environmental, social and economic requirements, seeking the balance needed to meet current demand without compromising future generations, as we can only be truly competitive when we are sustainable.

Brasília, June 18, 2013.

**Antonio Sergio Alipio**

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# LIST OF SYMBOLS, UNITS AND ACRONYMS

## LIST OF SYMBOLS AND UNITS

SYMBOLS AND UNITS	DESCRIPTION
§	Paragraph
%	Percentage
°	Degree
p.a.	Per Annum
BRL	Brazilian Real
GW	Gigawatt
ha	Hectare
kW	Quilowatt
m <sup>3</sup>	Cubic Meter
m <sup>3</sup> /ano	Cubic Meter per year
m <sup>3</sup> /ha ano	Cubic Meter per hectare year
mdc	Meter Charcoal
nº	Number
t	Ton
USD	American Dollar

## LIST OF ACRONYMS

ACRONYMS	DESCRIPTION
ABIB	Associação Brasileira das Indústrias de Biomassa e Energia Renovável (Brazilian Association of Renewable Biomass Energy)
ABIMCI	Associação Brasileira da Indústria de Madeira Processada Mecanicamente (Brazilian Association for Mechanically Processed Timber)
ABIPA	Associação Brasileira da Indústria de Painéis de Madeira (Brazilian Association of the Wood Panel Industry)
ABNT	Associação Brasileira de Normas Técnicas (Brazilian Association of Technical Standards)
ABRAF	Associação Brasileira de Produtores de Florestas Plantadas (Brazilian Association of Planted Forest Producers)

ACRONYMS	DESCRIPTION
<b>AC</b>	Estado do Acre (State of Acre)
<b>ACR</b>	Associação Catarinense de Empresas Florestais (Forest Companies Association of Santa Catarina)
<b>AFUBRA</b>	Associação dos Fumicultores do Brasil (Tobacco Growers Association of Brazil)
<b>AGEFLOR</b>	Associação Gaúcha de Empresas Florestais (Forest Companies Association of Rio Grande do Sul)
<b>ALICEWEB</b>	Sistema de Análise das Informações de Comércio Exterior (Foreign Trade Information Analysis System)
<b>AMS</b>	Associação Mineira de Silvicultura (Silviculture Association of Minas Gerais)
<b>ANEEL</b>	Agência Nacional de Energia Elétrica (National Agency of Electrical Energy)
<b>AP</b>	Estado do Amapá (State of Amapá)
<b>APABOR</b>	Associação Paulista de Produtores e Beneficiadores de Borracha (Association of Rubber Producers and Processors of São Paulo)
<b>APP</b>	Área de Preservação Permanente (Permanent Preservation Area)
<b>APRE</b>	Associação Paranaense de Empresas Florestais (Forest Companies Association of Paraná)
<b>ARETINS</b>	Associação dos Reflorestadores do Tocantins (Association of Reforesters of Tocantins)
<b>ART</b>	Artigo (Article)
<b>BA</b>	Estado da Bahia (State of Bahia)
<b>BASA</b>	Banco da Amazônia (Bank of the Amazon)
<b>BB</b>	Banco do Brasil (Bank of Brazil)
<b>BCB</b>	Banco Central do Brasil (Brazilian Central Bank)
<b>BEN</b>	Balanço Energético Nacional (Brazilian Energy Balance)
<b>BHKP</b>	Bleached Hardwood Kraft Pulp
<b>BNB</b>	Banco do Nordeste do Brasil (Bank of Northeast Brazil)
<b>BNDES</b>	Banco Nacional de Desenvolvimento Econômico e Social (Brazilian National Bank for Social and Economic Development)
<b>BRACELPA</b>	Associação Brasileira de Celulose e Papel (Brazilian Pulp and Paper Association)
<b>CAGED</b>	Cadastro Geral de Empregados e Desempregados (Labor Register of Employed and Unemployed Workforce)
<b>CAR</b>	Cadastro Ambiental Rural (Rural Environmental Registration)

# LIST OF SYMBOLS, UNITS AND ACRONYMS

ACRONYMS	DESCRIPTION
<b>CERFLOR</b>	Programa Brasileiro de Certificação Florestal (Brazilian Program of Forest Certification)
<b>COFINS</b>	Contribuição para o Financiamento da Seguridade Social (Social Security Financing)
<b>CNAE</b>	Classificação Nacional de Atividades Econômicas (National Classification of Economic Activities)
<b>CSA</b>	Canadian Standard Association
<b>CSLL</b>	Contribuição Social sobre o Lucro Líquido (Social Contribution on Net Income)
<b>DAP</b>	Declaração de Aptidão (Aptitud Declaration)
<b>E&amp;R</b>	Education and Income
<b>EGP</b>	Edge Glued Panel
<b>EMBI+</b>	Emerging Markets Bond Index Plus
<b>ES</b>	Estado do Espírito Santo (State of Espírito Santo)
<b>FCO</b>	Fundos Constitucionais de Financiamento do Centro- Oeste (Midwest Constitutional Financing Fund)
<b>FIRJAN</b>	Federação das Indústrias do Rio de Janeiro (Federation of Industries of the State of Rio de Janeiro)
<b>FNE</b>	Fundos Constitucionais de Financiamento do Nordeste (Northeast Constitutional Financing Fund)
<b>FNO</b>	Fundos Constitucionais de Financiamento do Norte (North Constitutional Financing Fund)
<b>FSC</b>	Forest Stewardship Council
<b>GEE</b>	Gases de Efeito Estufa (Greenhouse Gas Emissions)
<b>GO</b>	Estado de Goiás (State of Goiás)
<b>HDF</b>	High Density Fiberboard
<b>IBAMA</b>	Instituto Brasileiro do Meio Ambiente (Brazilian Institute of Environment)
<b>IBGE</b>	Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics)
<b>IBOVESPA</b>	Bovespa Index
<b>IBPT</b>	Instituto Brasileiro de Planejamento Tributário (Brazilian Institute of Tax Planning)
<b>ICMS</b>	Imposto sobre Circulação de Mercadorias e Serviços (Goods and Services Tax)
<b>IDEB</b>	Índice de Desenvolvimento da Educação Básica (Basic Education Development Index)

ACRONYMS	DESCRIPTION
<b>IDH</b>	Índice de Desenvolvimento Humano (Human Development Index)
<b>IFDM</b>	Índice FIRJAN de Desenvolvimento Municipal (FIRJAN Municipal Development Index)
<b>ILFP</b>	Integração Lavoura, Pecuária e Floresta (Integration of Crops, Cattle-raising Areas and Forests)
<b>IMA</b>	Incremento Médio Anual (Mean Annual Increment)
<b>INCAF-Pöyry</b>	Índice Nacional de Custos da Atividade Florestal – Pöyry (Forest Activity Costs National Index – Pöyry)
<b>IOF</b>	Imposto sobre Operações Financeiras (Tax on Financial Operations)
<b>IPCA</b>	Índice Nacional de Preços ao Consumidor Amplo (National Index of Consumer Prices Wide)
<b>IPEA</b>	Instituto de Pesquisa Econômica Aplicada (Institute of Applied Economic Research)
<b>IPI</b>	Imposto Sobre Produtos Industrializados (Tax on Industrialized Products)
<b>IRPJ</b>	Imposto de Renda de Pessoa Jurídica (Income Tax of Legal Entities)
<b>IRT-Pöyry</b>	Índice de Rentabilidade Timberland – Pöyry (Timberland Profitability Index – Pöyry)
<b>ISS</b>	Imposto Sobre Serviços (Tax on Services)
<b>ITR</b>	Imposto sobre a Propriedade Territorial Rural (Tax on Rural Property)
<b>MA</b>	Estado do Maranhão (State of Maranhão)
<b>MAPA</b>	Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Food Supply)
<b>MBRE</b>	Mercado Brasileiro de Redução de Emissões (Brazilian Market of Emission Reduction)
<b>MDA</b>	Ministério do Desenvolvimento Agrário (Ministry of Agrarian Development)
<b>MDF</b>	Medium Density Fiberboard
<b>MDIC</b>	Ministério do Desenvolvimento Indústria e Comércio (Ministry of Development, Industry & Commerce)
<b>MDL</b>	Mecanismo de Desenvolvimento Limpo (Clean Development Mechanism)
<b>MDP</b>	Medium Density Particleboard
<b>MG</b>	Estado de Minas Gerais (State of Minas Gerais)

# LIST OF SYMBOLS, UNITS AND ACRONYMS

ACRONYMS	DESCRIPTION
<b>MMA</b>	Ministério do Meio Ambiente (Provisional Presidential Decree)
<b>MPME</b>	Micro, Pequenas e Médias Empresas (Micro, Small and Medium-sized Enterprises)
<b>MS</b>	Estado do Mato Grosso do Sul (State of Mato Grosso do Sul)
<b>MT</b>	Estado do Mato Grosso (State of Mato Grosso)
<b>MTE</b>	Ministério do Trabalho e Emprego (Ministry of Labor and Employment)
<b>NCM</b>	Nomenclatura Comum do Mercosul (Mercosul Common Nomenclature)
<b>OSB</b>	Oriented Strand Board
<b>PA</b>	Estado do Pará (State of Pará)
<b>PASEP</b>	Programa de Formação do Patrimônio do Servidor Público (Civil Service Asset Formation Program)
<b>PDE</b>	Plano Decenal de Expansão de Energia (Decennial Plan for Energy Expansion)
<b>PPD</b>	Project Design Document
<b>PEFC</b>	Programme for the Endorsement of Forest Certification
<b>PEVS</b>	Produção da Extração Vegetal e da Silvicultura (Extraction Plant Production and Silviculture)
<b>PFNM</b>	Produtos Florestais Não-Madeireiros (NonTimber Forest Products)
<b>PI</b>	Estado do Piauí (State of Piauí)
<b>PIB</b>	Produto Interno Bruto (Gross Domestic Product)
<b>PIS</b>	Programa de Integração Social (Social Integration Program)
<b>PLANO ABC</b>	Plano Setorial de Mitigação e de Adaptação às Mudanças Climáticas para a Consolidação de uma Economia de Baixa Emissão de Carbono na Agricultura (Sector Plan for Mitigation and Climate Change Adaptation to Low-Carbon Agriculture Program)
<b>PMVA</b>	Produto de maior valor agregado (High Added Value Product)
<b>PNDR</b>	Política Nacional de Desenvolvimento Regional (National Development Regional Plan)
<b>PNMC</b>	Política Nacional de Mudança Climática (Climate Change National Policy)
<b>PNUD</b>	Programa das Nações Unidas para o Desenvolvimento (United Nations Development Program)



ACRONYMS	DESCRIPTION
PPCDAM	Plano de Prevenção e Controle do Desmatamento na Amazônia (Amazon Deforestation Prevention and Control Plan)
<b>PPC</b>	Plano de Ação para Prevenção e Controle do Desmatamento e das Queimadas no Cerrado (Action Plan for the Control and Prevention of Cerrado Deforestation)
<b>PR</b>	Estado do Paraná (State of Paraná)
<b>PROGRAMA ABC</b>	Programa Nacional para Redução da Emissão de Gases de Efeito Estufa na Agricultura – Agricultura de Baixo Carbono (Program for the Reduction of Greenhouse Gases Emission in Agriculture - Low-Carbon Agriculture)
<b>PRONAF</b>	Programa Nacional de Fortalecimento da Agricultura Familiar Florestal (National Program for Strengthening Family Agriculture)
<b>REDD</b>	Redução de Emissões por Desmatamento e Degradação (Reducing Emissions from Deforestation and Degradation)
<b>REFLORE</b>	Associação Sul Mato-Grossense de Produtores e Consumidores de Florestas Plantadas (Association of Planted Forest Consumers of Mato Grosso do Sul)
<b>RL</b>	Reserva Legal (Legal Reserve)
<b>RPPN</b>	Reserva Particular do Patrimônio Natural (Private Natural Heritage Reserve)
<b>RR</b>	Estado de Roraima (State of Roraima)
<b>RS</b>	Estado do Rio Grande do Sul (State of Rio Grand do Sul)
<b>SC</b>	Estado de Santa Catarina (State of Santa Catarina)
<b>SECEX</b>	Secretaria de Comércio Exterior (Bureau of Foreign Trade)
<b>SELIC</b>	Sistema Especial de Liquidação e de Custódia (Special Settlement and Custody System)
<b>SINDIFER</b>	Sindicato das Indústrias do Ferro no Estado de Minas Gerais (Minas Gerais Iron Industry Trade Union)
<b>SP</b>	Estado de São Paulo (State of São Paulo )
<b>TIMO</b>	Timberland Investment Management Organizations
<b>TJLP</b>	Taxa de Juros de Longo Prazo (Long Term Interest Rate)
<b>TO</b>	Estado de Tocantins (State of Tocantins)
<b>UF</b>	União Federativa (Federated State)
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>VBPF</b>	Valor Bruto da Produção Florestal (Gross Value of Forestry Production)

# EXECUTIVE SUMMARY

## EXECUTIVE SUMMARY

The productive chain of the Brazilian forest-based sector associated with planted forests is characterized by a great diversity of products, and encompasses the production, harvest and transport of wood as well as the production of end products in industrial segments such as Pulp and Paper, Industrialized Wooden Panels, Mechanically Processed Wood, Charcoal-fired Steelworks and Biomass, among others.

In 2012, the sector's gross production value (GPV) totaled BRL 56.3 billion, which is 4.6% higher than the figure for 2011. Taxes and tributes collected amounted to BRL 7.6 billion (0.5% of the domestic taxes collected). The commercial trade balance for forest-based industry (USD 5.5 billion), although 3.8% less than this value for 2011, increased its role in domestic trade surplus, moving from 19.1% to 28.1% (Graph 1).

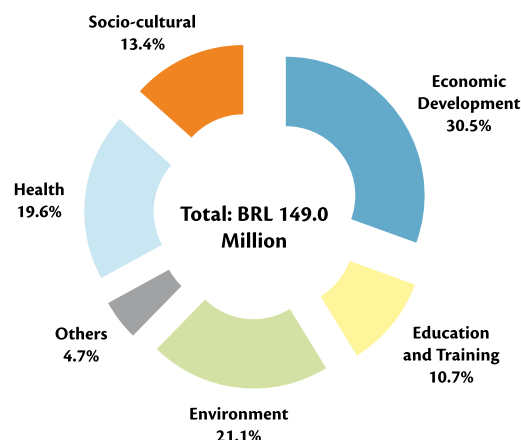
**Graph 1 Principal economic indicators for the forest sector, 2011-2012**



Source: ABRAF Yearbook (2012), BRACELPA (2012), ABIPA (2012), AMS (2013), Pöyry Silviconsult (2013), Brasil Móveis (2012) and SECEX (2012).

In the social arena, activities related to the sector's productive chain contributed to the generation of 4.4 million jobs, and to an investment of BRL 149.0 million in social improvement, education and environmental programs, benefiting 1.3 million people and approximately one thousand communities located in the regions influenced by companies; these activities consolidate the Brazilian forest-based sector as a force driving economic and social development in the country (Graph 2).

**Graph 2 Principal investments in social programs by ABRAF member companies, 2012**

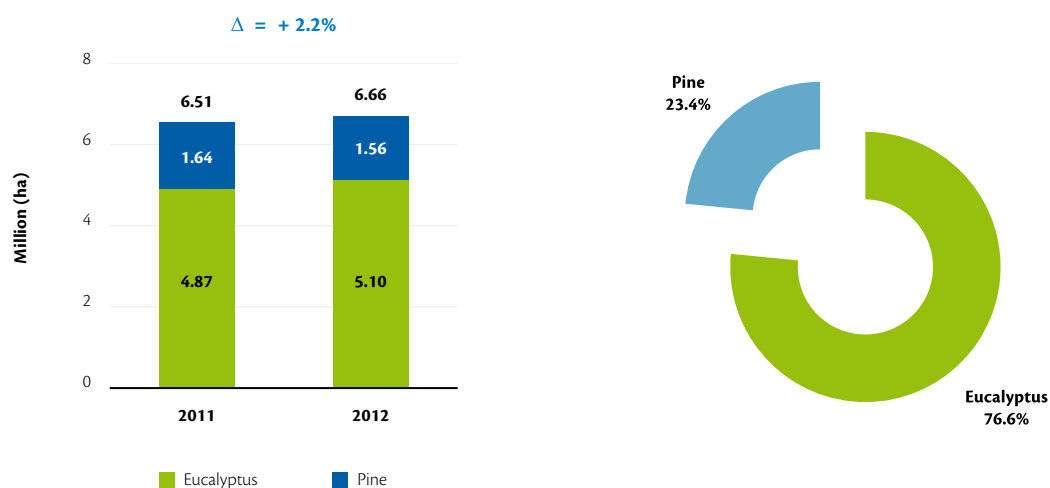


Source: ABRAF Individual Member Companies (2012).

## PLANTED AREA

In 2012, the area planted with Eucalyptus and pine plantations in Brazil reached 6.66 million hectares, a growth of 2.2% in relation to 2011. Eucalyptus plantations account for 76.6% of the total area, and pine plantations for 23.4% (Graph 3).

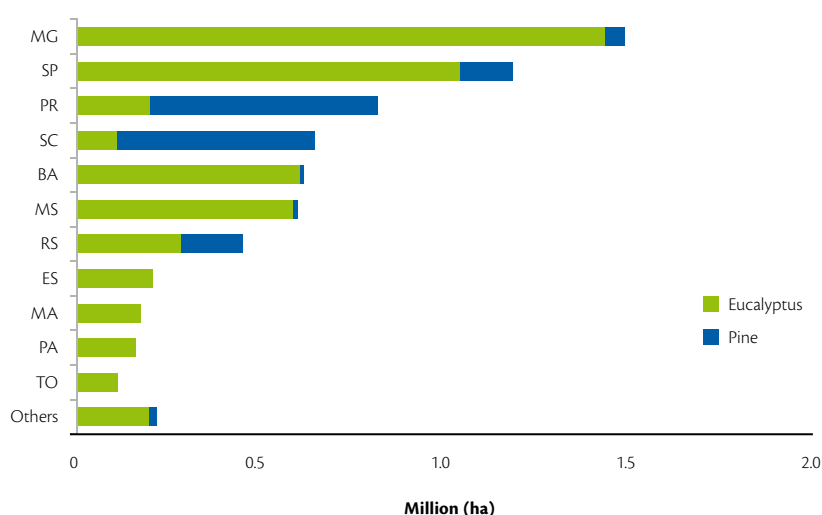
**Graph 3** Distribution of forest plantation area in Brazil by genus, and area of Eucalyptus and pine plantations in Brazil, 2011-2012



Source: ABRAF Yearbook (2012), ABRAF Individual Member Companies and Affiliated Members (2012) and Pöyry Silviconsult (2013).

The states with the greatest concentration of forest plantations were Minas Gerais, São Paulo, Paraná, Santa Catarina, Bahia and Mato Grosso do Sul (Graph 4).

**Graph 4** Distribution of forest plantation area (Pine and Eucalyptus) in Brazil, 2012

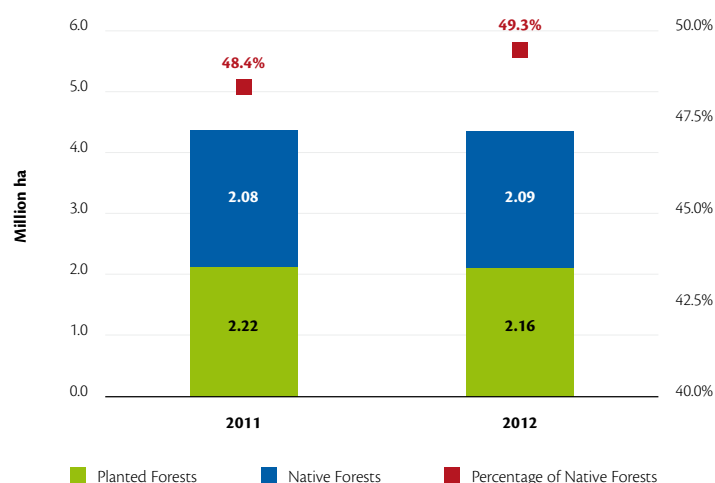


Source: ABRAF Yearbook (2012), ABRAF Individual Member Companies and Affiliated Members (2012) and Pöyry Silviconsult (2013).

## FOREST CONSERVATION AND PRESERVATION AREAS

In 2012, the area of native forests preserved by ABRAF member companies was 0.9% greater than that of the year before, which represents an increase of 16.3 thousand ha (Graph 5). For each 1.0 ha of planted forests, ABRAF individual member companies contributed to the preservation of 0.97 ha of native forests.

**Graph 5** Area of forest plantations and native forests preserved by ABRAF individual member companies, 2011 and 2012

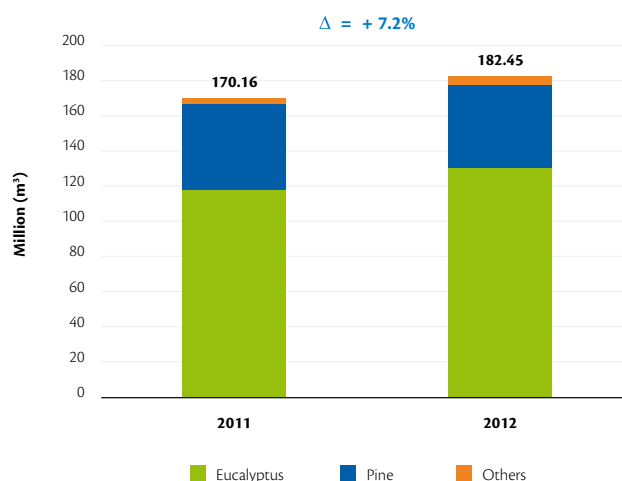


Source: ABRAF Yearbook (2012), ABRAF Individual Member Companies and Affiliated Members (2012) and Pöyry Silviconsult (2013).

## ROUND WOOD CONSUMPTION

In 2012, Brazilian consumption of logs from forest plantations was 182.4 million cubic meters (m<sup>3</sup>), an amount 7.2% higher than that of 2011 (Graph 6).

**Graph 6** Brazilian consumption of logs for industrial use by genus, 2011-2012

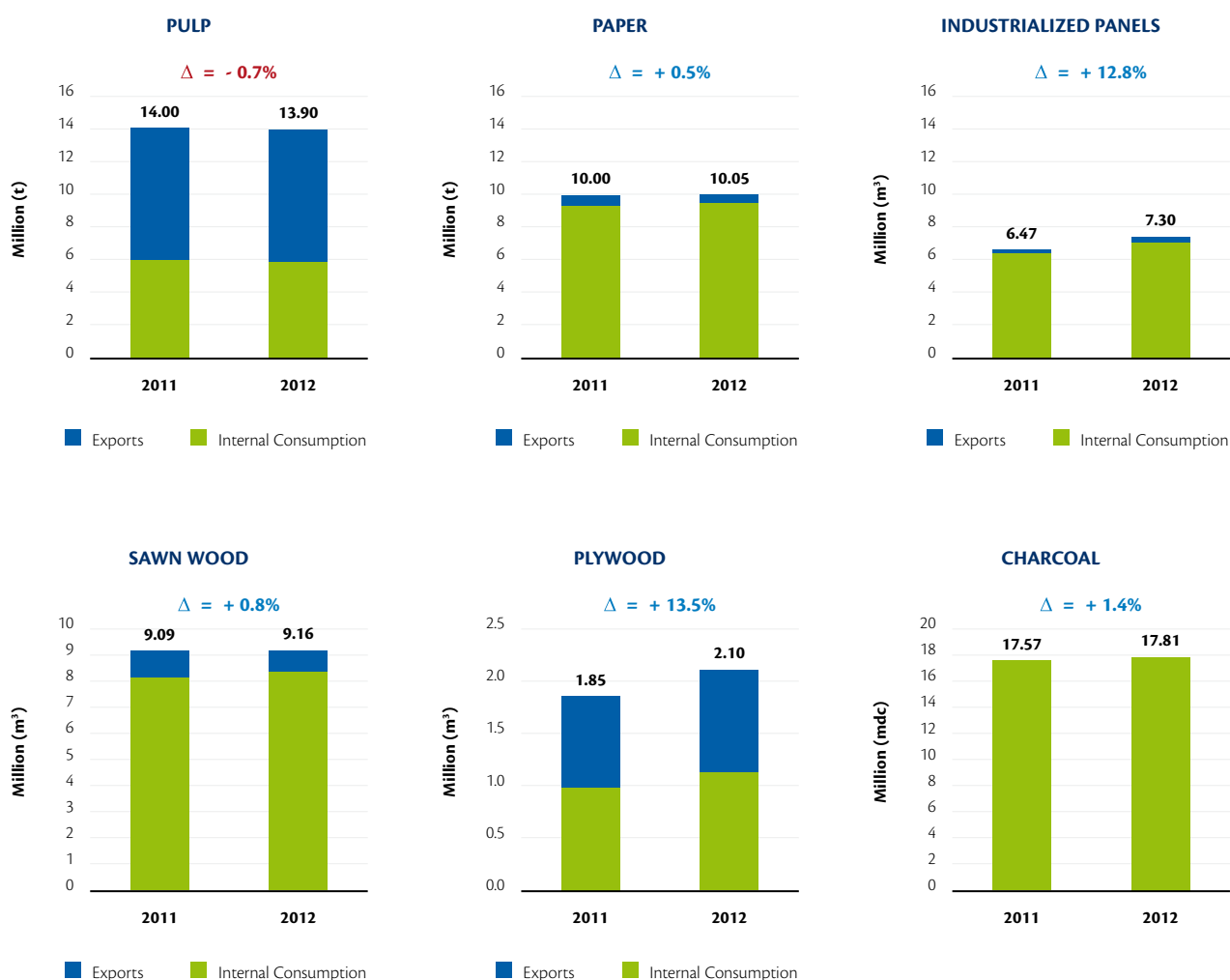


Source: ABRAF Yearbook (2012), BRACELPA (2012), ABIPA (2012), AMS (2013), Brasil Móveis (2012) and Pöyry Silviconsult (2013).

## EXPORTS AND INTERNAL CONSUMPTION OF THE PRINCIPAL FOREST PRODUCTS

In 2012, segments of Brazilian forest-based industry associated with planted forests registered a growth in exports and in internal consumption, with the exception of pulp, which had lower levels of production than those registered in 2011 (Graph 7).

**Graph 7** Historical change in exports and internal consumption of the main forest products, 2011-2012



Source: ABRAF Yearbook (2012), ABRAF Individual member companies and collective associates (2013), SECEX (2012) and Pöyry Silviconsult (2013).

The foreign market played an important role in consumption of Brazilian forest products in 2012. The main importers of products from Brazilian forests were Argentina, Germany and China, which led the rankings in importing paper, plywood and pulp, respectively. The United States was the leader in importing panels and sawn wood (Figure 1).

**Figure 1** Main importers of Brazilian forest products, 2012



Source: SECEX (2012).

A graphic for Chapter 1. It features a dark blue horizontal bar with the word "CHAPTER" in white, uppercase letters. To the right of this bar is a large, light gray rounded square containing a large white number "1".

# CHAPTER 1

## *FOREST PLANTATIONS IN BRAZIL*

FOREST PLANTATIONS OF EUCALYPTUS AND PINE

AREA PLANTED WITH EUCALYPTUS AND PINE

BY ABRAF ASSOCIATES

FORESTS PLANTED WITH OTHER SPECIES

PLANTED FORESTS VS. NATIVE FORESTS

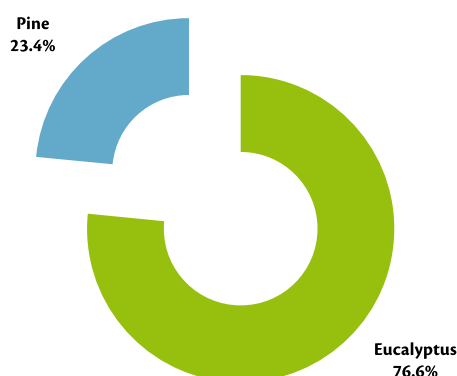


# 1 FOREST PLANTATIONS IN BRAZIL

## 1.1 FOREST PLANTATIONS OF EUCALYPTUS AND PINE

In 2012, Brazil's total area of forest plantations growing Eucalyptus and Pine was 6,664,812 ha (Tables 1.01 and 1.02); 76.6% of this area was planted with Eucalyptus, and 23.4% with Pine (Graph 1.01).

**Graph 1.01** Distribution of planted forest area in Brazil by genus, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

In 2012, it was not possible to confirm that the area planted with Eucalyptus and Pine increased in Brazil, as the increase in area (148,968 ha), around 2.2%, falls within the study's margin of error. The indicator for 2012 corroborates the trend towards slowed growth in planted area, which was observed in the previous two years (Graph 1.02). For the period 2006-2012, annual growth was 2.8%.

The main reasons for stagnating growth in planted area in 2012 were:

- measures taken by the Brazilian government to restrict land purchases by domestic groups funded with a majority share of foreign capital;
- reduced economic activity in EU member countries and in the United States, countries which import forest products or those associated with the planted forest-based chain;
- products from the Brazilian forest-based product chain are less competitive on the international market; and
- excessive bureaucracy and long terms required by government agencies in order to obtain environmental licensing for new forest and industrial projects in the country.

In contrast, Mato Grosso do Sul stood out on the domestic scene due to its 22.5% increase in area planted with Pine and Eucalyptus compared with 2011. This is due to the firm establishment of the state as one of the main centers for pulp production.

In 2012, area planted with Eucalyptus totaled 5,102,030 ha (Table 1.03), a growth of 4.5% (228,078 ha) over 2011 (Graph 1.02). The main factor which brought about this growth was the establishment of new plantations in order to meet future demand from industrial projects in the pulp and paper segment.

The area planted with Pine added up to 1,562,782 ha (Table 1.03) in 2012, 5.1% less than the number registered in 2011 (Graph 1.02). This result confirms the tendency to reduce the area planted with Pine, substituting it with Eucalyptus plantations. Analysis of the period 2006-2012 shows that the area occupied by Pine was reduced by 79,110 ha (-3.1% p.a.).

**Graph 1.02** Planted forest area in Brazil, 2006-2012



Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

Table 1.01 Pine and Eucalyptus plantations in Brazil, 2006-2012

State	Eucalyptus Plantations (ha)							Pine Plantations (ha)						
	2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
MG	1,181,429	1,218,212	1,278,210	1,300,000	1,400,000	1,401,787	1,438,971	146,000	143,395	145,000	140,000	136,310	75,408	52,710
SP	915,841	911,908	1,001,080	1,029,670	1,044,813	1,031,677	1,041,695	214,491	209,621	172,480	167,660	162,005	156,726	144,802
PR	121,908	123,070	142,430	157,920	161,422	188,153	197,835	686,453	701,578	714,890	695,790	686,509	658,707	619,731
BA	540,172	550,127	587,610	628,440	631,464	607,440	605,464	54,820	41,221	35,090	31,040	26,570	21,520	11,230
SC	70,341	74,008	77,440	100,140	102,399	104,686	106,588	530,992	548,037	551,220	550,850	545,592	538,254	539,377
RS	184,245	222,245	277,320	271,980	273,042	280,198	284,701	181,378	182,378	173,160	171,210	168,955	164,806	164,832
MS	119,319	207,687	265,250	290,890	378,195	475,528	587,310	28,500	20,697	18,800	16,870	13,847	11,871	9,825
ES	207,800	208,819	210,410	204,570	203,885	197,512	203,349	4,408	4,093	3,990	3,940	3,546	2,546	2,546
PA	115,806	126,286	136,290	139,720	148,656	151,378	159,657	149	101	10	-	-	-	-
MA	93,285	106,802	111,120	137,360	151,403	165,717	173,324	-	-	-	-	-	-	-
GO	49,637	51,279	56,880	57,940	58,519	59,624	38,081	14,409	13,828	15,200	15,200	12,160	10,760	16,432
AP	58,473	58,874	63,310	62,880	49,369	50,099	49,506	20,490	9,000	1,620	810	15	445	445
MT	46,146	57,151	58,580	61,530	61,950	58,843	59,980	7	7	10	10	-	-	-
TO	13,901	21,655	31,920	44,310	47,542	65,502	109,000	-	700	850	850	850	850	853
PI	-	-	-	-	37,025	26,493	27,730	-	-	-	-	-	-	-
Others	27,491	31,588	27,580	28,380	4,650	9,314	18,838	4,189	-	-	490	-	-	-
<b>Total</b>	<b>3,745,794</b>	<b>3,969,711</b>	<b>4,325,430</b>	<b>4,515,730</b>	<b>4,754,334</b>	<b>4,873,952</b>	<b>5,102,030</b>	<b>1,886,286</b>	<b>1,874,656</b>	<b>1,832,320</b>	<b>1,794,720</b>	<b>1,756,359</b>	<b>1,641,892</b>	<b>1,562,782</b>

Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

Table 1.02 shows the changes in Eucalyptus and Pine plantations between 2006 and 2012 across the Brazilian states.

**Table 1.02 Total area planted with Pine and Eucalyptus by state, 2006-2012**

State	Total Area Planted with Eucalyptus and Pine (ha)						
	2006	2007	2008	2009	2010	2011	2012
MG	1,327,429	1,361,607	1,423,210	1,440,000	1,536,310	1,477,195	1,491,681
SP	1,130,332	1,121,529	1,173,560	1,197,330	1,206,818	1,188,403	1,186,497
PR	808,361	824,648	857,320	853,710	847,931	846,860	817,566
BA	594,992	591,348	622,700	659,480	658,034	628,960	616,694
SC	601,333	622,045	628,660	650,990	647,992	642,941	645,965
RS	365,623	404,623	450,480	443,190	441,997	445,004	449,533
MS	147,819	228,384	284,050	307,760	392,042	487,399	597,135
ES	212,208	212,912	214,400	208,510	207,431	200,058	205,895
PA	115,955	126,387	136,300	139,720	148,656	151,378	159,657
MA	93,285	106,802	111,120	137,360	151,403	165,717	173,324
GO	64,046	65,107	72,080	73,140	70,679	70,384	54,513
AP	78,963	67,874	64,930	63,690	49,384	50,543	49,951
MT	46,153	57,158	58,590	61,540	61,950	58,843	59,980
TO	13,901	22,355	32,770	45,160	48,392	66,352	109,853
PI	-	-	-	-	37,025	26,493	27,730
Others	31,680	31,588	27,580	28,870	46,50	9,314	18,838
<b>Total</b>	<b>5,632,080</b>	<b>5,844,367</b>	<b>6,157,750</b>	<b>6,310,450</b>	<b>6,510,693</b>	<b>6,515,844</b>	<b>6,664,812</b>

Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Póry Silviconsult (2013).

Table 1.03 shows that the area planted with Eucalyptus and Pine belonging to ABRAF affiliates (member companies and collective members) made up 51.7% (3,446,229 ha) of total planted area in 2012.

**Table 1.03 Area planted with Eucalyptus and Pine belonging to ABRAF affiliates and non-affiliates by state, 2012**

State	Total Planted Area Belonging to ABRAF Affiliates <sup>2</sup>				Planted Area Belonging to Non-Affiliates				Planted Area <sup>1</sup> – Brazil			
	Eucalyptus	Pine	Total	%	Eucalyptus	Pine	Total	%	Eucalyptus	Pine	Total	%
MG	832,202	6,369	838,571	24.2%	606,769	46,341	653,110	20.2%	1,438,971	52,710	1,491,681	22.4%
SP	481,398	3,485	484,882	14.1%	560,298	141,317	701,615	21.8%	1,041,695	144,802	1,186,497	17.8%
PR	152,186	276,007	428,192	12.4%	45,649	343,725	389,374	12.1%	197,835	619,731	817,566	12.3%
BA	441,645	4,830	446,475	13.0%	163,819	6,400	170,219	5.3%	605,464	11,230	616,694	9.3%
SC	23,723	183,079	206,802	6.0%	82,865	356,298	439,163	13.6%	106,588	539,377	645,965	9.7%
RS	235,642	78,040	313,681	9.1%	49,060	86,792	135,851	4.2%	284,701	164,832	449,533	6.7%
MS	375,794	6,041	381,834	11.1%	211,516	3,784	215,300	6.7%	587,310	9,825	597,135	9.0%
ES	168,624	-	168,624	4.9%	34,725	2,546	37,271	1.2%	203,349	2,546	205,895	3.1%
PA	200	-	200	0.0%	159,457	-	159,457	5.0%	159,657	-	159,657	2.4%
MA	88,832	-	88,832	2.6%	84,492	-	84,492	2.6%	173,324	-	173,324	2.6%
GO	-	-	-	0.0%	38,081	16,432	54,513	1.7%	38,081	16,432	54,513	0.8%
AP	-	-	-	0.0%	49,506	445	49,951	1.6%	49,506	445	49,951	0.7%
MT	-	-	-	0.0%	59,980	-	59,980	1.9%	59,980	-	59,980	0.9%
TO	67,705	853	68,558	2.0%	41,295	-	41,295	1.3%	109,000	853	109,853	1.6%
PI	17,400	-	17,400	0.5%	10,330	-	10,330	0.3%	277,30	-	277,30	0.4%
RJ	2,177	-	2,177	0.1%	16,191	-	16,191	0.5%	18,368	-	18,368	0.3%
Others	-	-	-	0.0%	470	-	470	0.0%	470	-	470	0.0%
Total	2,887,526	558,703	3,446,229	100.0%	2,214,504	1,004,079	3,218,583	100.0%	5,102,030	1,562,782	6,664,812	100.0%

Source: ABRAF member companies and collective members (2013) and Póry Silviconsult (2013).

<sup>1</sup> Companies associated with ABRAF and companies affiliated to ABRAF Collective Members (see ABRAF – Structure and Associates).

**Table 1.04** Total area planted with Eucalyptus and Pine belonging to companies directly affiliated with ABRAF (member companies and collective members), 2012

States	ABRAF Member Companies¹				Collective Members²				Total Area of Companies Affiliated with ABRAF³			
	Eucalyptus	Pine	Total	%	Eucalyptus	Pine	Total	%	Eucalyptus	Pine	Total	%
MG	832202	6,369	838,571	26.9%	-	-	-	0.0%	832202	6,369	838,571	24.3%
SP	481,398	3,397	484,794	15.6%	-	88	88	0.0%	481398	3,485	484,882	14.1%
PR	142,651	189,611	332,262	10.7%	9,534	86,396	95,930	29.1%	152186	276,007	428,192	12.4%
BA	415,134	297	415,431	13.3%	26,511	4,533	31,044	9.4%	441,645	4,830	446,475	13.0%
SC	19,847	127,048	146,895	4.7%	3,875	56,031	59,906	18.1%	23,723	183,079	206,802	6.0%
RS	211,123	4,532	215,655	6.9%	24,519	73,508	98,027	29.7%	235,642	78,040	313,681	9.1%
MS	375,794	6,041	381,834	12.3%	-	-	-	0.0%	375,794	6,041	381,834	11.1%
ES	168,624	-	168,624	5.4%	-	-	-	0.0%	168,624	-	168,624	4.9%
PA	-	-	-	0.0%	200	-	200	0.1%	200	-	200	0.0%
MA	88,832	-	88,832	2.9%	-	-	-	0.0%	88,832	-	88,832	2.6%
GO	-	-	-	-	-	-	-	0.0%	-	-	-	-
AP	-	-	-	-	-	-	-	0.0%	-	-	-	-
MT	-	-	-	0.0%	-	-	-	0.0%	-	-	-	0.0%
TO	23,529	3	23,532	0.8%	44,176	850	45,026	13.6%	67,705	853	68,558	2.0%
PI	17,400	-	17,400	0.6%	-	-	-	0.0%	17,400	-	17,400	0.5%
RJ	2,177	-	2,177	0.1%	-	-	-	0.0%	2,177	-	2,177	0.1%
Others	-	-	-	-	-	-	-	0.0%	-	-	-	-
Total	2,778,710	337,298	3,116,008	100.0%	108,815	221,405	330,221	100.0%	2,887,526	558,703	3,446,229	100.0%

Source: ABRAF member companies and collective members (2013).

<sup>1</sup> Only ABRAF member companies in 2013, including plantations on their own property, outgrower schemes, and leasing.

<sup>2</sup> Companies associated with collective members of ABRAF.

<sup>3</sup> ABRAF member companies and companies affiliated to ABRAF Collective Members (see ABRAF – Structure and Associates).

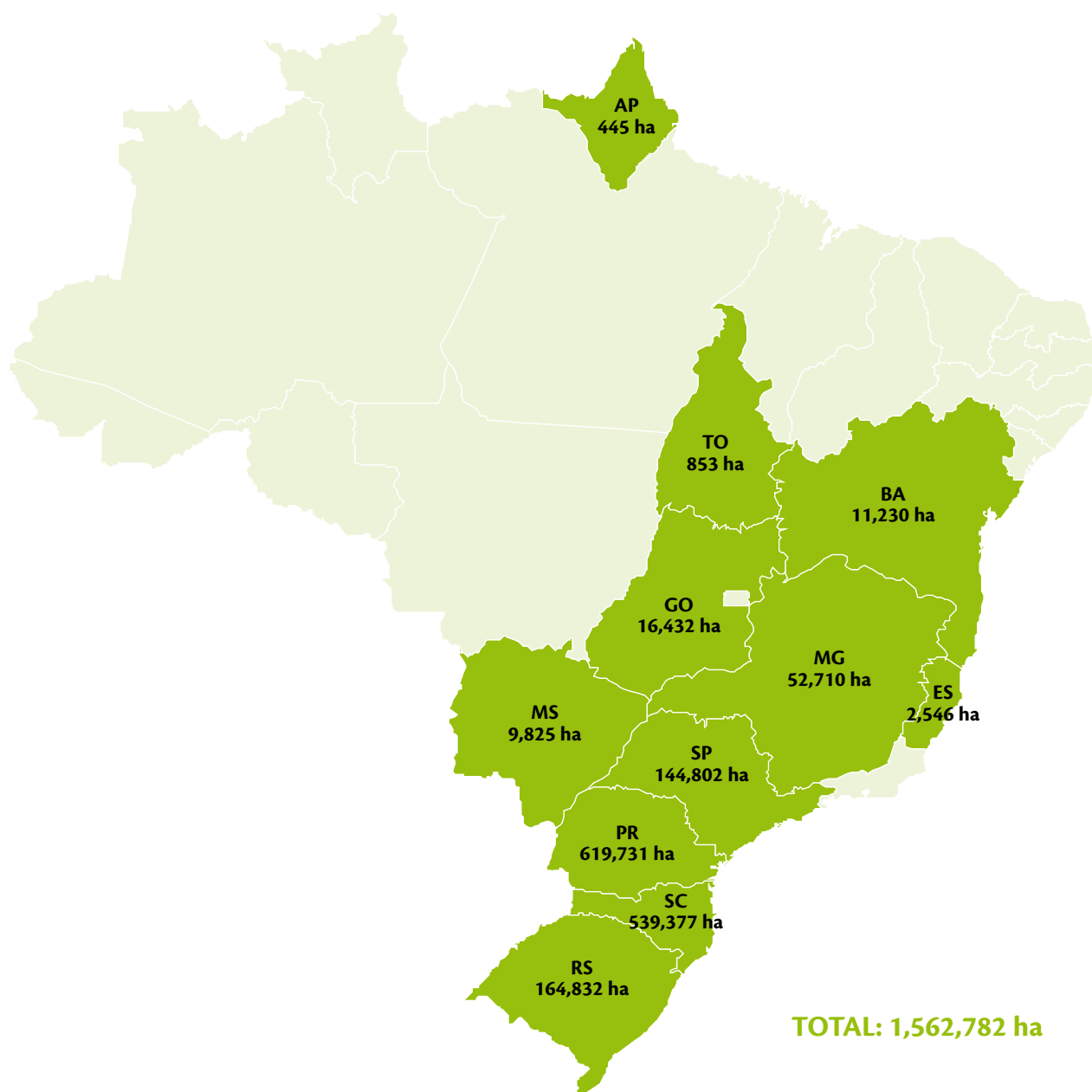
Geographical distribution of the planted areas in 2012 is shown in Figures 1.01 (Eucalyptus) and 1.02 (Pine). Figure 1.03 illustrates the total area and cumulative distribution of the area planted with these species.

**Figure 1.01** Area and distribution of Eucalyptus plantations in Brazil by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

**Figure 1.02** Area and distribution of Pine plantations in Brazil by state, 2012



Source: ABRAF member companies and collective members (2013) and e Pöyry Silviconsult (2013).



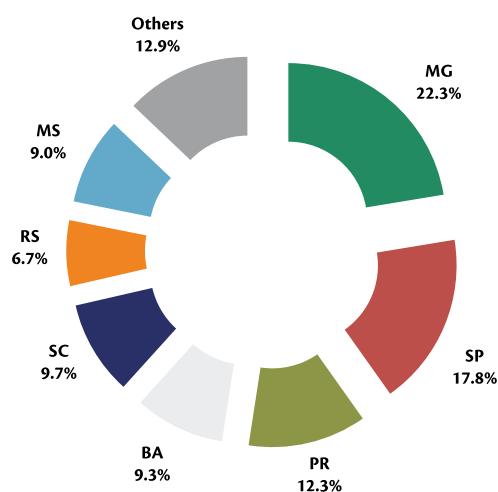
**Figure 1.03** Total area and distribution of Eucalyptus and Pine plantations in Brazil by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

The states of Minas Gerais, São Paulo, Paraná, Bahia, Santa Catarina, Mato Grosso do Sul and Rio Grande do Sul stood out on the national scene; together, they hold 87.1% of the total planted area (Graph 1.03).

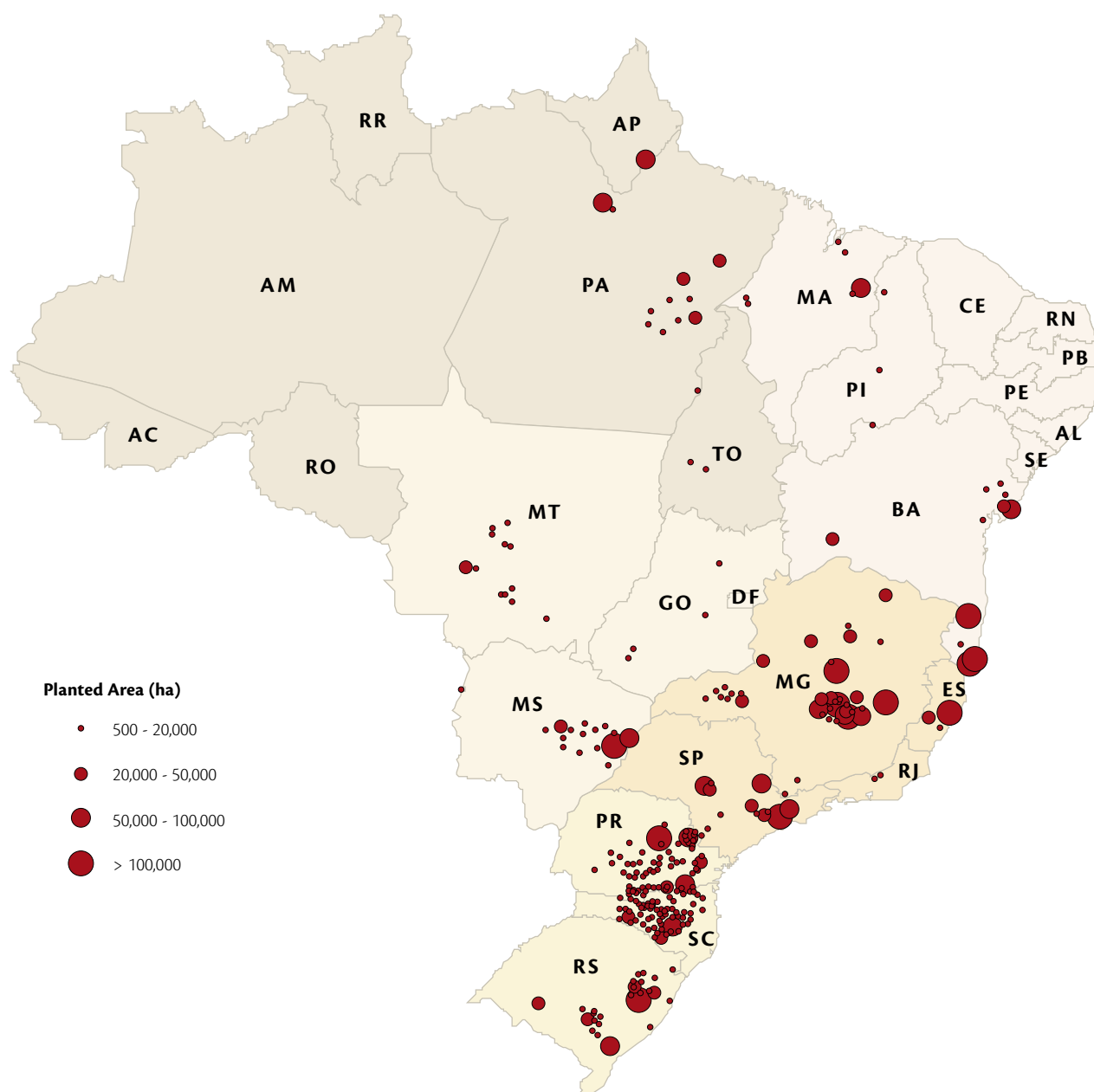
**Graph 1.03** Distribution of area planted with Eucalyptus and Pine by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

Figure 1.04 shows the distribution of planted forests belonging to the main Brazilian companies by size class and state.

**Figure 1.04** Distribution of main forest centers by state, 2012

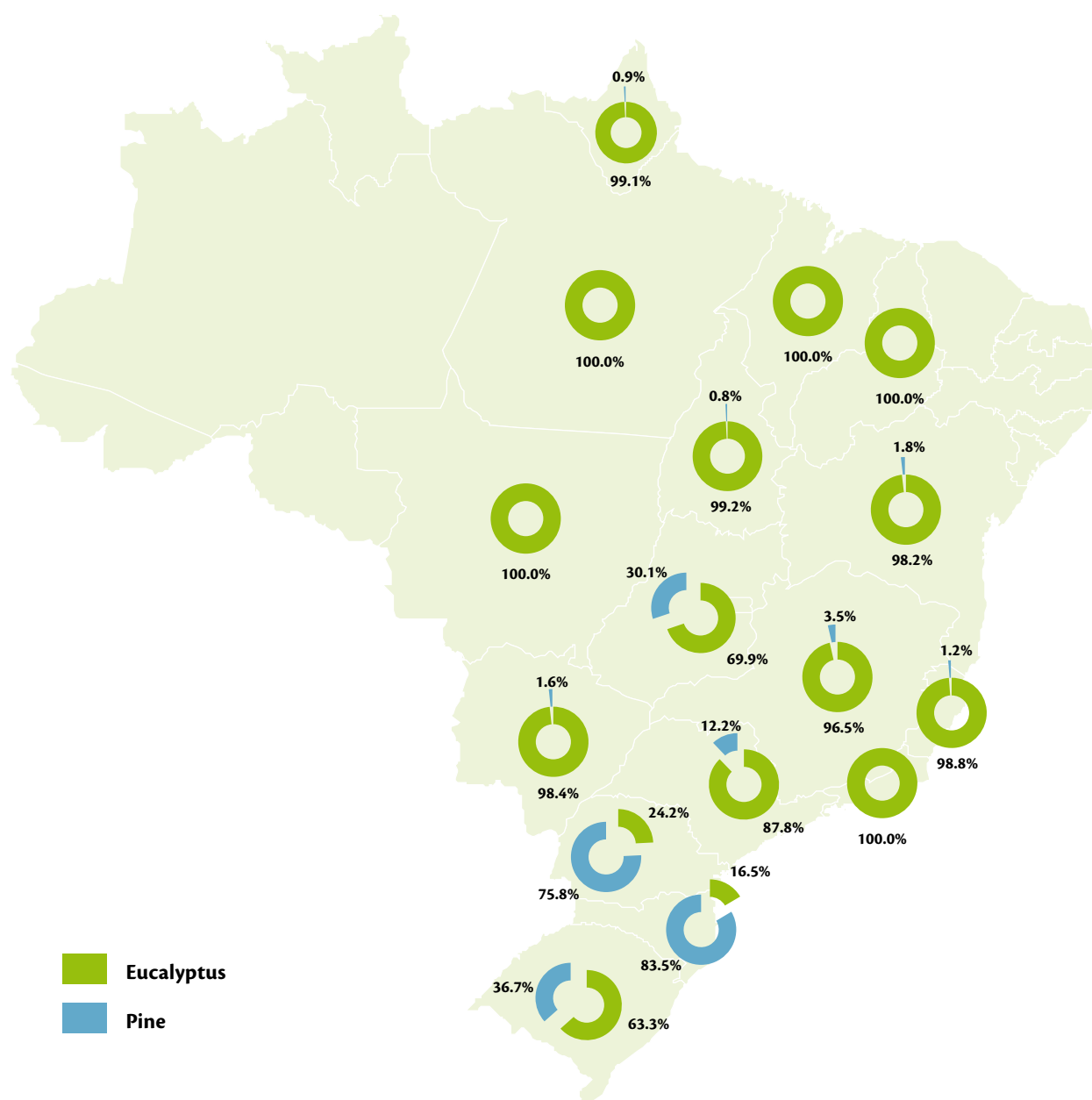


Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

The large concentration of forest plantations in the south and southeast regions of the country (72.3%) is due to the location of major industrial units in the following segments: Pulp and Paper, Industrialized Wood-based Panels, Charcoal-based Steelworks, and Mechanically Processed Wood.

With regards to the geographic distribution of planted areas by species, Pine predominates in the southern states, and Eucalyptus in the other regions (Figure 1.05).

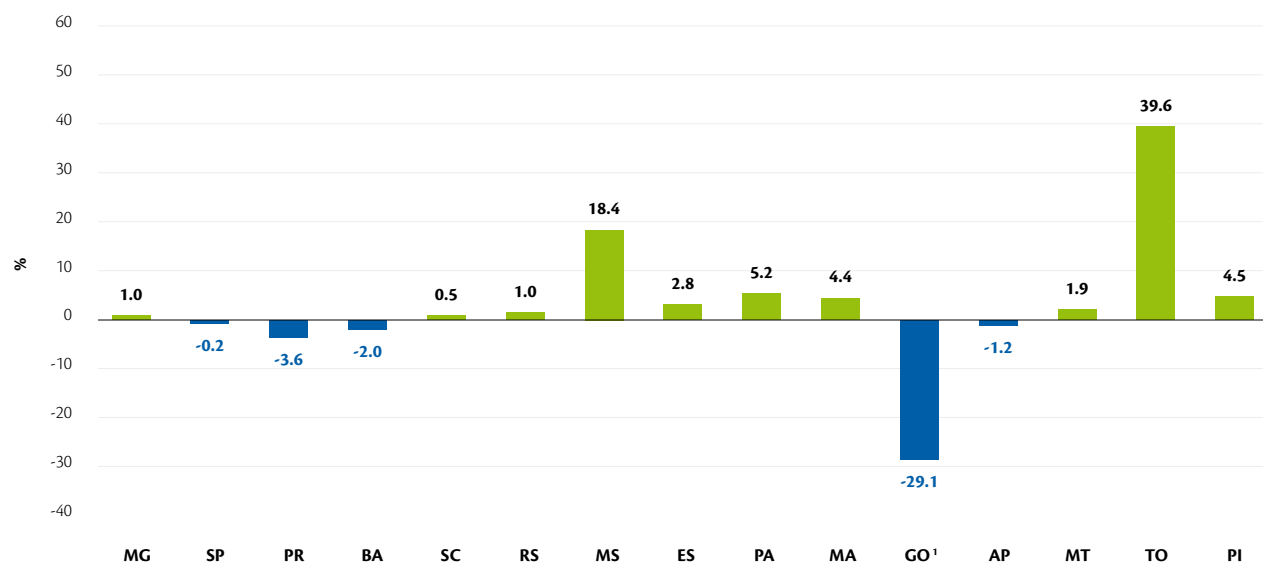
**Figure 1.05** Area and distribution of Eucalyptus and Pine plantations in Brazil, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

As for changes in the planted area, the states which showed the largest growth were Mato Grosso do Sul (18.4%) and Tocantins (39.6%). Bahia, Paraná and Goiás showed the greatest reductions, with -2.0%, -3.6% and -29.1% respectively (Graph 1.04).

**Graph 1.04** Growth in area planted with Eucalyptus and Pine by state, 2011-2012



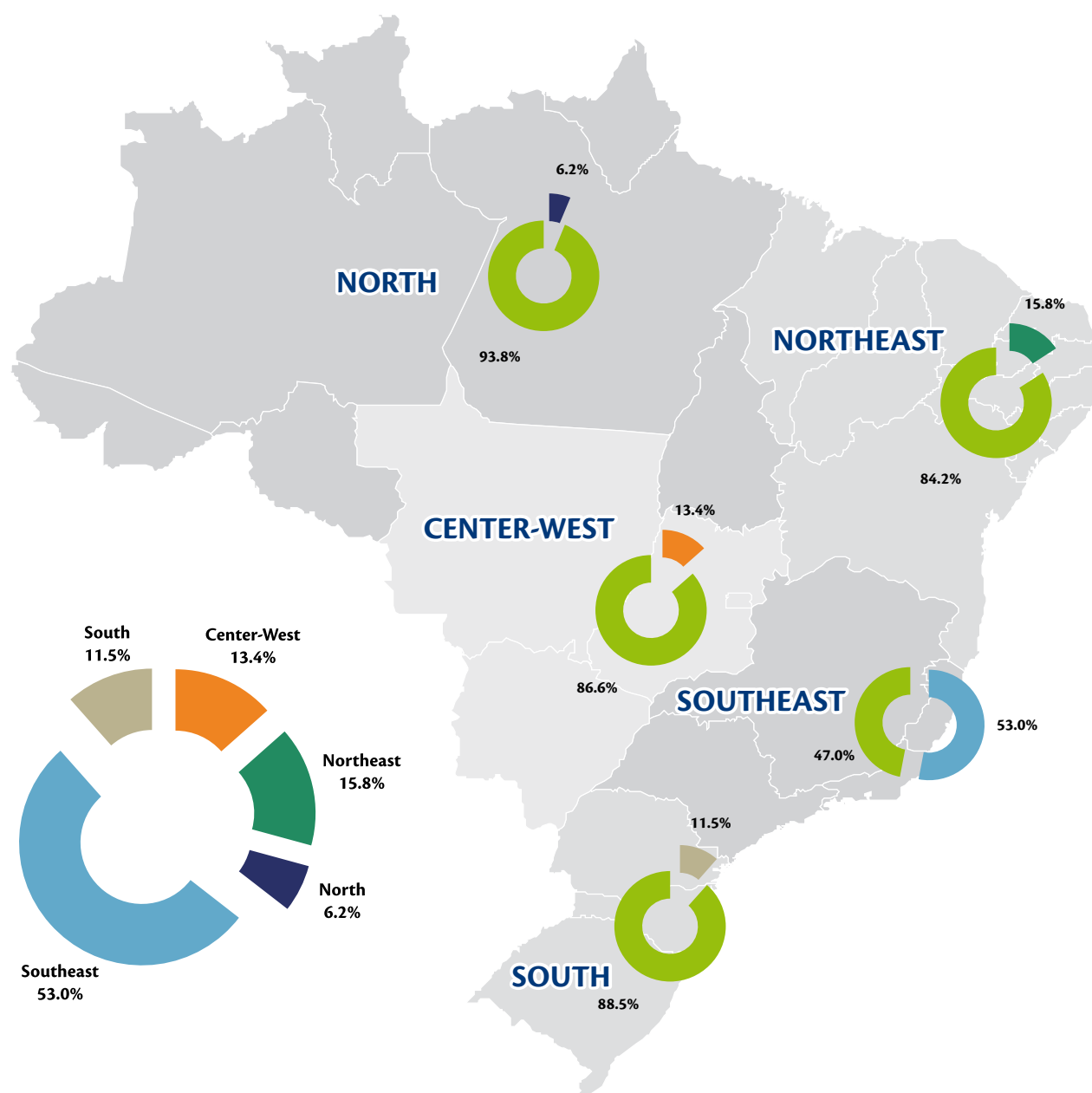
Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

¹See the Methodology section in Chapter 5 of this Yearbook.

### 1.1.1 Eucalyptus Plantations

Of the area planted with Eucalyptus in Brazil (5,102,030 ha), 53.0% was concentrated in the southeast region (Figure 1.06).

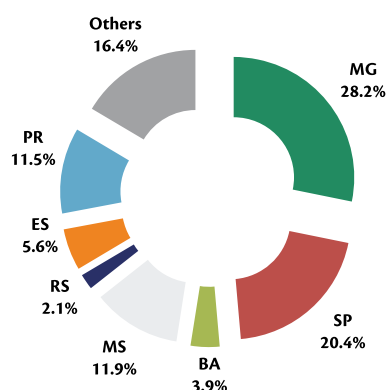
**Figure 1.06** Area and distribution of Eucalyptus plantations in Brazil, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

On the state level, Minas Gerais, São Paulo, Bahia, Mato Grosso do Sul, Rio Grande do Sul, Espírito Santo and Paraná held 83.6% of Eucalyptus plantations (Graph 1.05).

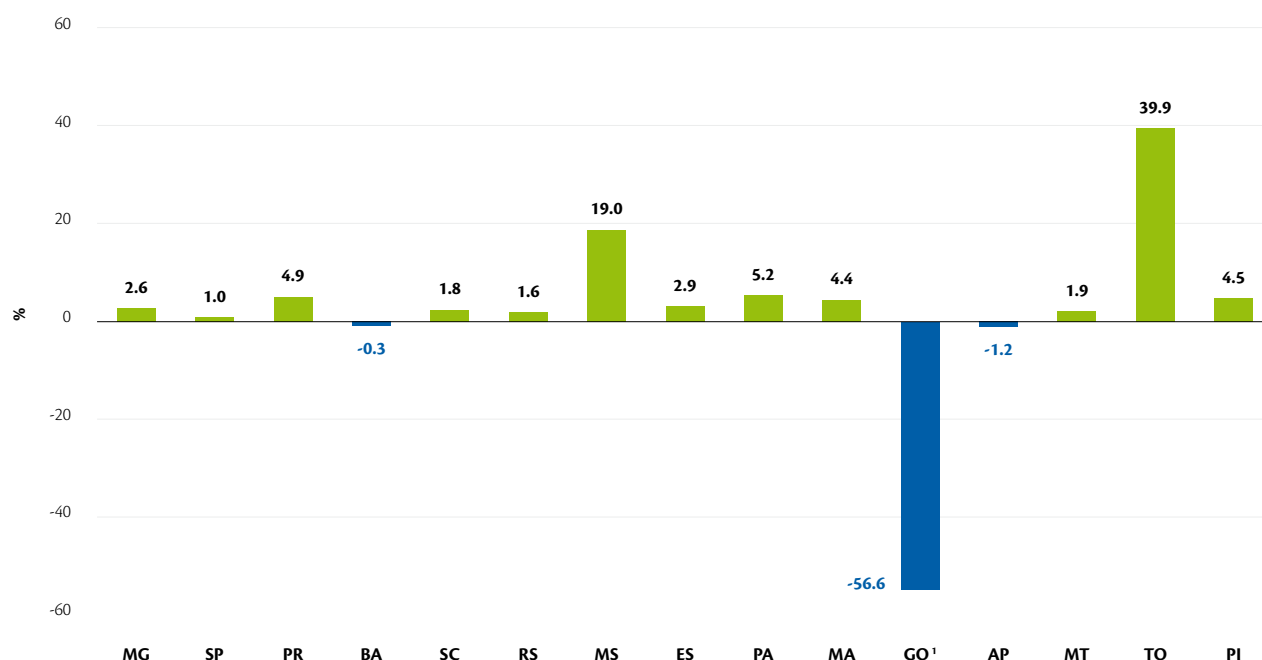
**Graph 1.05** Percentage of area planted with Eucalyptus by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

In 2012, the increase in area planted with Eucalyptus was due to investments by domestic companies in the pulp and paper segment; the largest expansion was seen in Mato Grosso do Sul (19.0%) and Tocantins (39.9%), as can be seen in Graph 1.06.

**Graph 1.06** Percentage growth in area planted with Eucalyptus by state, 2012



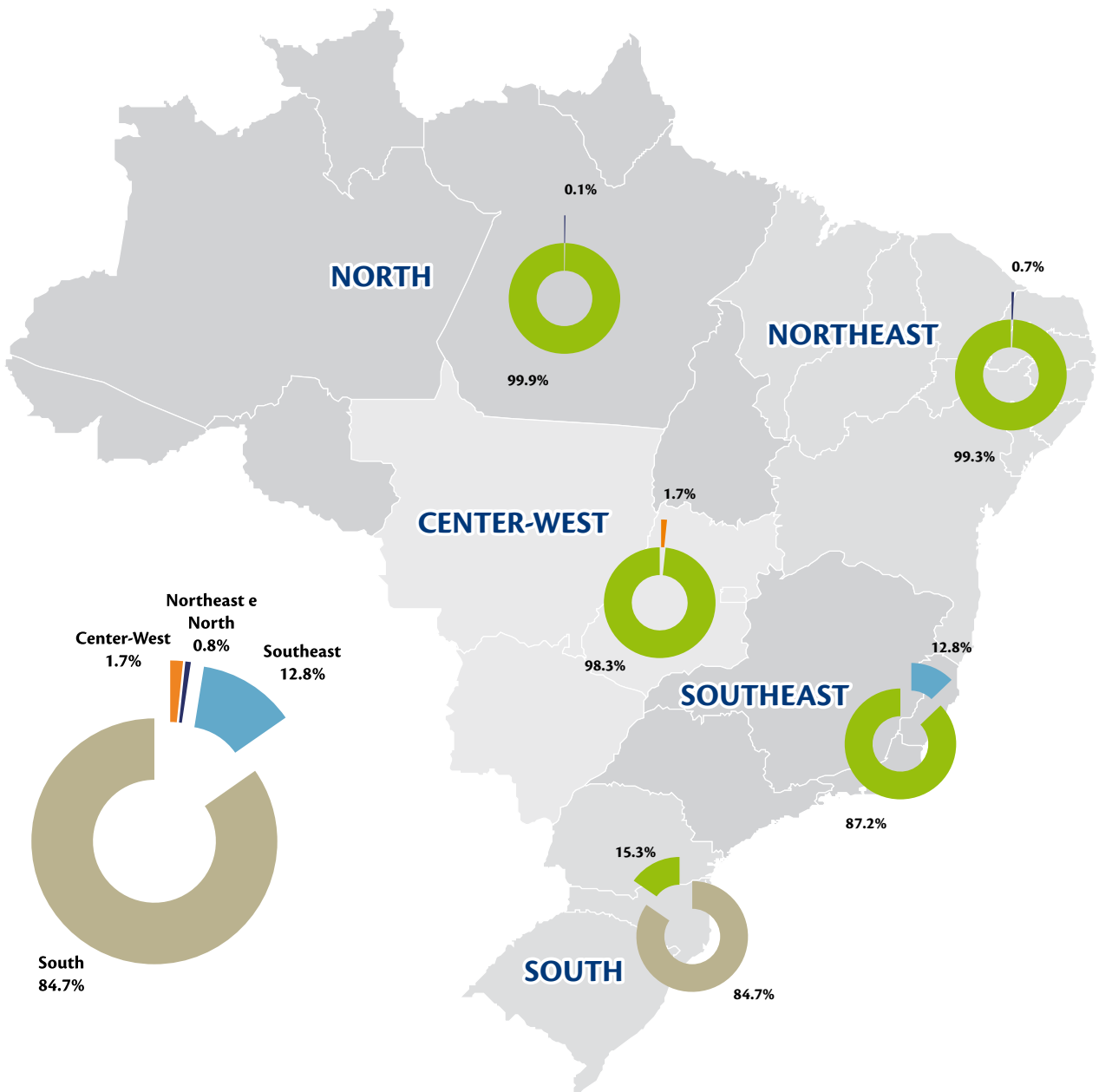
Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

¹See the Methodology section in Chapter 5 of this Yearbook.

1.1.2 Pine Plantations

The area planted with Pine (1,562,782 ha) is primarily concentrated in the southern region of Brazil (84.7%) due to soil and climate conditions and the location of the main centers where this type of wood is processed (Figure 1.07).

**Figure 1.07** Distribution of area planted with Pine by region, 2012

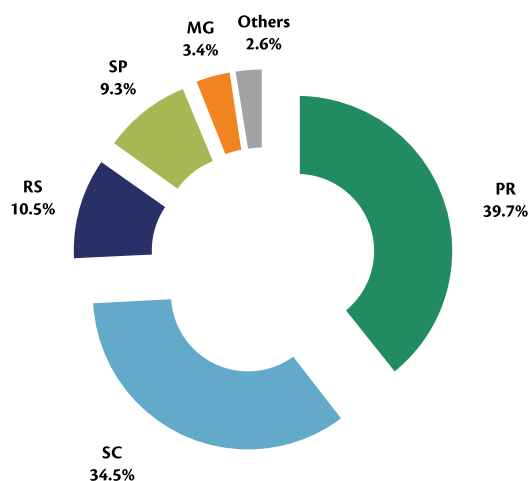


Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).



The state of Paraná leads the rankings in area planted with Pine, with 39.7% of the total area. Santa Catarina takes second place with 34.5% (Graph 1.07).

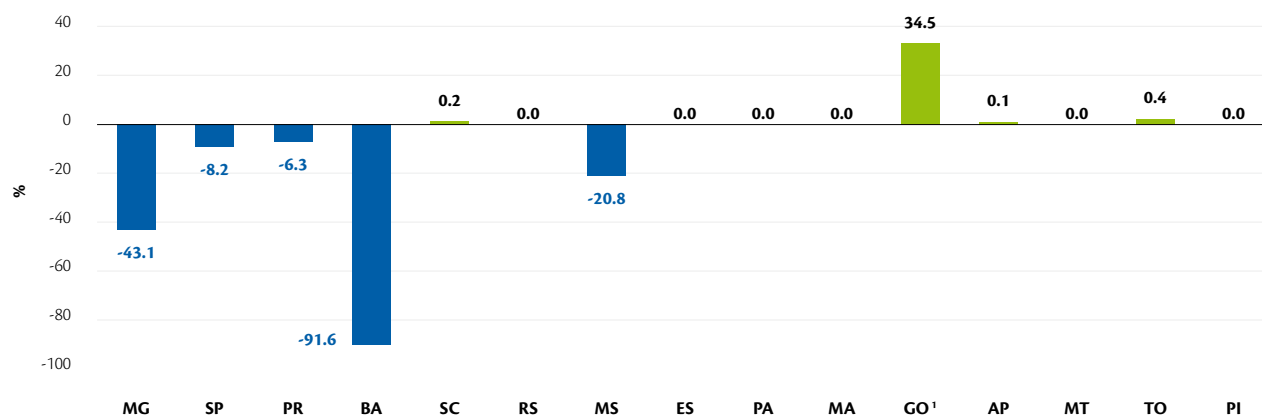
**Graph 1.07** Distribution of area planted with Pine by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

In 2012, the total area planted with Pine decreased by 79.1 thousand hectares (-4.8%). The states showing the greatest overall reduction in areas planted with Pine were Bahia (-91.6%), Minas Gerais (-43.1%), Mato Grosso do Sul (-20.8%), São Paulo (-8.2%) and Paraná (-6.3%), as can be seen in Graph 1.08.

**Graph 1.08** Percentage variation in area planted with Pine by state, 2011-2012



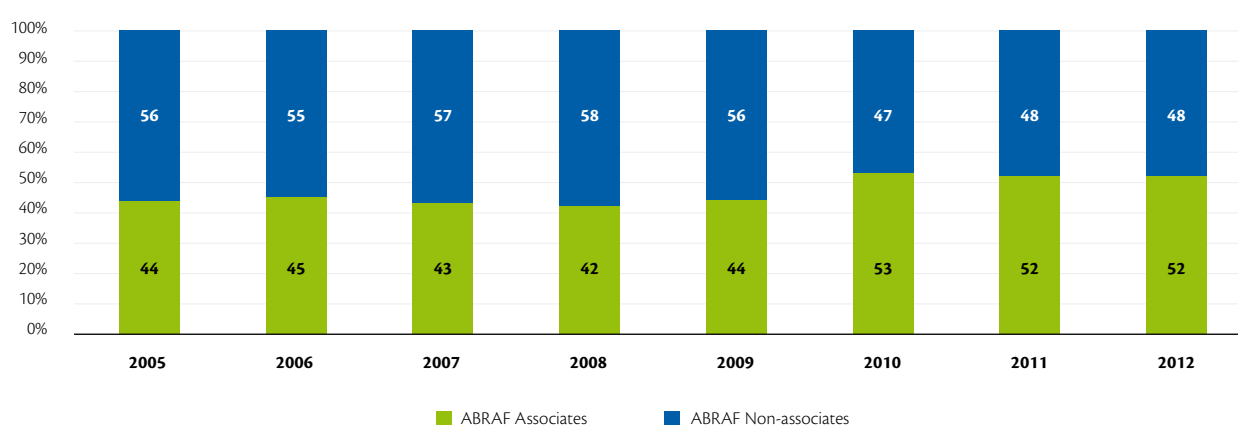
Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

¹See Methodology Notes in Chapter 5 of this Yearbook.

## 1.2 AREA PLANTED WITH EUCALYPTUS AND PINE BY ABRAF ASSOCIATES

In 2012, the area planted with Eucalyptus and Pine by companies associated with ABRAF (member companies and collective members) represented 51.7% (3,446,229 ha) of Brazil's forest plantations. Since 2009, relative participation in association with ABRAF (member companies and collective members) is increasing, as shown in Graph 1.09. The main factors which explain increased participation by companies associated with ABRAF are the expansion of the forest based of companies already affiliated with ABRAF, and new affiliations.

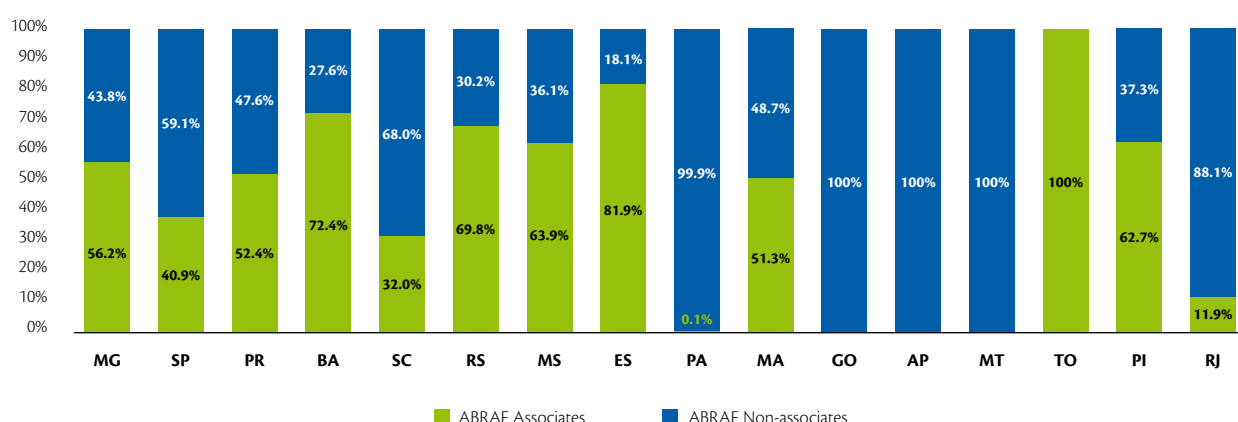
**Graph 1.09** Percentage of participation by companies associated with ABRAF in plantation area in Brazil, 2012



Source: ABRAF Yearbook (2013), ABRAF member companies and collective members (2013) and Pöry Silviconsult (2013).

At the state level, representation of area by ABRAF associates varies significantly. In the states of Bahia, Espírito Santo and Tocantins, more than 70% of planted area belongs to ABRAF-associated companies, while less than 30% of the planted area in the states of Pará and Rio de Janeiro belongs to companies associated with ABRAF. Goiás, Amapá and Mato Grosso are the only states in which 100% of planted area has no connection with companies associated with ABRAF (Graph 1.10).

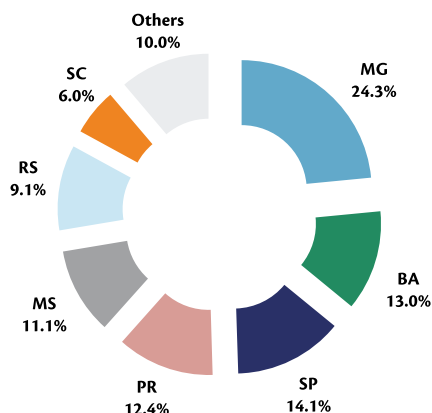
**Graph 1.10** Representation of ABRAF member companies and collective associates by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöry Silviconsult (2013).

Distribution of plantations belonging to ABRAF-associated companies (member companies and collective members) by state is similar to the distribution of total planted area, as 90.0% of the plantations are concentrated in Minas Gerais, Bahia, São Paulo, Paraná, Rio Grande do Sul, Mato Grosso do Sul and Santa Catarina (Graph 1.11).

**Graph 1.11** Distribution of planted area belonging to ABRAF member companies and collective members by state, 2012

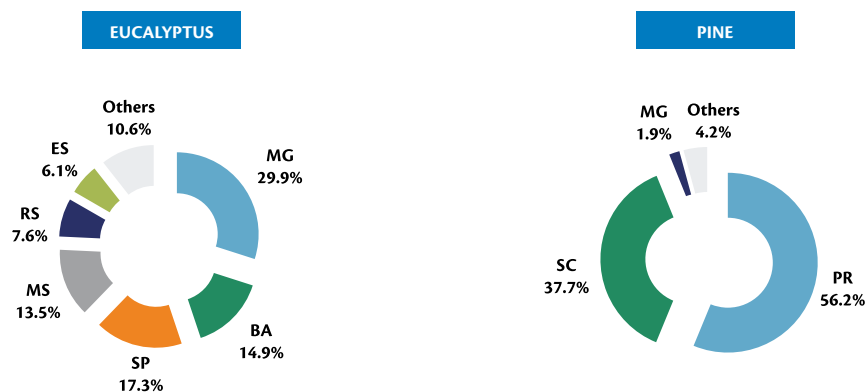


Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

### 1.2.1 ABRAF Member Companies

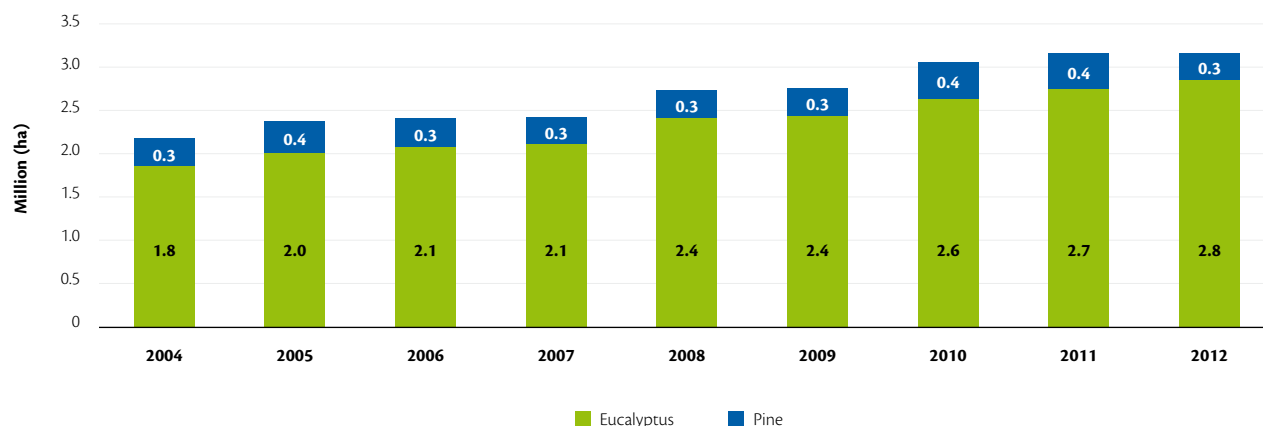
In 2012, the total area of forest plantations belonging to ABRAF member companies was 3,116,008 ha, distributed among 13 states. Eucalyptus plantations totaled 2,778,710 ha and Pine plantations 337,298 ha (Graph 1.12 and Graph 1.13).

**Graph 1.12** Distribution of planted forest area of ABRAF member companies by state, 2012



Source: ABRAF Member Companies (2013).

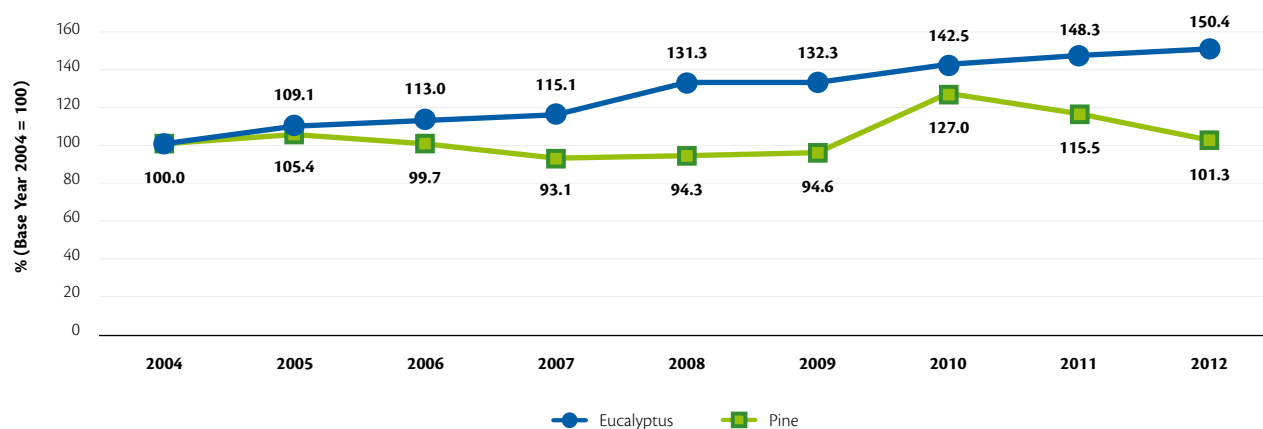
**Graph 1.13** Change in planted area of ABRAF member companies, 2004-2012



Source: ABRAF Member Companies (2013).

Between 2004 and 2012, cumulative growth in area planted with Eucalyptus by ABRAF member companies was 50.4%, continuing an eight-year trend. With regards to Pine plantations, growth was 1.3% compared with 2004; nevertheless, cumulative growth of area planted with Pine by ABRAF member companies has fallen over the last two years (Graph 1.14).

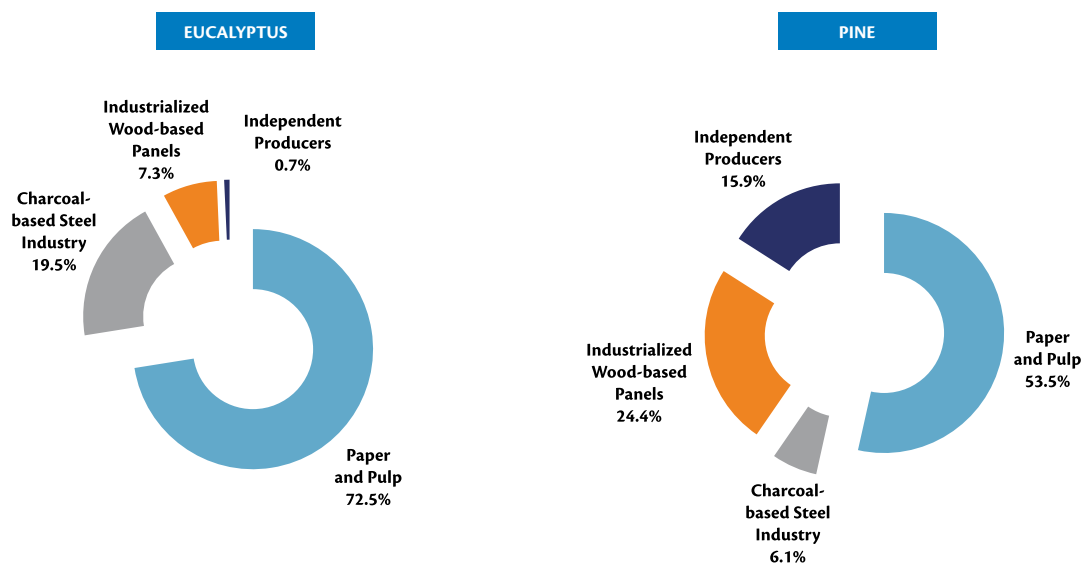
**Graph 1.14** Relative evolution in numbers – indexes (2004 = 100) of the planted area held by ABRAF member companies by species, 2004-2012



Source: ABRAF Member Companies (2013).

As for distribution of ABRAF member companies' total area planted with Eucalyptus and Pine by industrial segment, the leading segments were Pulp and Paper and Charcoal-based Steelworks (Graph 1.15).

**Graph 1.15** Distribution of area planted with Eucalyptus and Pine by ABRAF member companies by industrial segment, 2012



Source: ABRAF Member Companies (2013).

With specific regard to Eucalyptus, 72.5% of the planted area is concentrated in the Pulp and Paper segment, followed by Charcoal-based Steelworks (19.5%), Industrialized Wood-based Panels (7.3%) and Independent Producers (0.7%). As for Pine, besides Pulp and Paper (53.5%), the segments which were most represented were Industrialized Wood Panels and Independent Producers, which respectively held 24.4% and 15.9% of planted area (Graph 1.15).

With relation to type of property, the data shown in Table 1.05 show the change in distribution of areas planted with Eucalyptus and Pine by ABRAF member companies.

Compared with 2011, plantations established in 2012 on companies' own lands decreased 3.0% (60,929 ha) and plantings on rented lands increased 14.0% (54,041 ha); this fact is due to difficulty in acquiring new lands. Furthermore, outgrower schemes decreased by 1.0% (2,675 ha).

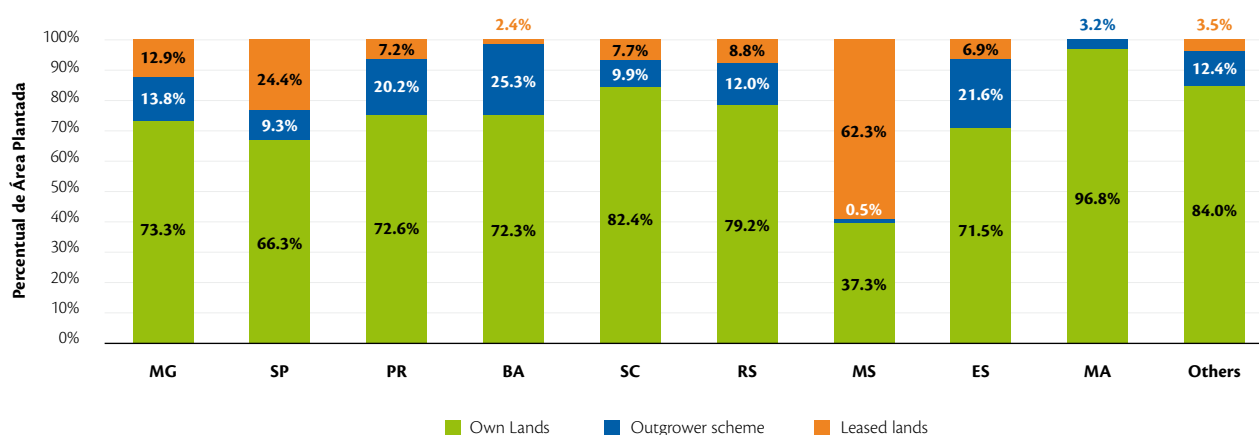
**Table 1.05** Changes in distribution of areas planted with Eucalyptus and Pine by ABRAF member companies by property type, 2011 to 2012

States	Planted Forests (ha) – 2011				Planted Forests (ha) – 2012				Relative Variation (%)			
	Own Lands	Outgrower Scheme	Leased Lands	Total	Own Lands	Outgrower Scheme	Leased Lands	Total	Own Lands	Outgrower Scheme	Leased Lands	Total
MG	570,942	109,385	96,173	776,500	614,952	115,822	107,797	838,571	7	7	12	8
BA	379,367	115,710	9,504	504,581	300,268	105,171	9,993	415,431	-20	-9	5	-17
SP	322,162	47,181	114,305	483,648	321,621	44,957	118,216	484,794	-	-4	4	-
PR	279,866	60,465	25,130	365,461	241,365	67,027	23,871	332,262	-14	12	-5	-9
MS	139,061	1,431	207,797	348,289	142,253	1,852	237,729	381,834	3	1	38	14
RS	162,301	28,720	16,473	207,493	170,767	25,919	18,969	215,655	5	-10	17	4
ES	122,097	39,431	1,259	162,787	120,565	36,366	11,692	168,624	-1	-7	829	4
SC	120,229	13,849	13,878	147,956	121,042	14,609	11,245	146,895	1	6	-18	-1
MA	78,031	2,265	929	81,225	85,968	2,864	-	88,832	12	-	-	11
MT	20,887	-	439	21,326	-	-	-	-	-70	-	-	-
TO	12,515	3,648	-	16,163	23,093	-	439	23,532	-	-	2	31
Outros	8,494	540	1,108	10,142	13,130	5,363	1,084	19,577	66	571	-2	48
Total	2,215,952	422,624	486,995	3,125,571	2,155,023	419,949	541,036	3,116,008	-3	-1	14	-

Source: ABRAF Yearbook (2012) and ABRAF Member Companies (2013).

In general terms, forest plantations that ABRAF member companies established on their own lands made up more than 70.0% of the total planted area except for in the state of Mato Grosso do Sul, where 62.3% of planted forests were established on leased lands, and in São Paulo, where 24.2% of forests were on leased land. With regards to outgrower schemes, the most notable states were Espírito Santo and Bahia, with 25.3% and 21.6%, respectively (Graph 1.16).

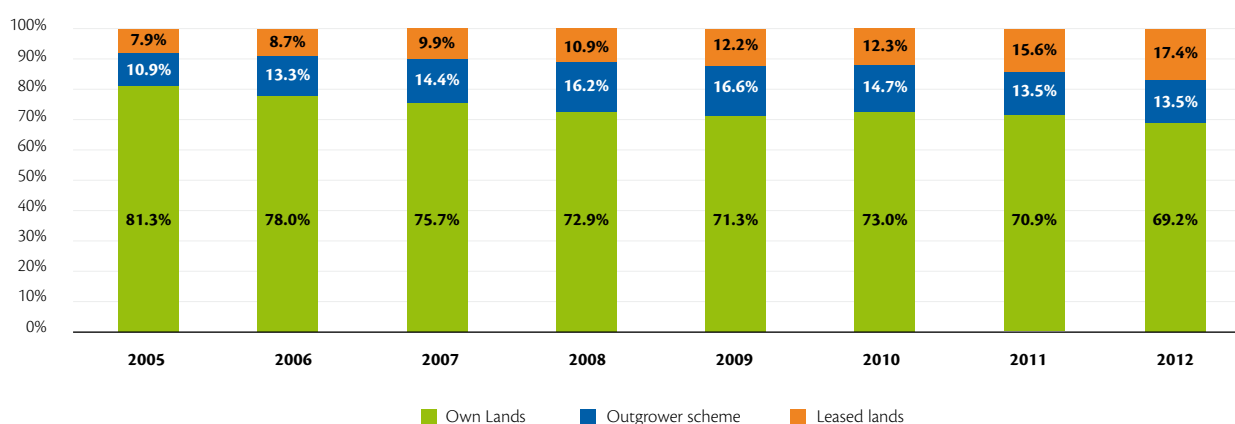
**Graph 1.16** Distribution of area planted with Eucalyptus and Pine by ABRAF member companies by state and property type, 2012



Source: ABRAF Member Companies (2013).

In 2012, the percentage of owned forests across the entire forest base fell by 1.7% (Graph 1.17), yielding primarily to plantations established on leased lands, a direct consequence of the restrictions on land purchase by domestic groups funded with a majority of foreign capital in their shareholding structure.

**Graph 1.17** Change in property modality by ABRAF member companies, 2005-2012



Source: ABRAF Yearbook (2013) and ABRAF Member Companies (2013).

### 1.3 FORESTS PLANTED WITH OTHER SPECIES

In 2012, the area occupied by plantations of non-conventional species such as Acacia, Araucaria, Populus, Teak, Rubber Tree and Paricá was 521,131 ha (listed under “others”), accounting for 7.2% of the total area of planted forests in Brazil (Table 1.06 and Figure 1.08).

**Table 1.06** Total area of forest plantations in Brazil by genus, 2012

Genus	Plantation Area (ha)		
	2011	2012	%
Eucalyptus	4,873,952	5,102,030	70.8%
Pine	1,641,892	1,562,782	22.0%
Others	489,281	521,131	7.2%
<b>Total</b>	<b>7,005,125</b>	<b>7,185,943</b>	<b>100%</b>

Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

<sup>1</sup> Other species include: Acacia, Rubber Tree, Paricá, Araucaria, Teak, Populus, etc.



Figure 1.08 Area and distribution of area planted with other species in Brazil, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

In comparison with 2011, the area planted with these species increased by 6.5% (Table 1.07).

**Table 1.07** Characteristics and area of plantations with other species in Brazil, 2010-2012

Species	Scientific Name	States	Planted Area (ha)			Main Uses
			2010	2011	2012	
Acacia	<i>Acacia mearnsii</i> and <i>Acacia mangium</i>	AP, MT, PR, RR, RS, AM	127,600	146,813	148,311	Wood: energy, charcoal, chip for pulp, wood panels. Tannins: tanneries, adhesives, petroleum industry, rubber
Rubber Tree	<i>Hevea brasiliensis</i>	SP, MS, SP, TO	159,500	165,648	168,848	Wood: energy, pulp Sap: Rubber
Parica	<i>Schizolobium amazonicum</i>	PA, MA, TO	85,470	85,473	87,901	Veneer and plywood, roofing, sticks, paper, furniture, finishing and frames
Teak	<i>Tectona grandis</i>	MT, PA, RR	65,440	67,693	67,329	Civil construction (doors, windows, siding, panels, roofing), decks and wood flooring, furniture, nautical applications and decorative veneers
Araucaria	<i>Araucaria angustifolia</i>	PR, RS, SC, SP	11,190	11,179	11,343	Sawn wood, veneers, roofing, frames, laths, boxes and crates, furniture frames, matchsticks, pencils and reels
Populus	<i>Populus spp.</i>	PR, SC	4,221	4,220	4,216	Matchsticks, furniture components, doors, indoor carpentry, toys, kitchen utensils
Others	–	–	8,969	8,256	33,183	–
<b>Total</b>			<b>462,390</b>	<b>489,282</b>	<b>521,131</b>	

Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

<sup>1</sup> Areas planted with species such as Bracatinga, Japanese raisin tree (*Hovenia dulcis*) and pupunha palm, among others.

<sup>2</sup> The area planted with rubber in 2009 was adjusted based on information received from APABOR (Associação Paulista de Produtores e Beneficiadores de Borracha).

## 1.4 PLANTED FORESTS VS. NATIVE FORESTS

Table 1.08 shows the change in distribution between 2010 and 2012 for planted and native forests belonging to ABRAF member companies.

**Table 1.08** Distribution of owned planted forests and native forests preserved by ABRAF member companies by state, 2010-2012

State	Forest Area (ha) – 2010		Forest Area (ha) – 2011		Forest Area (ha) – 2012	
	Own plantations <sup>2</sup>	Native stands <sup>3</sup> (ha)	Own plantations <sup>2</sup>	Native stands <sup>3</sup> (ha)	Own plantations <sup>2</sup>	Native stands <sup>3</sup> (ha)
MG	592,161	465,345	570,942	498,502	614,952	495,560
BA	398,205	306,611	379,367	296,538	300,268	261,984
SP	328,322	201,276	322,162	233,345	321,621	214,792
PR	276,973	212,711	279,866	329,699	241,365	296,811
RS	159,240	168,245	162,301	168,487	170,767	185,838
ES	122,537	74,418	122,097	71,621	120,565	74,655
SC	129,120	118,104	120,229	73,308	121,042	140,138
MS	121,602	84,358	139,061	186,520	142,253	190,072
MA	66,986	112,007	78,031	126,552	85,968	147,534
Others	36,877	72,662	41,896	93,748	36,223	87,227
<b>Total</b>	<b>2,232,023</b>	<b>1,815,738</b>	<b>2,215,952</b>	<b>2,078,320</b>	<b>2,155,023</b>	<b>2,094,612</b>

Source: ABRAF Yearbook (2012), ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).

<sup>1</sup> Only forests owned by ABRAF member companies, excluding outgrower and leased areas.

<sup>2</sup> Includes RPPN, Permanent Preservation Areas, Legal Reserve and others.

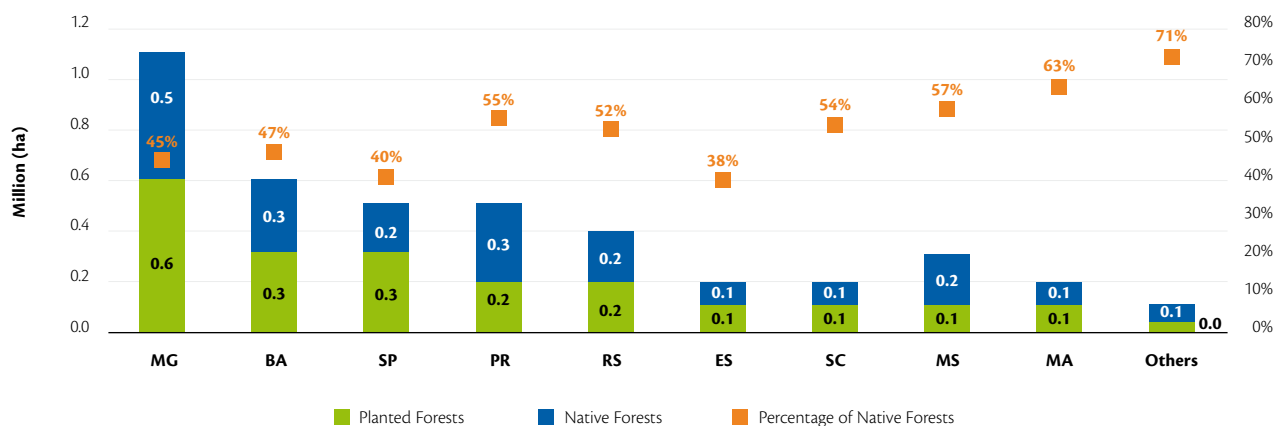
<sup>3</sup> Other states include Pará, Mato Grosso, Rio de Janeiro, Piauí and Tocantins.

In 2012, the area of native forests preserved by ABRAF member companies was 0.8% greater than the preceding year, a growth of 16.3 thousand ha.

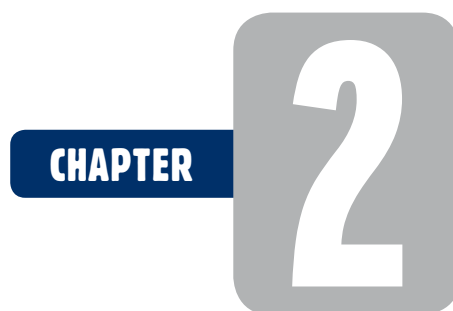
It is important to stress that for each 1.0 ha of forest plantations, ABRAF member companies helped to preserve 0.97 ha of native forests. This indicator increased in comparison with 2011, when for each 1.0 ha of planted forests, 0.94 ha of native forests were preserved.

Graph 1.18 shows the area of planted forests and the area of native forests preserved by ABRAF member companies by state. The relationship between preservation areas and the total forest area (planted and native) can also be seen.

**Graph 1.18** Area of planted forests and native forests preserved by ABRAF member companies by state, 2012



Source: ABRAF member companies and collective members (2013) and Pöyry Silviconsult (2013).



## CHAPTER 2

### *SILVICULTURE OF PLANTED FORESTS*

BRAZILIAN OUTLOOK

COMPETITIVENESS AND PROFITABILITY  
OF THE FOREST SECTOR

FORESTRY HIGHLIGHTS 2012

ANNUAL PLANTED AREA

TECHNOLOGY AND FOREST PRODUCTIVITY

INVESTMENTS

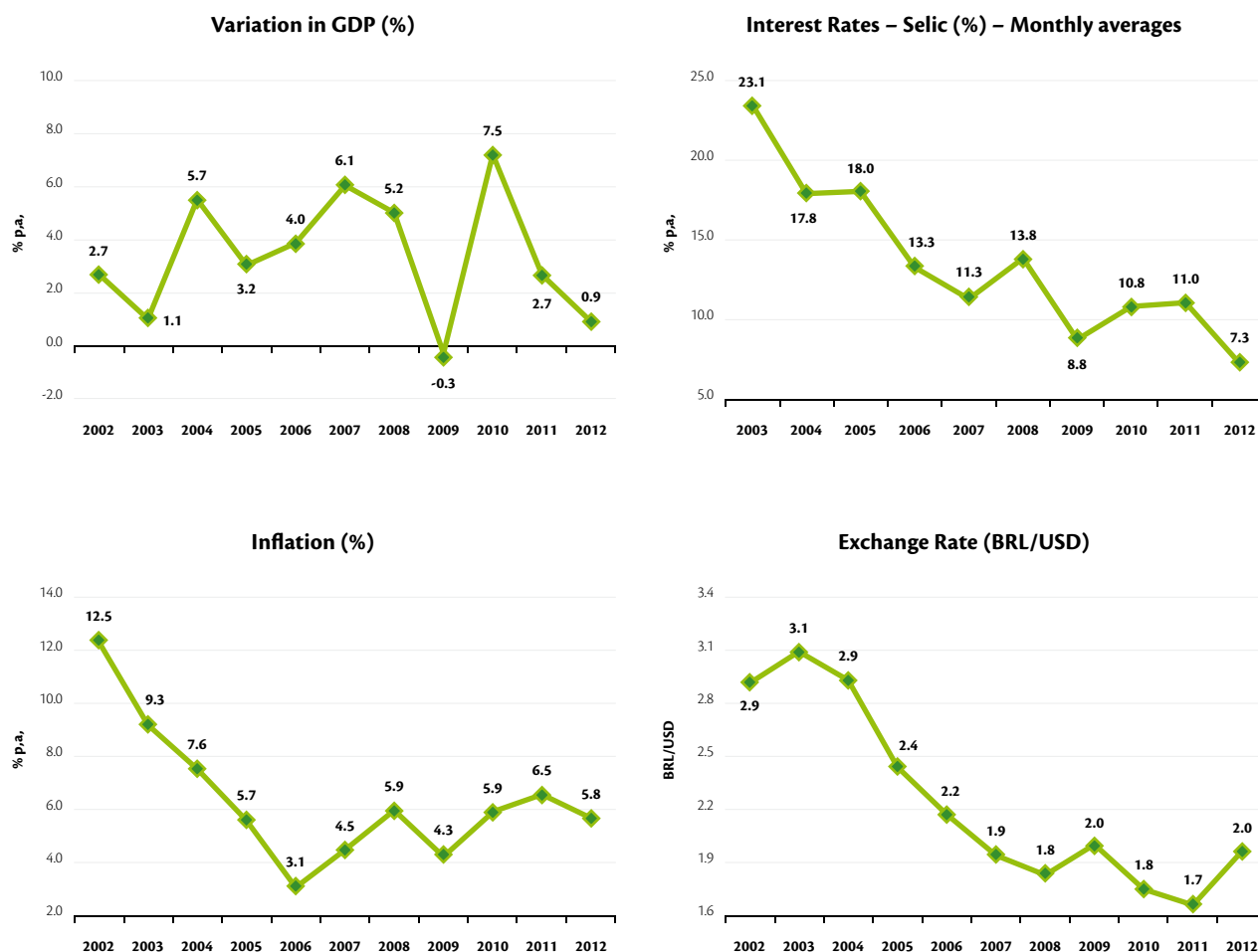
## 2 SILVICULTURE OF PLANTED FORESTS

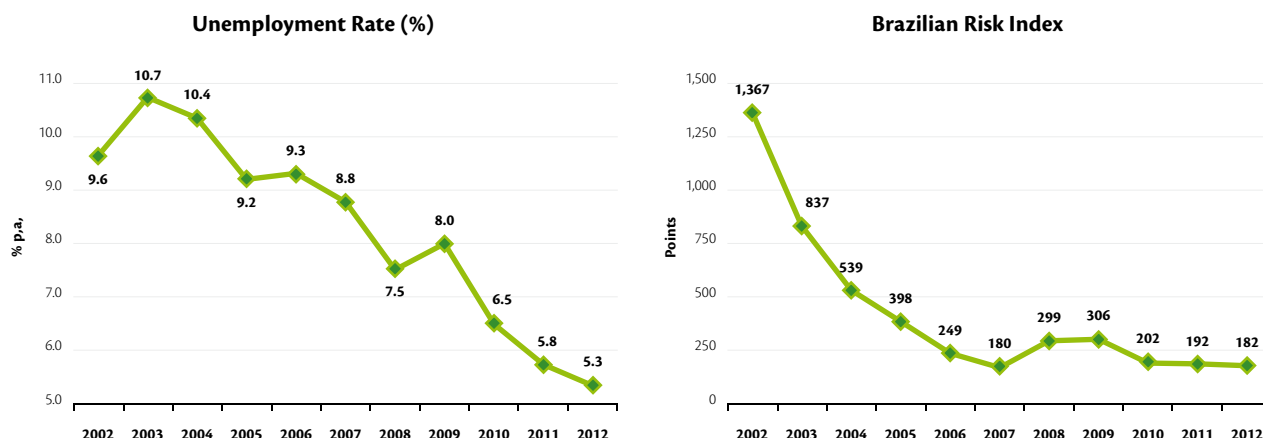
### 2.1 BRAZILIAN OUTLOOK

#### 2.1.1 Economic Situation in 2012

Among global turbulence in 2012, the rate of GDP growth decreased, reaching only 0.9%. Short term government measures including lowered interest rates, tax exemptions and reduced energy costs may have averted even poorer performance. The Brazilian economy's return to growth, on the other hand, still depends on structural measures which promote a reduction in production costs and incentivize investments, as well as growth due to internal consumption and anti-cyclical policies; these would increase productivity necessary to make domestic products competitive again, and help to expand the economy. Changes in indicators describing the Brazilian economy over the last ten years are presented in Graph 2.01.

**Graph 2.01** Changes in the principal Brazilian macroeconomic indicators, 2003-2012





Source: IBGE (2012), BCB (2012), IPEADATA (2012).

Brazilian inflation, as measured by the IPCA (Wide Consumer Price Index), reached 5.8% p.a. in 2012, falling in comparison with 2011, when it reached 6.5% p.a. Higher domestic consumption may have pushed this indicator to the upper reaches of the target limit, 6.5% p.a., which was established by Brazilian monetary policy for the third consecutive year.

After a falling trend since 2010, the average exchange rate increased over 2011, closing 2012 at BRL 1.95/ USD 1.00. This scenario, along with the recovery of the international market, was favorable for the export results for industrial segments in the forest sector.

The average basic interest rate (SELIC) fell from 11.0% p.a. in 2011 to 7.3% p.a. in 2012, the result of periodic cuts to the rate meant to maintain economic growth without losing control of inflation. This measure helped maintain levels of domestic consumption during the year, which avoided the need for large-scale changes in the country's industrial production, although it has not yet been possible to stimulate new investments and boost consumer confidence.

In 2012, the unemployment rate again went even lower to reach the new low point since the beginning of the series 2002-2012, closing the year at 5.3% p.a., compared with 5.8% p.a. reached in 2011. Continuing reduction of the unemployment rate continues to reflect the increasingly dynamic job market, although uncertainties about the medium and long term investment scenario present challenges to maintaining this situation.

JP Morgan Chase's country risk index, also known as the *Emerging Markets Bond Index Plus* (EMBI+), closed 2012 with an average of 182 points, contributing to the trend towards improving levels of confidence for international investors with regards to the Brazilian economy.

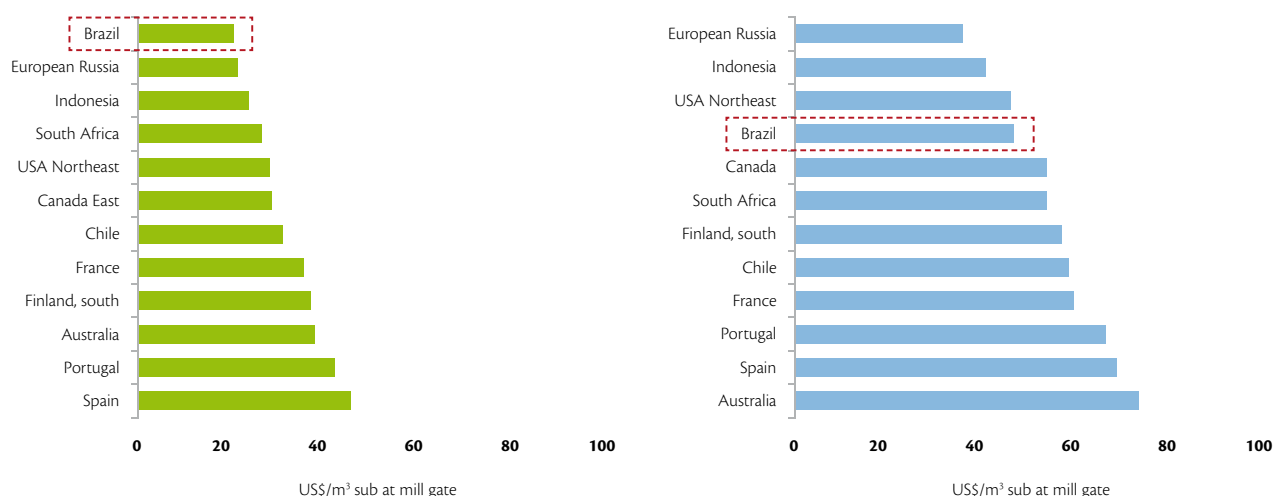
The economic situation formed by the tripod of interest rates, exchange rates and inflation continued to be a challenge towards the development of forest activities in Brazil within the wider sphere of a macroeconomic environment more favorable to business.

## 2.2 COMPETITIVENESS AND PROFITABILITY OF THE FOREST SECTOR

Despite the undeniable economic and socio-environmental importance of the planted forest sector to Brazil, the business environment in which forest activities take place in the country is not the best. In fact, the competitiveness of forest products is deteriorating compared to that of the main international competitors.

At the beginning of this decade, Brazil enjoyed international status as the country with the lowest production costs for wood for process. In the meantime, twelve years later, we have already fallen four slots. It is more expensive to produce wood for the pulp industry in Brazil than it is in Russia, Indonesia and the United States (Graph 2.02).

**Graph 2.02 International Benchmarking of Production Costs for Wood for Process**

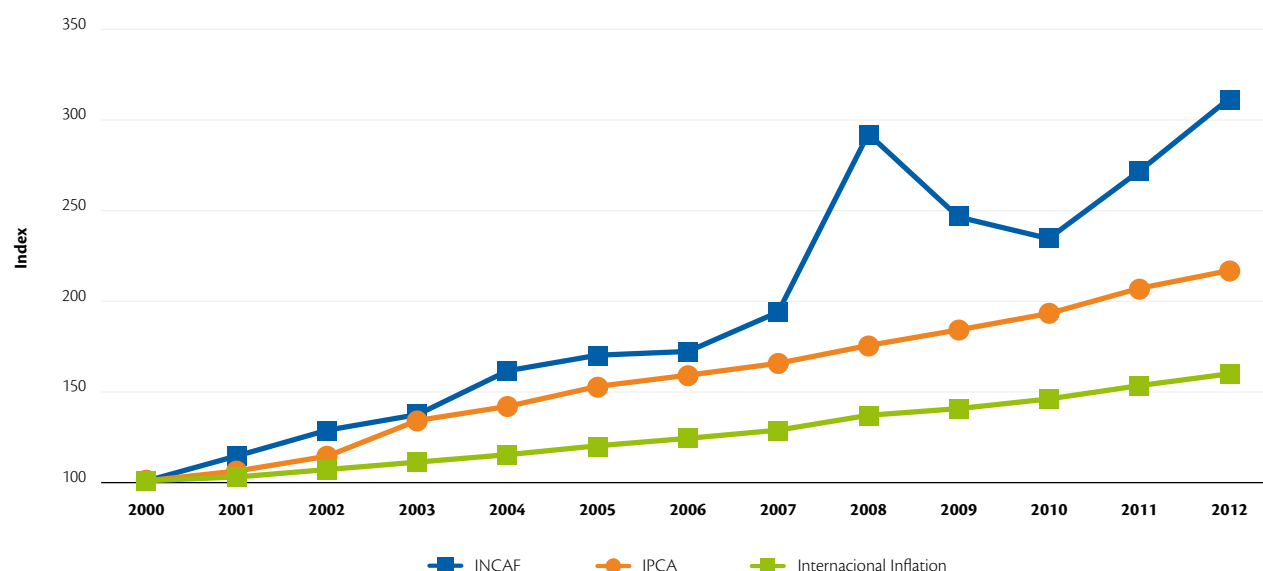


Source: IPEA and Pöyry (2012).

In 2012, inflation in the Brazilian forest sector (measured by the *INCAF-Pöyry*<sup>1</sup>), was 14.7% p.a., three times higher than the IPCA (5.8% p.a.) and four times higher than average international inflation (4.0% p.a.), as can be seen in Graph 2.03.

<sup>1</sup> National Index of the Costs of Forest Activity

**Graph 2.03 Behavior of Inflation in the Brazilian Forest Sector (INCAF-Pöyry), the IPCA and Mean International Inflation (base index 100 = 2000)**

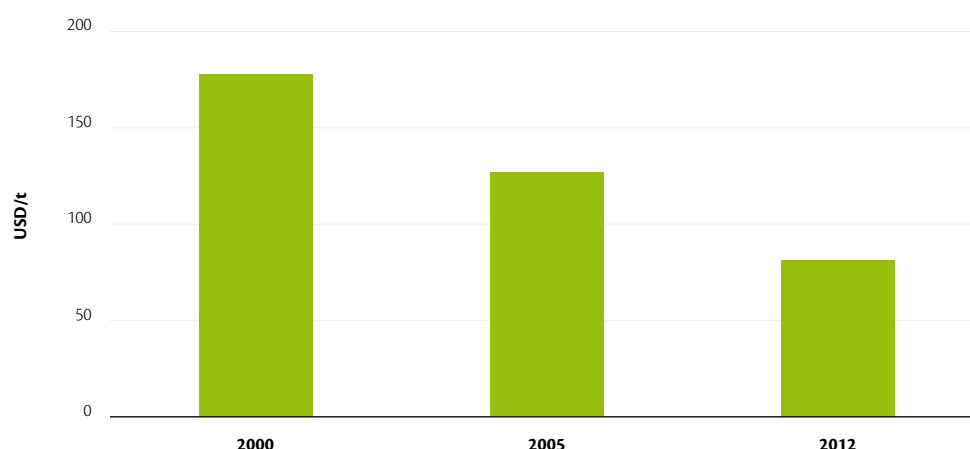


Source: IPEA and Pöyry Silviconsult (2012).

The general increase in the costs of producing wood in Brazil is significantly decreasing the profitability of industry integrated into the forest base, and of independent producers of forest plantations.

In 2000, the leading pulp industries in Brazil had a competitive advantage in their production costs of approximately 175 USD/t compared to the international industry average. By 2012, this advantage had already fallen to around 80 USD/t. Brazil is losing its leading status to countries such as Uruguay, Chile and Indonesia (Graph 2.04).

**Graph 2.04 Change in the Cost Differential for Producing BHKP Pulp – Leading Brazilian Pulp Industries vs. International Average**

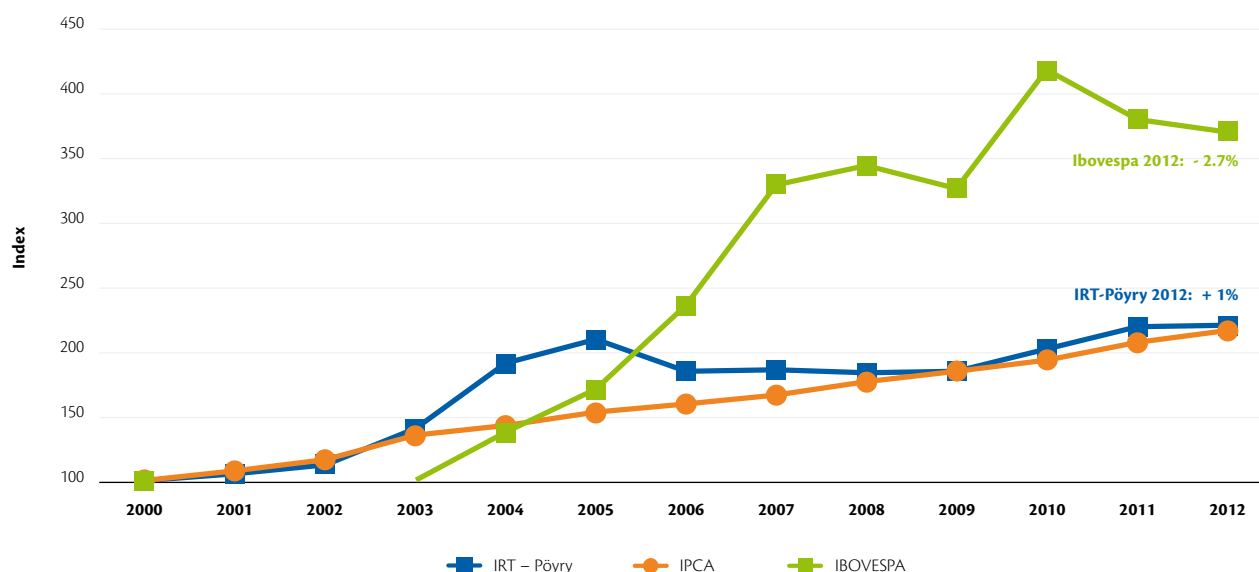


Source: Pöyry International (2012).



Although they would be a great alternative for a stock portfolio, as they show gains unassociated with the behavior of the stock market or inflation, the profitability of forest investments has also gradually fallen over the years. Between 2000 and 2012, the average profitability of Brazilian forest assets (as measured by the *IRT-Pöyry*<sup>2</sup>), was 7.3% p.a.; this indicator was higher than inflation for this period and also higher than the return on other low-risk investments, for example deposit accounts (5.5% p.a.). However, in 2012 the average profitability of forest business in Brazil did not surpass 1.0% p.a. (Graph 2.05).

**Graph 2.05** Change in average profitability of Brazilian forest assets (*IRT-Pöyry*) versus the Ibovespa (base index 100 = 2000)



Source: IPEA and Pöyry Silviconsult (2012).

Brazil has the potential to consolidate itself as one of the major economies of the world; however, for this to happen, it is necessary to create conditions which would allow domestic industry to continue to be competitive and diversified. Specifically with relation to the forest sector, the country needs to effectively take advantage of its potential, eliminating the main barriers which limit the progress of the sector, such as:

- **Legal Insecurity:** Restrictions on the purchase of land by foreigners and lack of solid regulations on this topic served to block more than BRL 22 billion of foreign capital which would have been dedicated to productivity in Brazilian forest-based industry.
- **Bureaucracy in Environmental Licensing:** In Brazil, the average time necessary to obtain an environmental license for a forest-based industry is 122 days. In China, this process takes no more than 30 days. Under the current policy, there are so many actors and mechanisms restricting activities that it is no longer possible to understand what the objective of sectoral policy is or, should be.
- **Complex and Excessive Taxes:** Brazilian companies spend one third of a year dealing with tax issues. Currently, there are 88 federal, state and municipal taxes. Furthermore, tax regulations change constantly: 46 norms are published daily by the treasury department.

<sup>2</sup> Index of Profitability for Investment in Forest Assets

- Onerous Costs of Financing: loans to establish working capital in Brazil cost approximately 19% p.a.. In China, this cost is less than 4.0% p.a.
- Insufficient and Precarious Infrastructure: In emerging economies, the ratio between Investment/GDP is approximately 30%. In Brazil, this indicator does not surpass 20%. In the USA, the average logistics costs involved in transporting a ton of pulp to port is approximately US\$ 20. In Brazil, expenses related to this same activity can reach US\$ 90.
- Excessively Onerous Labor Legislation: Labor taxes and fees in Brazil account for 60% of base salary. In China, this number is 31%; in the United States, 9%, and in Denmark, 6%.

Despite the structural conditions in Brazil and in the international economy which are not favorable to a vigorous cycle of development for the forest sector, the current situation still allows opportunities for the country to become one of the main figures in the international forest-based industry.

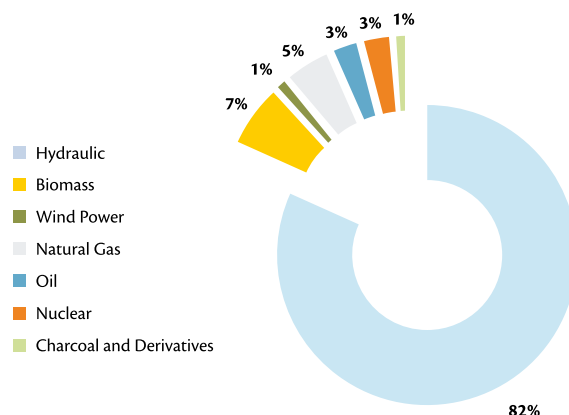
However, for this to happen, it is important that private institutions link the removal of institutional barriers to sectoral development, prioritizing improvements to industrial and forestry processes as well as investments in technological innovations. The result of this process will be an increase in sectoral productivity, reduced production costs for products from the forest base, and the beginning of a new round of investments in the sector.

## 2.3 FORESTRY HIGHLIGHTS 2012

### 2.3.1 Biomass – The Energy Issue

In 2012, biomass accounted for 7% of the electricity generated in Brazil (Graph 2.06).

**Graph 2.06 Distribution of Brazilian energy generation**

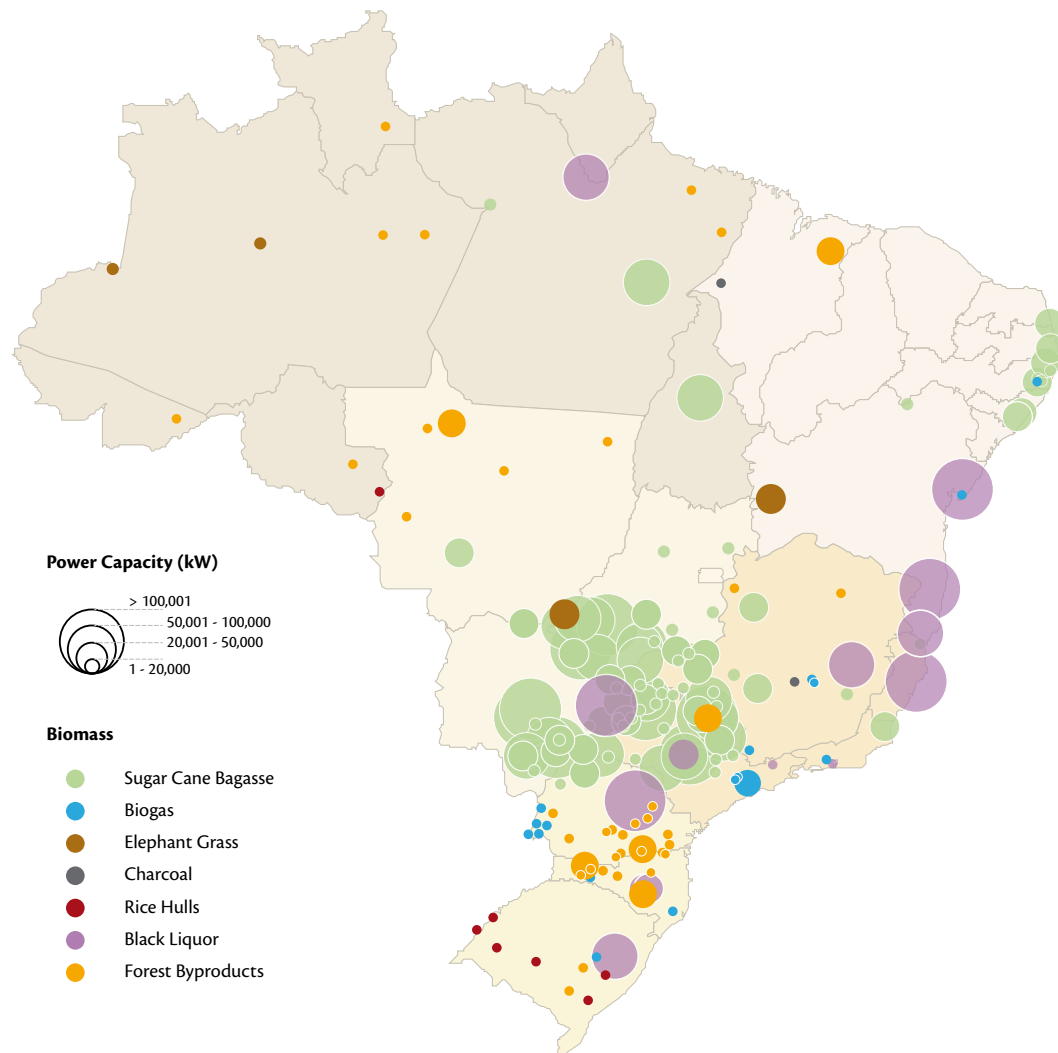


Source: BEN (2012).

Besides sugar cane bagasse, black liquor and forest byproducts are the main types of biomass used to generate electricity in Brazil.

Currently, biomass from the forest base accounts for 15.8% of energy generated from biomass. Other types of biomass such as biogas, rice hulls, elephant grass and palm oil make up only 1.8% (Figure 2.01).

**Figure 2.01** Distribution of biomass-powered thermoelectric power plants in Brazil, 2012

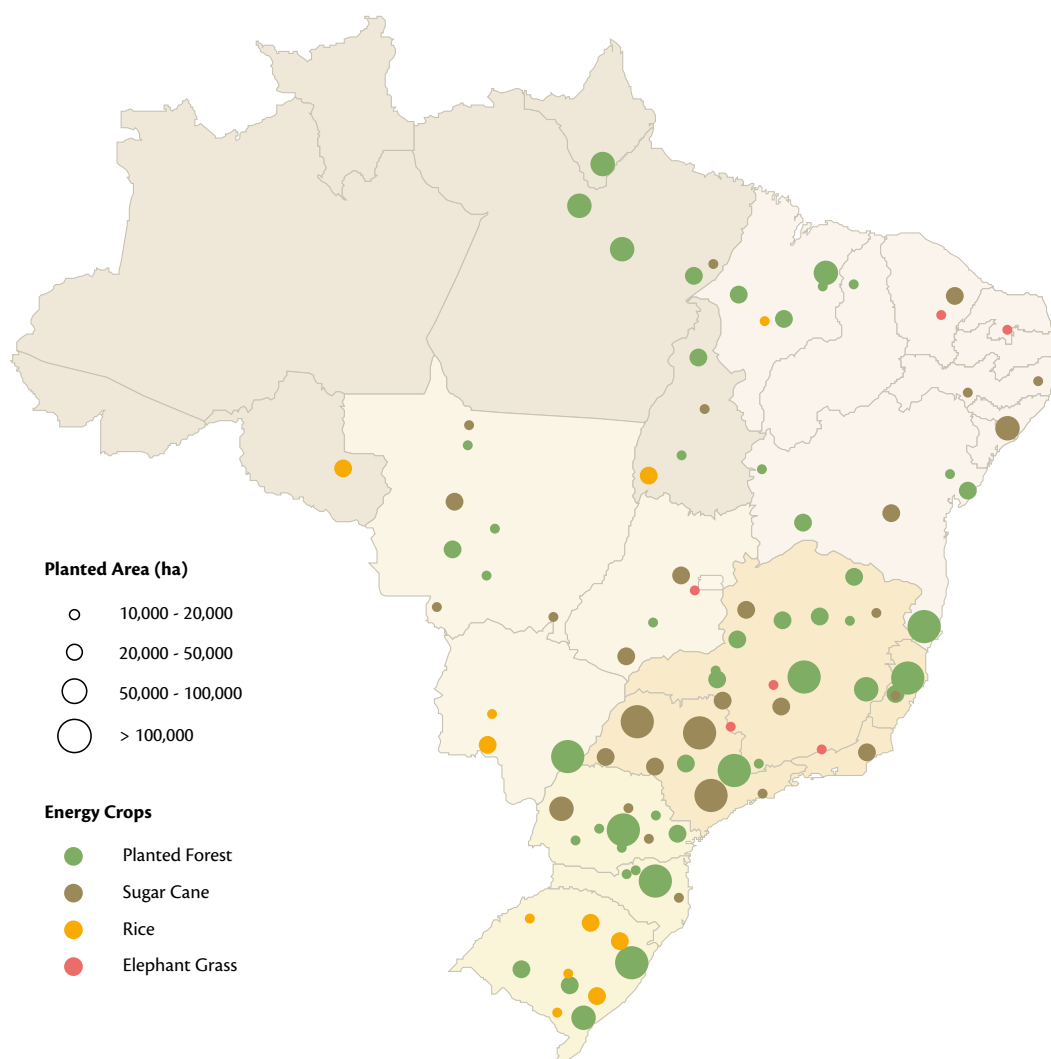


Source: ANEEL (2012).

Despite its significant presence, the energy-generating biomass potential for Brazilian forest byproducts is even greater. Currently, the wood processing industry and forest harvesting create around 41 million tons of residue, which is capable of generating the equivalent of 1.7 GW/year.

The southern and southeastern regions have the greatest potential for generating energy from biomass, due to the high concentration of forest and sugarcane plantations. Figure 2.02 shows the regions which have potential for generating energy from biomass by the location of areas planted with the main energy crops.

**Figure 2.02** Area planted with the main energy crops in Brazil, 2012



Source: IBGE (2012).

Among the actions taken by the Brazilian government to diversify the national energy grid, Legislation project 3.529/2012 stands out; this would institute a national policy of generating energy from biomass, making it obligatory to integrate biomass into the national energy generation process. With the approval of this law, generation of electrical energy from biomass will be inevitable and renewable sources will account for an even greater portion.

### 2.3.2 Treated Wood

Treated wood is the product resulting from the preservation of wood by means of vacuum and pressure in order to control biological, physical and chemical agents such as rain, sun and parasites which could affect the durability of wood. The main products made from treated wood are posts, crossbeams, sleepers, fences and structures for civil construction, among others. Treatment of wood is regulated by specific legislation and oriented by the norms issued by the Brazilian Association of Technical standards (ABNT).

In recent years, treated wood has gained market share in many different regions of the country. The main industrial units which treat wood are mainly located in the southeast and south regions, where the largest reforested areas of the country are also located. It is estimated that in 2012 production of treated wood reached 1.6 million m<sup>3</sup>. The increase in demand for this product is due to better understanding of the product's quality and various applications by consumers. Besides being of good quality, treated wood is a substitute for native wood, and in this way contributes to the preservation of native forests.

### 2.3.3 The forest-based sector and climate change

The forest-based sector possesses great potential to contribute to the fight against climate change, considering the opportunities for mitigation in expanding native and planted forests and their productive chains. On the other hand, expansion of the sector and its respective potential for mitigation is dependent on the overcoming of various barriers. The economic valorization of the carbon forest market plays a fundamental role in this context. It involves a sector with a renewable base, and its role in constructing climate policies should agree with this structural characteristic.

The forest-based industry is based on two principal parts: (i) the forest component, which represents the areas of planted forests and associated areas where native forests are preserved and (ii) the industrial component, which represents structures where wood is processed (for example, pulp and paper production, renewable charcoal, pig iron, ferroalloys, steel, plywood panels and boards, treated wood for civil construction, sawnwood, etc.).

From a climate change point of view, the two components have distinct implications which should be analyzed in tandem. The industrial component could involve emissions or positive flows of greenhouse gases (GHGs). Various segments of forest-based industry have come closer to self-sufficiency with renewable energy, characterized by minimal emissions levels. As the forest component is based on the formation of carbon stocks through productive forests and areas associated with conservation, it allows for removal of GHGs (emissions or negative flows), contributing to reduced levels of GHGs in the atmosphere for the entire time that stocks are maintained.

The scale of removals and capacity to maintain them over the long term allow the forest component great potential for mitigation, especially over the coming decades. This is occurring exactly at the time when the country is seeking to reduce its overall emissions. Therefore, maintaining and increasing stock (additional removal capacity) could play an important role to balancing the emissions from the Brazilian productive sector on the whole.

Each forest-based product can contribute not only to the maintenance or increase of carbon stocks, but also can help avoid emissions associated with the use of products coming from fossil fuel or non-renewable materials. There are therefore two types of potential climate benefits directly associated with the production of forests: (i) carbon stocks in plantation areas and (ii) potential emissions avoided by using products from well-managed forests instead

of products from fossil fuels or non-renewable sources at different stages of the productive process. Any initiatives, in terms of public policy or specific regulations, should consider these two dynamics in efforts aimed at accounting for net emissions.

However, the mitigation potential of the sector is directly related to overcoming the main roadblocks to its development in Brazil. Beyond structural issues which affect the entire Brazilian productive sector (need for tax reform, making investments more affordable, etc.), the main challenges to the expansion of this sector are strongly linked to the forest base. Therefore, strengthening of existing mechanisms and the development of new alternatives which economically favor climate benefits generated by the sector represent positive collaborations which are greatly valuable to sustainable development in Brazil.

In this context, it is important to have government systems capable of integrating public policies related to the sector with actions within the scope of the National Policy on Climate Change (PNMC) and which can take advantage of opportunities on the international level, especially those covered by the United Nations Framework Convention on Climate Change (UNFCCC). The following section presents some of the main points which affect the forest sector and which should be coordinated on the domestic and international level:

## Domestic level

With regards to amplifying the forest-based productive chain, and the coordination of growth efforts in the planning stage, it is fundamental that all sectoral plans for mitigation and adaptation (which relate to the planted forest base) are coordinated with or integrated into the scope of the National Policy on Climate Change (PNMC). It is also important that there be coordination of such plans with the National Policy on Planted Forests.

Currently, all five sectoral mitigation plans which have been announced at the federal level have some connection with the planted forest sector (PPCDAM/Action Against Amazon Deforestation, PPCerrado/Action Against Cerrado Deforestation, PDE/Energy Development Plan, Plano ABC/Low Carbon Agricultural Plan and Plan for Charcoal-fired Steelworks). In many cases, analysis of estimates and planned measures needs to be developed in more depth. For example, it would be important to clarify the relationship between the numbers mentioned in the different plans, the final destination of the wood entailed in each estimate and possibly synergies or overlaps.

Although each segment in the planted forest sector has its own socio-economic and environmental dynamic, it is fundamental that the synergies between the segments and the different sectoral plans be identified and utilized. Besides optimizing the sector's potential for mitigation in terms of the value of carbon, it is important to avoid overlapping of efforts; a process identifying the synergies would facilitate demarcation of integrated economic/ecological areas and a coordinated agenda for industrial policy. It should be stressed that the forest-based sector has a great potential to contribute to national mechanisms under discussion and development, such as the national REDD+ strategy and the Brazilian Emissions Reduction Market (MBRE). Finally, it is also important to have coordination between federal policy and the various state policies.

### International Level

In the international arena, it is fundamental to utilize the mechanisms which already exist or are being developed, including the evolution of the Clean Development Mechanism (CDM) from the Kyoto Protocol. There are already approved CDM methodologies which apply to the sector, often developed in a pioneering fashion by companies from the Brazilian forest-based sector. Equally important is the utilization of initiatives from REDD+ and new market mechanisms, without damaging the environmental integrity of the Climate Convention and its regulation.

Full utilization of these mechanisms by Brazil and other emerging countries depends on the refining of fundamental points. In some cases, multilateral regulations need to be adjusted, and coordination increased with domestic initiatives, which should be addressed in a manner integrated with the sector's characteristics in the country, and related domestic policy.

The following points deserve to be highlighted, and directly affect the country's capacity to take advantage of these mechanisms:

- Ending of unilateral restriction on forest credits, including the European system of emissions trading;
- Improve the response to the issue of “non-permanency” of forest credits, including reinforcement of the current approach to temporary credits and definition of alternative forms which respect the principal of environmental integrity;
- Eligibility of lands containing forests in exhaustion for CDM projects;
- Utilization of opportunities related to REDD+ initiatives; and
- Utilization of opportunities in the area of potential new market and financing mechanisms.

Further, it is important to remember that the REDD+ initiatives and market mechanisms (including CDM) may be approved not only for the implementation of new forest plantations in Brazil but also for reforestation of degraded areas using native species, even for restoration of permanent preservation and legal reserve areas. Besides initiatives on the multilateral level, it is also important that Brazil take advantage of possible opportunities at the regional or bilateral level.

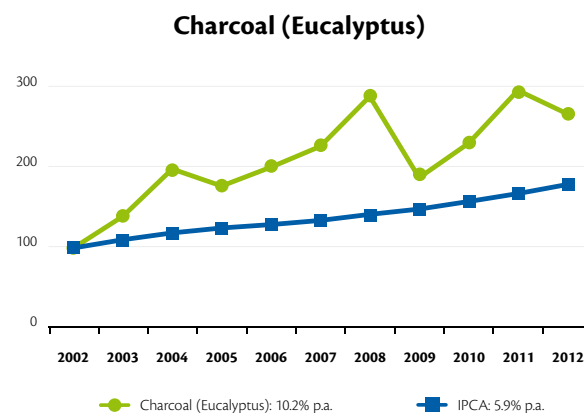
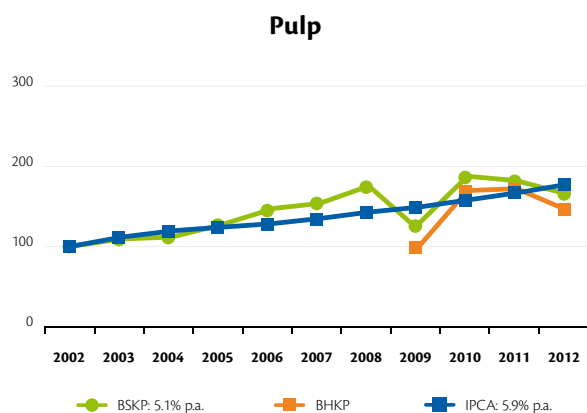
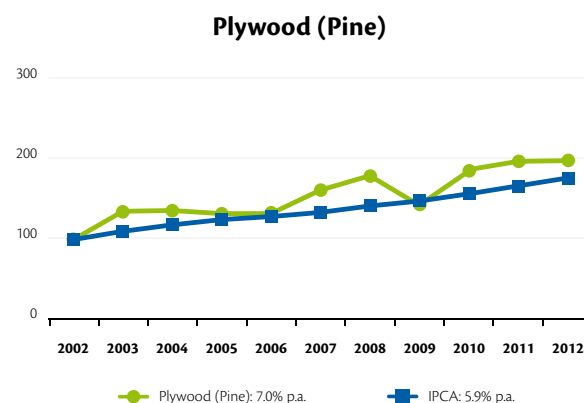
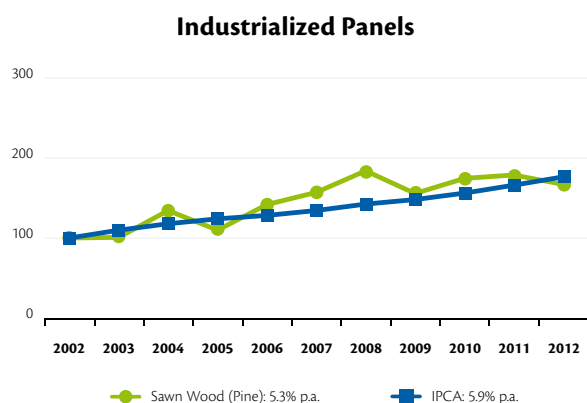
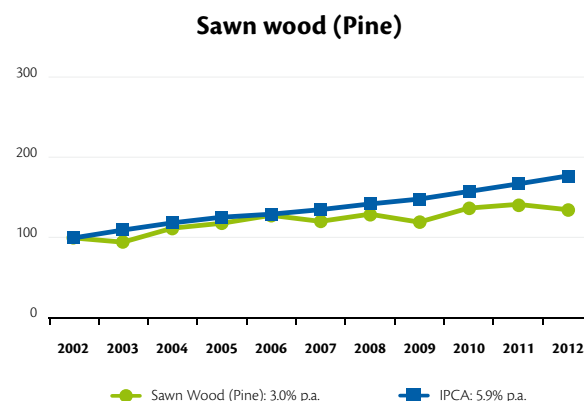
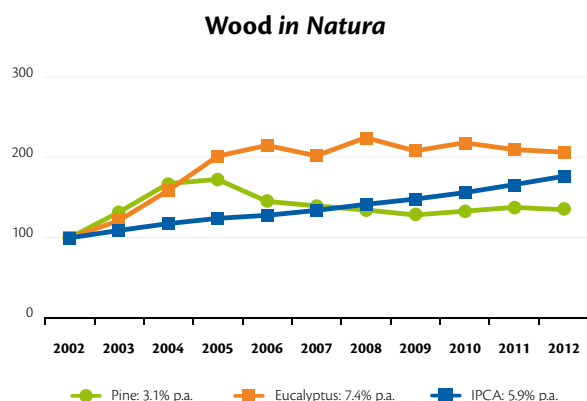
#### 2.3.4 Prices for Forest Products

Prices of wood and its derivatives have risen in recent years due to growth in the domestic and international markets, which has pressured increased demand for forest products, in turn impacting the attractiveness of forest business and expansion of the country's planted area.

Log prices reached their peak in 2005 (for pine wood), and in 2006 (for Eucalyptus), and lost value in the following years as a result of the impact of the north American financial crisis (Graph 2.07). For the period 2009-2012, prices fell as a result of decreased demand from the external market, principally with relation to the wood industry (sawnwood and plywood).

The other products derived from the forest base also followed the rising trend until 2008, destabilizing along with the world economic crisis and re-establishing themselves on the path to recovery of pre-crisis price levels, as seen in the last two years.

**Graph 2.07** Change in Nominal Prices for Forest Products and their Derivatives (base index 100 = 2002)



Fonte: Radar Pöry Silviconsult, FOEX, MDIC, AMS e IPEA.



## 2.4 ANNUAL PLANTED AREA

### 2.4.1 General Concepts

In order to facilitate understanding of the forest planting information presented in this section, the concepts of yearly planted area and total planted forest area are detailed below.

- Annual planted area: planting performed throughout each year, including:
  - New planting (expanding the forest base) and
  - Re-establishment (post-harvest replanting)
  - In summary:

$$P_n = Np + Ref$$

- Assuming:
  - ✓  $n$ : year assessed
  - ✓  $P_n$ : annual planted area in the year  $n$
  - ✓  $Np$ : new plantings (expansion in new areas) in the year  $n$
  - ✓  $Ref$ : re-establishment areas in the year  $n$
- **Total yearly planted area:** the above area added to the number of sprouts, as established in this Yearbook:

$$P_{nt} = P_n + Reb$$

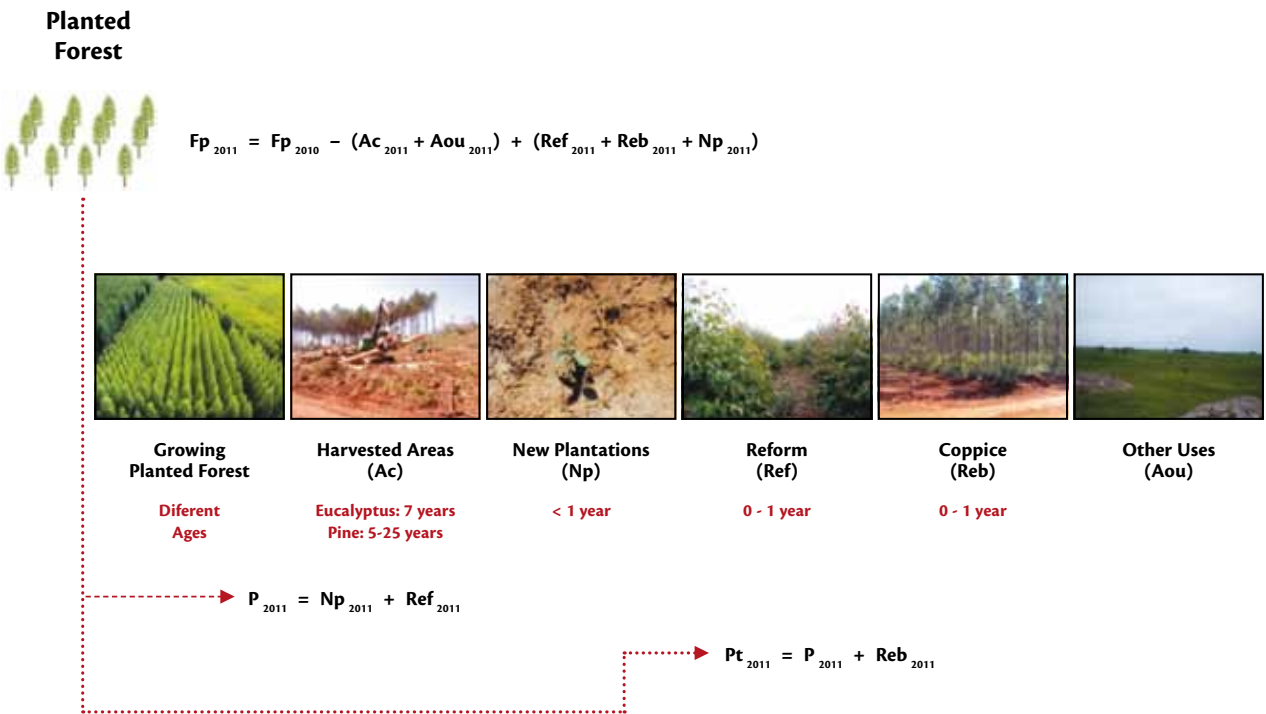
- Assuming:
  - ✓  $n$ : year assessed
  - ✓  $P_n$ : annual planted area in the year  $n$
  - ✓  $P_{nt}$ : total planted area in the year  $n$
  - ✓  $Reb$ : areas with sprouts (coppicing of the stump after harvest) in the year  $n$
- **Total area with forests planted in a given year:**

$$Fp_n = Fp_{n-1} - (Ac + Aou) + (Ref + Reb + Np)$$

- Assuming:
  - ✓  $n$ : year assessed
  - ✓  $P_n$ : annual planted area in the year  $n$
  - ✓  $P_{nt}$ : total annual planted area in the year  $n$
  - ✓  $Np$ : new plantings (expansion to new areas) in the year  $n$
  - ✓  $Ref$ : re-establishment areas in the year  $n$
  - ✓  $Reb$ : areas with sprouts (coppicing of the stump after harvest) in the year  $n$
  - ✓  $Fp_n$ : total area of planted forests in the year  $n$
  - ✓  $Fp_{n-1}$ : total area of planted forests in the previous year
  - ✓  $Ac$ : area harvested in the year  $n$
  - ✓  $Aou$ : area converted for other uses in the year  $n$

The main alternatives for forming and managing planted forests are known as: new planting (expansion to new areas), forest re-establishment and Eucalyptus sprouting (also known as management through “lopping”). Figure 2.03 illustrates these alternatives integrated into the concept of yearly planted area and total planted forests.

**Figure 2.03** Diagram of the concepts of yearly planted area and total planted forests

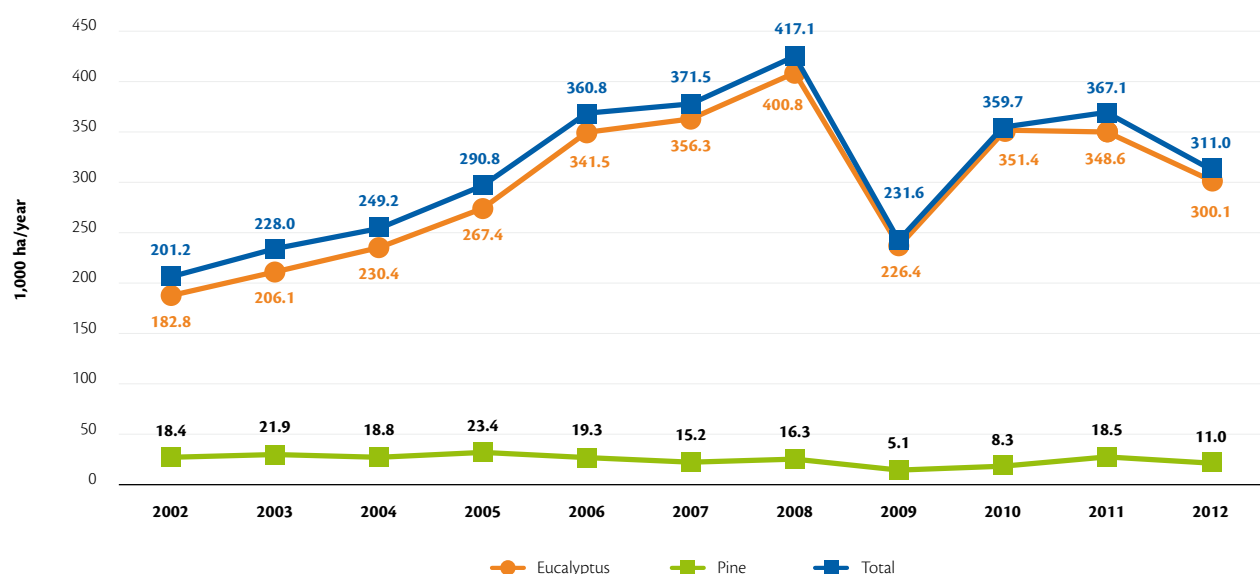


Source: ABRAF Yearbook (2010), adapted by Pöyry Silviconsult (2011).  
Photos: Pöyry Silviconsult (2011).  
Harvest: operations to cut and extract timber from forests at the end of the production cycle; can be performed manually or be mechanized.  
New plantings: expansion of planted area in areas that previously had other agricultural uses.  
Re-establishment: management of planted forests by planting after harvest is performed in an area previously occupied by planted forests. No expansion of area occurs.  
Coppicing (sprouting): Management of planted forests by coppicing after stems are cut, in an area previously occupied by planted forests (for example, Eucalyptus). No expansion of planted area occurs.

## 2.4.2 Total Annual Planting by ABRAF Member Companies

Graph 2.08 shows the trend towards growth in the area of total yearly planting by ABRAF member companies (from 2002 to 2012).

**Graph 2.08** Change in annual area planted with Eucalyptus and Pine forests<sup>1</sup> by ABRAF member companies, 2002-2012



Source: ABRAF Yearbook (2012) and ABRAF member companies (2013).

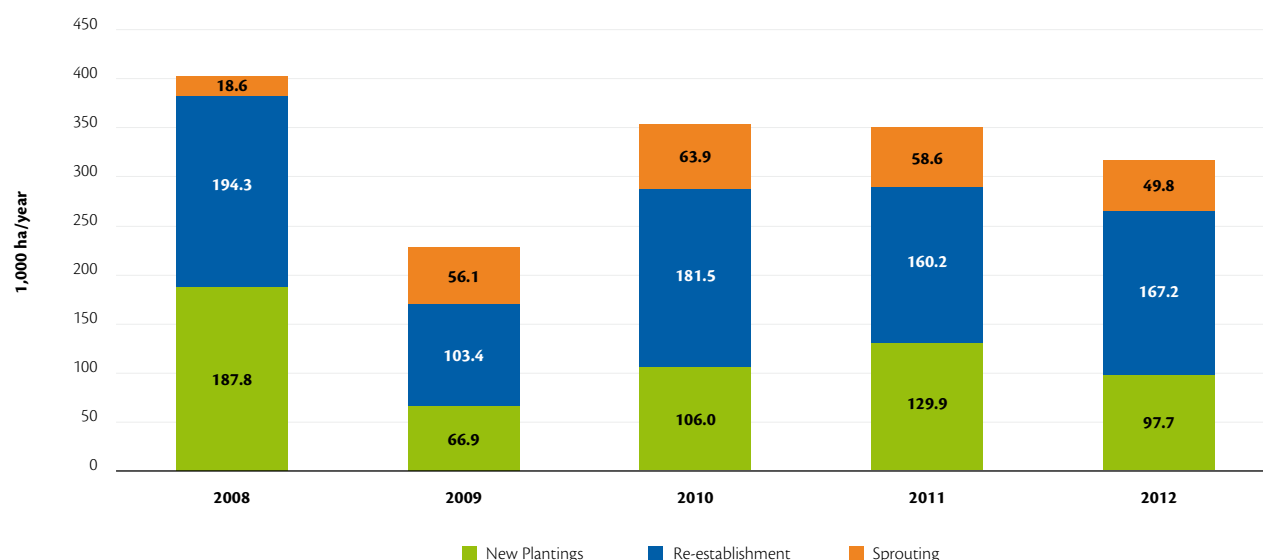
<sup>1</sup> Includes expansion, forest re-establishment and sprouts (this latter applying only to Eucalyptus).

Over this period, the average annual growth of area planted with Eucalyptus grew 5.1%. However, the planted area added up to 300,100 ha in 2012, a drop of 13.9% compared to 2011.

Over the last ten years, the average annual growth rate of the area planted with Pine showed a drop of 5.0%. In 2012, the area planted with Pine by ABRAF member companies totaled 11.0 thousand ha, registering a drop of 40.5% in relation to 2011.

With regard to the type of new planting conducted in 2012, the areas which used sprouting and new plantations decreased 15.0% and 24.8% compared to the previous year. On the other hand, re-establishment areas grew by 4.4%, adding up to 167.2 thousand ha/year (Graph 2.09).

**Graph 2.09** Change in total yearly planting of Eucalyptus by type of planting, new plantings, re-establishment and sprouting<sup>1</sup> by ABRAF member companies, 2008-2012



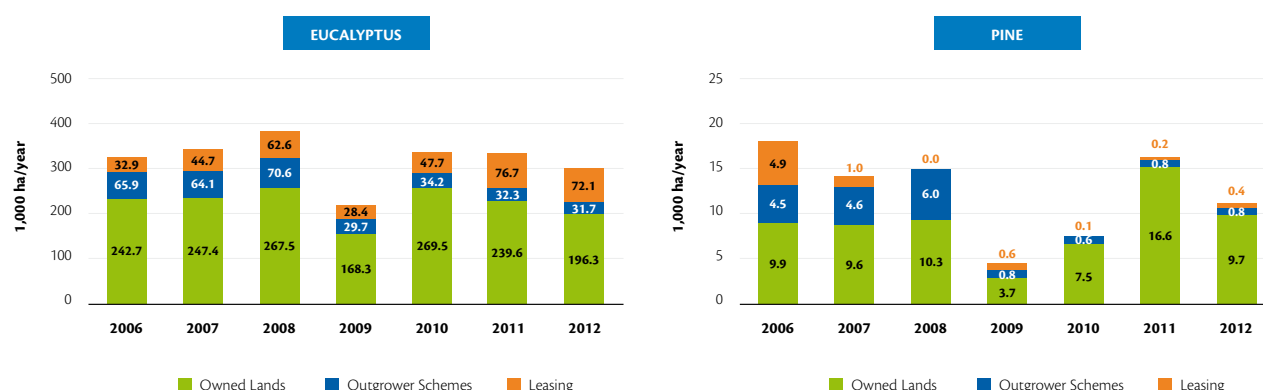
Source: ABRAF Yearbook (2012) and ABRAF member companies (2013).

<sup>1</sup> See the concepts illustrated in Figure 2.01.

The change in total yearly planting by ABRAF member companies by planting modality (owned lands, outgrower schemes and leasing) between 2006 and 2012 shows the predominant tendency to plant on owned lands, for both Eucalyptus and Pine (Graph 2.10).

In 2012, plantings of Eucalyptus on owned lands, through outgrower schemes and on leased lands decreased 18.1%, 1.9% and 6.0%, respectively. Plantings of Pine through outgrower schemes and on leased lands maintained constant with the numbers from 2011; however, plantings on owned lands decreased 41.6%.

**Graph 2.10** Changes in total yearly planting by ABRAF member companies by planting modality, 2006-2012



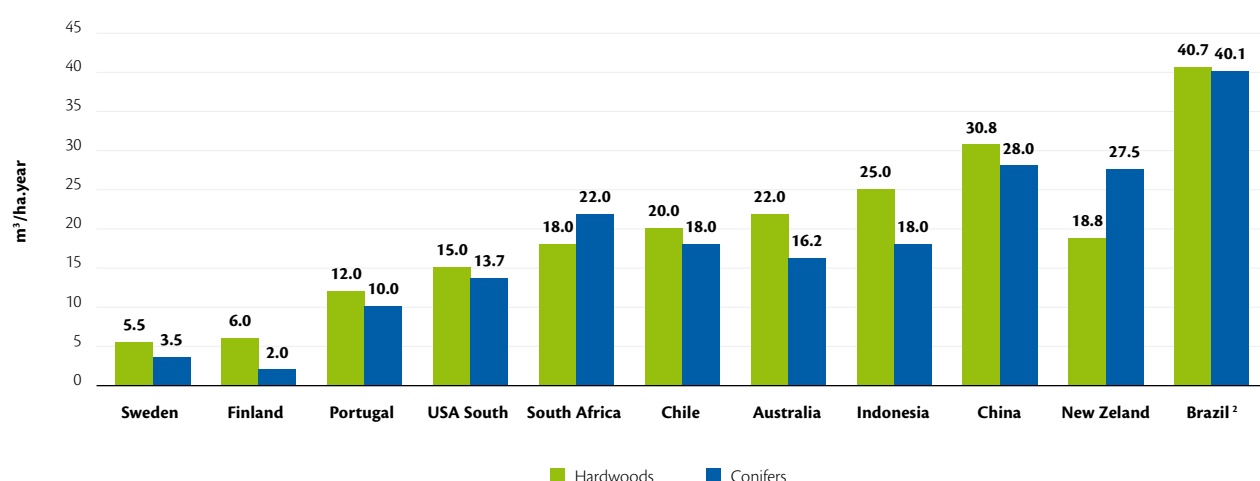
Source: ABRAF Yearbook (2012) and ABRAF member companies (2013).

## 2.5 TECHNOLOGY AND FOREST PRODUCTIVITY

### 2.5.1 Forest Productivity

Soil and climate conditions, along with land ownership and factors such as historical policies related to research and development, the verticalization of the sector and the quality of labor used in these activities have led to greater productivity per hectare and, consequently, the shortest harvest cycle for forest plantations established in Brazil, a situation quite different from that of other producing countries (Graph 2.11).

**Graph 2.11 Comparative productivity of conifer and hardwood forests in Brazil<sup>1</sup> and in other selected countries, 2012**



Source: ABRAF Yearbook (2012) and ABRAIF member companies (2013).

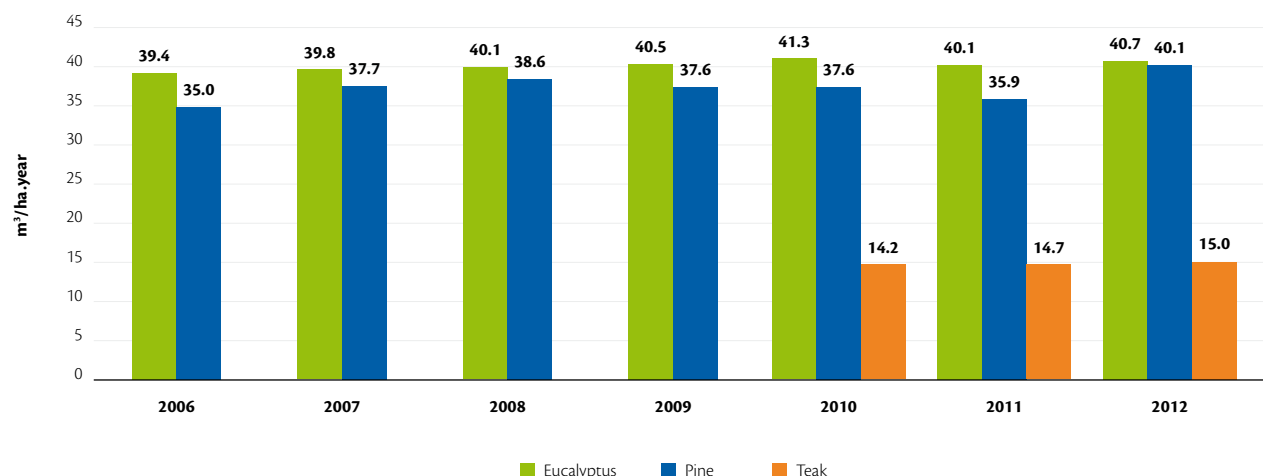
<sup>1</sup> The weighted MAI was used (as a function of planted areas) for areas planted with Eucalyptus and Pine by ABRAF member companies.

<sup>2</sup> Eucalyptus – MAI of companies associated with ABRAF; Pine – MAI of companies associated with ABRAF.

Research and development activities carried out by ABRAF member companies in order to improve genetic material and optimize forest management brought about significant gains in the mean annual increase (MAI) of the forest base. Every year, ABRAF member companies make significant investments in research and forest development to increase productivity as well as to find ways to adapt the main forest species to the new frontiers of the sector.

The forest plantations which belong to ABRAF member companies have the highest commercial MAIs in the country. The mean weighted productivity as a result of planted area of Eucalyptus plantations belonging to ABRAF associates grew from 39.4 m³/ha.year in 2006 to 40.7 m³/ha.year in 2011. The average productivity of Pine and Teak plantations was 40.1 and 15.0 m³/ha.year, respectively (Graph 2.12).

**Graph 2.12** Change in the mean annual increment (MAI) of forest plantations belonging to ABRAF member companies, 2006-2012



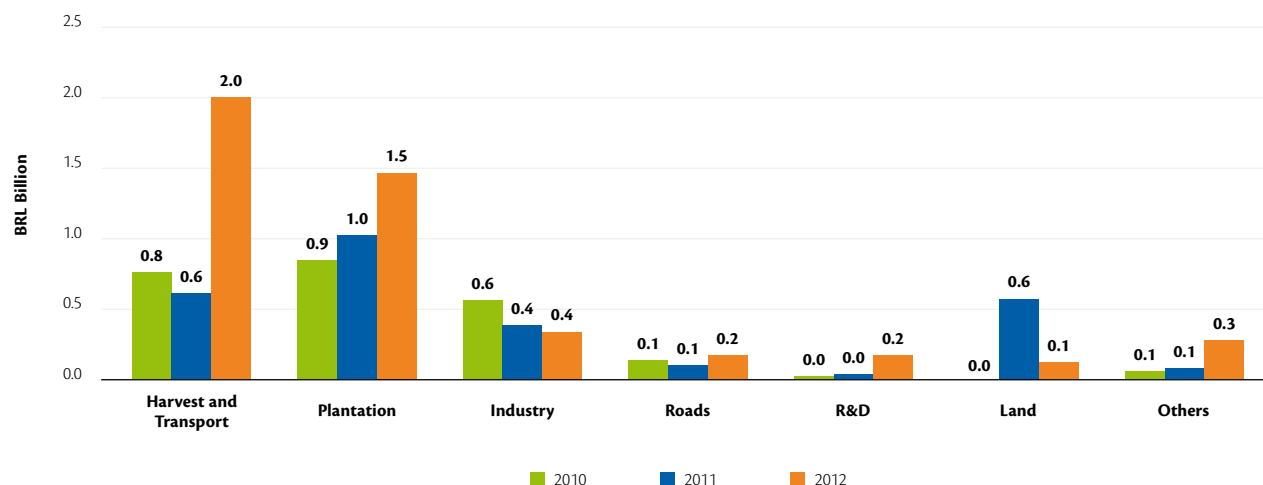
Source: ABRAF yearbook (2012) and ABRAF member companies (2013).

## 2.6 INVESTMENTS

### 2.6.1 Investments in Forest Formation

Current investments carried out by ABRAF member companies totaled BRL 4.6 billion in 2012, an increase of 60.9% compared to the investments made the year prior. This significant increase is due to the process of modernization that companies are undergoing in order to improve their competitiveness on the domestic and international markets. The segments that most benefited from the present investments were planting and harvest and transport, which saw invested value rise significantly in comparison with 2011. (Graph 2.13).

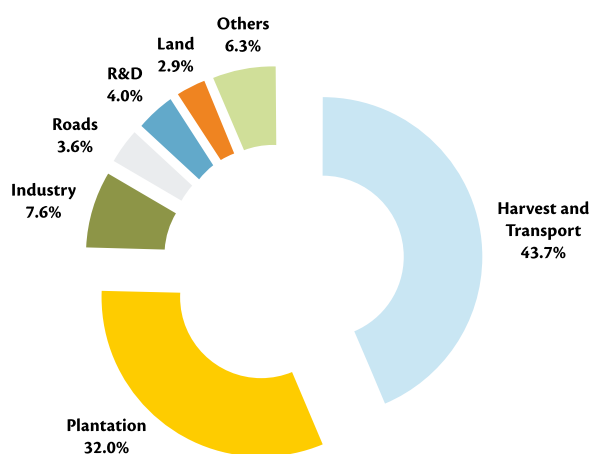
**Graph 2.13** Investments made in forest activities and industries by ABRAF member companies, 2010-2012, in nominal values



Source: ABRAF yearbook (2012) and ABRAF member companies (2013).

Graph 2.14 shows the proportional representation of investments made by forest companies associated with ABRAF in 2012.

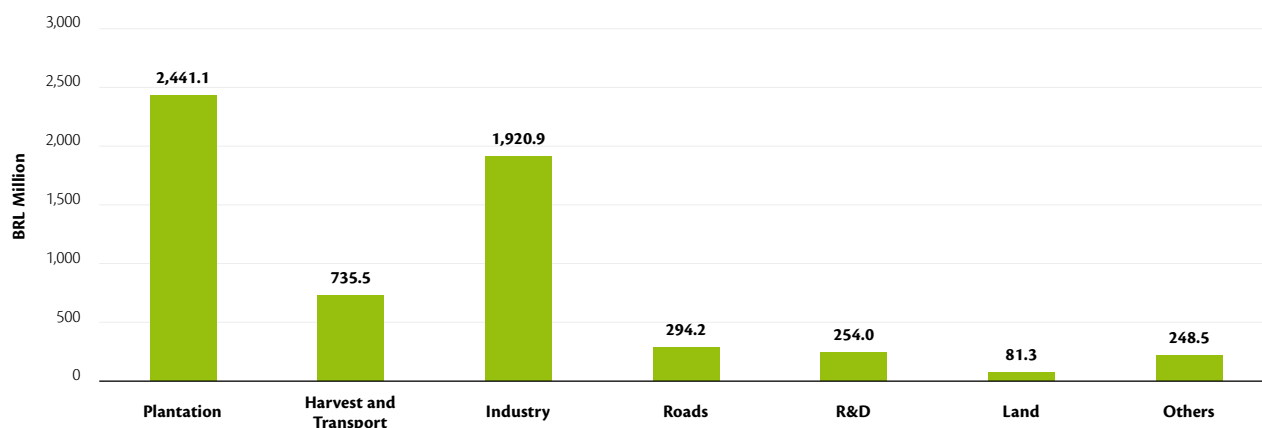
**Graph 2.14** Distribution of investments made by ABRAF member companies, 2012



Source: ABRAF member companies (2013).

ABRAF member companies predict that investments over the next five years (2013-2017) could reach BRL 6.0 billion (Graph 2.15).

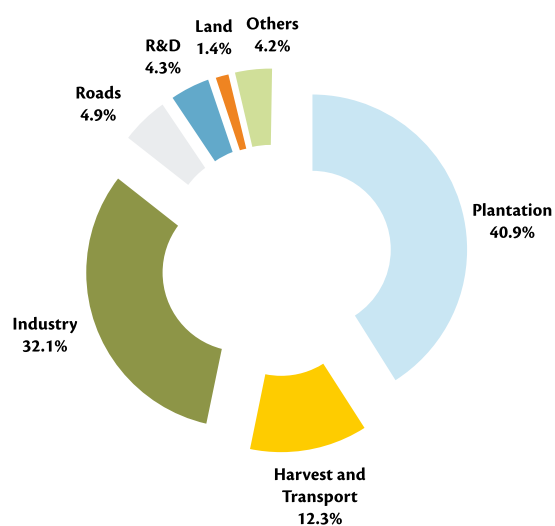
**Graph 2.15** Prospective investments in forest activities by ABRAF member companies for the period 2013-2017



Source: ABRAF member companies (2013).

A large portion of investments continues to be put towards planting operations (BRL 2.4 billion) and industrial investments (BRL 1.9 billion), which respectively account for 40.9% and 32.1% of the total (Graph 2.16).

**Graph 2.16** Distribution of prospective investment by ABRAF member companies, 2013-2017



Source: ABRAF member companies (2013).



A graphic for Chapter 3. It features a dark blue horizontal bar on the left with the word "CHAPTER" in white, uppercase letters. To the right of this bar is a large, light gray rounded square containing a large white number "3".

# CHAPTER 3

## *THE MARKET FOR FOREST PRODUCTS*

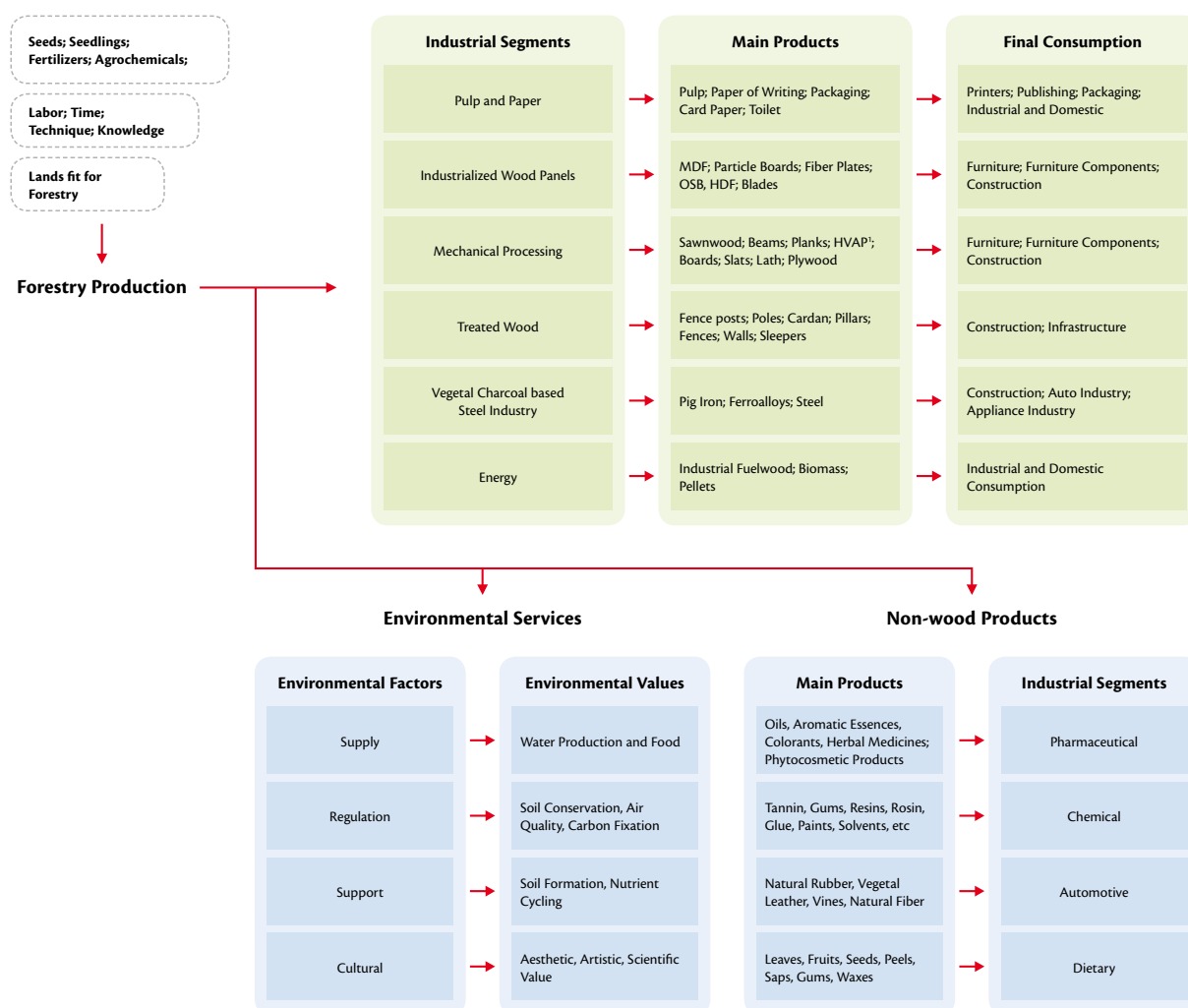
MAIN PRODUCTS DERIVED  
FROM PLANTED FORESTS

ROUND WOOD

### 3 THE MARKET FOR FOREST PRODUCTS

The production chain of the Brazilian planted forest sector is characterized by the large diversity of products, which encompasses a set of activities which transform wood at the beginning of the process into the final products at the end. Figure 3.01 shows a simplified model of forest production, highlighting its main products and services.

**Figure 3.01** Simplified model of the production chain in the forest sector

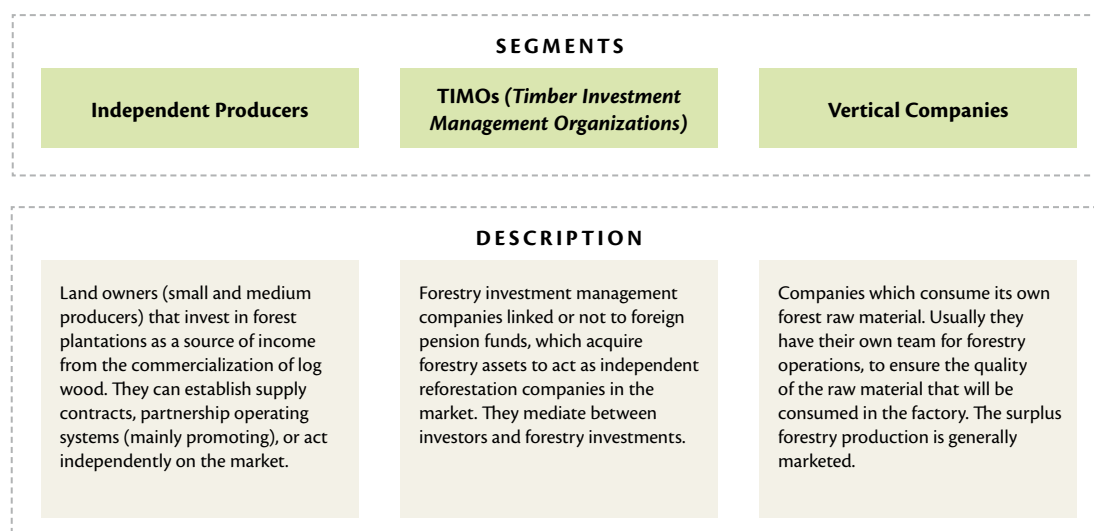


Source: Adapted from VIEIRA, L. A. – Setor Florestal em Minas Gerais: caracterização e dimensionamento. Belo Horizonte – Universidade Federal de Minas Gerais, 2004 and FSC 2011.

<sup>1</sup> HVAP (High Value Added Products) – doors, windows, frames, floors, decks, sleepers, and others.

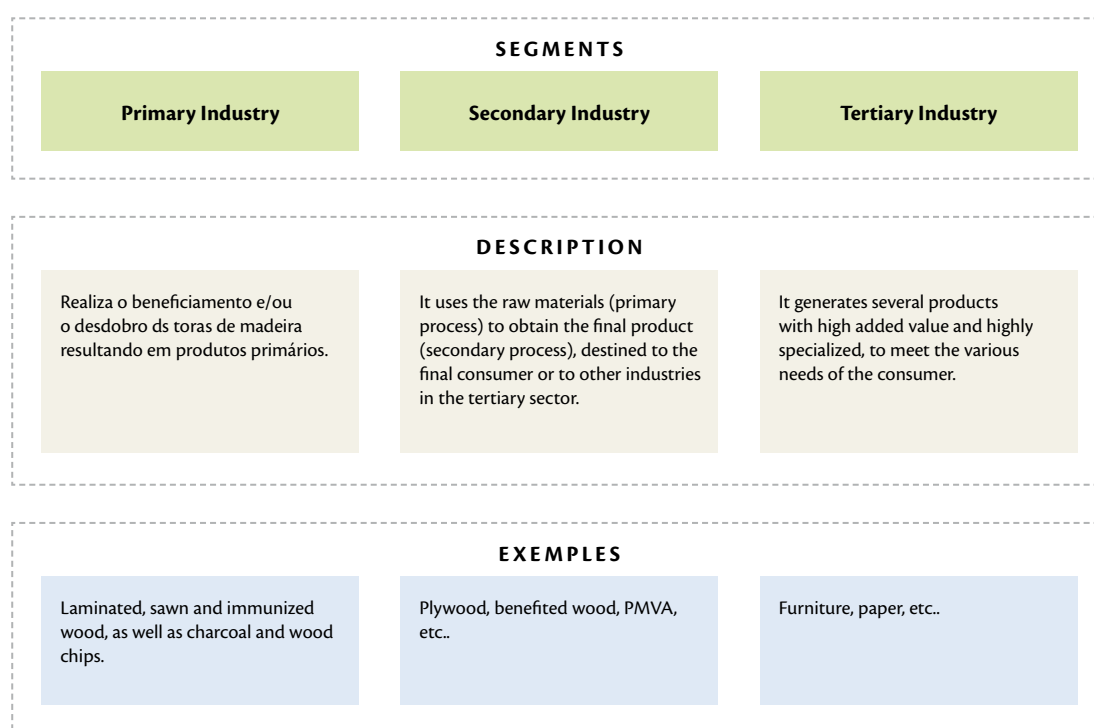
In Brazil, forest producers are divided into three large groups: vertical companies, independent producers and Timber Investment Management Organizations (TIMOs). Vertical companies and TIMOs are considered to be large scale companies, while the majority of independent producers are classified as small and medium scale producers (Figure 3.02).

**Figure 3.02** Groups of forest producers



The wood processing industry is classified into three segments: primary processing, secondary processing, and tertiary processing. This typology is applied as a function of the physical and chemical processes which transform raw materials of low aggregated value into intermediate products and end-use goods. Figure 3.03 describes and gives examples of each of these segments.

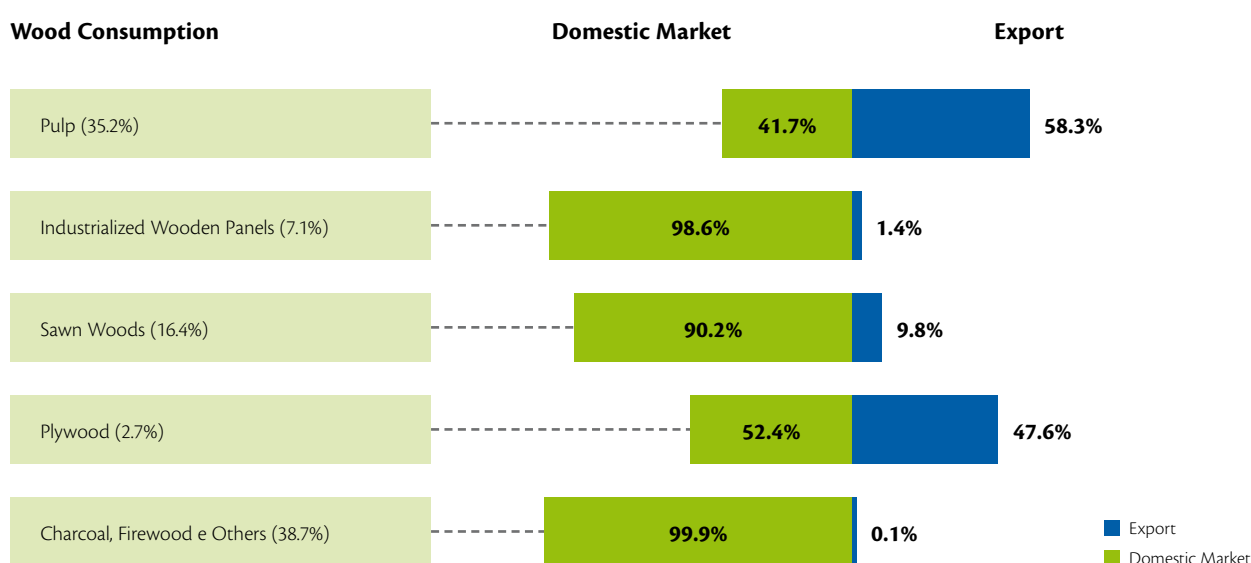
**Figure 3.03** Segments of the wood-processing industry



In 2012, 35.2% of all wood coming from planted forest was used in the production of pulp; sawn wood, industrialized wood panels and plywood respectively accounted for 7.1%, 16.4% and 2.7% of the total wood produced. The remainder (38.7%) was used for firewood and other forest products.

Figure 3.04 shows the proportional distribution of consumption of the Pine and Eucalyptus wood produced in 2012 by the main forest segments, as well as the destination of the resulting products with relation to the domestic and international markets.

**Figure 3.04** Proportional distribution of consumption of wood from planted forests, and destination of resulting production – 2012



Source: BRACELPA (2012), ABIPA (2012), Pöyry Silviconsult and AMS (2013).

It should be noted that, except for firewood, charcoal, sawn wood and industrialized wood panels (the consumption of which is basically concentrated in the domestic market), the other products are primarily aimed at the foreign market. A significant portion of the products from tertiary processing industries (furniture, paper, floors, frames, etc) is also exported, showing the importance of the international markets to the Brazilian forest sector.

### 3.1 MAIN PRODUCTS DERIVED FROM PLANTED FORESTS

The continent-spanning size of Brazil favored the development of forest-based industry throughout its territory. Nevertheless, companies tend to concentrate where regional and logistical aspects favor economies of scale and, therefore, are a competitive advantage. The regions where the main companies and consumers of wood from planted forests are concentrated are shown in Figure 3.05.

**Figure 3.05** Location of main companies and forest centers consuming wood from planted forests in Brazil, 2012



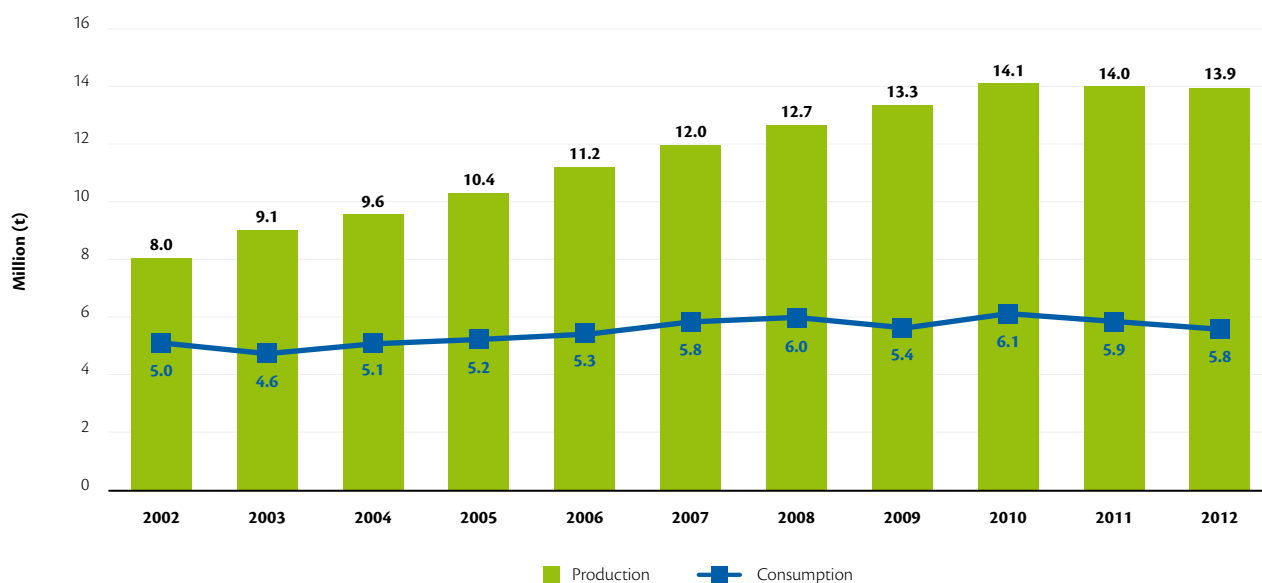
### 3.1.1 Production and Consumption in Brazil

#### Pulp

In 2000, Brazil was the world's 5th largest producer of pulp (long and short fiber), exceeded only by the United States, Canada, Japan and Finland. Today, the country is the world's 3rd largest producer of pulp among integrated producers, behind only the United States and Canada, and takes first place among independent producers.

Over the last ten years (2002-2012), the domestic pulp industry has grown an average of 5.7% p.a., reflecting the increase in exports to the Asian and European markets. In 2012, pulp production totaled 13.9 million tons and consumption reached 5.8 million tons, registering a drop of 0.1 million tons compared to the previous year (Graph 3.01).

**Graph 3.01 History of pulp production and consumption in Brazil, 2002-2012**



Source: BRACELPA (2012).

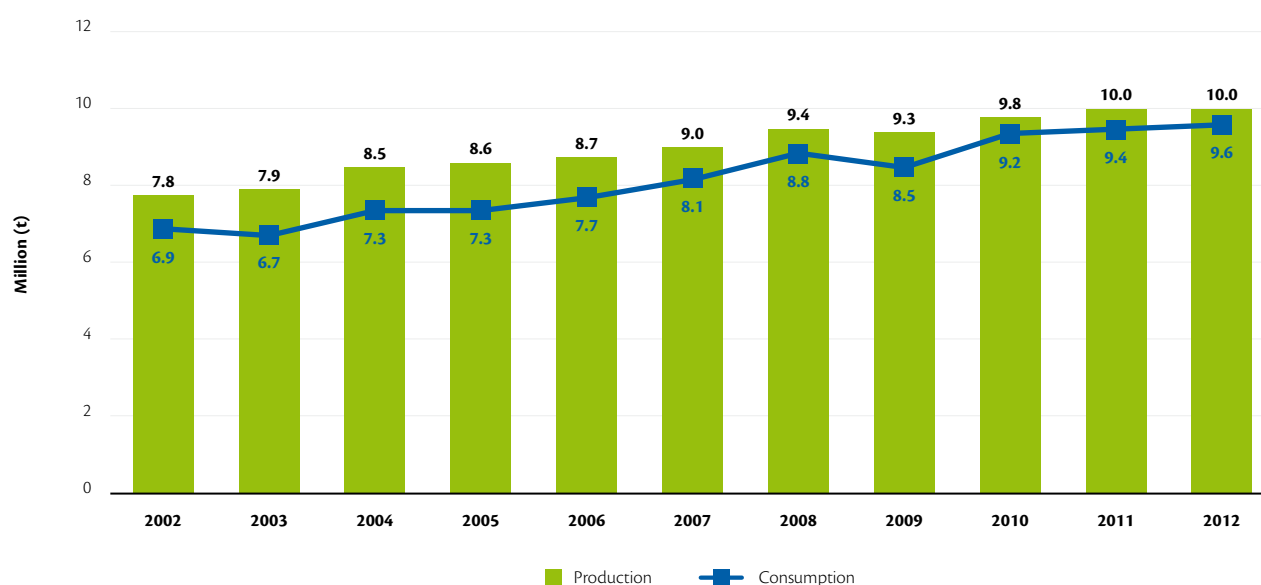
On the Brazilian scene, drops in production and consumption were due to global economic uncertainty. In 2012, companies in the pulp sector suffered a strong drop in international prices for the product, which was the result of reduced international demand and overvalued exchange rates in the first semester of the year.

## Paper

The domestic paper industry holds 9th position in the international ranking of major producers. The main products of this segment make up the market of packaging, hygiene and beauty products, and printing and writing paper.

In the last 10 years (2002-2012), the paper industry has grown an average of 2.5% p.a. as a function of increased internal and external demand. In 2012, paper production totaled 10.0 million tons and consumption reached 9.6 million tons, registering practically constant levels of production and consumption compared to the previous year (Graph 3.02).

**Graph 3.02 History of paper production and consumption in Brazil, 2002-2012**



Source: BRACELPA (2012).

As with pulp, stagnation in the production and consumption of paper is due to international economic uncertainties which resulted in a slowing of the market.

### Industrialized Wooden Panels

The industrialized wood panel sector is composed of the industries which produce MDP panels (particle board), MDF, OSB and fiber board. The industries in this segment are important suppliers of raw materials to the furniture, civil construction and packaging industries.

The market for industrialized wood panels is currently expanding in Brazil. In the last ten years (2002-2012), annual production of industrialized wood panels has grown from 3.1 million tons to 7.3 million tons, an average growth of 8.9% p.a. Along similar lines, annual consumption of wood panels also grew from 2.8 million tons to 7.2 million tons, an average increase of 9.9% p.a. In 2012, the production of industrialized wooden panels grew 12.3% and consumption grew by 10.8% (Graph 3.03).

**Graph 3.03** History of production and consumption of industrialized wood panels in Brazil, 2002-2012



Source: ABIPA (2012).

In recent years, production and consumption of industrialized wood panels has shown the largest annual increase on average of all Brazilian forest products. According to the Brazilian Wood Panel Industry Association (ABIPA), this increase was due to growth in domestic consumption as well as to significant investments made by industries in the sector which doubled nominal installed capacity over the last decade.

Substitution of plywood with industrialized wooden panels in furniture production has significantly affected development in this sector. Government stimulus packages aimed at elevating the competitiveness of the Brazilian furniture sector in 2012 such as the elimination of the IPI taxes (taxes on industrialized products) benefited the entire chain of furniture producers, which earned BRL 35.1 billion in 2011, 11.4% more than in 2010. Similarly, public policies aimed at the



housing sector (the *Minha Casa Minha Vida* program) and growth in the Brazilian population's average income have also contributed to the increase in demand for products based on industrialized wood panels.

Growth in the panel market is strongly linked to the domestic economic situation, where increased income and growth in civil construction are factors which propel the real estate and durable goods markets; this in turn brings about increased demand for industrialized wooden panels in order to manufacture consumer products.

## Mechanically Processed Wood

The mechanically processed wood sector is made up of the solid wood industries which produce sawn wood, veneers and plywood as well as other high value added products (HVAPs) such as doors, windows, frames and furniture parts, among other processed products.

The productive structure of the sector is very widely spread out, as it is made up of a large number of small companies, typically family businesses. The main consuming segments on the Brazilian market are furniture and civil construction.

Over the last 10 years (2002-2012), annual plywood production grew from 1.6 million m<sup>3</sup> per year in 2002 to 2.1 million m<sup>3</sup> per year in 2012, an average growth of 2.8% p.a. Consumption grew from 0.5 million m<sup>3</sup> per year in 2002 to 1.1 million m<sup>3</sup> per year in 2012, resulting in an increment of 9.0% p.a. In 2012, plywood production reached a volume 16.7% greater than that of 2011; consumption was 10.0% higher (Graph 3.04).

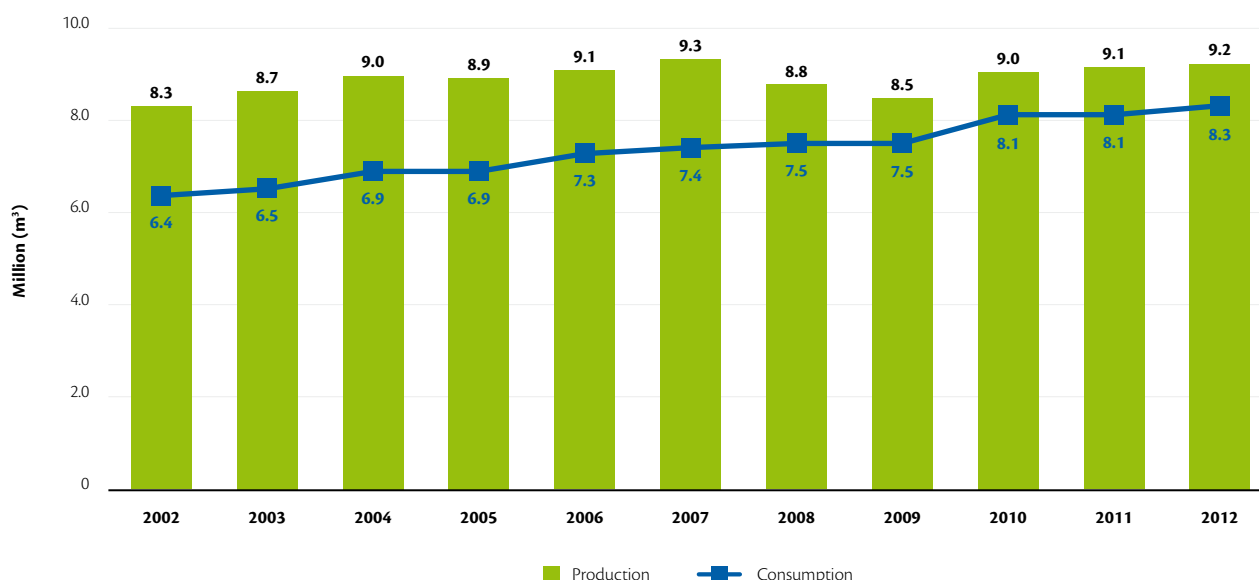
**Graph 3.04 History of plywood production and consumption in Brazil, 2002-2012**



Source: Pöyry Silviconsult.

Over the same period (2002-2012), production of sawn wood<sup>1</sup> grew from 8.3 million m<sup>3</sup> per year to 9.2 million m<sup>3</sup>, an average growth of 1.0% p.a. And consumption, which was 6.4 million m<sup>3</sup> per year in 2002, grew to 8.3 million m<sup>3</sup> per year in 2012, an increment of 2.7% p.a. In 2012, production of sawn wood added up to a volume 1.1% greater than the volume produced in 2011, and consumption was 2.5% greater (Graph 3.05).

**Graph 3.05 History of sawn wood<sup>1</sup> production and consumption in Brazil, 2002-2012**



Source: Poyry Silviconsult.

The production of sawn wood and plywood is propelled by internal and foreign consumption in distinct proportions. The main factors influencing its performance are exchange rate policy, the rate of growth in the domestic and international economies, and increasing international competition, especially from China.

Over recent years, growth in the consumption of sawn wood has been influenced principally by the development of the domestic market, which in turn was stimulated by growth in the civil construction industry and the packaging market, which are strongly impacted by expansionist government policy which aims to grow the Brazilian economy. Foreign consumption, which depends on devaluation of the exchange rate and the reaction in international demand (especially from the United States) continues to recover.

Growth in consumption of laminates and plywood has suffered a significant impact in foreign demand. The recovery of international demand, especially from Europe, will be a fundamental factor in the sector's own recovery. On the domestic market, as with sawn wood, the segment has benefited from the same favorable conditions which are present.

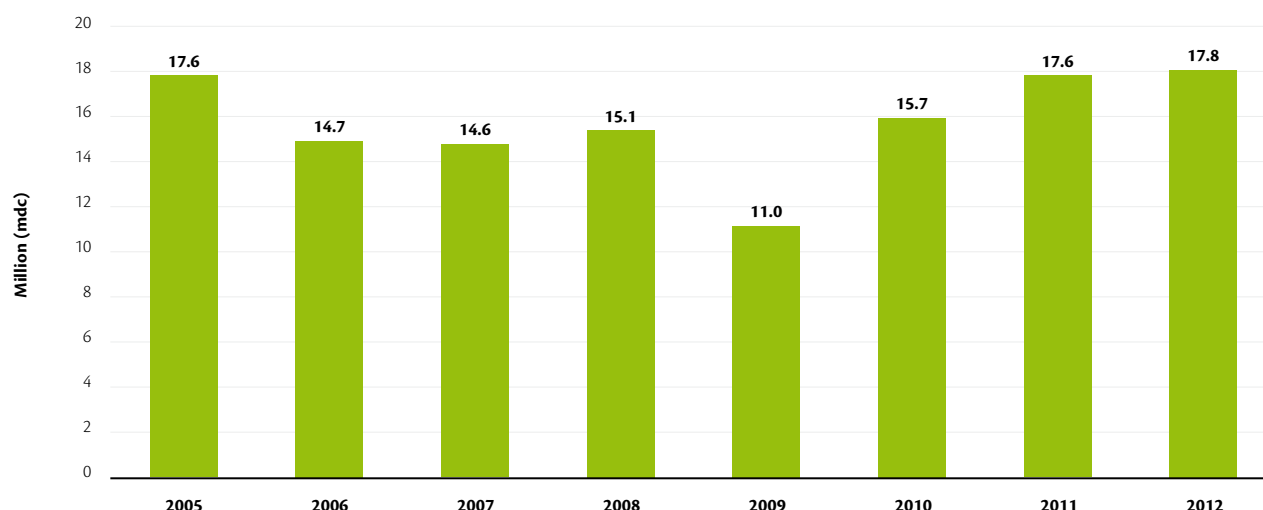
<sup>1</sup> Includes sawn wood and higher value added products (HVAPs) such as floors, doors, windows, frames, window frames, veneers, furniture parts and pieces, clear blocks, blanks, edge glued panels, and fence boards, among others.

## Steelworks and Charcoal

The steelworking segment continues to be one of the few segments which have not yet totally recovered from the financial crisis of late 2008. In this context, the Steelworks and Charcoal sectors exhibited a similar trajectory with some aggravating factors. China reduced its purchases of Brazilian pig iron, and the United States has bought even less than in prior years. These factors are significantly reflected in the domestic charcoal market, as this is an important input used in producing pig iron and ferroalloys.

Consumption of charcoal from exclusively planted forests, however, has been showing very different behavior compared to the Steelworks and Charcoal sector over recent years. An increase of 61.4% was observed between 2009 and 2012. Increased consumption of charcoal, especially charcoal coming from planted forests, was due to various factors, including demands and constant pressure from domestic and international consumers of pig iron to reduce or even eliminate the use of charcoal from native forests, along with increasingly stronger environmental demands stemming from legislation and regulations. Accordingly, more and more charcoal from forest plantations is being consumed to produce pig iron domestically. Large consumers of charcoal (industries independent of or integrated into the production of pig iron and ferroalloys) are increasing the efficiency of the process of wood carbonization and the industrial process in order to achieve greater environmental, economic and social sustainability in producing charcoal and steel (Graph 3.06).

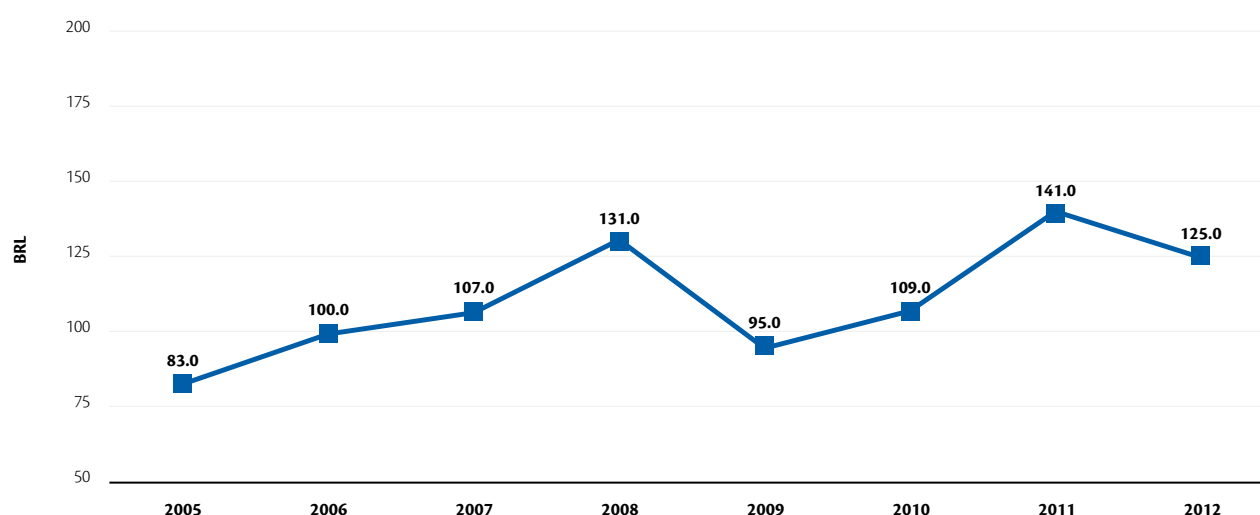
**Graph 3.06** Domestic consumption of charcoal from planted forests, 2005-2012



Source: AMS 2013.

With relation to prices practiced on the domestic market, some variations were seen in comparison with those practiced in 2011 and through 2012, when there were some situations of oversupply. One cubic meter of charcoal (mdc), which was sold at BRL 190.0 in 2011, reached BRL 130.0 at the beginning of 2012 and closed the year around BRL 115.0, showing a drop of approximately 40.0%. This drastic fall in price was reflected in the increase of charcoal supplies, from both native and planted forests, without any corresponding demand from the pig iron sector. In 2012, although the production of pig iron using charcoal (which is the largest consumer of this input) held steady compared with 2011, around 55.0% of independent steelworks producing pig iron remained closed. These factors were reflected in the average prices practiced throughout 2012, which fell 11.3% in nominal values (Graph 3.07).

**Graph 3.07 History of nominal prices of charcoal in Minas Gerais, 2005-2012**



Source: AMS 2013.

It is important to stress that the pig iron produced with charcoal (remembering that Brazil is still the only country which produces pig iron from vegetable charcoal) is of higher quality, and does not contribute to environmental pollution as coke-fired steelworks do. The production of “green pig iron” using charcoal from planted forests shows, again, the growing commitment of ABRAF’s sector to environmental preservation.

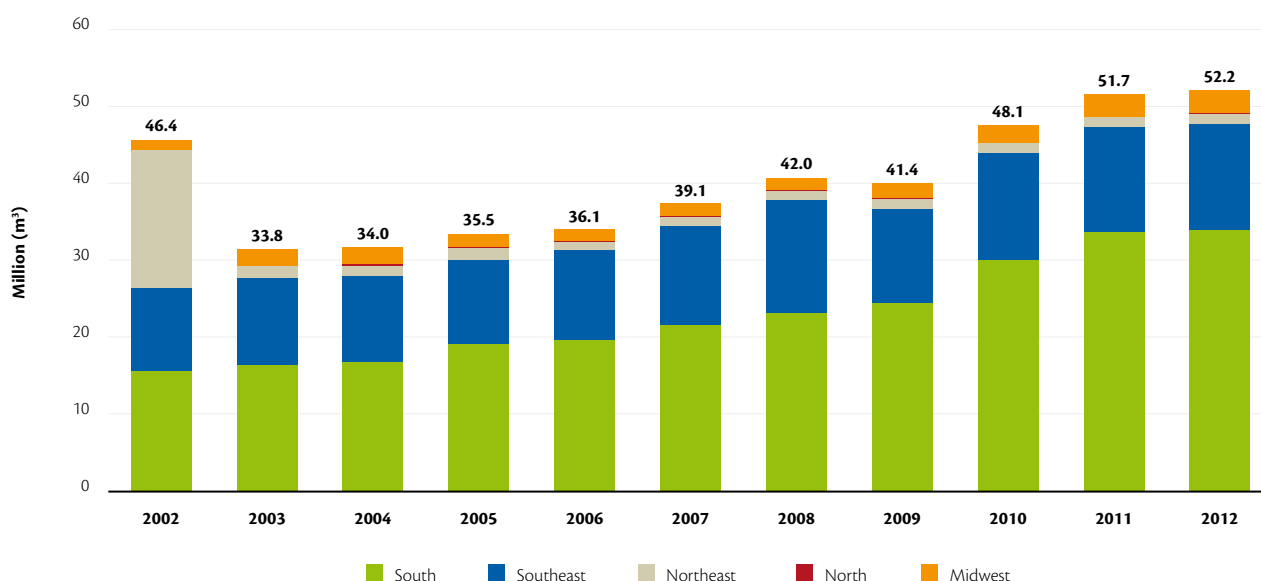
In spite of increased consumption of charcoal from planted forests, challenges remain, such as the value of green pig iron, the volume of which has risen. Also challenging are the development of activities to publicize its qualities and how it contributes environmentally, namely by reducing greenhouse gas emissions and other contributions relevant to improving environmental quality.

## Firewood

Although the consumption of firewood for the generation of household energy has historically been one of the main uses of this product, growth in industries such as pulp and paper, ceramics, charcoal-fired steelworks and agribusiness, among others, has pressured growth in the consumed volume of firewood from planted forests.

Between 2002 and 2012, production of firewood grew at an average rate of 1.2% p.a. and the south and southeast regions were historically the main consuming regions. In 2012, it is estimated that Brazil produced 52.2 million m<sup>3</sup> of firewood from planted forests, with the south and southeast regions accounting for 92.5% of this total. The historical series of domestic production for the period between 2002 and 2012 is shown in Graph 3.08.

**Graph 3.08** Historical time-series of firewood production from planted forests in Brazil, 2002-2012

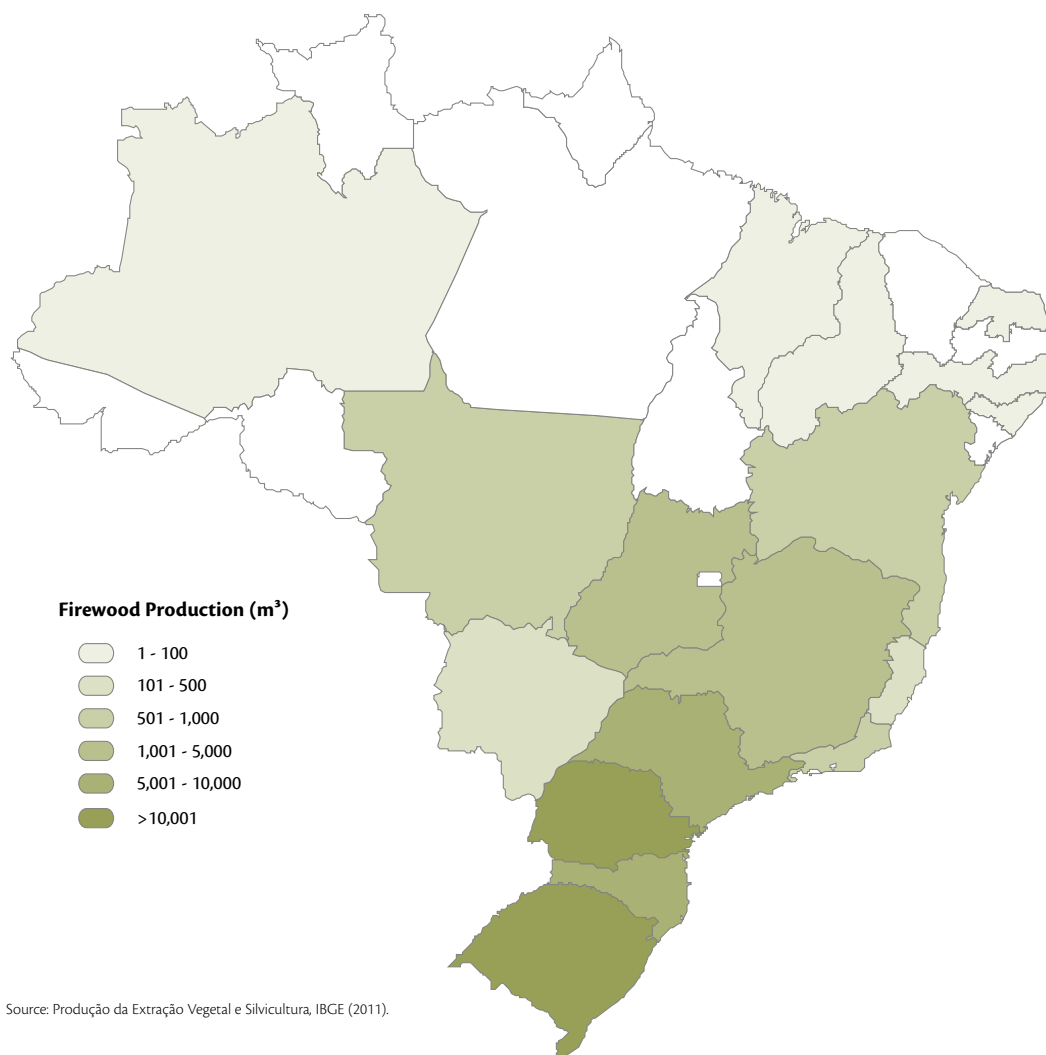


\*PSC estimate.

Source: Produção da Extração Vegetal e Silvicultura, IBGE (2012).

The main states producing firewood are Rio Grande do Sul and Paraná, as can be seen in Figure 3.06.

**Figure 3.06** Distribution of planted forest firewood production in Brazil, 2002-2012



Firewood from planted Pine forests is almost entirely consumed in the southern and southeastern states. In the hotter regions of the country, such as the states of Pará, Mato Grosso and Bahia, firewood comes mainly from planted Eucalyptus forests.

Forests planted for energy uses (energy forests), or Eucalyptus and Pine cultivated to produce wood to generate energy, contributed to the sustainable growth of the industrial sectors which consume forest biomass.

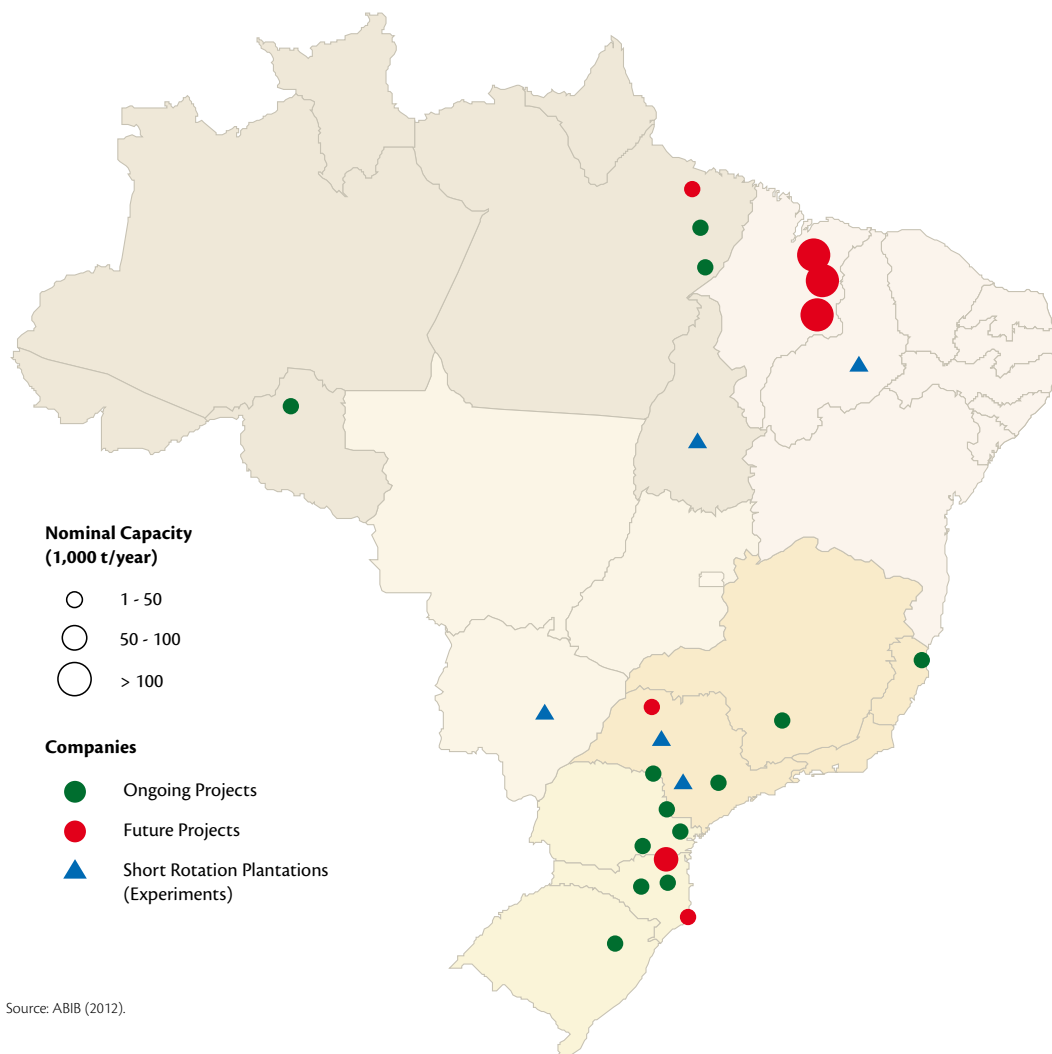
## Pellets

Prospects for the Brazilian pellet market are promising. The intention of the European Union is that approximately 20.0% of all the energy produced there come from renewable resources by 2020. In 2010, world production of pellets reached 16.0 million tons, with Europe responsible for 67.0% of this total production, followed by North America with 30.0% of total produced volume. In Brazil, pellet production remains modest, registering 47,000 tons in 2010.

The use of pellets by the industrial sector is stronger in countries where the production of electricity is based on combustion of biomass, as in the case of Sweden, Denmark, Holland, Belgium and the United Kingdom. Countries such as Germany, Italy and Austria as well as the North American countries restrict their demand to residential heating. In both cases, incentive mechanisms have been important to the growth and direction of demand.

There are currently plans for large-scale projects which seek to consolidate this new frontier in Brazil (Figure 3.07). As a result, the trend is that Brazil will meet part of international demand by producing 2.0 million tons of pellets annually.

**Figure 3.07** Location of pellet industries and future projects in Brazil, 2012-2013



## Other Products

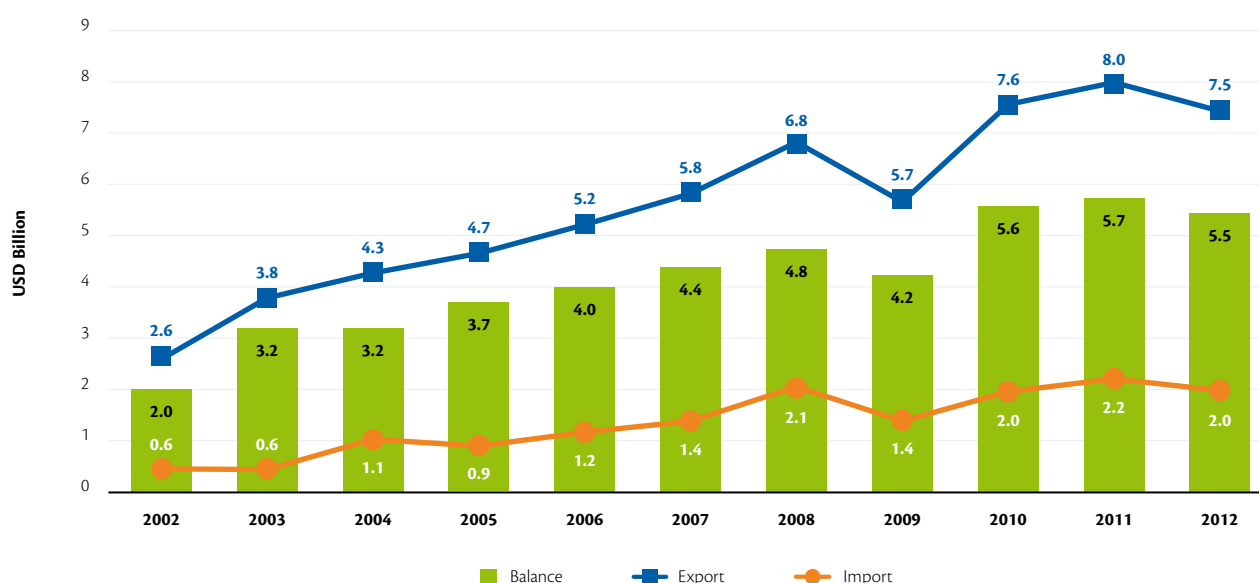
On a smaller scale, production of other forest products such as chips, shavings, sawdust, briquettes, poles, and gateposts, among many others, continues to take place. However, the absence of statistics concerning the market for these products, due to the scattered locations of their production centers, impedes the real measurement and analysis of the potential of these markets.

### 3.1.2 Internacional Trade

The total Brazilian export balance reached USD 242.6 billion in 2012, a drop of 5.2% in relation to 2011 (USD 256.0 billion). Imports fell 1.4% compared to 2011, totaling USD 223.1 billion. In this context, the Brazilian trade balance was positive for 2012 by USD 19.5 billion, although it declined 34.6% compared to 2011.

The trade balance with relation to forest activity registered a surplus of USD 5.5 billion in 2012. Nevertheless, due to the drop in exports which occurred in 2012, the commercial balance fell 3.5% in relation to 2011's figure. Exports totaled USD 7.5 billion and registered a drop of 6.2% compared to the previous year. Similarly, imports registered a loss of 9.1% in relation to 2011, adding up to USD 2.0 billion. It should be stressed that the drop in prices impacted exports in 2012, as the quantity of exports was slightly above that of 2011 (Graph 3.09).

**Graph 3.09 Trade balance evolution of products from planted forests in Brazil, 2002-2012<sup>1</sup>**



Source: SECEX (2012).

<sup>1</sup> See Methodology Notes in Chapter 5 of this Yearbook.



The main importers of Brazilian forest products were Argentina, Germany and China, which led the rankings in imports of paper, plywood and pulp, respectively. The United States led imports of panels and sawn wood (Figure 3.08).

**Figure 3.08** Main importers of Brazilian forest products



Source: SECEX (2012).

Table 3.01 shows the evolution of the monetary value of exports of the main products coming from the Brazilian planted forest sector for the period 2002-2012.

**Table 3.01** Evolution of Brazilian exports of planted forest products, 2002-2012

Item	Annual Exports (Million USD)										
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Pulp	1,161	1,744	1,722	2,034	2,484	3,024	3,917	3,315	4,762	5,002	4,706
Paper	895	1,087	1,188	1,372	1,524	1,702	1,920	1,686	2,009	2,188	1,951
Sawn wood <sup>1</sup>	292	302	367	365	334	328	245	171	188	199	183
Industrialized wooden panels <sup>2</sup>	93	114	154	167	162	166	127	85	82	95	117
Plywood <sup>3</sup>	211	344	521	510	438	422	477	279	360	325	372
Charcoal	2	3	6	4	3	3	2	2	1	1	0,5
Others <sup>4</sup>	165	194	335	201	262	178	137	116	169	162	219
<b>Total</b>	<b>2,819</b>	<b>3,788</b>	<b>4,293</b>	<b>4,653</b>	<b>5,207</b>	<b>5,823</b>	<b>6,825</b>	<b>5,654</b>	<b>7,571</b>	<b>7,972</b>	<b>7,549</b>

Source: SECEX (2012).

<sup>1</sup> Only conifers and non-conifers in SP, SC, PR and RS.

<sup>2</sup> Industrialized panels, according to SECEX, include: MDP, MDF, hardboard, OSB and others (waferboard).

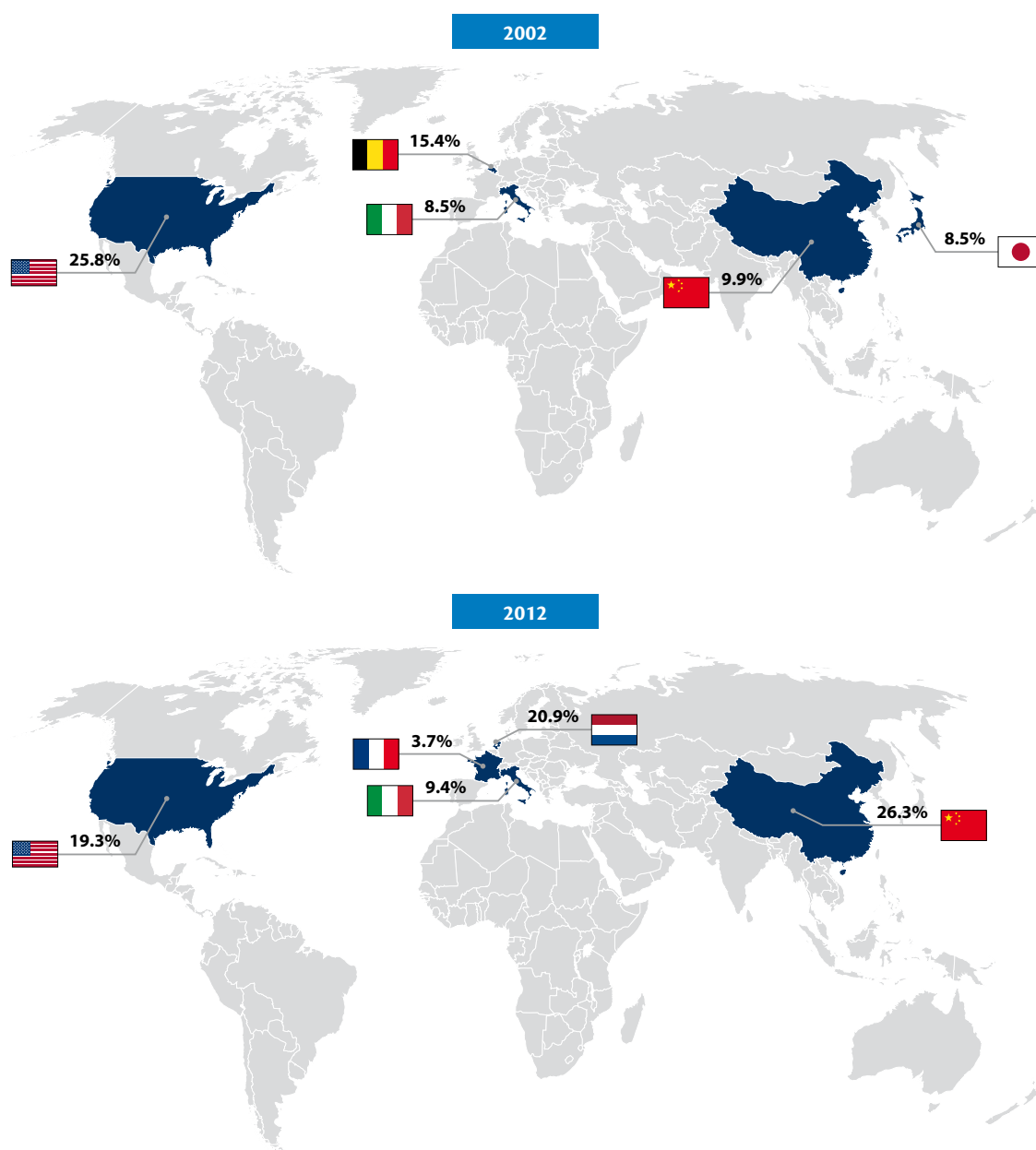
<sup>3</sup> Includes only conifers.

<sup>4</sup> "Others" includes: frames, blocks and planks and EGP.

In 2012, pulp exports amounted to approximately USD 4.7 billion, showing a decrease of 5.9% in relation to 2011 (USD 5.0 billion), as a result of the retraction in European and North American demand, and of the drop in international pulp prices.

In 2002, the United States was the main destination for Brazilian pulp exports. In 2012, China was the largest importer of this product. It also should be noted that Holland's pulp imports grew; the largest portion of Brazilian pulp passes through this country's port (20.9% of total exports) and is distributed among various European countries. Figure 3.09 shows the main destinations of pulp exports for the years 2002 and 2012.

**Figure 3.09** Main destinations for Brazilian exports – Pulp

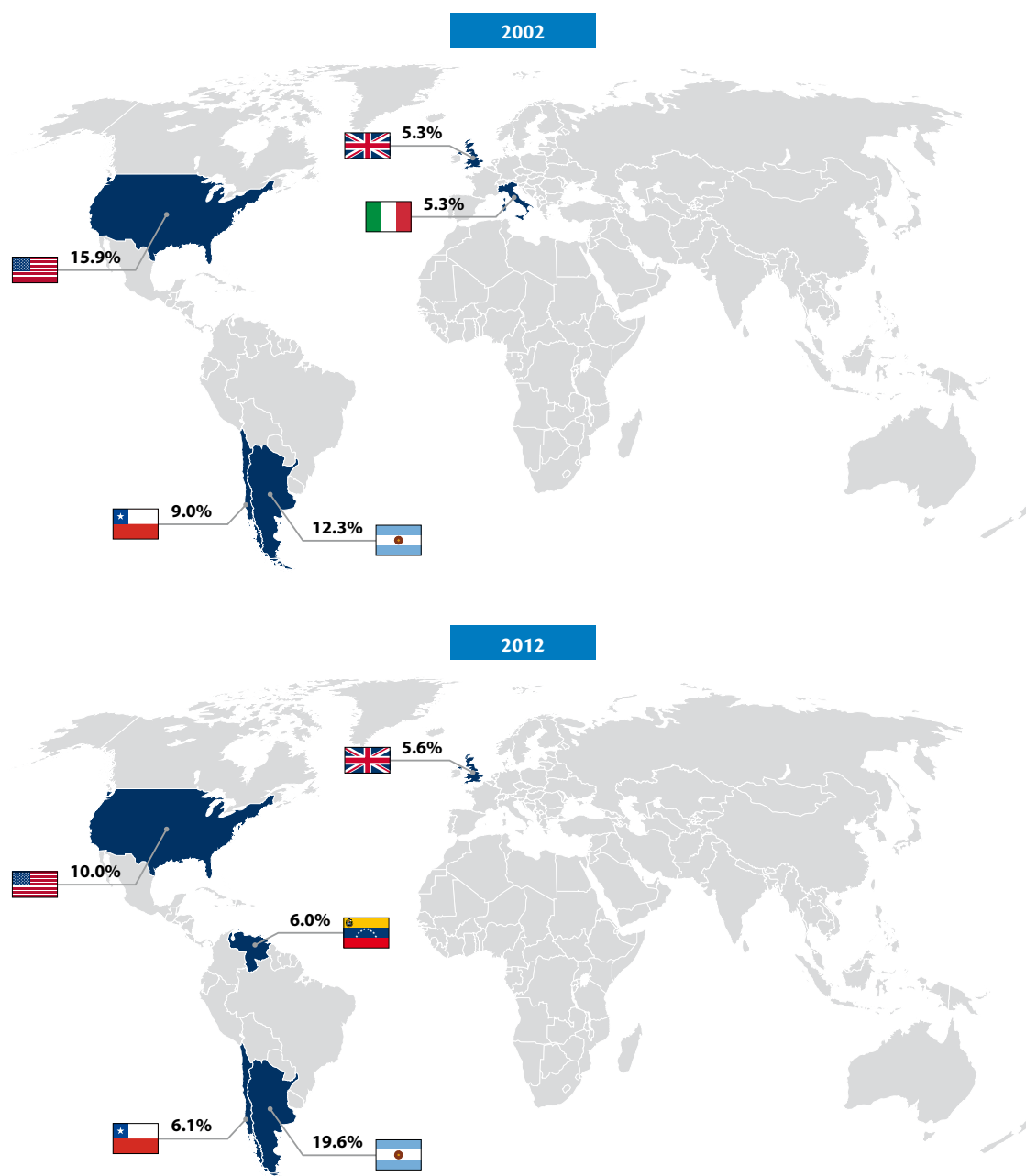


Source: SECEX (2012).

In 2012, paper exports added up to approximately USD 2.0 billion, a drop of 9.1% compared with 2011 (USD 2.2 billion).

In 2002, the United States accounted for 15.9% of Brazilian paper exports, while Argentina was responsible for 12.3%. In 2012, exports to the US fell to 10.0% of the total, and exports to Argentina increased to 19.6%, making it the main destination for this product. Figure 3.10 shows the main destinations of paper exports in 2002 and 2012.

**Figure 3.10** Main destinations for Brazilian exports – Paper

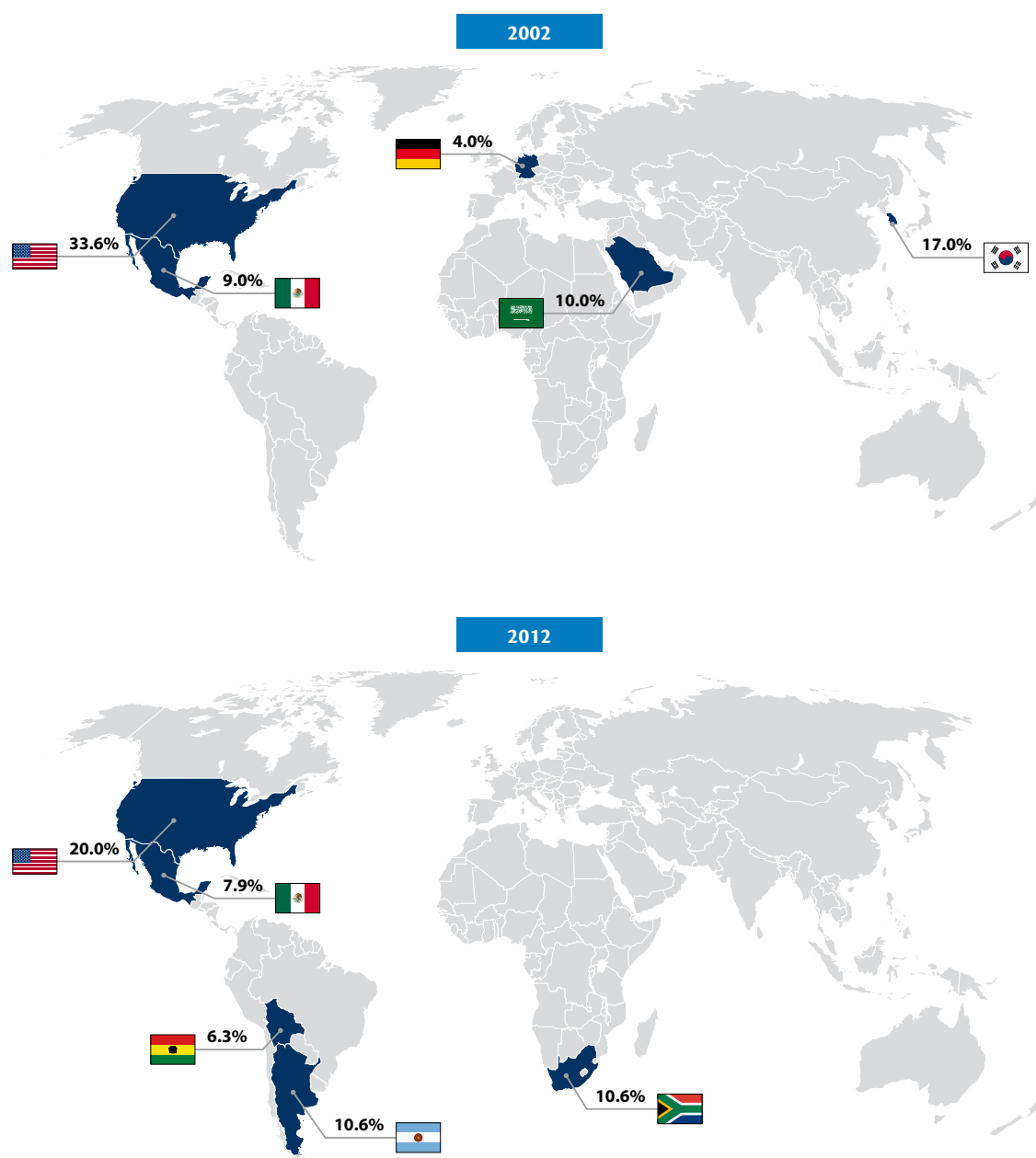


Source: SECEX (2012).

In 2012, exports of industrialized wood panels totaled USD 117.0 million, an increase of 23.2% compared with 2011 (USD 95.0 million).

In 2002, the United States and South Korea were the main destinations for Brazilian exports of industrialized wood panels. In 2012, the main destinations were the United States, Argentina and South Africa, which together accounted for 41.2% of total exports of industrialized wooden panels. Figure 3.11 shows the main destinations of exported industrialized wood panels in 2002 and 2012.

**Figure 3.11** Main destinations for Brazilian exports – Industrialized Wood Panels

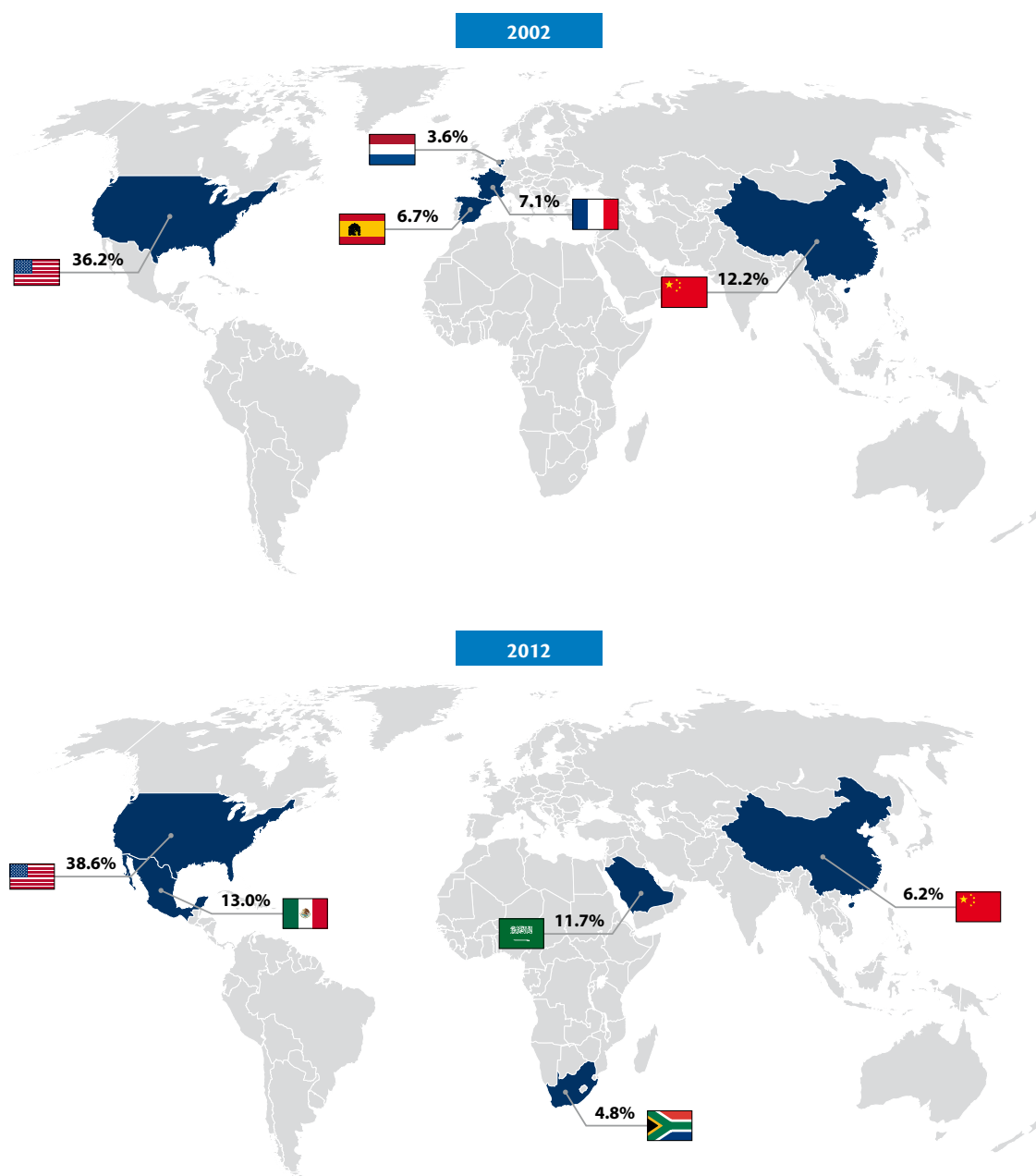


Source: SECEX (2012).

In 2012, exports of sawn wood<sup>1</sup> fell 8.0% in relation to 2011, adding up to USD 183.0 million in 2012 (up from 199.0 million in 2011). North America and Asia were the primary export destinations.

In 2002, the United States and China were the main destinations for Brazilian sawn wood<sup>1</sup> exports. In 2012, the principal destinations were the United States, Mexico and Saudi Arabia, which together accounted for 63.3% of total sawn wood exports<sup>1</sup>. Figure 3.12 shows the main destinations for sawn wood exports<sup>1</sup> produced in 2002 and 2012.

**Figure 3.12 Main destinations for Brazilian exports – Sawn Wood<sup>1</sup>**



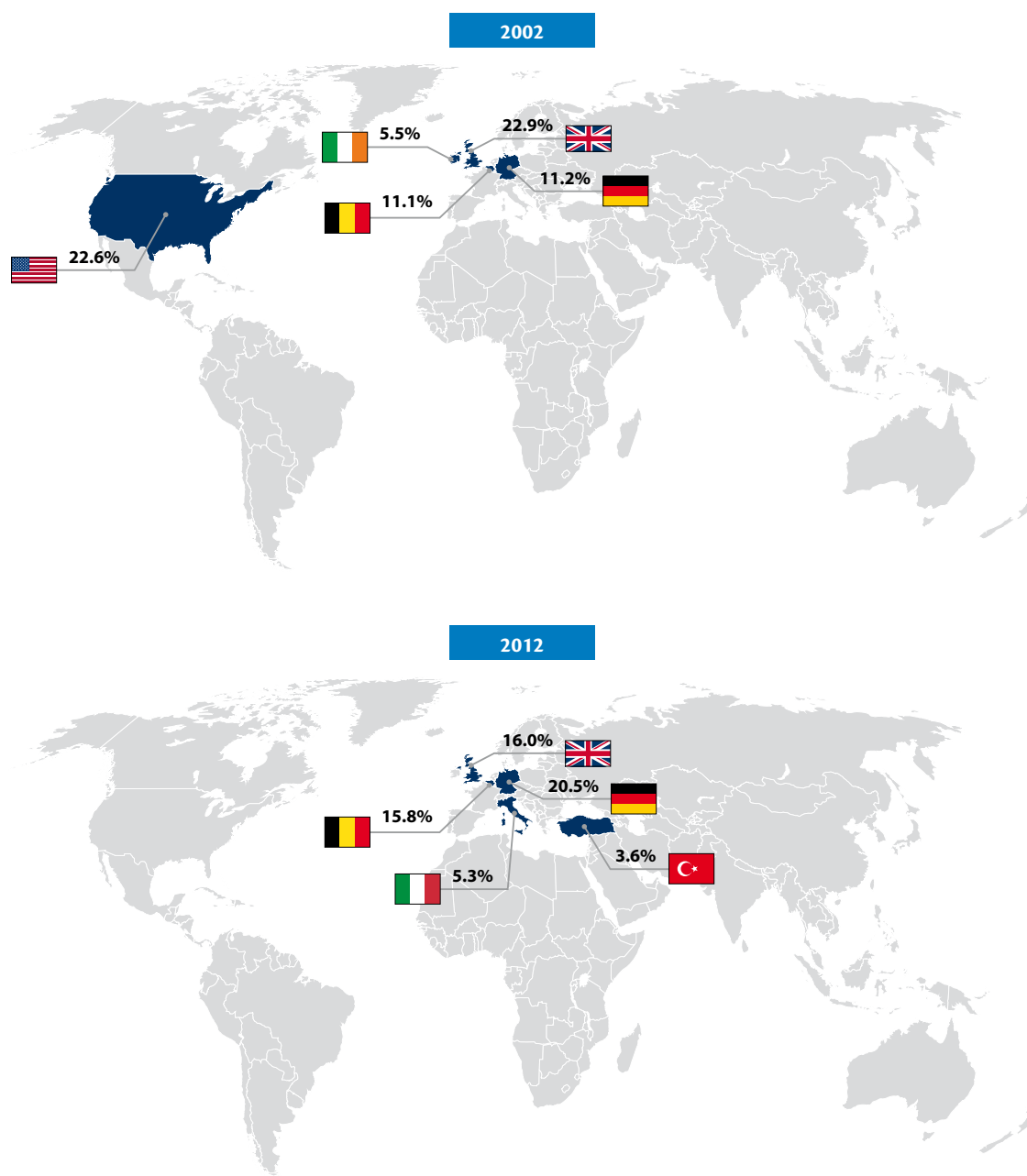
Source: SECEX (2012).

<sup>1</sup> Only conifers and non-conifers from SP, SC, PR and RS.

In 2012, plywood exports totaled USD 372.0 million, 14.5% higher than the figure registered in 2011 (USD 325.0 million). The main destination for Brazilian plywood was the European market.

In 2002, the United States and Europe were the main importers of Brazilian plywood. In 2012, the European market continued to stand out, accounting for 57.6% of total exports, while the United States did not figure among the main importers. Figure 3.13 shows the destination of plywood exports in 2002 and 2012.

**Figure 3.13** Main destinations of Brazilian exports – Plywood<sup>1</sup>



Source: SECEX (2012).  
<sup>1</sup> Includes only conifers.

## 3.2 ROUND WOOD

### 3.2.1 Production of Round Wood

It is estimated that the potential round wood production of Pine, Eucalyptus and Teak is on the order of 271.5 million m<sup>3</sup>/year, considering the current area of forest plantations and the mean annual increment (MAI) for each region. Of the estimated total, 76.5% corresponds to Eucalyptus and 23.1% to Pine. Production of Teak logs accounts for only 0.4% of total production (Table 3.02 and Graph 3.10).

**Table 3.02** Estimate of potential Eucalyptus, Pine and Teak wood production in Brazil, 2012

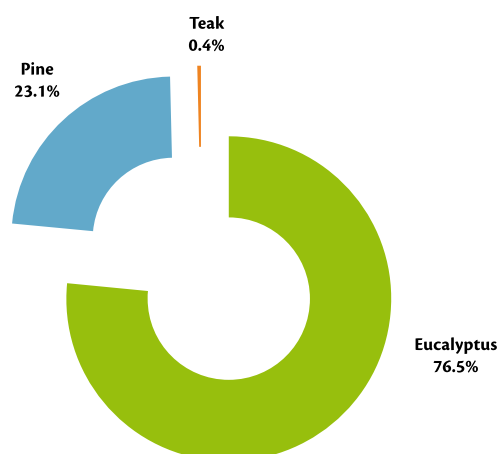
Species	Planted Area (ha)	MAI <sup>1</sup>	Sustained Production <sup>2</sup>	%
Eucalyptus	5,102,030	40.7	207,766,039	76.5%
Pine	1,562,782	40.1	62,745,114	23.1%
Teak	67,329	15.0	1,009,939	0.4%
<b>Total</b>	<b>6,732,141</b>	-	<b>271,521,092</b>	<b>100%</b>

Source: ABRAF member companies and collective members and Pöry Silviconsult (2013).

<sup>1</sup> MAI = Mean Annual Increment (m<sup>3</sup>/ha year). The weighted MAI was adopted (in view of planted area) in areas with Eucalyptus, Pine and Teak plantations belonging to ABRAF member companies.

<sup>2</sup> Sustained production (m<sup>3</sup>/year) was calculated by multiplying planted area by the weighted MAI of each species.

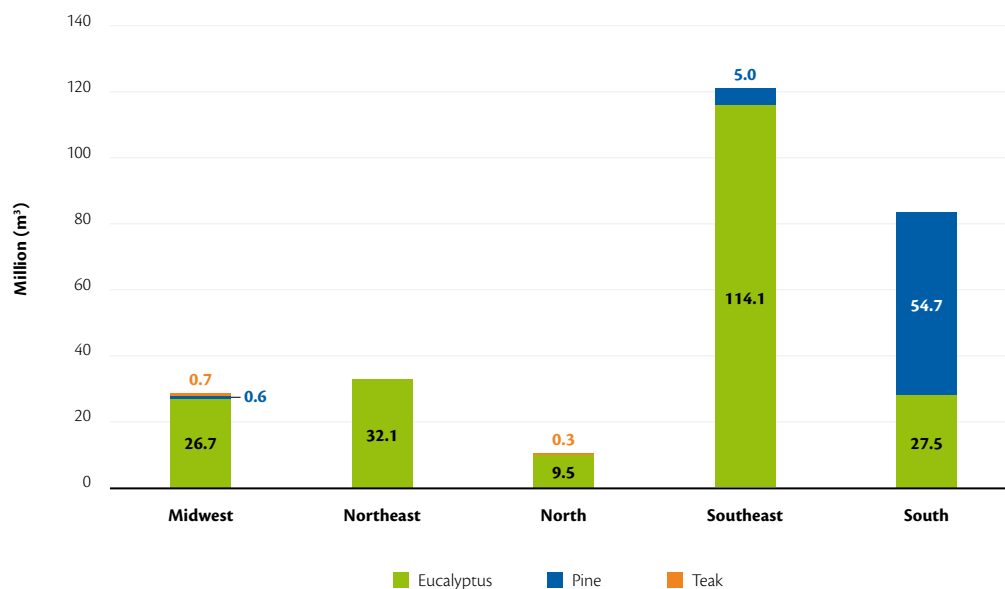
**Graph 3.10** Composition of sustained production of forest plantations by genus, 2012



Source: ABRAF member companies and collective members (2013) and Pöry Silviconsult (2013).

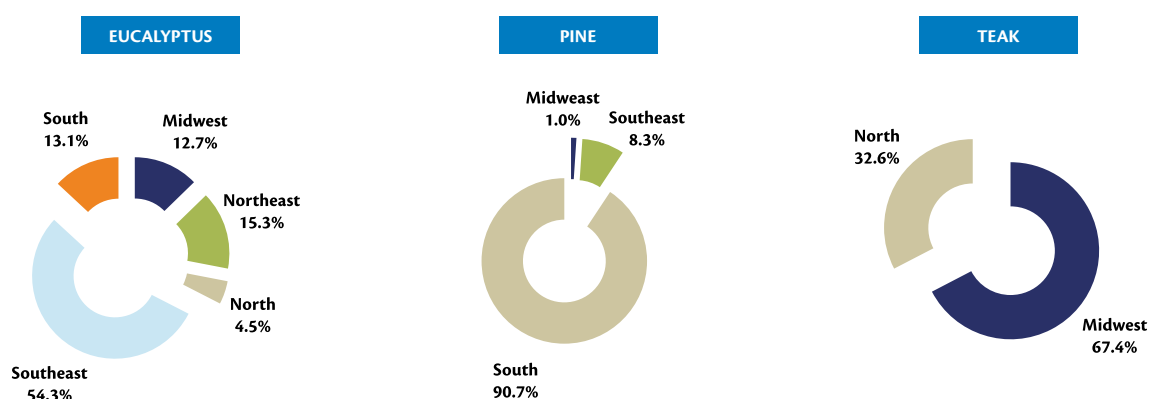
At the same time, this estimate does not represent a supply of wood effectively available for the period under consideration, but instead an estimate of the potential supply, as the plantation ages vary.

Wood production is concentrated in the south and southeast regions of Brazil. In the southeast, Eucalyptus predominates (114.1 million m<sup>3</sup>/year) over Pine (5.0 million m<sup>3</sup>/year). In the south, Pine has a higher sustained production of 54.7 million m<sup>3</sup>/year, while Eucalyptus accounts for 27.5 million m<sup>3</sup>/year. It is important to stress that the center-west region produces 0.7 million m<sup>3</sup>/year of Teak (Graph 3.11).

**Graph 3.11** Estimate of sustained Eucalyptus, Pine and Teak production by region, 2012

Source: ABRAF member companies and collective members (2012) Pöyry Silviconsult (2013).

A large part of potential Eucalyptus production is concentrated in the southeast region (54.3%), a function of the large number of pulp, paper, and charcoal-fired steel companies which are located in this region. Similarly, the majority of potential Pine production is located near the panel, sawnwood, plywood and solid wood industries which are located in the southern region of the country (90.7%). Teak production is divided between the northern (32.6%) and center-west (67.4%) regions. Graph 3.12 shows the distribution of potential wood production by region in Brazil in 2012.

**Graph 3.12** Distribution of potential wood production by region in Brazil, 2012

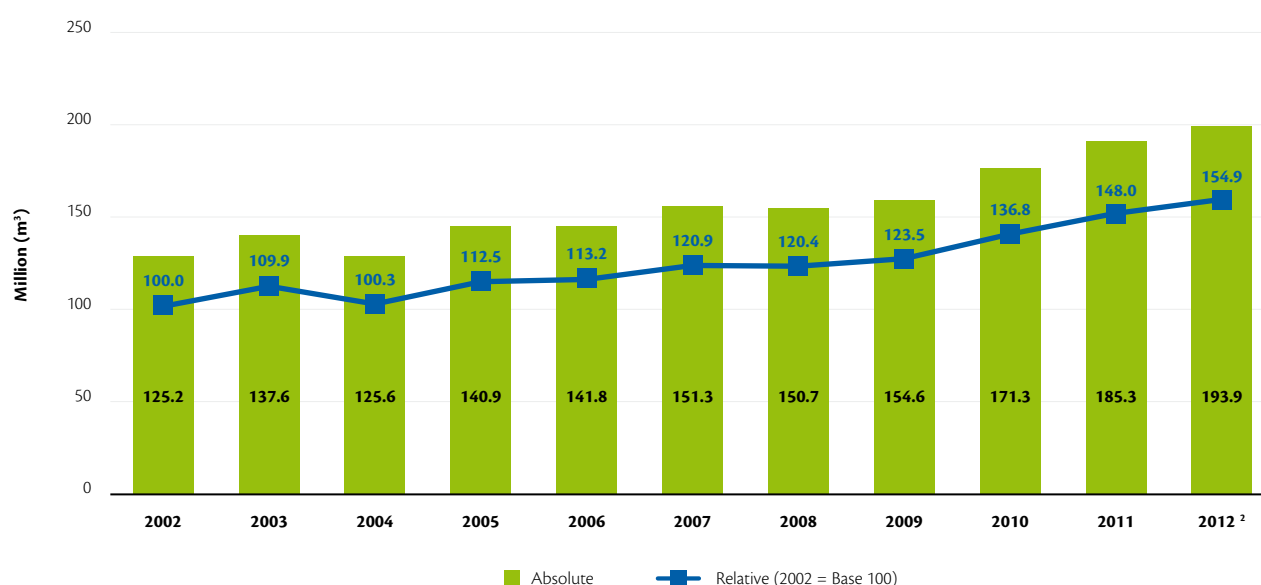
Source: ABRAF member companies and collective members (2012) and Pöyry Silviconsult (2013).



According to the IBGE, annual round wood production from planted forests totaled 193.9 million m<sup>3</sup> in 2012. Of this total, 67.4% (130.7 million m<sup>3</sup>) was directed to industrial use, 28.3% (54.9 million m<sup>3</sup>) to firewood production and 4.3% (8.3 million m<sup>3</sup>) to charcoal making.

Graph 3.13 presents the historical evolution of round wood production in Brazil for the period 2002-2012. During this time, average annual production was 152.6 million m<sup>3</sup> and average annual growth was 4.5% p.a.

**Graph 3.13 History of annual round wood production for industrial use in Brazil, 2002-2012<sup>1</sup>**



Source: IBGE (2013), adapted by Pöry Silviconsult (2013).

<sup>1</sup> Includes charcoal (equivalent in round wood), firewood and round wood for energy, pulp, sawmilling and veneers exclusively from cultivated forests.

<sup>2</sup> Estimate by Pöry Silviconsult based on data from IBGE (2013).

### 3.2.2 Round Wood Production by ABRAF Individual Member Companies

In 2012, the production of round Eucalyptus, Pine and Teak wood by ABRAF individual member companies totaled 74.2 million m<sup>3</sup>. Of this total, 77.2% corresponded to production from Eucalyptus plantations, 22.6% came from Pine plantations and 0.2% from Teak plantations (Table 3.03).

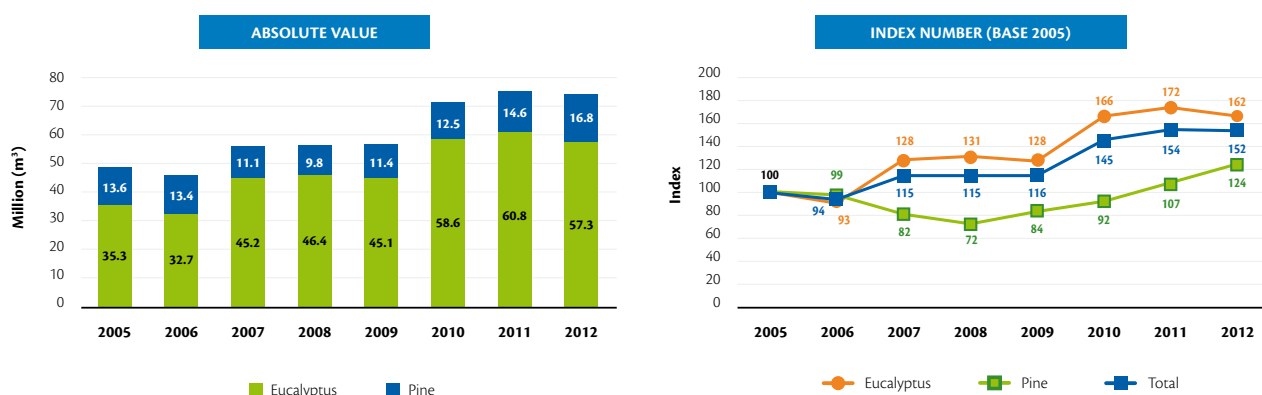
**Table 3.03 Round wood production by ABRAF individual member companies, 2012**

Genus	Production	
	m <sup>3</sup> /year	%
Eucalyptus	57,324,839	77.2%
Pine	16,801,500	22.6%
Teak	116,561	0.2%
<b>Total</b>	<b>74,242,900</b>	<b>100.0%</b>

Source: ABRAF individual member companies (2012).

Compared with 2011, production of Eucalyptus round wood fell approximately 5.8%. For Pine, wood production increased by 15.1% (Graph 3.14).

**Graph 3.14 Evolution of round wood production by ABRAF individual member companies, 2005-2012**



Source: ABRAF Yearbook (2012) and ABRAF member companies (2013).

### 3.2.3 Round Wood Consumption

In 2012, Brazilian consumption of round wood from forest plantations was 182.4 million m<sup>3</sup>. The pulp and paper segment stood out as the principal consumer with 35.2% of the total.

Table 3.04 and Graph 3.15 show Brazilian consumption of round wood for industrial use by segment and genus as well as percentage of round wood by segment in 2012.

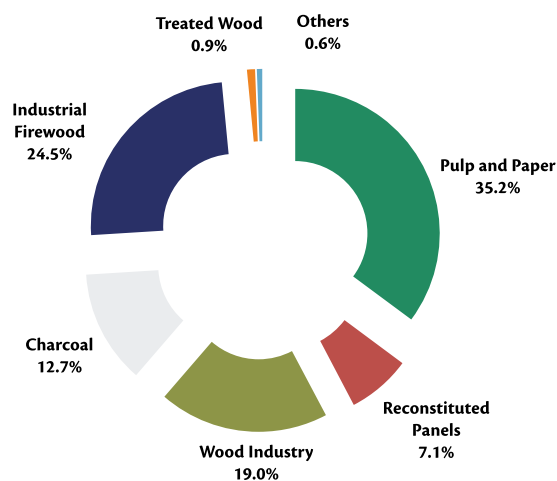
**Table 3.04 Brazilian consumption of round wood for industrial use by segment and genus, 2012<sup>1</sup>**

Segment	Round Wood Consumption (m³)			
	Eucalyptus	Pine	Others	Total
Pulp and Paper	55,033,172	9,108,030	5,000	64,146,202
Reconstituted Panels	5,580,247	7,252,635	158,576	12,991,458
Wood industry	7,034,315	27,424,294	288,000	34,746,609
Charcoal	23,144,200	-	-	23,144,200
Industrial Firewood	37,067,120	3,829,361	3,786,103	44,682,584
Treated Wood	1,650,320	-	-	1,650,320
Others	1,061,617	31,135	-	1,092,752
<b>Total</b>	<b>130,570,991</b>	<b>47,645,455</b>	<b>4,237,679</b>	<b>182,454,125</b>

Source: ABIPA (2012), AMS (2012), BRACELPA (2012) and Pöryr Silviconsult (2012).

<sup>1</sup> Values were estimated by Pöryr Silviconsult based on round wood equivalent-product conversion factors (see Methodology notes in Chapter 5, item 5.3).

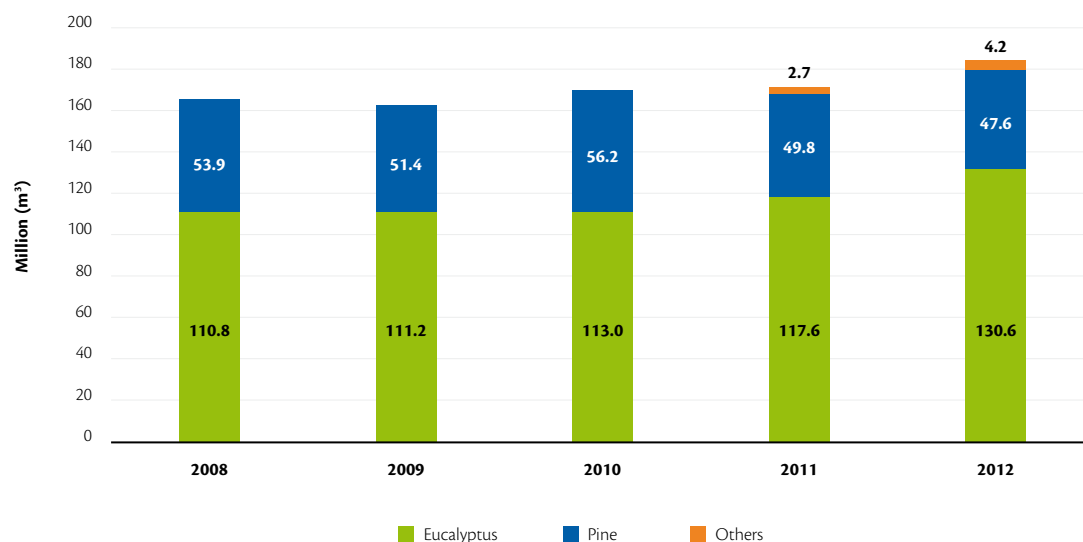
**Graph 3.15** Percentage of round wood consumption by segment, 2012



Source: ABIPA (2012), AMS (2012), BRACELPA (2012) and Pöyry Silviconsult (2012).

In comparison with 2011, Eucalyptus round wood consumption grew 11.1% (13.0 million m<sup>3</sup>) in 2012, while Pine round wood consumption fell by 4.4% (2.2 million m<sup>3</sup>), as shown in Graph 3.16.

**Graph 3.16** Round wood consumption by genus, 2012



Source: ABIPA (2012), AMS (2012), BRACELPA (2012) and Pöyry Silviconsult (2012).

### 3.2.4 Round Wood Consumption by ABRAF Individual Member Companies

In 2012, consumption of Eucalyptus and Pine round wood by ABRAF individual member companies added up to 70.0 million m<sup>3</sup>. Of the total consumed, 83.9% was Eucalyptus and 16.1% was Pine (Table 3.05).

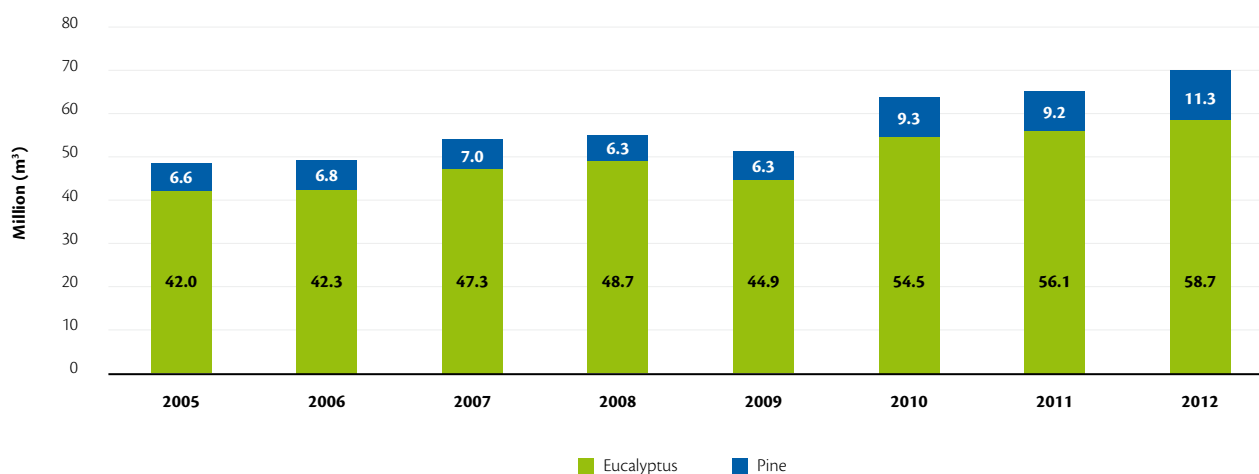
**Table 3.05 Round wood consumption by ABRAF individual member companies, 2012**

Genus	Consumption	
	m <sup>3</sup> /year	%
Eucalyptus	58,717,747	83.9%
Pine	11,305,363	16.1%
<b>Total</b>	<b>70,023,110</b>	<b>100.0%</b>

Source: ABRAF individual member companies (2012).

Considering ABRAF associates alone, Eucalyptus round wood consumption grew from 56.1 to 58.7 million m<sup>3</sup>, an increase of 4.6% between 2011 and 2012. Consumption of Pine was superior to the number registered for the previous year, moving from 9.2 to 11.3 million m<sup>3</sup> (Graph 3.17).

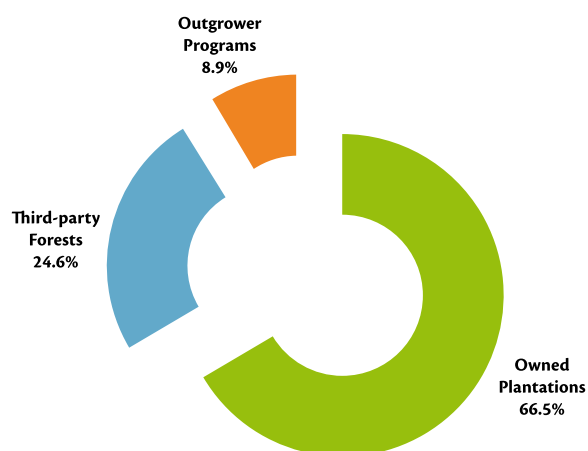
**Graph 3.17 Evolution in round wood consumption by ABRAF individual member companies, 2005-2012**



Source: ABRAF Yearbook (2010) and ABRAF individual member companies (2012).

Graph 3.18 shows the origin of forest-based raw materials consumed by ABRAF individual member companies. Of the total consumed, 66.5% comes from owned plantations, 8.9% from outgrower programs and 24.6% of third-party forests.

**Graph 3.18** Distribution of round wood consumption by ABRAF member companies by origin, 2012



Source: ABRAF individual member companies (2012).

A graphic for Chapter 4. It features a dark blue horizontal bar on the left with the word "CHAPTER" in white, uppercase letters. To the right of this bar is a large, light gray square with rounded corners, containing a large white number "4".

# CHAPTER 4

## *IMPORTANCE OF PLANTED FORESTS IN BRAZIL*

GROSS FOREST PRODUCT VALUE IN THE  
SECTOR OF PLANTED FORESTS

TAX COLLECTION

EMPLOYMENT GENERATION

FUNDING AVAILABLE TO THE FOREST  
SECTOR IN BRAZIL

HUMAN DEVELOPMENT INDEX

ENVIRONMENT

SOCIAL AND ENVIRONMENTAL  
RESPONSIBILITY PROGRAMS

## 4 IMPORTANCE OF PLANTED FORESTS IN BRAZIL

For the Brazilian economy and society as a whole, the planted forests sector contributes significantly to the generation of products, taxes, jobs and wellbeing. The sector is also strategic in the supply of raw material and products for export, and contributes directly to the conservation and preservation of natural resources. Forest production is characteristically a long-term investment which requires consciousness and diligence in politics and planning, but especially in management practices in order to avoid negative impacts.

Planted forests offer a wide range of wood and non-wood products for both corporate investors and small producers for commercial or subsistence purposes. Besides their products, planted forests provide a series of social and environmental services which range from rehabilitating degraded areas, combating soil desertification, sequestering and storing carbon to improving landscapes. Planted forests also can be a component of or a supplement to initiatives to reduce greenhouse gases produced by deforestation and forest degradation in developing countries.

In the social scope, production chain activities in the sector promote employment and revenue generation by including small producers in the production system, investing in social inclusion programs, education and the environment in regions of influence; further, since they help settle the population in the countryside, they also assist in improving quality of life in rural areas.

From the environmental standpoint, the planted forests sector contributes to the conservation of native forests and biodiversity promotion since it offers a sustainable economic alternative: wood from forest plantations, which prevents deforestation of native forests for the same economic purpose. It also contributes to the maintenance of fluvial regimes, soil fertility and air and water quality.

In this context, this chapter describes the economic, social and environmental contribution of the planted forests sector in 2011, through the presentation of indexes such as the Gross Forest Product Value (GFPV), tax collection and employment generation in the country. It also brings information about funding mechanisms available in the sector and population development indexes with regard to forest activity as well as social and environmental responsibility programs developed by ABRAF member companies.

Methodologies adopted and/or developed in the calculation and estimation of variables and indexes presented in this chapter are described in Chapter 5 of this Yearbook.

## 4.1 GROSS FOREST PRODUCT VALUE IN THE SECTOR OF PLANTED FORESTS

The Gross Forest Product Value (GFPV), as a result of the multiplication of forest product price by the amount respectively produced is one of the main indicators of the economic performance of the sector of planted forests. In 2012, the GFPV estimated for planted forests was BRL 56.3 billion, i.e., 4.6% higher than the number achieved in 2011 in nominal values (Table 4.01).

**Table 4.01** Estimate of gross forest production value according to the main segments associated to the sector of planted forests, 2011-2012

Segment	Gross Forest Product Value <sup>1</sup> (BRL Billion)			
	2011	%	2012	%
Pulp & Paper	30.8	57.3	30.2	53.7
Industrialized Wooden Panel	5.3	9.9	6.5	11.6
Charcoal Metallurgy	2.2	4.1	2.3	4.1
Mechanically Processed Wood <sup>2</sup>	5.2	9.6	5.8	10.3
Furniture	10.3	19.1	11.4	20.3
<b>Total</b>	<b>53.8</b>	<b>100.0</b>	<b>56.3</b>	<b>100.0</b>

Source: BRACELPA, ABIPA, AMS, Pöry Silviconsult and Brasil Móveis.

<sup>1</sup> Includes only byproducts from planted forests.

<sup>2</sup> Estimate by Pöry Silviconsult. Includes sawn wood, PMVA, veneer and plywood.

The GFPV estimated for the Pulp & Paper segment was BRL 30.2 billion in 2012, and it stood out as the sector that contributed the most to GFPV, representing 53.7% of total.

The GFPV estimated for the Furniture, Industrialized Wooden Panels, Mechanically Processed Wood and Charcoal Metallurgy reached BRL 11.4, 6.5, 5.8 and 2.3 billion, respectively, representing 46.3% of total GFPV.

## 4.2 TAX COLLECTION

According to the IBGE, the GDP grew 0.9% in 2012, totaling BRL 4.4 trillion in current values, as a result of the value added growth (0.8%) and taxes (1.6%). Estimates of the Brazilian Institute of Tax Planning (*Instituto Brasileiro de Planejamento Tributário* – IBPT) pointed to a tax collection equivalent to 36.3% of the GDP, totaling BRL 1.6 trillion, which is 7.0% higher than collection in 2011 (BRL 1.49 trillion).

The taxes collected by segments related to planted forests, which were calculated based on the Gross Production Value and the percentage relative to estimated tax collection (as specified in Chapter 5 – Methodological Notes), corresponded to BRL 7.6 billion in 2012, which represents 0.48% of the national tax collection (Table 4.02).



**Table 4.02** Estimate of the percentage value of taxes collected by segments related to planted forests in Brazil, 2011-2012

Segment	2011		2012	
	BRL (million)	%	BRL (million)	%
Forest Industry (Planted Forests)	7,605	0.51	7,646	0.48
Brazil (federal, state and municipal taxes)	1,491,480	100.00	1,597,016	100.00

Source: IBPT (2012) and Pöyry Silviconsult.

This indicator consolidates the total value collected by taxable, forestbased economic activities, including the main taxes generated by national companies – Tax on Legal Entities (Imposto de Renda de Pessoa Jurídica – IRPJ), Tax on Goods and Services (Imposto sobre Circulação de Mercadorias e Serviços – ICMS), Profit Participation Program (Programa de Integração Social – PIS), Social Security Funding Contribution (Contribuição para o Financiamento da Seguridade Social – COFINS), Civil Servants' Investment Program (Programa de Formação do Patrimônio do Servidor Público – PASEP), Tax on Services (Imposto sobre Serviços – ISS), Tax on Industrialized Products (Imposto Sobre Produtos Industrializados – IPI), Tax on Financial Operations (Imposto sobre Operações Financeiras – IOF).

### 4.3 EMPLOYMENT GENERATION

In 2012, it is estimated that the forest sector maintained 4.4 million jobs, including direct employment (0.6 million), indirect employment (1.3 million) and jobs resulting from the income effect (2.4 million), as shown in Table 4.03

**Table 4.03** Estimate of number of direct, indirect and incomeeffect jobs in the planted forest sector by segment, 2012

Segment	Job generation – Sector of Planted Forests			
	Direct	Indirect	Income-Effect	Total
Forestry	139,614	569,194	365,143	1,073,951
Charcoal Metallurgy	14,956	157,036	575,797	747,789
Wooden <sup>1</sup>	196,526	147,395	270,224	614,145
Furniture	113,418	85,064	155,950	354,431
Pulp & Paper	156,988	361,073	1,051,821	1,569,883
<b>Total<sup>2</sup></b>	<b>621,502</b>	<b>1,319,762</b>	<b>2,418,935</b>	<b>4,360,199</b>

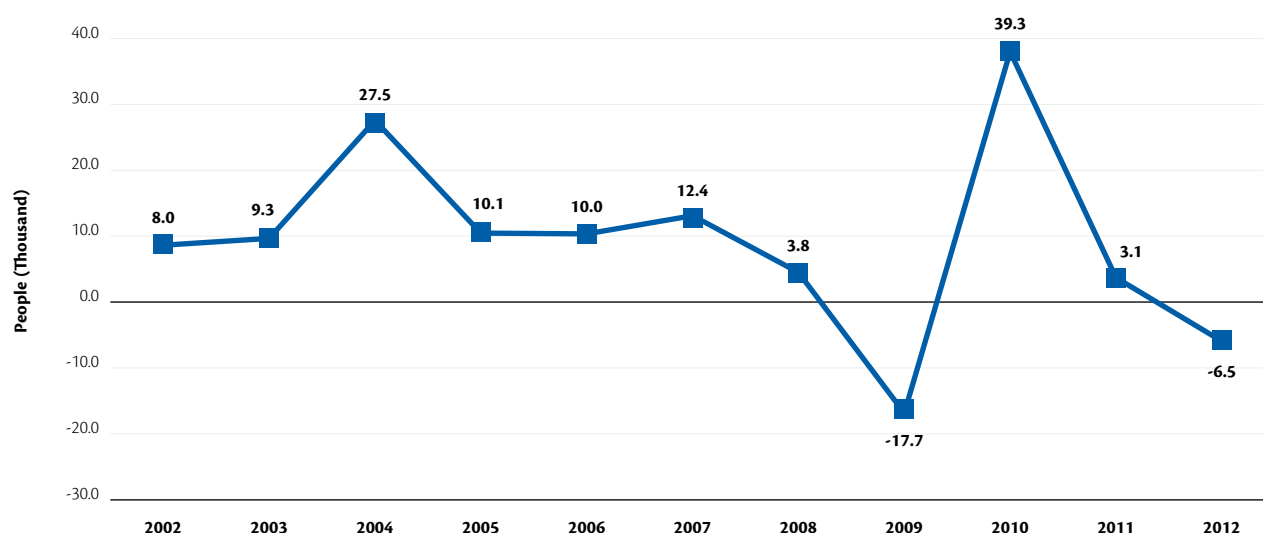
Source: CAGED (2012).

<sup>1</sup> Includes sawn wood, PMVA, veneer and plywood.

<sup>2</sup> Includes only byproducts from planted forests.

Graph 4.01 presents the evolution in the number of jobs maintained by the Brazilian forest sector between 2002 and 2012.

**Graph 4.01** Evolution in the number of jobs generated in the forest sector in Brazil, 2002-2012



Source: CAGED (2012).

In 2012, ABRAF individual member companies contributed to the maintenance of 97.7 thousand jobs, of which 35.7% were related to industry and 64.3% to the forest activity. The indicator grew by 10.2% compared to 2011, and forestry-related workforce stood out with an increase of 91.8% as shown in Table 4.04.

**Table 4.04** Number of jobs of ABRAF member companies, 2011-2012

Bond	2011			2012		
	Industry	Forestry	Total	Industry	Forestry	Total
Owned	17,678	12,322	30,000	17,520	23,633	41,153
Third Parties	14,317	44,352	58,669	17,318	39,219	56,537
<b>Total</b>	<b>31,995</b>	<b>56,674</b>	<b>88,669</b>	<b>34,838</b>	<b>62,852</b>	<b>97,690</b>

Source: ABRAF individual member companies (2012).

#### 4.4 FUNDING AVAILABLE TO THE FOREST SECTOR IN BRAZIL

Forest activity depends on funding availability for investment and costing. Public and private funding, including credit lines intended to the sector, provide the expansion and development of the planted forest sector.

The importance of funding available to leverage new projects in this area is reflected in the working capital amount required, provided through bank loans for the purchase of land, equipment, input, seedlings and infrastructure, which would not be feasible otherwise.

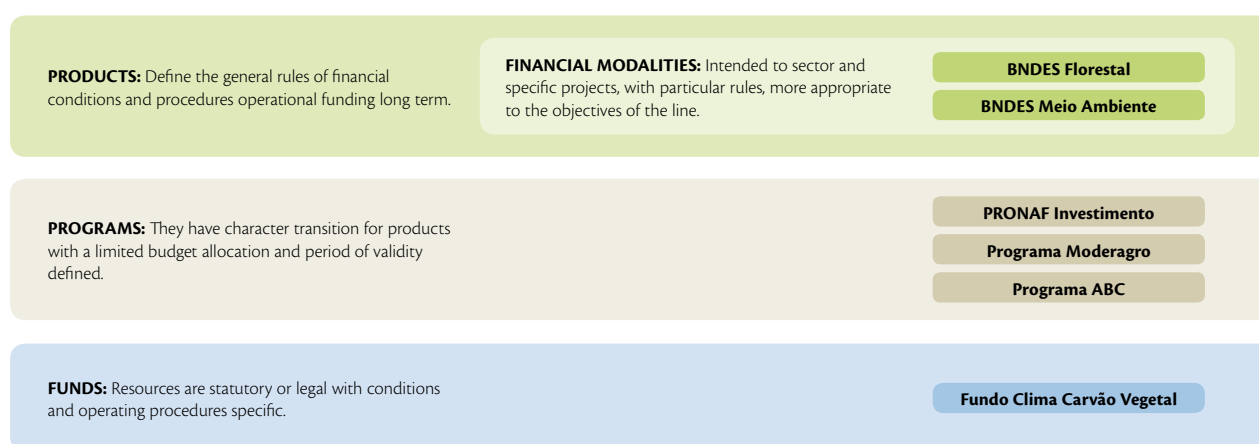
The private sector often stands out regarding funding volume. However, the public sector is also representative, in particular when large investments are concerned, such as those intended to the pulp & paper sector.

Funding provided by the public sector is managed by public banks, such as Banco do Brasil (BB) and the National Bank of Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES) through resources passed on by the Federal budget, Ministry of Agriculture, Livestock and Supply (Ministério da Agricultura, Pecuária e Abastecimento – MAPA) and Ministry of Agrarian Development (Ministério do Desenvolvimento Agrário – MDA).

The main financial agent is still BNDES. BNDES' funding modalities are Products, Programs and Funds. In general, Products define the main financial conditions and operational procedures for funding acquisition. Programs are transitory and intended to specific economic segments. Funds are provision sources, statutory or legal, with specific conditions and operational procedures. Some Funds are intended to non-refundable investments and specific activity sectors as well.

Figure 4.01 presents descriptions of the main financial modalities provided by BNDES.

**Figure 4.01 Financial modalities provided by BNDES**



Source: BNDES (2012).

In addition, the Ministry of National Integration (Ministério da Integração Nacional), in its commitment to economicsocial development and reduction of regional inequalities, performs the transfer of a portion of tax revenues as provided in the constitution – the so-called constitutional funds – for application in funding programs of the sectors most in need, specifically in the North, Northeast and Midwest, aiming at the development of these regions.

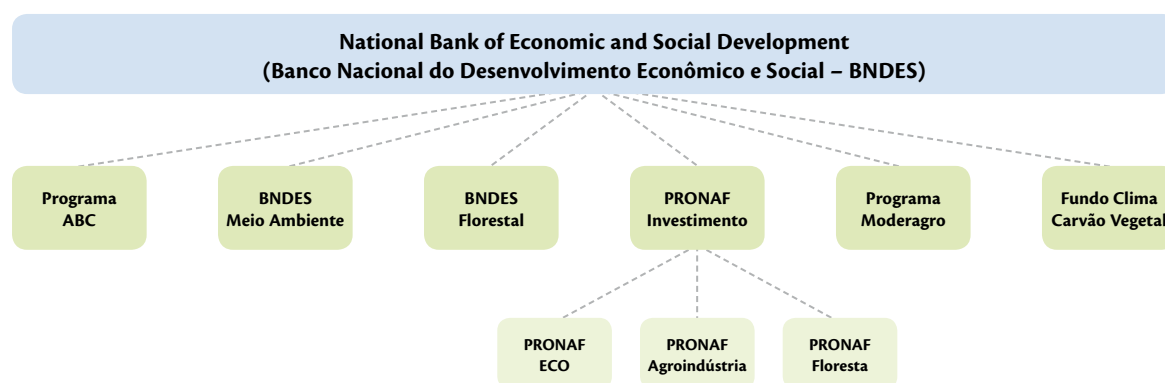
The Federal Constitutional Funds are formed by the Constitutional Financing Fund for the North (FNO), Northeast (FNE) and Midwest (FCO) and the financing institutions of such funds are Banco da Amazônia S.A., Banco do Nordeste do Brasil and Banco do Brasil S.A., respectively.

#### 4.4.1 Financing Programs and Lines

The financing lines provided by BNDES, intended to forest activity including funds for costing, investment or trade, are the ABC Program (National Program of Reduction of Greenhouse Gas Effect on Agriculture – Low Carbon Agriculture); BNDES Meio Ambiente (Support to Environmental Investments); BNDES Florestal (Support to Reforestation, Recovery and Sustainable Use of Forests); PRONAF Investimento (National Program for Strengthening Family Farming); the Moderagro Program (Agriculture Modernization and Natural resources Conservation Program) and the Fundo Clima Carvão Vegetal Program (Climate Fund).

Figure 4.02 schematically illustrates funding programs and lines provided by BNDES to be intended to the forest sector in 2012-2013.

**Figure 4.02 Funding programs and lines<sup>1</sup> provided by BNDES, 2012-2013**



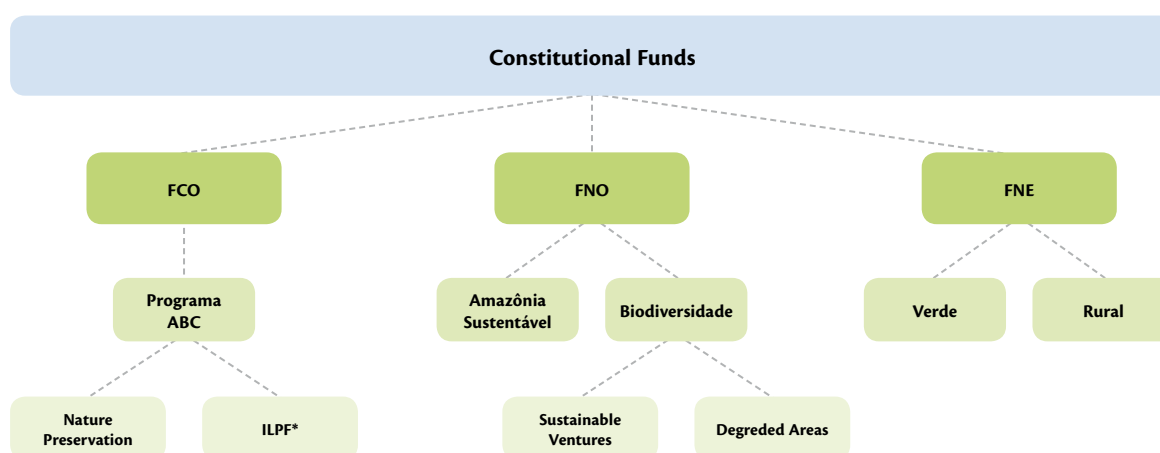
Source: BNDES (2012).

<sup>1</sup> With regard to 2012, it should be noted that the BNDES Program of Support to Forest Compensation, provided by BNDES in 2011/2012, expired in May, 2012.

Financing programs provided by Constitutional Funds intended to economic-social development and reduction of regional inequalities, also intended to the forest activity are: FNE Verde (Support to Conservation and Control of the Environment), FCO Pronatureza (Financing Line for Nature Preservation), FNO Biodiversidade (Support to Sustainable Enterprises and Recovery of Degraded Areas) and FNO Amazônia Sustentável (Support to the Sustainable Development of the Amazon).

Figure 4.03 schematically illustrates funding programs and lines provided by Constitutional Funds for the forest sector in 2012-2013.

**Figure 4.03** Funding programs and lines provided by Constitutional Funds, 2012-2013



Source: Banco do Brasil (BB), Banco da Amazônia (BASA), Banco do Nordeste do Brasil (BNB).

\*Integration of Crop, Cattle-raising and Forest.

The main financing lines for the forest sector provided by BNDES and the Constitutional Funds in 2012-2013 are presented below (Tables 4.05, 4.06 and 4.07).

**Table 4.05 Summary of the main financing lines for forest activity provided by BNDES, Brazil, 2012-2013**

Program Description	BNDES ABC	BNDES Meio Ambiente	BNDES Florestal	Programa Moderagro	Fundo Clima Carvão Vegetal
<b>General objective / purposes</b>	Finance adequate practices, adapted technologies and efficient production systems that eventually contribute to mitigating GHG emissions.	Support entrepreneurship and explore opportunities to invest in innovative companies, enabling the development of clean technologies	Support reforestation of forest species for energy purposes and/or oxyreduction with positive environmental externalities and reforestations in degraded areas or areas converted to forest management.	Support and foster the sectors of production, processing, industrialization, packaging and storage of products.	Support investments aimed at improving efficiency and sustainability of charcoal products.
<b>Financeable items</b>	Sustainable forest management. Implementation of integration systems. Maintenance and management of commercial forests. Adaptation or regularization of rural properties according to environmental legislation. Recovery of environmental functions in degraded areas. Implementation and maintenance of oil palm forests.	Conservation of ecosystems, biodiversity and recovery, preservation and compensation of Legal reserves and Permanent Preservation Areas. Planning and management: environmental certification, studies on environmental impact and related prevention and mitigation actions. Recovery of environmental liabilities: recovery of degraded, mined and contaminated areas. Clean Development Mechanism: feasibility study, project preparation, Project Design Document (PDD) and validation and registration process. Basic sanitation and projects belonging to the Watershed Committees. Eco-efficiency: Water treatment and reuse. Replacement of fossil fuels with renewable source fuels.	Projects, research and development, topography, geoprocessing, images, my remote sensing, inventories, land marking, technical assistance and audit, certification, monitoring and training. Environmental compliance such as recomposition of LR and PPA areas, including productive preservation systems with sustainable forest management in LR. Forest maintenance: land preparation, soil and water conservation, irrigation, phytosanitary control and biosafety measures, forest fire fighting and prevention. Plantation management: opening, preparation, planting, replanting, clear cutting, pruning, reform and sprouting. Works, facilities and infrastructure. Seeds, seedlings and nurseries – collection, acquisition, storage and production.	Construction, installation and streamlining through improvements. Acquisition of equipment of general use for alternative energy generation. Investments required for the supply of water, food and waste related to activities involved in cattle-raising provided by Moderagro.	Coaling systems comprising furnaces with gravimetric yields above 35%. Ancillary systems for improved energy efficiency and recovery systems, energy treatment and use. Project approval requires documentation proving the legal origin of wood for charcoal production.
<b>Beneficiaries</b>	Rural producers, legal and individual entities, their associations and cooperatives.	Societies with headquarters and administration in the country, individual entrepreneurs, associations and foundations, legal entities of public law.	Legal entities of both private and public law, individual entrepreneurs, associations and foundations.	Rural producers (individual or legal entities) and their cooperatives, including transfer to their cooperative members	Companies with headquarter and administration in the country.
<b>Financing value</b>	Up to BRL 1 million.	Minimum value of BRL 10 million.	Up to BRL 1 million.	For an individual venture: up to BRL 600,000, by client. For a collective venture: up to BRL 1.8 million.	Minimum value of BRL 10 million.
<b>Interest rate</b>	5.5% p.a.	3% p.a. Direct operations: TJLP + BNDES remuneration + Credit risk rate. Indirect operations: TJLP + BNDES remuneration + Net interest margin + Remuneration of accredited financial institution.	Direct operations: TJLP + BNDES remuneration + Credit risk rate. Indirect operations: TJLP + BNDES remuneration + Net interest margin + Remuneration of accredited financial institution.	5.5% p.a.	Financial cost: 5% p.a. BNDES basic remuneration: 0.9% p.a. Risk rate: up to 4.18% p.a. Net Interest Margin: 0.5% p.a. Micro, small and medium enterprises (MPMEs) are exempt of this tax. Remuneration of accredited financial institution: up to 3.0% p.a., to be negotiated between client and institution.

Program Description	BNDES ABC	BNDES Meio Ambiente	BNDES Florestal	Programa Moderagro	Fundo Clima Carvão Vegetal
<b>Payment term and grace period</b>	From 5 up to 15 years, with a grace period of 1 to 8 years, depending on the purpose of the project presented.	Determined in view of the payment capability of the venture, company or economic group.	Up to 15 years for forest management of native areas e reforestation with native forest species. And up to 11 years for energetic forestation and reforestation and/or oxyreduction.	Up to 10 years, including a 3-year grace period.	Up to 15 years, including grace period, to expire 6 months after venture goes live, without exceeding 5 years.
<b>Financing institution</b>	Banco do Brasil, Banco da Amazônia, Banco do Nordeste and other bodies connected to the National Rural Credit System.	BNDES or accredited financial institution.	BNDES or accredited financial institution.	BNDES or accredited financial institution.	BNDES or accredited financial institution.

Source: BNDES, Banco Brasil, Ministério do Meio Ambiente – MMA.

<sup>1</sup> The Long Term Interest Rate (LTIR) is calculated from meta inflation parameters and risk premium. The LTIR is defined as the basic cost of financings granted by BNDES LTIR evolution (quarterly): 2011 – 6% in each of the four quarters of 2011; 2012 – 6% in the first two quarters and 5.5% in the last two quarters of 2012; 2013 – 5% in the first quarter of 2013.

**Table 4.06 Summary of main PRONAF financing lines aimed at forest activity, provided by BNDES, 2012-2013**

Program Description	PRONAF Floresta	PRONAF Agroindústria	PRONAF ECO
<b>General Objective / Purpose</b>	Finance agroforestry projects, recovery of environmental preservation areas and encourage reforestation for commercial purposes, aiming at employment generation and increasing family income through multiple use of rural properties.	Financial support to investments in infrastructure, processing and trading of livestock, forest and extractivism products, crafts and rural tourism.	Encourage the use of environmental technology of renewable energy at the property level. Stimulate forestry and conservationist practices of correcting soil acidity. Projects of hydro-energetic use
<b>Financeable Items</b>	Agroforestry systems and enrichment of forest areas through planting of one or more forest species native to the biome. Ecologically sustainable extractivism and forest management plan. Recomposition and maintenance of permanent Preservation Areas and Legal Reserve as well as recovery of degraded areas.	Implementation of small and medium agri-industries, both individual and in networks. Implementation of central management support units that provide quality control service for processing, marketing, acquisitions, distribution and production trading. Expansion, recovery and streamlining of agri-industrial units of family farmers already installed or operational. Implementation, recovery, expansion or streamlining of infrastructure of livestock and non-livestock production and services as well as operationalization of activities in the short term. Payment of party quotas linked to the project to be funded.	Forestry of forest settlements. Technology of renewable energy and replacement of fossil fuel technology with renewable, agriculture equipment. Environmental technologies, such as water treatment station and storage. Adoption of conservationist practices for correcting soil acidity. Acquisition of machinery and equipment accredited by BNDES.
<b>Beneficiaries</b>	Group of Family Farmers included in PRONAF: Group <sup>1</sup> A, A/C and B. Legal entities of public law.	Individual entities included as family farmers in PRONAF; cooperatives or associations formed by family farmers included in PRONAF; through presentation of a Declaration of Aptitude ( <i>Declaração de Aptidão – DAP</i> ) to PRONAF.	Individual entities classified as PRONAF family farmers, as long as they present a technical proposal or project.
<b>Financing Value</b>	Up to BRL 20,000, exclusively for agroforestry systems, except for those included in groups A, A/C or B. Up to BRL 8,000 for Group B. Up to BRL 12,000 in all other cases.	Up to BRL 50,000 for individual entities. BRL 10 million to BRL 25 million for legal entities with individual value up to BRL 30,000 by beneficiary.	Up to 50,000 for individual entity. Up to BRL 10 million for collective operations, with an individual value per farmer of up to BRL 20,000.
<b>Interest Rate</b>	1% p.a.	1% p.a. for family farmers in individual contracts up to BRL 10,000. 2% p.a. for family farmers in individual contracts between BRL 10,000 and BRL 50,000. For cooperatives and associations with financing between BRL 500,000 and BRL 10 million, limited to BRL 30,000 by member or active participant.	1% p.a. for one or more operations in a value up to BRL 10,000. 2% p.a. for one or more operations in a value between BRL 10,000 and BRL 50,000. 2% p.a. for collective operations.
<b>Payment Term and Grace Period</b>	Term up to 20 years, including grace period up to 12 years for agroforestry systems, except for groups A, A/C and B. In all other cases, up to 12 years, with grace period limited to 8 years.	Up to 10 years, 3 to 5 years grace period, depending on the assisted need proven in the technical project.	Payment terms between 5 and 12 years and grace period between 2 and 10 years, depending on project purpose.
<b>Financing Institution</b>	BNDES or accredited financial institution.	BNDES or accredited financial institution.	BNDES or accredited financial institution.

Source: Instituto Brasileiro do Meio Ambiente – IBAMA; Banco do Nordeste do Brasil – BNBN; Banco da Amazônia – BASA; Banco do Brasil – BB.

<sup>1</sup> Group A: agrarian reform settlements or National Land Credit Program; Group A/C: agrarian reform settlements or National Land Credit Program; Group B, C, D: family farmers, owners, squatters, lessees, partners, *quilombolas*, indigenous groups and agrarian reform concessionaires that comply with the rules of access to PRONAF.



Table 4.07 Summary of the main Constitutional Funds aimed at financing forest activity, Brazil, 2012-2013

Program Description	FCO Conservação da Natureza	FCO – ILPF <sup>1</sup>	FNO Biodiversidade	FNO Amazônia Sustentável	FNE Verde	FNE Rural
<b>General Objective / Purpose</b>	Incentivize the establishment of forest businesses, with a focus on generating jobs and income; implanting productive systems and technologies aimed at mitigating the emission of CHGs; making projects which include carbon sequestration viable.	Intensify the use of land in areas which are already cleared of forests, integrating agriculture, livestock raising and forestry; increase agricultural and livestock production in areas which are already cleared of native vegetation, domestic supply and export capability for meat, dairy products, grains, forest products, fibers and oils.	Enable reforestation, agroforestry systems and other sustainable activities for the regularization and recovery of legal reserve areas (incentive to adoption of alternatives of a sustainable economic land use).	Contribute to the economic development of the Northern region in a sustainable manner, supporting rural and non-rural enterprises by granting financing adequate to the real needs of producers in the sector.	Promote the development of ventures and economic activities that encourage environmental preservation, conservation, control and/or recovery, with a focus on sustainability and competitiveness of the companies and product chains; and promote the regularization and recovery of degraded LR and PPA areas.	Promote the development of agriculture and livestock activities as well as the forest sector, observing environmental legislation, and the consequent increase in supply of agro-industrial raw materials by means of: strengthening, amplifying, modernizing the productive infrastructure of agricultural and forest enterprises.
<b>Financeable Items</b>	Establish plans for sustainable forest management; implant systems integrating field/forest, livestock/forest and field/livestock/forest. Establish, maintain and manage commercial forests. Adjust or regularize rural properties according to environmental legislation. Recovery of environmental functions in degraded areas. Establish and maintain oil-palm forests, with priority given to degraded areas.	Preparing the soil, acquisition, transport, application and incorporation of amendments; purchase of seeds and plants; planting of fields, pastures, forests and soil-cover crops; construction and modernization of improvements; acquisition of machines and equipment associated with the integration project which is the object of the financing; expenses related to the development of the technical project and georeferencing expenses related to regularization of ownership and environmental compliance on the rural property according to current legislation.	Regularization and recovery of Legal Reserve and Permanent Preservation Areas which are degraded or altered by reforesting, agro-forest systems and other sustainable activities.	Activities in production systems based on sustainability and complying with current laws, related to agriculture, cattle raising, aquaculture and fishing.	Forest management, reforestation, agroforestry systems, forest grazing systems, wood certification, Recovery of Legal Reserve and Permanent Preservation Areas. Sustainable use of natural resources in areas susceptible to desertification. Support the production chain of wood and non-wood products from the Caatinga. Energy generation from renewable sources. Clean Development Mechanism (CDM).	The establishment, expansion, diversification and modernization of agricultural and livestock enterprises, with the exception of those involving irrigation and drainage, including: investments in reforestation for economic purposes, agricultural and livestock costing.
<b>Beneficiaries</b>	Rural producers who are individual or legal entities, their cooperatives of production and producer associations as long as they are devoted to a rural production activity.	Rural producers who are individual or legal entities, their cooperatives of production and producer associations as long as they are devoted to a rural production activity.	Rural producers and extractivists, their cooperatives and associations; companies; traditional Amazon populations not comprised by PRONAF.	Rural producers who are individual entities. And legal entities of private law, including individual firms, associations and cooperatives that are devoted to rural ventures.	Rural producers and rural, industrial, agri-industrial, commercial and service provision companies. Cooperatives and associations.	Rural producers (individual entities and legal entities). Formally established associations and cooperatives of rural producers. Individual or legal entities (reforestation project or reforestation for economic purposes).
<b>Financing Value</b>	Fixed or semi-fixed investment: 70 to 100% of the investment proposed, depending on the size of the beneficiary <sup>2</sup> and the location of the venture <sup>3</sup> . Isolated costing: 70 to 100% of the investment proposed, depending on the size of the beneficiary and the location of the venture.	Up to BRL 1 million.	Micro up to BRL 33,000. Small up to BRL 144,000. Medium up to BRL 643,000. Large up to BRL 1,688 million. Assoc. & Coop. – Mini and Small up to BRL 964,000. Assoc. & Coop. – Mini and Small BRL 1,728 million.	Micro up to BRL 160,000 <sup>4</sup> or 120,000 <sup>5</sup> . Small up to BRL 133 million <sup>4</sup> or 1 million <sup>5</sup> . Small-medium up to BRL 65 million <sup>4</sup> or BRL 5 million <sup>5</sup> . Medium up to BRL 10 million <sup>4</sup> or BRL 7.5 million <sup>5</sup> .	Micro up to BRL 360,000. Small between BRL 360,000 and 3.6 million. Small-medium between BRL 36 and 16 million. Medium between BRL 16 and 90 million. Large above BRL 90 million.	Micro up to BRL 360,000. Small between BRL 360,000 and 3.6 million. Small-medium between BRL 36 and 16 million. Medium between BRL 16 and 90 million. Large above BRL 90 million.

Program Description	FCO Conservação da Natureza	FCO – ILPF <sup>1</sup>	FNO Biodiversidade	FNO Amazônia Sustentável	FNE Verde	FNE Rural
<b>Interest Rate</b>	5% p.a. for micro-producers; 6.75% p.a. for small producers; 7.25% p.a. for medium producers; 8.5% p.a. for large producers; 4% p.a. for forest operations aimed at regularization and recovery of degraded Legal Reserve areas (Law 11775/2008, art. 44). Compliance bonus: 15% on financial charges except for forestry operations of regularization and recovery of degraded Legal Reserve areas.	5.5% p.a.	In areas with alternative soil use: Microproducer: 5% p.a. Small producer: 6.75% p.a. Medium producer: 7.25% p.a. Large producer: 8.50% p.a. Legal Reserve Area: Mini, small, medium and large: 4% p.a.	Beneficiaries of the rural sector, according to size: <sup>2</sup> Microproducer: 5% p.a. Small producer: 6.75% p.a. Medium producer: 7.25% p.a. Large producer: 8.50% p.a. Compliance Bonus of 15% on financial charges. Grace period up to 6 years.	For rural operations: Microproducer: 5% p.a. Small producer: 6.75% p.a. Medium producer: 7.25% p.a. Large producer: 8.50% p.a. For the other sectors: Microbusiness: 6.75% p.a. Small business: 8.5% p.a. Medium business: 9.5% p.a. Large business: 10% p.a. Fixed and Mixed Investments up to 12 years, including a 4-year grace period.	Microproducer: 5% p.a. Small producer: 6.75% p.a. Medium producer: 7.25% p.a. Large producer: 8.50% p.a.
<b>Payment Term and Grace Period</b>	Forestation and reforestation projects: I. Essences for sawmills and veneering: up to 20 years, with grace period of up to 10 years; II. Essences for energy purposes: up to 15 years, with grace period up to 10 years; III. Degraded LR and PPA regularization and recovery through wood or non-wood exploration: up to 20 years, grace period up to 12 years.	Up to 12 years, 3-year grace period included. Machinery and equipment: up to 10 years, observing working life of the asset financed. Cost associated to investment project: up to 3 years including 1-year graced period.	Fixed or mixed investment: up to 12 years, grace period included; for long term maturing cycle plantations, period can be extended to 20 years, including 12-year grace period according to term required by each species, as long as justified by technical assistance and confirmed by Banco da Amazônia. Semi-fixed investment: up to 10 years, including grace period; and Cost and/or trade: up to 2 years.	Fixed or mixed investment – up to 12 years, grace period included. Semi-fixed investment: up to 10 years, including grace period; and Cost and/or trade: up to 2 years. Working capital not associated with acquisition of raw material/input/goods/products up to 24 months, including a 6-month grace period.	Fixed and mixed investments* – up to 12 years, 4-year grace period included. Semi-fixed investments – up to 8 years, including a 3-year grace period. (*) Mixed investments refer to investments with associated working capital and similar term approach. Trading: up to 240 days. Offspring retention: up to 2 years.	Fixed investment – up to 12 years, 4-year grace period included. Semi-fixed investments – up to 8 years, including a 3-year grace period. Livestock costing: up to 1 year. Agricultural costing: up to 2 years. Trading: up to 240 days. Offspring retention: up to 2 years.
<b>Financing Institution</b>	Banco do Brasil (BB).	Banco do Brasil (BB).	Banco da Amazônia (BASA).	Banco da Amazônia (BASA).	Banco do Nordeste do Brasil (BNB).	Banco do Nordeste do Brasil (BNB).

Source: Instituto Brasileiro do Meio Ambiente – IBAMA; Banco do Nordeste do Brasil – BNB; Banco da Amazônia – BASA; Banco do Brasil – BB.

<sup>1</sup> ILPF – Integração Lavoura, Pecuária e Floresta (Integration of Agriculture, Livestock and Forestry).

<sup>2</sup> Classification of beneficiary size according to annual gross operation income for the rural sector (FNO, FCO, FNE): Mini – up to BRL 150 000; Small – above BRL 150 000 up to BRL 300 000; Medium – above BRL 300 000 up to BRL 19 million; Large – above BRL 19 million.

<sup>3</sup> Other ventures can be located in municipalities with low income, stagnated income, dynamic income and high income according to typology defined in the National Policy for Regional Development (Política Nacional de Desenvolvimento Regional – PNDR), established by the National Integration Ministry, which defines the highest percentages for lower income and less dynamics areas.

<sup>4</sup> Limit by client for Low Income municipalities; for all municipalities in the states of Acre, Amapá and Roraima; municipalities in the border strip and municipalities that integrate different mesoregions.

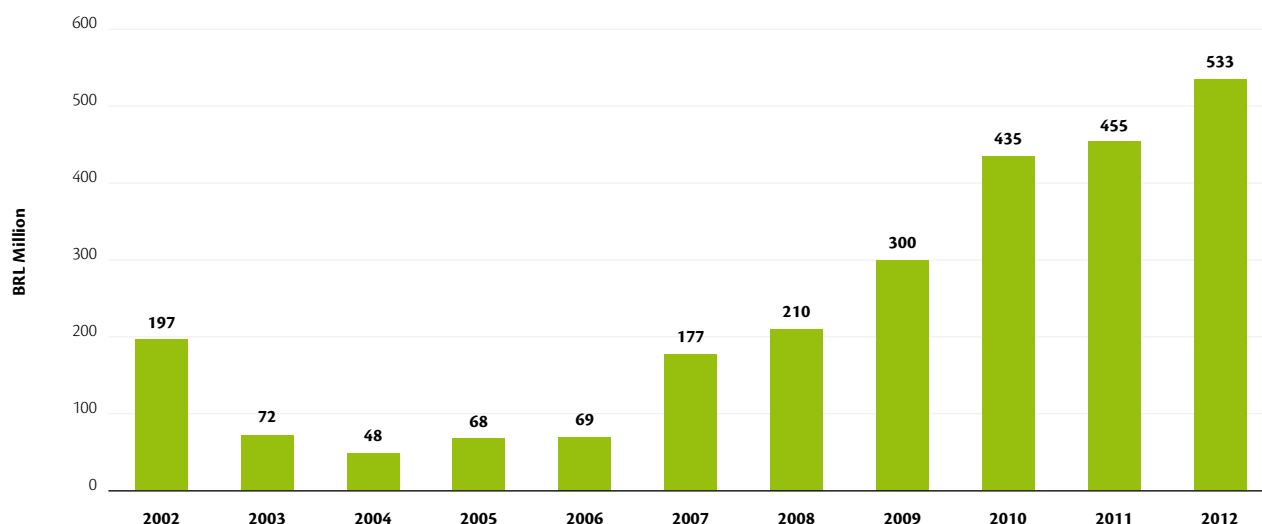
<sup>5</sup> Other location.

#### 4.4.2 Disbursements of Financing Programs

According to the BNDES' 4<sup>th</sup> quarterly report on resources of the national treasury, BRL 4.2 billion were disbursed for the industrial sector of pulp & paper in 2012. This value corresponds to 8.8 % of the total investment in that industry in Brazil, according to the National Classification of Economic Activity (*Classificação Nacional de Atividade Econômicas – CNAE*), the industry comprises chemical and petrochemical, transportation material, food & beverage, basic metallurgy among others. The total financing for industries reached BRL 47.7 billion last year. The amount disbursed to the pulp & paper sector in 2012 was 180% higher than the amount in 2011 (BRL 1.5 billion).

With regard to BNDES' programs, funds and financing lines intended to develop the forest sector in 2012, BRL 533 million were disbursed in direct, indirect and combined operations. This value was aimed especially at financing projects in the areas of acquisition of capital goods and trading, and forest implementation and management activities. When compared to 2011, this amount was 17.1% higher than BRL 455 million disbursed. Disbursement evolution from 2002 to 2012, with consolidated data from programs, funds and financing lines for the forest area, is presented in Graph 4.02.

**Graph 4.02** Evolution of total BNDES disbursements for the forest sector, Brazil, 2002-2012



Source: BNDES, 2012.

## 4.5 HUMAN DEVELOPMENT INDEX

Among the indexes that assess the evolution of the Brazilian population's quality of life, the Human Development Index (HDI), the United Nations Development Programme (UNDP) and the FIRJAN Index of Municipal Development (Índice *FIRJAN de Desenvolvimento Municipal* – IFDM), created by the Federation of Industries of the State of Rio de Janeiro (*Federação das Indústrias do Estado do Rio de Janeiro* – FIRJAN).

The HDI allows a follow up of the improvement in the population's quality of life through the ratio between economic growth and improved social conditions and it takes into account socio-economic income, education and longevity indicators. It has a scale ranging from zero and 1; the closer to 1 the indicator is, the more developed the society in the socio-economic parameters of income, education and longevity. The HDI has decennial frequency and only shall be available with 2012 data in the first quarter of 2013.

The IFDM allows a follow up of the improvement in the population's quality of life through the ratio between economic growth and improved social conditions and it takes into account socio-economic income, education and longevity indicators. It has a scale ranging from zero and 1; the closer to 1 the indicator is, the more developed the society in the socio-economic parameters of income, education and longevity. The IFDM has decennial frequency and only shall be available with 2012 data in the first quarter of 2013.

In the 2013 Yearbook edition, the IFDM 2012 (2010 basis) was chosen to address the national development at both the national and municipal levels.

It should be remarked that the IFDM's annual frequency allows a reality portrait of Brazilian municipalities with higher accuracy as it allows to identify whether the improvement in a given municipality was a result of the adoption of specific policies or whether the result obtained simply reflected the fall in the indicators presented by the other municipalities.

### 4.5.1 FIRJAN Municipal Development Index

In 2010, the IFDM Brazil, which refers to Employment & Income, Education & Health indexes, reached 0.7899 point, maintaining Brazil' ranking as a country of moderate development. This scoring is 3.9% higher than the scoring recorded in 2009, reflecting not only the Brazilian economy recovery in 2010 in the face of the world crisis of 2008-2009 as well as important achievements in the area of Education.

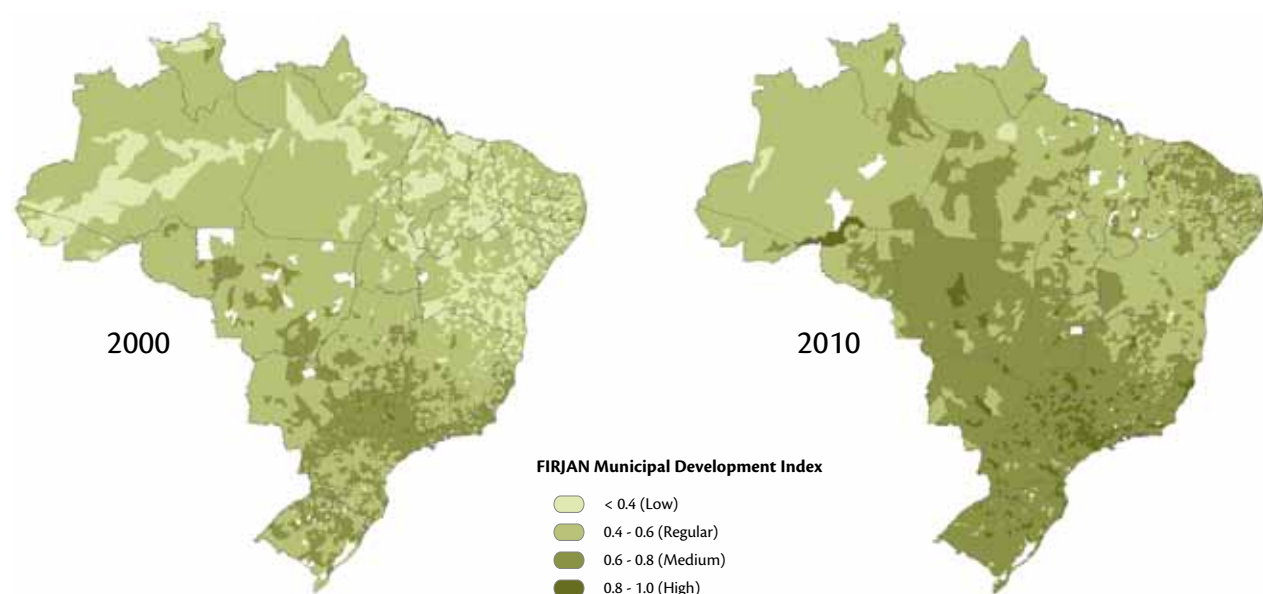
The Employment & Income (E&I) index grew by 8.6% in a single year, changing from 0.7286 to 0.7914 point. However, only 152 of the 5,563 Brazilian municipalities achieved the high development classification. A comparison between data from 2000 and 2010 shows that this picture changed little: in 2000, more that 95% of the municipalities were ranked low or regular development in the E&I category; in 2012, this number remained in 87.8%.

Education improved in 98% of the Brazilian municipalities between 2000 and 2010. In the IFDM-Education in 2010, 88.2% of municipalities were ranked moderate to high development. This percentage was twice higher than 39.7% observed in 2000.

Health improved in more than 93% of the Brazilian municipalities according to the index between 2000 and 2010. The number of municipalities that exceed 0.8 point in the IFDM-Health more than tripled in the period, from 17.2% in 2000m to 53.5% in 2010.

With regard to the geographic Brazilian regions, a comparison between 2000 and 2010 (Figure 4.04) shows an evident change in development patterns.

**Figure 4.04** Comparison of IFDM from 2000 to 2010



Source: FIRJAN (2012).

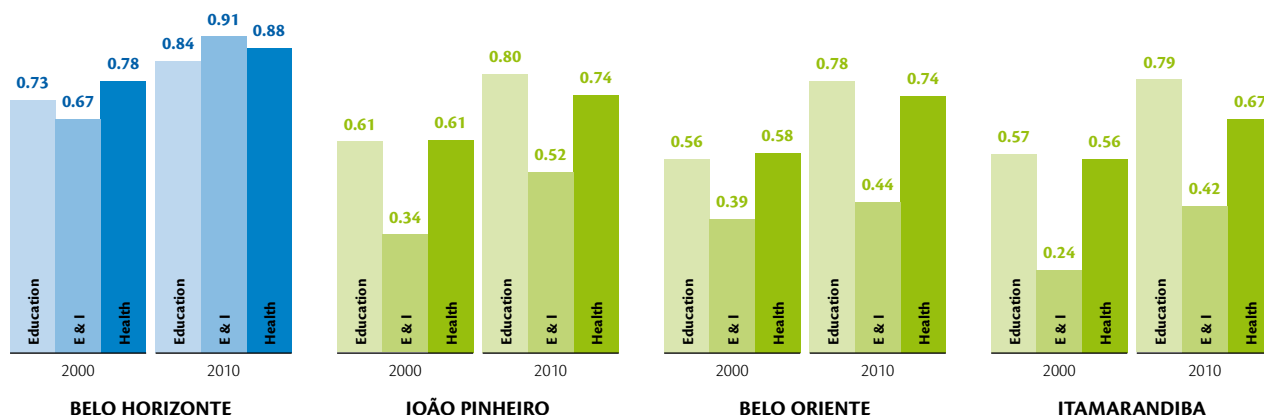
It should be noted that 18.2% had low development indexes in 2000. This percentage became 0.3% in 2010.

Below, some municipalities where forest activity based on planted forests stands out in the local socio-economic scenario where the IFDM comparison between such municipalities and their state capital cities was performed (between 2000 and 2010). The capital cities of the states where the municipalities are were used as the parameter as they have higher development indexes and more diversified economic activities. Such analysis indicates the effect of forest activity on the development of other municipalities.

## MINAS GERAIS

In Minas Gerais, when indexes obtained in 2000 and 2010 are compared, the highest gains occurred in Education and Health. The municipalities of João Pinheiro, Belo Oriente and Itamarandiba maintained an increasing evolution of all indexes with variations (2000-2010) of 35.5%, 27.2% and 45.1%, respectively, whereas in the capital city the variation was 14.5% in the same period. Despite the growth obtained in 2010, the municipalities of Belo Oriente and Itamarandiba remain in the category of low development as to the E&H item. João Pinheiro, however, grew from low development to regular development. And Belo Horizonte reached the high development category.

**Graph 4.03** Comparison between the FIRJAN Index 2000/2010 in Belo Horizonte and forest municipalities in Minas Gerais

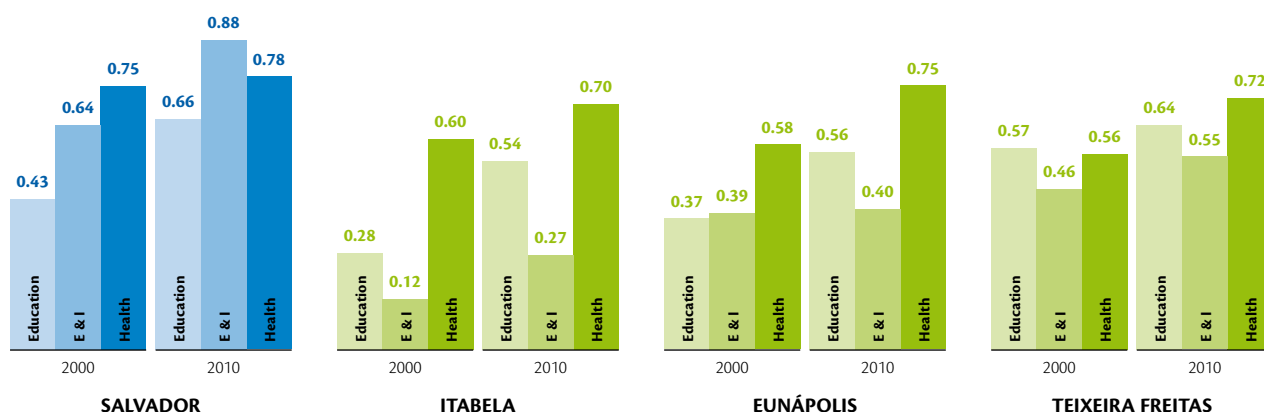


Source: Sistema FIRJAN, 2013.

## BAHIA

Among the municipalities analyzed in Bahia, Itabela stood out with an ascending evolution of its indexes of Education and E&I with a variation of 94.5 and 119.1%, respectively, between 2000 and 2010. In Eunápolis, even though there was a positive variation, it added 50.4% to Education and only 3.6% to E&I. Both Itabela and Eunápolis remain in the low development zone for E&I. In the Education are, Teixeira Freitas went from regular to moderate, and Itabela and Eunápolis went from low to regular development. In the Health item, all municipalities went from regular to moderate development between 2000 and 2010.

**Graph 4.04** Comparison between the FIRJAN Index 2000/2010 in Salvador and forest municipalities in Bahia



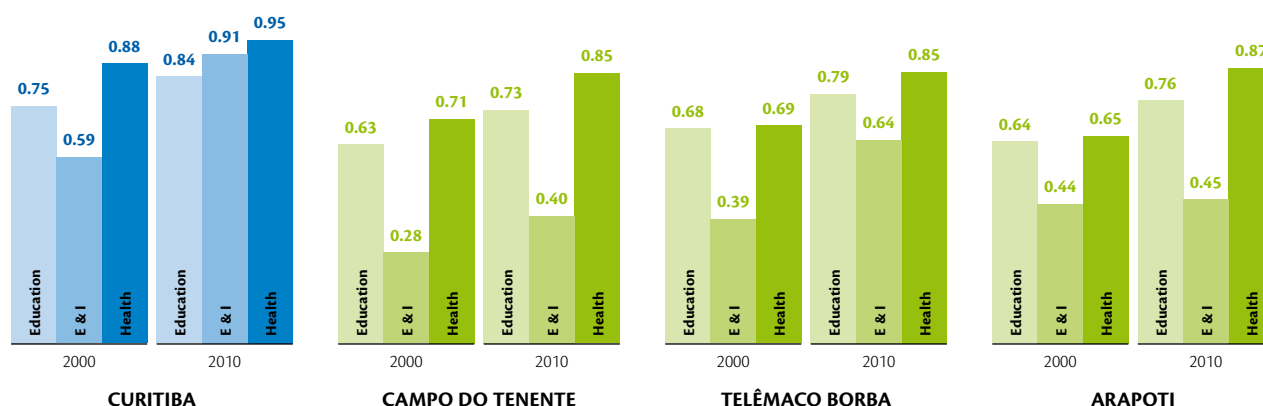
Source: Sistema FIRJAN, 2013.

## PARANÁ

In the group of municipalities of Paraná, all municipalities grew from regular to moderate in the Education development between 2000 and 2010. The Health issue evolution went from moderate to high. The E&I issue had a

variation of 63.2%, which is higher than the trend observed in the capital city, Curitiba, which in turn was 55.2%. The municipality of Campo do Tenente, had an increase by 44.7%, in the same issue and only 3.0% in Arapoti. Despite the growth, the E&I issue remains in the low development category and is quite lower than the index observed in the capital, which is classified as high development.

**Graph 4.05** Comparison between the FIRJAN Index 2000/2010 in Curitiba and forest municipalities in Paraná

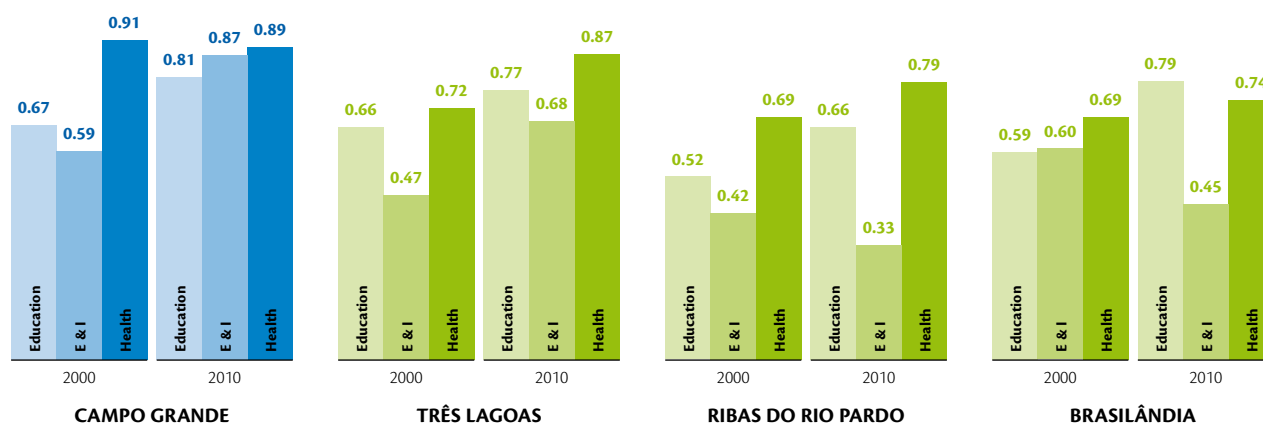


Source: Sistema FIRJAN, 2013.

## MATO GROSSO DO SUL

All municipalities maintained an increasing growth of Health and Education indexes as the index observed in the capital city, Campo Grande. When comparing 2000 and 2010, besides the capital city Campo Grande, only Três Lagoas (44.7%) presented an ascending variation in E&I, with an increase from 0.47 to 0.68. The municipalities of Ribas do Rio Pardo and Brasilândia had negative results in this issue, presenting decreases from 0.42 to 0.33 and from 0.60 to 0.45, respectively.

**Graph 4.06** Comparison between the FIRJAN Index 2000/2010 in Campo Grande and forest municipalities in Mato Grosso do Sul



Source: Sistema FIRJAN, 2013.

## 4.6 ENVIRONMENT

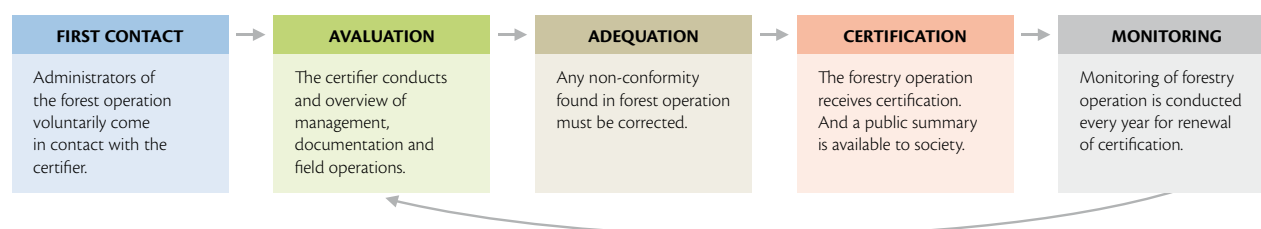
According to the Ministry of Environment, in 2011, Brazil had 519.5 million hectares of native forests. The area of planted forests in Brazil is equivalent to 6.5 million hectares. The forest base sector protects areas 66% larger than its total area in the form of Permanent Preservation Areas (PPAs), Legal Reserves (LRs) and Private Reserves of the Natural Heritage (PRNHs).

### 4.6.1 Forest Certification

The certification process is a voluntary process where a forest venture is evaluated by an independent organization. Certification can be obtained both for forest management and for the custody chain of a given venture. The accredited organization evaluates the forest venture and verifies whether economic, environmental and social requirements meet established criteria. Each accredited organization has its own *modus operandi*. Therefore, principles and criteria may vary from one accredited organization to another.

In general, the system testifies, in a reliable and independent way, that the wood used in a certain product comes from an environmentally correct, socially fair and economically feasible process, one that also fully complies with current law. Figure 4.05 is a simplified illustration of the main stages in the forest certification forest.

**Figure 4.05** Main stages in the forest certification process

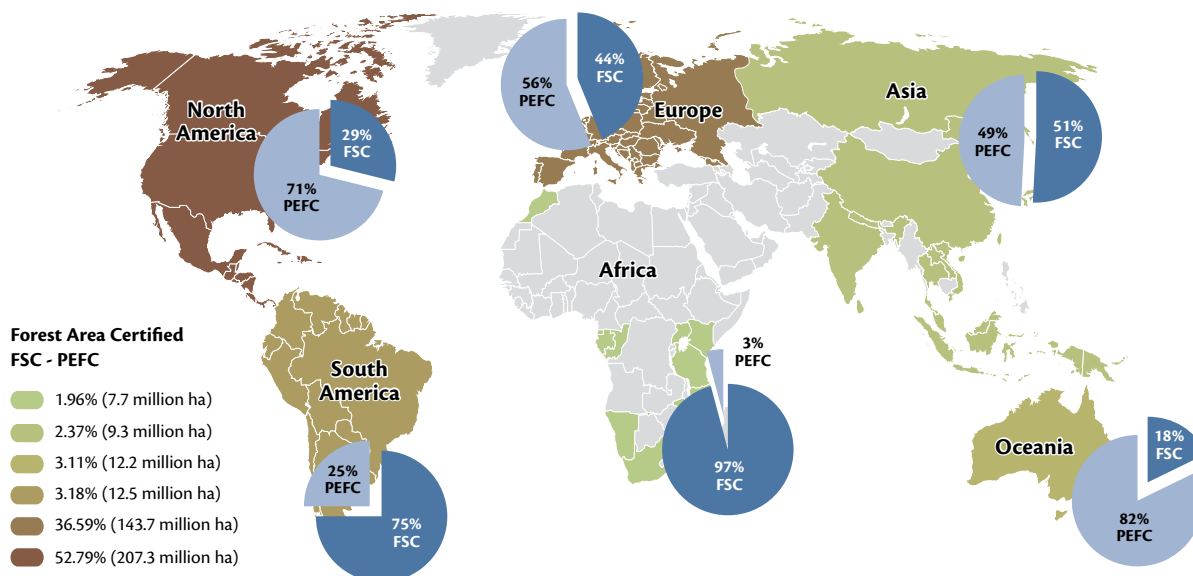


Presently, there are many different forest certification systems, among which we highlight the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification Schemes (PEFC), the Canadian Standard Association (CSA) and the Brazilian Forest Certification Program (*Programa Brasileiro de Certificação Florestal* – CERFLOR). It should be noted that CERFLOR was internationally acknowledged by PEFC as a certification system.

Globally, considering the two main accreditation bodies (FSC and PEFC), the area with certified forests grew 5.1% in 2012, totaling 412.8 million hectares. It should be remarked that North America and Europe are the continents with the largest certified area. Figure 4.06 shows the ratio of forests certified by accredited organizations and certified forest area around the world.



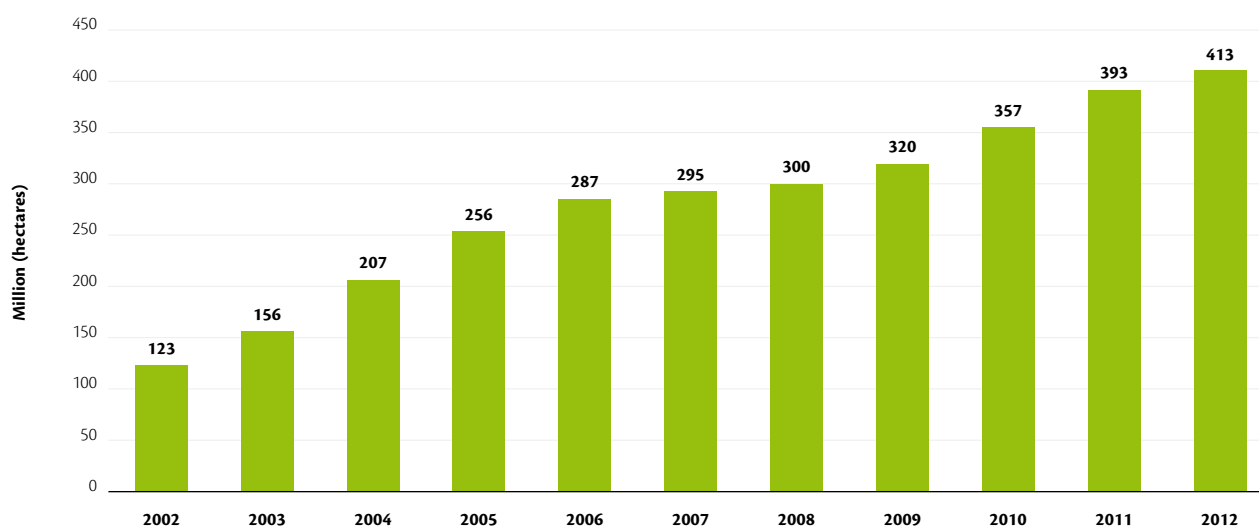
**Figure 4.06** Ratio of forests certified by accredited organizations and global certified forest area, 2012



Source: FSC, PEFC (2011).

Graph 4.07 illustrates the evolution of areas certified over the last 10 years. Intensification in growth of the annual certified area can be observed, as a result of growing attention to environmental preservation and the maturing concept of sustainability. Between 2002 and 2012 a significant increase in certified area was observed, with an average annual growth of 12.9% p.a.

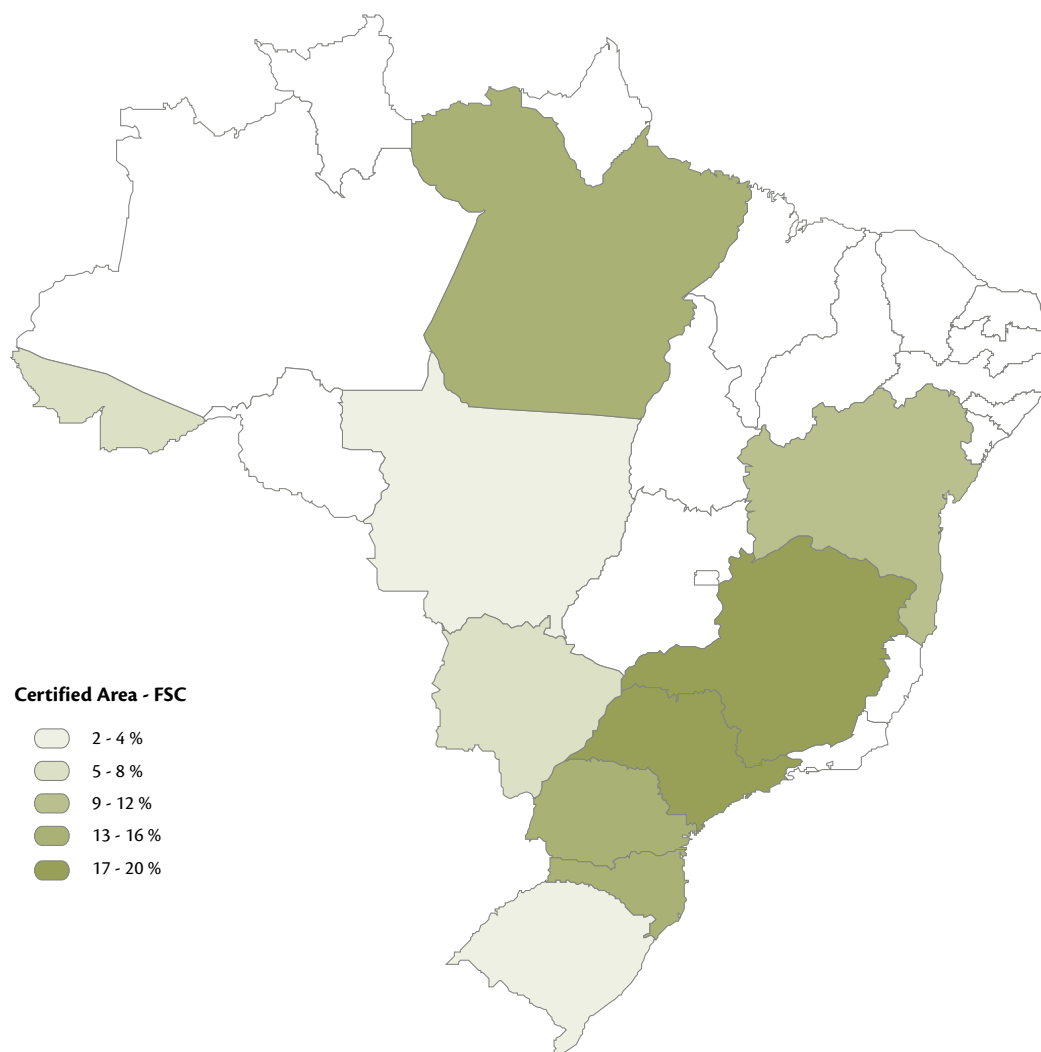
**Graph 4.07** Evolution of certified forests in the world, 2002-2012



Source: FSC, PEFC (2012).

In 2012, Brazil had approximately 7.2 million hectares of forests certified by FSC and 1.3 million hectares of forests certified by PEFC, representing only 2.1% of the world total. The certified area in Brazil increased about 37.1% between 2011 and 2012. Figure 4.07 below presents the distribution of total areas certified by FSC in Brazil in 2012.

**Figure 4.07** Distribution of planted forest area certified by FSC in Brazil, 2012



Source: FSC (2012).

It is noteworthy that the forestry companies can be simultaneously certified by both seals. Moreover, both the FSC and PEFC certify forest plantations and forest management areas.

## 4.7 SOCIAL AND ENVIRONMENTAL RESPONSIBILITY PROGRAMS

ABRAF member companies, as well as other companies of the forest sector in Brazil, have increasingly invested in social and environmental responsibility programs. Forest fostering, social, health, environment and education programs promoted by ABRAF member companies in 2012 are described below.

### 4.7.1 Forest Fostering

Forest fostering, also known as outgrower schemes, was developed in order to fulfill forestbased industries' demand for raw materials. Also, this program strengthens the social action of the company in the region.

From the environmental standpoint, forest fostering mitigates the pressure on native forests, recovers degraded soils and promotes soil conservation. From the social standpoint, this program prevents land concentration, makes local activities feasible, creates opportunities of additional income and assists in settling people in the countryside.

The most frequent forest fostering modalities include providing forest species seedlings, revenue anticipation programs and wood purchase guarantee at harvest time.

In 2012, ABRAF individual member companies entered 1,012 new forest fostering contracts that benefited 759 rural producers and encompassed 37.4 thousand hectares. Accumulated until 2012, ABRAF individual member companies benefited 13,098 owners, through 15,945 fostering contracts, encompassing an area of 426.8 thousand hectares (Table 4.08).

**Table 4.08 Results of forest fostering for ABRAF member companies, 2012**

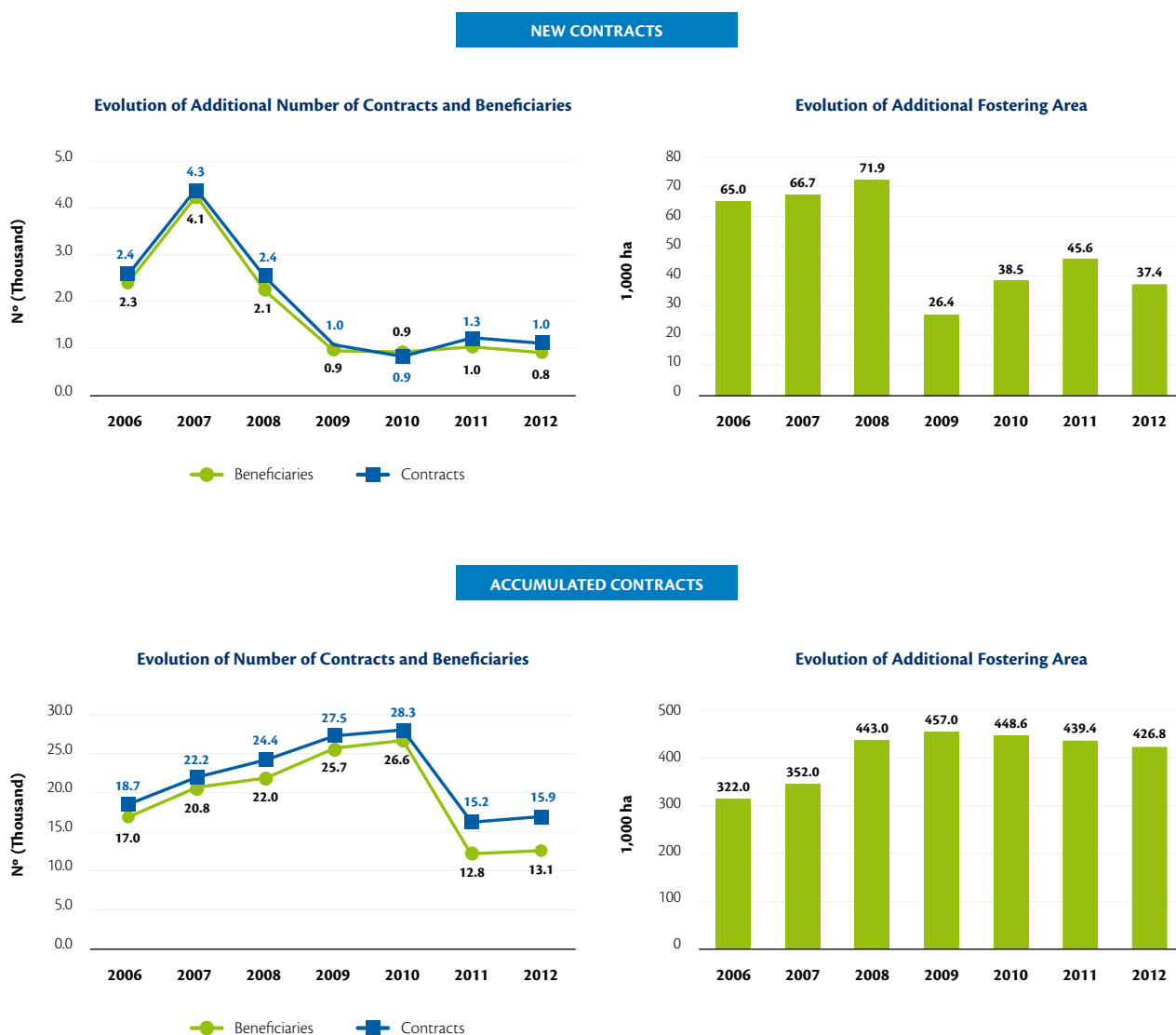
Type	Number of Beneficiaries	Number of Contracts	Area (thousand ha)
Accumulated until 2012 <sup>1</sup>	13,098	15,945	426.8
New Contracts (2012)	759	1,012	37.4

Source: ABRAF individual associates (2012).

<sup>1</sup> Including 2012.

Graph 4.08 presents the evolution in the number of fostering contracts of ABRAF member companies in the 2006-2012 period.

**Graph 4.08** Evolution of number of contracts, beneficiaries and planted areas in fostering programs of ABRAF member companies, by year and accumulated, Brazil, 2006-2012



Source: ABRAF individual associates (2012).

It is noteworthy that the reduction in the fostering accumulation area in 2011 occurred due to data rectification by ABRAF individual member companies. Such rectification was also responsible for the decline in the number of beneficiaries and accumulated contracts.

### 4.7.2 Social Programs

In 2012, investments in social programs made by ABRAF member companies totaled BRL 149.0 million, 93.0% higher than the value of investments made in 2011. This significant increase is mainly due to expansion projects and startup of pulp & paper industries. However, the number of municipalities served and the number of benefited people decreased by 43.9% 17.9% (Table 4.09).

**Table 4.09** Results of social programs developed by ABRAF member companies, 2005-2012

Year	Number of Beneficiaries	Number of Municipalities Served	Investment (BRL million)
2005	652,827	579	36.3
2006	1,088,457	742	76.3
2007	1,567,244	704	77.8
2008	2,181,487	993	65.4
2009	2,373,613	597	61.6
2010	2,884,075	986	81.5
2011	1,643,208	1,809	77.2
2012	1,349,063	1,014	149.0

Source: ABRAF individual associates (2012).

### 4.7.3 Health

In 2012, health programs provided by ABRAF member companies to their employees and local communities through medical and dental assistance amounted to BRL 29.2 million, for the benefit of 258,065 people in 99 municipalities (Table 4.10).

**Table 4.10** Results of health programs developed by ABRAF member companies, 2005-2012

Year	Number of Beneficiaries	Number of Municipalities Served	Investment (BRL million)
2005	63,000	137	7.3
2006	364,000	100	23.6
2007	204,800	59	21.6
2008	303,400	75	24.2
2009	330,900	68	25.1
2010	409,000	93	20.6
2011	175,000	138	12.6
2012	258,065	99	29.2

Source: ABRAF individual associates (2012).

#### 4.7.4 Education and Culture

The investments related to social inclusion programs aimed at employees of ABRAF member companies, their family dependents and neighboring communities totaled BRL 35.9 million in 2012. In general, these programs consist of actions of school education improvement, fighting illiteracy and stimulating culture in the surrounding communities, which benefited 459 municipalities and 799,240 people (Table 4.11).

**Table 4.11** Results of educational and cultural programs developed by ABRAF member companies, 2005-2012

Year	Number of Beneficiaries	Number of Municipalities Served	Investment (BRL million)
2005	397,400	296	14.6
2006	308,900	273	20.5
2007	1,136,700	319	21.2
2008	292,400	381	21.4
2009	395,700	233	14.1
2010	623,000	1,116	16.7
2011	762,347	1,018	34.9
2012	799,240	459	35.9

Source: ABRAF individual associates (2012).

#### 4.7.5 Environment

In 2012, the environmental programs developed by ABRAF member companies totaled BRL 31.4 million and benefited 234 municipalities, which was 47% higher than in 2011. The increased investment aimed at the environment indicates a growing awareness of the environment by ABRAF member companies (Table 4.12).

**Table 4.12** Results of environmental programs developed by ABRAF member companies, 2005-2012

Year	Number of Beneficiaries	Number of Municipalities Served	Investment (BRL million)
2005	167,300	98	11.2
2006	131,200	232	26.9
2007	209,900	191	30.9
2008	1,547,900	351	15.2
2009	1,474,600	151	14.5
2010	296,000	196	34.4
2011	258,000	317	21.3
2012	219,166	234	31.4

Source: ABRAF individual associates (2012).

#### 4.7.6 Non-Wood Forest Production

Table 4.13 presents the history of investments in the production of nonwood forest products (NWFP) by ABRAF member companies. In 2012, the investment in the production of honey, wax, resin, rubber and dyes was around BRL 1.7 million and benefited 7,460 people in 126 municipalities.

**Table 4.13** Results of NWFP production in the areas of ABRAF member companies, 2005-2012

Year	Number of Beneficiaries	Numbers of Municipalities Served	Investment (BRL million)
2005	1,310	35	0.4
2006	1,342	30	0.1
2007	3,448	80	0.3
2008	6,499	87	0.4
2009	1,760	61	0.1
2010	5,090	169	2.4
2011	8,367	109	2.2
2012	7,460	126	1.7

Source: ABRAF individual associates (2012).

A graphic for Chapter 5. It features a dark blue horizontal bar on the left with the word "CHAPTER" in white, uppercase letters. To the right of this bar is a large, light gray rounded square containing a large white number "5".

# CHAPTER 5

## *METHODOLOGY NOTES*

AREA WITH PLANTED FORESTS IN BRAZIL

TOTAL PRESERVATION AREA LINKED  
TO PLANTED FORESTS

BALANCE OF PRODUCTION AND CONSUMPTION  
OF ROUND WOOD AND FOREST PRODUCTS

GROSS VALUE OF FOREST PRODUCTION (VBPF)

COLLECTION OF TAXES

PRODUCTION AND CONSUMPTION OF FOREST PRODUCTS

COMMERCIAL BALANCE OF FOREST PRODUCTS

EMPLOYMENT GENERATION

HUMAN DEVELOPMENT INDEX (IDH)

THE FIRJAN INDEX OF MUNICIPAL DEVELOPMENT (IFDM)



## 5 METHODOLOGY NOTES

This chapter is a description of the methodology adopted to prepare this yearbook with regards to the collection, compilation and analysis of the data from 2012.

In order to prepare the 2013 Yearbook (base year 2012), the Brazilian Association of Planted Forest Producers (ABRAF) used methodological procedures which were similar to those used in preparing previous yearbooks, comparing estimates, crossing data, etc. The quantitative analysis presented in the yearbook was derived from the collection of primary and secondary data.

The primary data were obtained by means of:

- Complete questionnaires sent to ABRAF member companies;
- Simplified questionnaires sent to state collective associations affiliated with ABRAF;
- Contact with class associations such as ABIPA (the Brazilian Association of the Wood Panel Industry), BRACELPA (Brazilian Association of Pulp and Paper), ABIMÓVEL (Brazilian Association of Furniture Industries) and SINDIFER-MG (United Iron Industry of Minas Gerais State) and others; and
- Direct research using information collected from companies not associated with ABRAF.

Secondary data were collected from research institutions such as IBGE, BNDES, the Instituto de Economia Agrícola de São Paulo (Agricultural Economics Institute of São Paulo), Associação Paulista de Produtores e Beneficiadores de Borracha (São Paulo Association of Rubber Tree Producers and Processors), Centro de Pesquisas do Paricá (the Paricá Research Center), official data platforms such as Alice Web from MDIC, CAGED from MTE, MMA and MDA.

### 5.1 AREA WITH PLANTED FORESTS IN BRAZIL

**Reference: Chapter 1 – Item 1.1: Area Planted with Eucalyptus and Pine in Brazil**

The area planted with Eucalyptus and Pine in Brazil was estimated based on data obtained from:

- Complete questionnaires sent to ABRAF individual member companies;
- Simplified questionnaire responses from the following state collective associations: AMS (Minas Gerais Forestry Association); AGEFLOR (Rio Grande do Sul Association of Forestry Companies); APRE (Paraná Association of Forestry Companies); ACR (Santa Catarina Association of Forestry Companies); REFLORE (Mato Grosso do Sul Association of Producers and Consumers of Replanted Forests); ARETINS (Reforesters Association of Tocantins) and AFUBRA (Tobacco Growers Association of Brazil);
- Official documents and data from government institutions and authorities such as departments of state government, institutes, foundations and universities;
- Contact with various companies in the sector which are not associated with ABRAF.

As the information about planted area in Brazil was to a large extent presented by state in Chapter 1, the methodology for obtaining these estimates is also detailed below by state:

- **Amapá:** the planted area was estimated based on direct contact with forestry companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 22.5%.
- **Goiás:** the planted area was estimated through direct contact with forestry companies unaffiliated with ABRAF, and using mapping of forest plantations taken from images from *Landsat-5* (2011/2012), which has a resolution of 30 meters. It is estimated that the margin of error for this state may be 20%.
- **Bahia:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 7.4%.
- **Espírito Santo:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. The margin of error for this state is estimated at 14.3%.
- **Maranhão:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 12.2%.
- **Pará:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 26.6%.
- **Mato Grosso:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 16.4%.
- **Mato Grosso do Sul:** planted area was estimated using information provided by ABRAF individual member companies, REFLORE, and direct contact with non-associated forest companies. The margin of error for this state is estimated at 3.3%.
- **Minas Gerais:** the area planted with Eucalyptus was estimated based on limits set using information provided by AMS together with information obtained from ABRAF individual member companies as well as direct contact with companies that are not affiliated with ABRAF. The area planted with Pine was estimated using information produced by ABRAF individual member companies and through direct contact with forest companies unaffiliated with ABRAF. It is estimated that the margin of error for this state is 2.1%.
- **Paraná:** planted area was estimated using information made available by ABRAF individual member companies, APRE, AFUBRA, and by direct contact with forest companies unaffiliated with ABRAF. The margin of error for this state is estimated at 9.8%.
- **Rio Grande do Sul:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 16.4%.
- **Santa Catarina:** planted area was estimated using information provided by ABRAF individual member companies, by ACR, APRE and AFUBRA, as well as through direct contact with companies unaffiliated with ABRAF. The margin of error for this state is estimated to be 16.4%.

- **São Paulo:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 10.1%.
- **Tocantins:** planted area was estimated from information produced by ABRAF individual member companies and by ARETINS as well as by direct contact with forest companies not affiliated with ABRAF. The margin of error for this state is estimated at 9.8%.
- **Piauí:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF. It is estimated that the margin of error for this state may be 8.2%.
- **Other states:** planted area was estimated based on information provided by ABRAF individual member companies and by direct contact with companies unaffiliated with ABRAF.

#### Reference: Chapter 1 – Item 1.2: Area planted with Eucalyptus and Pine by ABRAF associates

The area of forest plantations belonging to companies associated with ABRAF was estimated based on the compilation of data obtained from the following data sources:

- Individual responses to complete questionnaires provided by ABRAF individual member companies; and
- Responses to simplified questionnaires provided by ABRAF collective associates, containing information about the planted area of affiliated companies. As mentioned in the previous item, the information and data were provided by ACR (Santa Catarina), AGEFLOR (Rio Grande do Sul), AMS (Minas Gerais), APRE (Paraná), REFLORE (Mato Grosso do Sul) and ARETINS (Tocantins).

#### Reference: Chapter 1 – Item 1.3: Forests planted with other species

The area planted with other species was estimated based on compiling data obtained from: (i) questionnaire responses from ABRAF individual member companies; (ii) simplified questionnaire responses from ABRAF collective associations; (iii) official documents and data from governmental and institutional sources such as departments of state government, institutions, foundations, etc; and (iv) direct contact with various companies in the industry which are not associated with ABRAF.

The following section presents the methodology used to estimate the area planted with other species used in forestry in Brazil:

- **Acacia:** the area planted with this species was estimated using information provided by ABRAF individual member companies, AGEFLOR and ARETINS, as well as through direct contact with companies unaffiliated with ABRAF.
- **Rubber Tree:** planted area was estimated based on information provided by REFLORE and ARETINS.
- **Parica:** plantation area was estimated based on information provided by ABRAF individual member companies as well as REFLORE and ARETINS.

- **Araucaria:** planted area was estimated using information provided by ABRAF individual member companies, ACR, APRE and AGEFLOR, as well as by direct contact with companies not associated with ABRAF.
- **Populus:** planted area was estimated using information provided by ABRAF individual member companies, ACR and APRE, and from direct contact with companies unaffiliated with ABRAF.
- **Others:** the area planted with species such as Bracatinga, Japanese Raisin Tree, Pupunha Palm, Indian Neem, and Walnut-Pecan was estimated by compiling information provided by individual member companies, by AGEFLOR, APRE and ARETINS, and by companies unaffiliated with ABRAF.

## 5.2 TOTAL PRESERVATION AREA LINKED TO PLANTED FORESTS

Reference: Chapter 4 – Item 4.6: Environment – Table 4.08

The legal concepts adopted for this yearbook in terms of types of protection and preservation areas such as Legal Reserve (RL), Permanent Preservation Areas (APP) and Private Reserve of Natural Heritage (RPPN) are presented below:

- **Permanent Preservation Area (APP):** according to Federal Law 12.651/2012, which amends the old Brazilian Forest Code (Federal Law 4.771/65), a Permanent Preservation Area is any “protected area, covered or not by native vegetation, which serves the environmental function of preserving water resources, the landscape, geological stability and biodiversity, facilitates the genetic flow of flora and fauna, protects the soil and assures the well-being of human populations”.

As a result of this law, the border strip along any natural or intermittent body of water (excluding ephemeral bodies of water) extends outward from the regular limits, banks or shore, a minimum of: 30 meters, for bodies of water less than 10 meters in length; 50 meters, for bodies of water between 10 and 50 meters in length; 100 meters, for bodies of water from 50 to 200 meters in length; 200 meters, for bodies of water 200 to 600 meters in length; 500 meters, for bodies of water longer than 600 meters.

Furthermore, for areas surrounding lakes and natural reservoirs, a border strip of at least 100 meters is required in rural zones, except for a body of water of up to 20 hectares of surface area, which requires a margin strip of 50 meters; and 30 meters, in urban zones. Areas surrounding artificial reservoirs resulting from damming or blocking natural bodies of water are defined in the company's environmental licensing. Areas surrounding springs and perennial water sources, regardless of topographical situation, require a minimum surrounding radius of 50 meters. Slopes or areas with a grade superior to 45°, the equivalent of 100% along the line of the greatest slope. Sandbanks, as stabilizers of dunes or mangroves. Mangrove swamps in their entirety. The edges of plateaus or highlands to the line where relief changes, in a strip not less than 100 m in horizontal projection. On the tops of hills, mountains, peaks and ridges with a minimum height of 100 meters and an average incline greater than 25°, the areas defined starting from the curve corresponding to 2/3 of the minimum height related to the base, which is defined by the horizontal plane or any adjacent body of water or, in the case of undulating terrain, by the nearest point that the hill breaks away from. Areas above 1,800 meters, regardless of vegetation. In veredas areas, a marginal strip of at least 50 meters measured horizontally from the space which is permanently swampy and wet.

- **Legal Reserve (RL):** Legal Reserve is also defined in the new Brazilian Forest Code (Federal Law 12.651/2012) as “the area located within a rural property or holding, as defined in article 12, which functions to assure the economical usage of the property’s natural resources in a sustainable manner, facilitating the conservation and rehabilitation of ecological processes, promoting the conservation of biodiversity, as well as providing shelter and protection for wildlife and native vegetation.” Furthermore, with the approval of the new Code, the filing requirements for Legal Reserve were also changed; they are currently regulated by § 4 of the new Forest Code, which states: “Registration of the Legal Reserve in the CAR removes the requirement to register in the Real Estate Hall of Records (Cartório de Registro de Imóveis), as during the period between the date of publication of this Law and registration in the CAR, the owner or rural landholder who desires to file will have the right to do so at no charge”.
- **Private Reserve of Natural Heritage (RPPN):** meant to conserve biological diversity on a property and in a region, this voluntary act promotes the efforts of civil society to conserve biological diversity. Consequently, RPPNs are considered to be an instrument by which private property may contribute to environmental protection and conservation as a whole. Their establishment confers benefits on the institutions/owners (ex.: right to preserved property, exemption from Rural Property Tax (ITR) on the RPPN area, the possibility of overlapping the perimeter of the RPPM with APP and RL areas, among others). The RPPN is a conservation unit defined in the terms of Decree 1.922/96, which justified its importance by means of its: (i) contribution to the expansion of protected areas in the country; (ii) extension of ecological corridors in the vicinity of Conservation Units; (iii) promotion of private initiative in the national effort towards conservation; (iv) participation in conserving the biodiversity of Brazilian biomes; and (v) other. Several ABRAF member companies hold significant RPPN areas on their properties, effectively helping to ensure improved environmental quality in their respective regions.

## 5.3 BALANCE OF PRODUCTION AND CONSUMPTION OF ROUND WOOD AND FOREST PRODUCTS

Reference: Chapter 3 – Item 3.2: Round wood

Consumption of round wood was estimated based on industrial production data and conversion factors representing the relationship between consumption of round wood and production of a specific manufactured product (Table 5.01). The estimate data were validated by direct sampling from the companies which participate in this market.

**Table 5.01 Conversion factors used in the ABRAF statistical yearbook, 2012**

Product	Unit	Conversion Factor
Short-fiber Pulp	m <sup>3</sup> log / t (product)	4.10
Long-fiber Pulp	m <sup>3</sup> log / t (product)	6.10
High-yield Pulp	m <sup>3</sup> log / t (product)	2.66
Sawn Wood	m <sup>3</sup> log / m <sup>3</sup> (product)	2.85
Charcoal	m <sup>3</sup> log / MDC (product)	1.30
MDF	m <sup>3</sup> log / m <sup>3</sup> (product)	2.08
MDP	m <sup>3</sup> log / m <sup>3</sup> (product)	1.43
Plywood	m <sup>3</sup> log / m <sup>3</sup> (product)	1.77
Pig Iron	mdc/t of product	2.75

Source: ABRAF Yearbook (2012) and Pöyry Silviconsult.

## 5.4 GROSS VALUE OF FOREST PRODUCTION (VBPF)

Reference: Chapter 4 – Item 4.1: Gross value of production of the planted forest sector – Table 4.01

The gross value of forest production (VBPF) is the indicator which quantifies the activity level of the forest sector, describing its performance for a given period. Its calculation follows the same methodological approach used in measuring gross value of the agribusiness sector, by assessing the turnover in industrial segments specifically related to forest plantations, and is the sum of the values of the main productive chains (pulp and paper, industrialized wood panels, charcoal-fired steelworks, mechanically processed wood and furniture).

The VBPF of each segment was estimated according to production and price information made available by the following institutions:

- Pulp and paper: BRACELPA (Brazilian Association of Pulp and Paper);
- Industrialized wooden panels: ABIPA (Brazilian Association of the Wood Panel Industry);
- Charcoal-fired steelworks;
- Mechanically-processed wood: Pöyry Silviconsult; and
- Furniture: Sector Report of the Brazilian Furniture Industry – Brasil Móveis 2012.

## 5.5 COLLECTION OF TAXES

Reference: Chapter 4 – Item 4.2: Tax Collection – Table 4.02

The country's tax system currently includes a list of taxes (taxes, contributions and fees) which apply to domestic economic activities at the state, federal and municipal levels. Estimates of the taxes paid by companies in the planted forest sector were made based on the estimated VBPF of each industrial segment associated with forest plantations, and the relative percentage of taxes collected per segment in order to estimate the value which corresponds to the total taxes collected from the planted forest sector as a whole.

Accordingly, the total estimate of taxes collected from the planted forest sector in 2012 was BRL 7.6 billion, as can be seen in Table 5.02.

**Table 5.02 Estimated taxes collected from the segments transforming planted forests, 2012**

Segment	VBPF (BRL Millions)	Factor	Estimated Taxes Collected (BRL Millions)
Pulp and Paper	30.2	0.0735	2.2
Industrialized Wooden Panels	6.5	0.2206	1.4
Charcoal-fired Steelworks	2.3	0.3653	0.8
Mechanically Processed Wood <sup>2</sup>	5.8	0.1982	1.1
Furniture	11.4	0.1743	2.0
<b>Total</b>	<b>56.3</b>	<b>-</b>	<b>7.6</b>

Source: BRACELPA, ABIPA, AMS, Pöyry Silviconsult and BRASIL MÓVEIS.

<sup>1</sup> Includes only products from derived from planted forests.

<sup>2</sup> Pöyry Silviconsult estimate. Includes sawn wood, HVAPs, veneers and plywood.

## 5.6 PRODUCTION AND CONSUMPTION OF FOREST PRODUCTS

Reference: Chapter 3 – Item 3.1.1: Production and consumption in Brazil – Graphs 3.01 to 3.07

To create the historical series of production and consumption of forest products, the following data published by institutions were utilized (shown here by forest product):

- Pulp and Paper: BRACELPA (Brazilian Association of Pulp and Paper). Available in the publication *Conjuntura BRACELPA*;
- Industrialized Wooden Panels: ABIPA (Brazilian Association of Wood Panel Industries);
- Mechanically Processed Wood: Pöyry Silviconsult.
- Firewood: IBGE (Instituto Brasileiro de Geografia e Estatística) – *Produção da Extração Vegetal e da Silvicultura (PEVS)* Pellets: Pöyry Silviconsult.
- Pellets: Pöyry Silviconsult; and
- Charcoal-fired Steelworks: AMS (Minas Gerais Forestry Association).

Due to the absence of publications relevant to the production and consumption of mechanically processed wood and pellets, Pöyry Silviconsult used its base of primary data along with representative sampling from companies in the sawnwood, HVP, veneer, plywood and pellet segments.

## 5.7 COMMERCIAL BALANCE OF FOREST PRODUCTS

Reference: Chapter 3 – Item 3.1.2: International Trade – Table 3.01

Data relevant to the commercial balance of forest products in monetary values for import and export were obtained from the AliceWeb system, which is available from the Secretary of Foreign Commerce (SECEX) in the Ministry of Development, Industry and Commerce (MDIC). These statistics were obtained using the Mercosur Common Nomenclature (NCM) pertaining to forest products for the year 2012, thereby obtaining the export values for the products considered to have originated specifically from planted forests.

## 5.8 EMPLOYMENT GENERATION

Reference: Chapter 4 – Item 4.3: Generation of Jobs – Table 4.03

To estimate the number of direct and indirect job posts, and the income-effect for the planted sector in 2012, the “New Model for Job Generation” from BNDES was utilized; this model considers that the number of jobs generated is proportional to the increase in production for each sector of the economy.

According to this model, jobs can be classified into three categories:

- **Direct Employment:** labor used by the segment which produces a specific product. Any increase in demand implies an increase in production of equal magnitude in the sector where this increase is seen, considering constant levels of productivity.
- **Indirect Employment:** labor utilized by the segments which make up the entire productive chain (intermediate goods) of a specific product. Increased demand in a specific sector generates an increase in production throughout the productive chain, replenishing the job-generating process.
- **Income-effect Employment:** labor utilized in producing various goods and services. Part of the income received by workers and entrepreneurs in the form of salaries and/or dividends is converted into private consumption, which stimulates the production of other sectors of the economy, replenishing the job-generating process. As a result, increased production leads to increased income, which in turn leads to increased private consumption.

To calculate the number of jobs generated in the planted forest sector by the forestry segment, two different methodologies can be utilized, as described below:

- Methodology 1: the ratio between the number of jobs generated by ABRAF individual member companies and their respective reforestation areas, which generates a factor showing employee/planted area. Afterward, by multiplying the total area of planted forests in Brazil (Eucalyptus, Pine and other species) by this factor, the number of direct jobs related to forestry activity in planted forests in Brazil is obtained.



- Methodology 2: is the ratio between the average number of jobs generated by forest companies in Minas Gerais in relation to the total area of reforestation in the state, according to the information in the AMS Yearbook (2011). As with Methodology 1, the total area of planted forests in Brazil (Eucalyptus, Pine and other species) is multiplied by the factor calculated to obtain the number of direct jobs in forestry in the country's planted forests.

For the segments Charcoal-fired Steelworks, Wood/Furniture and Pulp and Paper, the indicators were calculated according to the methodology indicated in the "New Model for Job Creation" published by BNDES.

The indicators represent the ratio between the absolute number of jobs generated by the main industrial segments in the planted forest sector in relation to the number of direct, indirect and income-effect jobs, as can be seen in Table 5.03.

**Table 5.03 Ratio between number of direct, indirect and income-effect jobs and the absolute number of jobs generated by the main segments in the planted forest sector**

Segment	Source	Jobs			
		Direct	Indirect	Income-Effect	Total
Forestry	AMS/ABRAF Yearbook	13%	53%	34%	100%
Charcoal-fired Steelworks	BNDES	2%	21%	77%	100%
Wood <sup>1</sup> and Furniture	BNDES	32%	24%	44%	100%
Pulp and Paper	BNDES	10%	23%	67%	100%

Source: AMS (2011) and BNDES (2007).

<sup>1</sup> Includes industrialized wooden panels, mechanically processed wood and HVAAPs.

Subsequently, the estimated generation of indirect and income-effect jobs for each segment of the planted forest sector was obtained by multiplying these indicators by the total direct jobs in each segment, which were obtained from the CAGED (General Register of Employment and Unemployment).

In order to refine the estimates, it became necessary to apply the following criteria to each of the following segments:

- Charcoal-fired Steelworks: 24.8% of all steel production was considered to correspond to production based on charcoal, excluding the portion of steelworks which consume coke (AMS Yearbook, 2011).
- Furniture: assuming the ratio between Brazilian wooden furniture exports and overall Brazilian furniture exports (wood and non-wood), the percentage of 80.7% was obtained; this number was adopted as a proxy (MDCI, 2012).

Table 5.04 shows the estimated generation of direct, indirect and income-effect jobs for the different segments of the forest industry and the criteria (factors) adopted in this analysis, including forest plantations and native forests destined for commercial uses.

**Table 5.04** Estimated generation of employment in the segments associated with the forest sector as a whole (planted and native forests), 2012

Industrial Segment	Source	Jobs Generated – Planted and Native Forests				Factor
		Direct	Indirect	Income-Effect	Total	
Charcoal-fired Steelworks	CAGED	21,531	226,080	828,961	1,076,573	24.8%
Wood <sup>1</sup>	CAGED	196,526	147,395	270,224	614,145	-
Furniture	CAGED	126,020	94,515	173,278	393,813	80.7%
Pulp and Paper	CAGED	156,988	361,073	1,051,821	1,569,883	-
<b>Total</b>		<b>501,065</b>	<b>829,063</b>	<b>2,324,284</b>	<b>3,654,414</b>	

<sup>1</sup> Includes industrialized wooden panels, mechanically processed wood and HVAPs.  
Source: CAGED (2012), AMS (2011), MDIC (2012) and IBGE (2012).

In order to determine the jobs generated only in the planted forest sector, excluding the portion of jobs related to native forests, the following criteria were adopted:

- Forestry, Wood<sup>1</sup> and Pulp/Paper: it was considered that 100.0% of the jobs generated by the segment refer to forest production based on reforested wood.
- Charcoal-fired Steelworks: it was assumed that 69.5% of the number of jobs generated by the segment are related to the production of charcoal from reforested wood, according to estimates from AMS (2011).
- Furniture: it was assumed that 90.0% of the number of jobs generated by the segments related to the production of industrialized wooden panels, mechanically processed wood, HVAPs and furniture come from reforested wood, estimated as the base of the proportion between the production of logs by forestry and by extraction, according to data from IBGE (2011).

The consolidated results of the estimated number of jobs generated by the planted forest sector are shown in Table 5.05, including the two methodologies used to make the estimates related to the forestry segment.

**Table 5.05** Estimated number of jobs in forestry and the industrial segments associated with planted forests, 2012

Segment	Jobs Generated				Factor
	Direct	Indirect	Income-Effect	Total	
Forestry					
Methodology 1	221,438	902,786	579,146	1,703,370	100.0%
Methodology 2	139,614	569,194	365,143	1,073,951	100.0%
Forest Industry					
Charcoal-fired Steelworks	14,956	157,036	575,797	747,789	69.5%
Wood <sup>1</sup>	196,526	147,395	270,224	614,145	100.0%
Furniture	113,418	85,064	155,950	354,431	90.0%
Pulp and Paper	156,988	361,073	1,051,821	1,569,883	100.0%
Total – Forest Industry	481,888	750,567	2,053,792	3,286,248	-
Total 1 (Methodology 1 + Forest Industry)	703,326	1,653,353	2,632,938	4,989,618	-
Total 2 (Methodology 2 + Forest Industry)	621,502	1,319,761	2,418,935	4,360,199	-

Source: CAGED (2012), AMS (2011), MDIC (2012) and IBGE (2012).  
<sup>1</sup> Includes industrialized wooden panels, mechanically processed wood and HVAPs.

It should be stressed that the estimated number of jobs (direct, indirect and income-effect) generated from the methodologies described above indicate that the number of jobs generated by the planted forest sector varies from 4.3 million to 5.0 million total employment posts, respectively, for Totals 2 and 1. For the ABRAF Statistical Yearbook (Base Year 2012), the total estimated from Methodology 2 was adopted (Forestry- Methodology 2 and Total 2), seeing as this reflected the most probably scenario for the planted forest sector.

## 5.9 HUMAN DEVELOPMENT INDEX (IDH)

Reference: Chapter 4 – Item 4.5 Human Development Index

The Human Development Index (HDI) is a summary measure of human development which measures the average achievements in a country in three basic dimensions: life expectancy (long and healthy life), literacy (access to knowledge) and Gross Domestic Product (standard of living). The HDI is the geometric mean of normalized indexes which measure the achievements in each dimension. In order to calculate the HDI, maximum and minimum values (ranges) are defined, placing the indicators into a range between 0 and 1.

Accordingly the following relationship is estimated:  $\text{index} = (\text{observed value} - \text{minimum value}) / (\text{maximum value} - \text{minimum value})$ . The resulting value shows the steps taken by a society as a proportion of the entire course of action to be taken to reach the full goal of that specific indicator. The difference between the maximum and minimum value represents the full course which a society needs to travel in the direction of that specific indicator and the difference between the observed value and the minimum value shows the progress which has already been made.

Each of these normalized indicators enters into the HDI with the same weight, and is calculated as a geometric mean. The adoption of equal weights is justified as all the dimensions of the HDI are equally valuable and desirable.

## 5.10 THE FIRJAN INDEX OF MUNICIPAL DEVELOPMENT (IFDM)

Reference: Chapter 4 – Item 4.5.1: The FIRJAN Index of Municipal Development – Graph 4.04

The FIRJAN Index of Municipal Development (IFDM) is an indicator of the levels of human, economic and social development of a municipality, on an annual basis, breaking down by municipality but with national coverage. Because it only uses official statistics, it presents a delay of three years in relation to the date it is published.

This index addresses the key areas of human development in Brazil: Employment & Income, Education and Health. The parameters considered in the Employment & Income category refer to the generation and stock of formal job posts and the average wage level. Similarly, Education is analyzed in terms of enrollment rates in early childhood education, the dropout rate and the rate of age-grade distortion, as well as the percentage of teachers in higher education, average daily teaching hours and the results of the Basic Education Development Index (IDEB). Health is verified by the number of prenatal visits and the number of infant deaths from preventable or poorly-defined causes.

Mathematical analysis of these parameters enables the creation of a final index which varies between 0 and 1 and, consequently, classifies municipalities into low stage of development ( $0 < \text{IFDM} < 0.4$ ), regular development ( $0.4 < \text{IFDM} < 0.6$ ), moderate development ( $0.6 < \text{IFDM} < 0.8$ ) and high stage of development ( $0.8 < \text{IFDM} < 1.0$ ).

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**[www.poyry.com.br](http://www.poyry.com.br)**

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Fone/Fax: (61) 3344-2400/3341-1384

**[atendimento@semeareditora.com.br](mailto:atendimento@semeareditora.com.br)**  
**[semear.editora@gmail.com](mailto:semear.editora@gmail.com)**

PENDRIVE DESIGN,  
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