THE STATE
OF THE WORLD's
FOREST GENETIC RESOURCES
COUNTRY REPORT

BRAZIL

This country report is prepared as a contribution to the FAO publication, The Report on the State of the World's Forest Genetic Resources. The content and the structure are in accordance with the recommendations and guidelines given by FAO in the document Guidelines for Preparation of Country Reports for the State of the World's Forest Genetic Resources (2010). These guidelines set out recommendations for the objective, scope and structure of the country reports. Countries were requested to consider the current state of knowledge of forest genetic diversity, including:

- Between and within species diversity
- List of priority species; their roles and values and importance
- List of threatened/endangered species
- Threats, opportunities and challenges for the conservation, use and development of forest genetic resources

These reports were submitted to FAO as official government documents. The report is presented on www. fao.org/documents as supportive and contextual information to be used in conjunction with other documentation on world forest genetic resources.

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BRAZILIAN MINISTRY OF ENVIRONMENT
SECRETARIAT OF BIODIVERSITY AND FORESTS
DEPARTMENT OF FORESTS

BRAZILIAN REPORT

ON

FOREST GENETIC RESOURCES

FIRST NATIONAL REPORT

BRASÍLIA – DF
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The subject of this report is vast, intricate, and deals with one aspect of the most biodiverse country in the world. In order to coordinate the process of preparing this first Brazilian National Report on Forest Genetic Resources, an Executive Committee was established, composed of representatives of the Ministry of Environment (Secretariat of Biodiversity and Forests[1]), Brazilian Forest Service[2], three units of the Brazilian Agricultural and Livestock Research Company (EMBRAPA)[3] (Headquarters; Embrapa Forestry; Embrapa Eastern Amazon), University of Sao Paulo USP/ESALQ[4] and the Ministry of Foreing Affairs[5].

Due to the short-term given for completion of the National Reports, the Executive Committee demanded expert advice for drafting a version of the report. This version was submited to the National Comission on Forests (CONAFLOR). By decision of the Executive Committee, the coordination of this process was conducted by the Department of Forests, within the Ministry of Environment.

Preparations for the report started in October 2011 and have included the study of FAO guidelines for the preparation of the report, large-scale data gathering, and data processing for maps and tables' preparation, meetings and conferences with many experts. First steps also involved visits, conversations and meetings with people from the Brazilian Forest Service, the organization currently managing the Brazilian National Forestry Information System, with experts in Genetics and Agriculture from EMBRAPA, with staff from the Chico Mendes Institute for Biodiversity, Universities and other Forest Institutes, with governmental staff members from the Forest Department of the Ministry of Environment and with members of the National Comission of Forests - CONAFLOR. A panel with geneticists in the field of Forest Plantations was also organized during the IUFRO Working Group 2.08.03 Meeting - Improvement and Culture of Eucalypts held in Porto Seguro from 14 to 18 of November 2011. Complementary, a group of graduate students from the University of São Paulo has consistently helped on the search for literature and preparation of data sets. To handle the management of its extensive areas with public forests and issues involving forest dependent communities, Brazil has made exceptional progress over the last ten years. The year of 2006, and the following four years, can be considered turning points in terms of new policies and public regulations that deal with our forest resources. Not only a new Public Forests Regulation Law was approved, but also important changes have been discussed and are about to be made in the Brazilian Forest Act, a subtle but still essential tool for a wide spread *in situ* forest diversity conservation strategy.

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This is the First National Report on the State of Brazil's Forest Genetic Resources, a document that contributes to the preparation of a country-driven first report commissioned by FAO on The State of the World's Forest Genetic Resources (SoW-FGR) to be released in 2013.

Although meant to attend thoroughly FAO´s guidelines, this document must be considered as a first step towards the daunting task of systematizing an increasingly large amount of information that has been generated to characterize the forest genetic resources of a mega-diverse country of continental size like Brazil. Most of the information needed for the report is still dispersed and/or difficult to access, either because there are multiple institutions in charge of managing these resources, or because the information within these institutions is still difficult to systematize. Given the long and labor intensive nature of the task, new future steps and more investments will be necessary to continue the effort on systematizing forest genetic information in Brazil.

The present report offers a simplified vision of the state of Brazil´s forest genetic resources, their roles in production systems and comments on factors that are driving changes. As a signatory of the Convention on Biological Diversity (CBD, 1992), Brazil has produced four reports that document its efforts in monitoring and actions to reduce the rate of biodiversity loss. These reports were used as references to produce some of the information provided here to characterize the diversity of the Brazilian forest genetic resources. The Fourth National Report to the CBD (Ministry of Environment, 2011) is the most recent and updated reference.

In terms of priorities for conservation and protection, the Brazilian Ministry of Environment updated in 2007 (Portaria Normativa 09, 23/01/2007) a list previously issued in 2004 (Decreto 5092, 24/05/2004, and Portaria MMA 126, 27/05/2004) with the areas and priority actions for the conservation of national biomes. Both official actions were essentially undertaken to guarantee the implementation of the Brazilian commitments signed in 1992 for the Convention on Biological Diversity (CBD, 1992).

The definition and regular update of Priority Areas have been used to determine public policies, to license private projects, to establish guidelines and constraints in bidding processes for oil exploration, to plan public infrastructure expansion (for instance roads and hydro electrical plants), to establish an agenda for investments in research (as in the cases of calls for biodiversity studies such as PROBIO/ MMA, and FNMA/MMA), and to create new Conservation Units at the federal and state levels.

Other important source also used was the second national report on the State of the Brazil´s Plant Genetic Resources, also commissioned by FAO and coauthored by twenty EMBRAPA researchers (Mariante *et al.*, 2009), the Brazilian chapter of the ITTO report on the Status of Tropical Forest Management 2011 (Blaser *et al.*, 2011), and the 2010 Brazilian Country Report on Global Forest Resources Assessment (FAO, 2009).

ABC	Brazilian Cooperation Agency	Agência Brasileira de Cooperação
ABRAF	Brazilian Association of Forest Planters	Associação Brasileira dos Produtores de Florestas Plantadas
ABS	Access and Benefit Sharing	Acesso e Repartição de Benefícios
ACTO	Amazon Cooperation Treaty Organization	Organização do Tratado de Cooperação Amazônica
ANA	National Water Agency	Agência Nacional de Águas
ANP	National Oil Agency	Agência Nacional do Petróleo
APP	Permanent Preservation Area	Área de Preservação Permanente
ARPA	Amazon Protected Areas Program	Programa Áreas Protegidas da Amazônia
BAG	Active Germplasm Bank	Banco Ativo de Gerrmoplasma
CBD	Convention on Biological Diversity	Convenção sobre Diversidade Biológica
CGEN	Genetic Resources Management Council	Conselho de Gestão dos Recursos Genéticos
CGFLOP	Public Forests Management Council	Conselho de Gestão de Florestas Públicas
CNPq	National Scientific and Technological Research Council	Conselho de Pesquisa Científica e Tecnológica
CNUC	National Cadastre of Conservation Units	Cadastro Nacional de Unidades de Conservação
CONAB	National Supply Company	Companhia Nacional de Abastecimento
CONABIO	National Biodiversity Commission	Comissão Nacional de Biodiversidade
CONAMA	National Environment Commission	Comissão Nacional de Meio Ambiente
CONAFLOR	National Commission of Forests	Comissão Nacional de Florestas
COP	Conference of the Parties to the CBD	Conferência das Partes da CDB
CTRM	Multilateral Technical Received Cooperation	Cooperação Técnica Recebida Multilateral
DETER	Real Time Deforestation Detection	System Sistema de Detecção de Desmatamento em Tempo Real
DFLOR	Forest Department of the SBF/MMA	Departamento de Florestas da SBF/MMA
EIA	Environmental Impact Assessment	Avaliação de Impacto Ambiental
EEZ (1)	Exclusive Economic Zone (marine)	Zona Econômica Exclusiva (marinha)
EEZ (2)	Ecological-Economic Zoning	Zoneamento Ecológico-Econômico
EIA/RIMA	Environmental Impact Study/Environmental Impact Report	Estudo de Impacto Ambiental/Relatório de Impactos sobre o Meio Ambiente
EMBRAPA	Brazilian Agricultural and Livestock Research Company	Empresa Brasileira de Pesquisa Agropecuária
EMBRATUR	Brazilian Tourism Company	Empresa Brasileira de Turismo
FAO	Food and Agriculture Organization	Organização para Alimentação e Agricultura
FAP	Protected Areas Fund (under the ARPA Program)	Fundo de Áreas Protegidas (no âmbito do ARPA)
FAPESP	São Paulo State Research Support Foundation	Fundação de Amparo à Pesquisa do Estado de São Paulo
FGR	Forest Genetic Resource	Recurso Genético Florestal
FLONA	National Forest	Floresta Nacional
FNDF	Forest Development National Fund	Fundo Nacional de Desenvolvimento Florestal
FNMA	Environmental National Fund	Fundo Nacional do Meio Ambiente
FRA	Forest Resources Assessment	Levantamento dos Recursos Floretais
FUNAI	National Foundation for Indigenous Peoples	Fundação Nacional do Índio
FUPEF	Forest Research Foundation	Fundação Pesquisas Florestais
GEF	Global Environment Facility	Fundo para o Meio Ambiente Global
GNP	Gross National Product	Produto Interno Bruto
HDI	Human Development Index	Índice de Desenvolvimento Humano
IBAMA	Brazilian Institute for the Environment and Renewable Natural Resources	Instituto Brasileiro de Meio Ambiente e Recursos Naturais Renováveis
IBGE	Brazilian Geography and Statistics Institute	Instituto Brasileiro de Geografia e Estatística
ICMBio	Chico Mendes Institute for Biodiversity Conservation	Instituto Chico Mendes para a Conservação da Biodiversidade
ICMS	Merchandise Circulation and Services Tax	Imposto sobre Circulação de Mercadorias e Serviços
ILAC	Sustainable Development Initiative for Latin America and the Caribbean	Iniciativa Latino-Americana e Caribenha para o Desenvolvimento Sustentável
IMCAM	Integrated Marine and Coastal Areas Management	Gerenciamento Integrado das Áreas Marinhas e Costeiras

INCRA	National Institute for Colonization and Agrarian Reform	Instituto Nacional de Colonização e Reforma Agrária
INPE	National Space Research Institute	Instituto Nacional de Pesquisa Espacial
IPEA	Applied Economic Research Institute	Instituto de Pesquisa Econômica Aplicada
IPEF	Forestry Science and Research Institute	Instituto de Pesquisas e Estudos Florestais
IT PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture	Tratado Internacional sobre Recursos Fitogenéticos para Alimentação e Agricultura (TIRFAA)
ITTO	International Tropical Timber Organizarion	Organização Internacional de Madeiras Tropicais
IUCN	International Union for Nature Conservation	União Internacional para a Conservação da Natureza
JBRJ	Rio de Janeiro Botanical Garden	Instituto de Pesquisas Jardim Botânico do Rio de Janeiro
MCT	Ministry of Science and Technology	Ministério de Ciência e Tecnologia
MMA	Ministry of the Environment	Ministério do Meio Ambiente
NatInEx	National Catalogue of *in situ* and *ex situ* Forest Genetic Resources Conservation & Improvement Projects	Catálogo Nacional de projetos *in situ* e *ex situ* de conservação e melhoramento de recursos genéticos florestais
NBSAP	National Biodiversity Strategy and Action Plan	Estratégia e Plano de Ação Nacional para a Biodiversidade (EPANB)
NGO	Non-Governmental Organization	Organização Não-Governamental
PA	Protected Areas	Áreas Protegidas (Unidades de Conservação)
PAE	Program to Support the Production and Commercialization of Extractive Products	Programa de Apoio à Produção e Comercialização de Produtos Extrativistas
PIB	Gross National Product	Produto Interno Bruto
PMFS	Plano de Manejo Florestal Sustentável	Sustainable Forest Management Plan
PNAP	National Protected Areas Plan	Plano Nacional de Áreas Protegidas
PNB	National Biodiversity Policy	Política Nacional de Biodiversidade
PNRH	National Water Resources Policy	Política Nacional de Recursos Hídricos
PPA	Federal Multi-Year Plan	Plano Plurianual Federal
PROBIO	Brazilian Biodiversity Conservation and Sustainable Use Project	Projeto de Conservação e Uso Sustentável da Biodiversidade Brasileira
PROBIO II	National Biodiversity Mainstreaming and Institutional Consolidation Project	Projeto Nacional de Transversalização da Biodiversidade e Consolidação Institucional
PRODES	Legal Amazon Deforestation Monitoring Project	Projeto de Monitoramento do Desflorestamento na Amazônia Legal
RAPPAM	Rapid Assessment and Prioritization of Protected Area Management	Método de avaliação rápida e priorização da gestão de áreas protegidas
REDD	Reduction of Emissions from Deforestation and Degradation	Redução das Emissões por Desmatamento e Degradação
RENASEM	National Register of Seeds and Saplings	Registro Nacional de Sementes e Mudas
RL	Legal Reserve	Reserva Legal
RPPN	Private Reserve of the Natural Heritage	Reserva Particular do Patrimônio Natural
SAE	Strategic Environmental Assessment	Avaliação Ambiental Estratégica
SBF	Secretariat of Biodiversity and Forests	Secretaria de Biodiversidade e Florestas
SFB	Brazilian Forest Service	Serviço Florestal Brasileiro
SINIMA	National Environmental Information System	Sistema Nacional de Informações sobre o Meio Ambiente
SISBIO	Biodiversity Information System	Sistema de Informação sobre Biodiversidade
SISNAMA	National Environment System	Sistema Nacional de Meio Ambiente
SNIF	National System of Forest Information	Sistema Nacional de Informações Florestais
SNUC	National Protected Areas System	Sistema Nacional de Unidades de Conservação
Spp	Species (plural)	Espécies
TI	Indigenous Land	Terra Indígena
UCUC	Protected Area(s) (under SNUC)	Unidade(s) de Conservação (áreas protegidas no âmbito do SNUC)
UM	United Nations	Organização das Nações Unidas
UNEP	UN Environmental Program	Programa das Nações Unidas para o Meio Ambiente (PNUMA)
UNESCO	UN Organization for Education, Science and Culture	Organização das Nações Unidas para a Educação Ciência e Cultura
USP	University of Sao Paulo	Universidade de São Paulo

LIST OF FIGURES

The Federative Republic of Brazil is the largest country in South America. The total area of the Brazilian territory is 8,547,403 km², surpassed only by Russia, Canada, China and the United States. Brazil is bordered by ten South American countries, counterclockwise from the North: French Guiana, Suriname, Guyana, Venezuela, Colombia, Bolivia, Peru, Paraguay, Argentina and Uruguay. To the East, the Atlantic Ocean washes the Brazilian shores and several island groups.

North-South and East-West distances are similar and impressive, 4,395 km (5°16'20" N to 33°45'03" S) and 4,319 km (34°47'30" E to 73°59'32 W). Brazilian geographical perimeter sums 23,086 km, of which the Atlantic coastline accounts for 7,367 km. Historically, land use and occupation started in the Eastern coastal part of the country where most of the population lives. The Brazilian Institute of Geography and Statistics (IBGE), based on a 2010 national census (IBGEa, 2011), estimates the Brazilian population at 190.73 million people. In recent years, there has been considerable migration to large urban centers, where approximately 77% of the country's population lives.

The climate is predominantly tropical in most of the country, given that 92% of its territory lies between the Equator and the Tropic of Capricorn. The equatorial climate prevails in the North and Northwestern regions, where temperatures range between 24 and 26 °C and rainfall averages above 2,500 mm/year (the highest rainfall rates in Brazil). The tropical climate prevails in the Central Plateau, and parts of Northeastern and Southeastern parts of Brazil. This climate is characterized by two distinct rain seasons during the year, both warms, with average temperature above 20 °C. The annual rainfall varies from 1,000 to 1.500 mm/year. The vegetation in this type of weather resembles savannahs, with thick bark shrubs and grasses. In areas adjacent to rivers, riparian forests are constantly present.

In highest regions located in the Southeastern areas of the Central Plateau, close to the Atlantic coast, the prevailing climatic aspect is referred to as Tropical of Altitude. This type of climate is characterized by average temperatures that vary between 18 and 22 °C, with annual varying from 1,000 to 1,500 mm/year. The so-called Tropical Atlantic climate prevails in almost all the Brazilian coastline. The average annual temperature variation ranges between 18 and 26 °C, with an average rainfall of 1,200 mm/year. Less than four centuries ago, Araucaria forests in most of the highlands of the Southeastern regions of the Central Plateau and tropical rainforests in the coast were dominant, but intensive use and human occupation have gradually devastated and fragmented these forests, which represent today less than 10% of the current vegetation cover type.

A semi-arid climate prevails in the northeastern backlands, including the valley of the São Francisco River. Rainfall of these areas is the lowest in the country, with an average of less than 800 mm per year. In contrast, average annual temperatures correspond to the highest in Brazil, varying by around 27 °C. The characteristic vegetation resembles the African savannas, with contorted and thorny bushes cetaceous plants.

The region with the coldest temperatures in Brazil is located south of the Tropic of Capricorn. The subtropical climate of these regions average temperatures below 20 °C, with rainfall ranging between from 1,500 to 2,000 mm per year. The coldest winters in Brazil are confined to these areas, where even snow showers have been frequently observed if elevation is above 1.800 m. The dominant vegetation type is the Araucaria forest in areas of higher elevation and grasses in places with lower elevations as in the Pampas and Southern Peripheral Depression.

Brazilian Biomes

Edaphic and climatic aspects command most of the ecological systems that cover with life the Brazilian continental territory. The resulting landscape, although immensely diverse in a micro scale, is usually represented in a macro scale as a contiguous set of six adjacent patches called biomes, the Northern Amazon, the Central Cerrado, the Northeastern Caatinga, the Eastern Atlantic Forest, the Southern Pampa and the Western Pantanal. One additional biome, the Coastal and maritime zone, although ecologically and economically important, is less relevant for the purposes of this report. For consistency, the State of Plant Genetic Resources report prepared by EMBRAPA (Mariante et al., 2009) is used for a brief description of each biome, and total area was estimated based on MMA (2007):

Amazon

4,245,024 km²

This biome covers 48.1% of the Brazilian territory. The average yearly rainfall is 2,000 to 3,000 mm, with places where the average can raise up to 4,500 mm. Most of the landscape is flat, with annual temperatures averaging around 26 to 28 °C. The most common vegetation cover type are "terra firme" broadleaf forests, comprising large areas covered by deciduous or semi deciduous forests, flooded forests associated with eutrophic ("várzeas") or oligotrophic ("igapós") river systems, savannahs that may or may not be Cerrados, and sclerophytic vegetation on sandy soils, similar to the north-eastern Caatinga. The Amazon region has approximately 14,000 species of vascular plants, among which 3,000 may be of some economical interest. The Amazon is the centre of origin for cocoa (*Theobroma cacao*), rubber tree (*Hevea spp.*), Brazil nut (*Bertholletia excelsa*) and peach palm (*Bactris gasipaes*). Over 280 species of native fruits have been reported, with the endemic guarana (*Paullinia cupana*), cupuaçu (*Theobroma grandiflorum*), açai (*Euterpe oleracea*) and camu-camu (*Myrciaria dubia*) slowly entering international markets. More than 600 species might be of some timber interest, with 65 being already commercially harvested. Among the most valuable species, mahogany (*Swietenia macrophylla*) and rosewood (*Aniba rosaeodora*) are considered endangered. The forest formations in the Amazon are habitat to one critically threatened (*Nycticalanthus speciosus*), one threatened (*Aniba rosaeodora*) and nine vulnerable tree species (*Amburana cearensis*, *Bertholletia excelsa*, *Dicypellium caryophyllaceum*, *Eschweilera piresii*, *Eschweilera subcordata*, *Gustavia erythrocarpa*, *Rhodostemonodaphne parvifolia*, *Rhodostemonodaphne recurva* and *Swietenia macrophylla*).

Cerrado

2,052,708 km²

This is a mosaic of many vegetation cover types where the most distinctive characteristic is its rainfall distribution. Two annual seasons, rainy and dry, both lasting five to seven months, result in an average yearly precipitation of around 1,500 mm. The Cerrado is often associated with flat plateaus and deep, friable soils of low natural fertility. The natural vegetation is characterized by an open savannah dominated by grasses, sedges and other herbaceous species interspersed by low trees and shrubs. Many gradients of Cerrado coexist, from open grasslands ("campo limpo") to patches of fairly tall trees, known as "cerradão". A distinctive Cerrado feature is the fact that most of its tree species are gnarled and with very thick bark. Other types of vegetation are gallery forests along water courses, mesophytic forests, such as South-eastern peripheral savannahs and the Amazonian savannahs, as well as local formations, such as permanent and seasonal marshes, veredas, and "campos de murunduns". Approximately 13 thousand taxa of vascular plants are reported in this biome, many of which also occur in other biomes. Among the timber species, the most important are *Hymenaea courbaril*, *Blepharocalyx salicifolius*, *Ocotea spp.*, *Pterodon emarginatus*, *Copaifera langsdorffii*, *Myracrodruon urundeuva* and *Calophyllum brasiliense*. Common fruit bearing species are pequi (*Caryocar brasiliense*), mangaba (*Hancornia speciosa*), baru (*Dypterix alata*), araticum (*Annona crassiflora*), gabiroba (*Compomanesia cambessedeana*) and cagaita (*Eugenia dysenterica*). The Cerrado is habitat to one critically threatened (*Dimorphandra wilsonii*), two threatened (*Pilocarpus microphyllus* and *Vellozia gigantea*) and fourteen vulnerable tree species (*Byrsonima macrophylla*, *Christiana macrodon*, *Eremanthus argenteus*, *Eremanthus seidelii*, *Euplassa semicostata*, *Huberia piranii*, *Hyptidendron claussenii*, *Lychnophora ericoides*, *Paralychnophora bicolor*, *Pilocarpus trachylophus*, *Pilosocereus fulvilanatus*, *Schinopsis brasiliensis*, *Syagrus ruschiana* and *Wunderlichia crulsian*).

Atlantic Forest

1,129,760 km²

The Atlantic Forest biome houses 70% of the Brazilian population as well as the largest cities and industries in the country. Extending from Rio Grande do Norte southward to Rio Grande do Sul, along a narrow fringe between the ocean and the dry uplands, only 2-5% of the Atlantic Forests' original 1,360,000 km² is still in its original state. The Atlantic Forest is also a complex mosaic of vegetation types, including mangroves, coastal "restinga" forests, mesophytic forests, low and high altitude mountain forests, rainforests, liana forests and high altitude savannahs ("campos rupestres" and "campos de altitude"). According to Conservation International, it is one of the 25 world hotspots, as it occupies the fourth place in amphibian and vascular plant diversity: a total of 1,807 species of mammals, birds, reptiles, and amphibians occur in the region, of which 389 are endemic. Flora of the Atlantic Forest is one of the oldest in the world, with many relic elements of the Gondwana flora and may be the centre of origin of many neotropical taxa. Over 50% of the tree species are thought to be endemic to the Atlantic Forest, including the genera Rodriguesia, Arapatiella, Harleyodendron (Fabaceae), Santosia (Asteraceae). The Atlantic Forest has a large number of intensively used tree species, among which are ipe (*Tabebuia spp.*), peroba (*Paratecoma peroba*), cedar (*Cedrela odorata*), vinhatico (*Plathymenia reticulata*), aderno (*Astronium concinnum*), pinheiro-do-paraná (*Araucaria angustifolia*) and putumuju (*Centrolobium microchaete*). Two species are especially important, pau-brasil (*Caesalpinia echinata*) and jacaranda (*Dalbergia nigra*). Both are endangered due to over-exploitation. In the southern states of Paraná, Santa Catarina and the Northern half of Rio Grande do Sul, this biome widens toward West and encompasses significant ranges of forests dominated by *Araucaria angustifolia*. The Atlantic Forest is habitat to four critically threatened tree species (*Duguetia restingae, Malmea obovata, Plinia complanata, Trattinnickia ferruginea*), forty four threatened and ninety two vulnerable tree species (see complete list in Table).

Caatinga

852,261 km²

The Caatinga biome is located in the semi-arid Northeastern Region of Brazil. It covers nine states and corresponds to approximately 10% of the country's territory. The annual precipitation is highly irregular and varies from 200 to 800 mm (rarely reaching 1,000 mm), with a 3-5 month rainy season and a 7-9 month dry season. Temperatures are isothermal, with averages between 25° and 29 °C. Most tree species in the Caatinga lose their small and firm (xeric) leaves during the dry season, present intense branching from the base (giving them a shrubby appearance). The presence of cactaceous and crassulaceous species is intense. Two main types of caatinga are usually described in the literature: a dry caatinga (sertão) in the countryside and a more humid caatinga (agreste) toward the coast. Many species are valuable edible fruit sources, such as *Talisia esculenta*, *Spondias mombin* (umbu), *Spondias tuberosa*, *Lecythis pisonis*, *Manilkara rufula* (massaranduba), and *Hancornia speciosa* (mangaba). There are important timber species, some of which also occur in other biomes, including angico (*Anadenanthera colubrina*), joazeiro (*Ziziphus joazeiro*), amburana (*Amburana cearensis*), aroeira (*Astronium graveolens*, *Astronium fraxinifolium and Myracrodruon urundeuva*), ipe (*Tabebuia impetiginosa* and *Tabebuia aurea*), and brauna (*Schinopsis brasiliensis*), as well as those found in patches of other types of vegetation, such as cedar (*Cedrela odorata*), Brazilian tulipwood (*Dalbergia frutescens*), morototó (*Schefflera morototoni*) and angico-branco (*Albizia polycephala*). Among the medicinal plants, the most important is jaborandi (*Pilocarpus jaborandii*) which, together with *Amburana cearensis*, is officially listed as being endangered. Palm trees are of special importance, since they constitute the backbone of the local domestic economy in many parts of Northeastern Brazil. Rural populations rely heavily on the collection of babaçu (*Orbignya phalerata*), carnaúba (*Copernicia prunifera*), tucum (*Astrocaryum aculeatissimum*) and, to a lesser extent, macauba (*Acrocomia aculeata*) and many species of *Syagrus*, *Scheelea*, and *Attalea*. The Caatinga is habitat to four critically threatened (*Jacaranda rugosa, Pilosocereus azulensis, Sparattosperma catingae* and *Tabebuia selachidentata*), two endangered (*Byrsonima blanchetiana, Espostoopsis dybowskii*) and eleven vulnerable tree species (*Amburana cearensis, Chloroleucon extortum, Erythroxylum maracasense, Facheiroa cephaliomelana, Godmania dardanoi, Leucochloron limae, Paralychnophora bicolor, Pereskia aureiflora, Schinopsis brasiliensis, Simira gardneriana, Tabebuia spongiosa*).

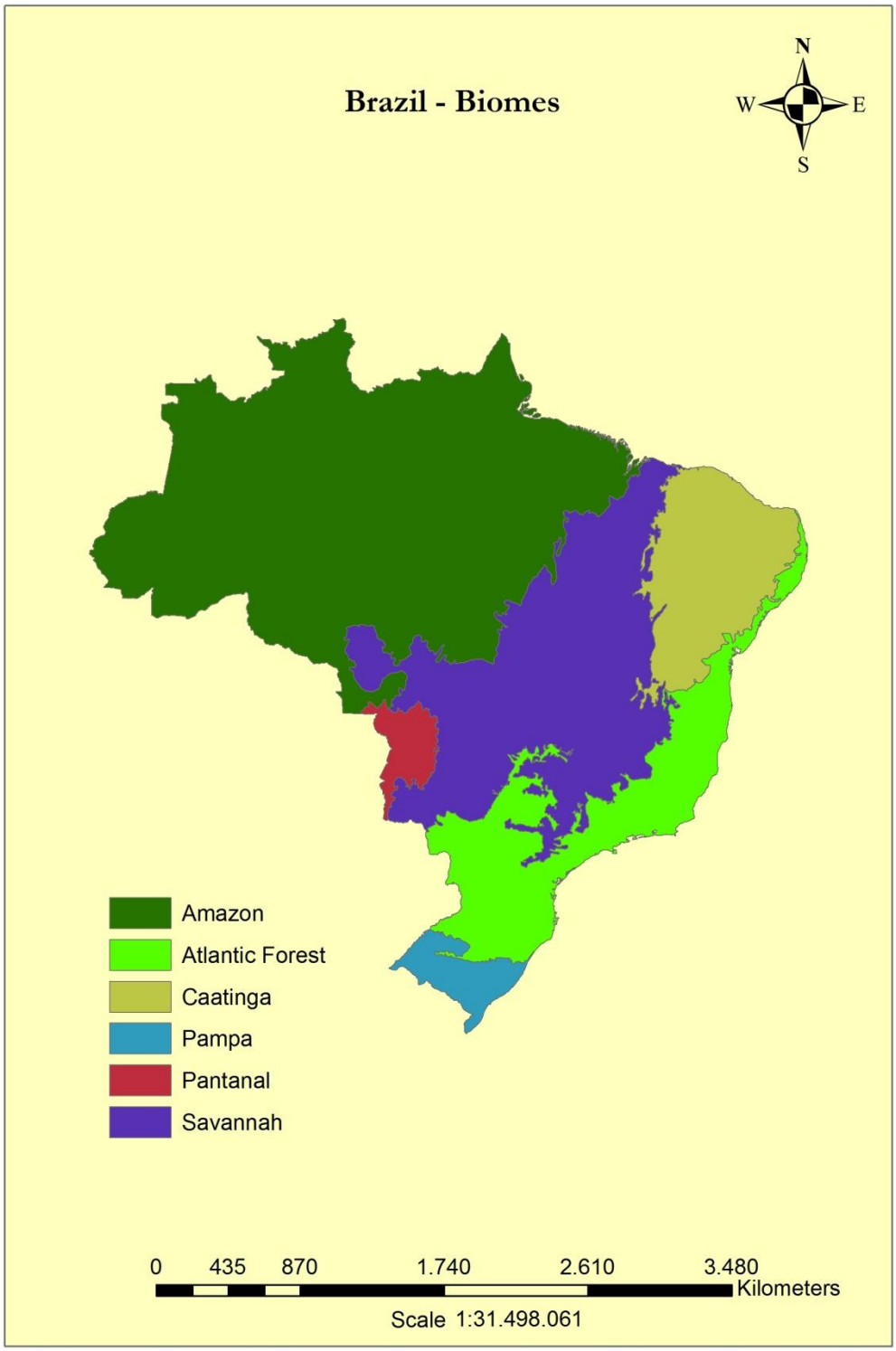

Figure 1: Brazilian Biomes (*Source: IBGE, 2004*)

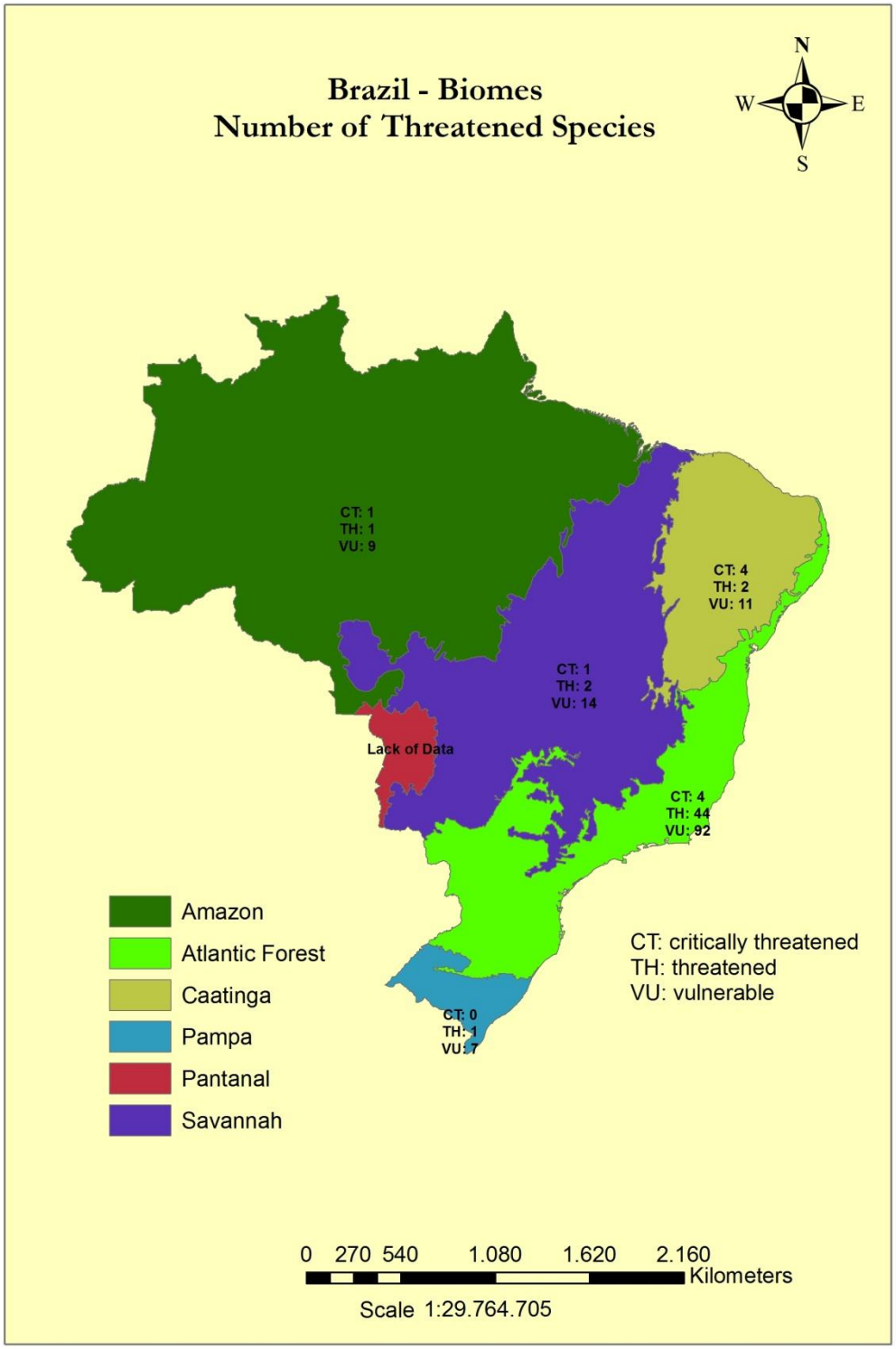

Figure 2: Number of threatened species per biome

Pampa

178,820 km²

The southern grasslands (Pampas) constitute a biome with open formations, covered almost exclusively with herbaceous species, mainly grasses, with some sparse trees and shrubs next to streams or in thick tree-shrub formations in areas with a more undulating relief. It is essentially located in the southern half of Rio Grande do Sul State, but extends also into neighboring Argentina and Uruguay. Its climate is subtropical, with mild temperatures, rainy, and with little variation through the year. The soils are generally fertile and extensively used for agriculture, mainly flooded rice crops. The best herds of European cattle breeds in Brazil are found in this region, based mainly on natural open grasslands, rich in grasses and high quality native fodder legumes, to which have been added winter cultivated grazing lands, based on European exotic species, such as ryegrass (*Lolium multiflorum*), annual clovers (*Trifolium* spp.) and bird's foot trefoil (*Lotus corniculatus*). In the Brazilian part of this biome, there are about three thousand species of vascular plants, of which approximately 400 are grasses, with the dominance of *Paspalum*, *Axonopus* and *Andropogon*. In recent years, temperate fruit production, previously concentrated on peach, has made significant progress, further increasing pressure on native vegetation. Lately, forestry companies have also expanded their activities in the region, replacing natural grasslands with eucalyptus plantations for pulp production. The Pampa is habitat to one endangered tree species (*Gleditsia amorphoides)* and seven vulnerable tree species (*Butia eriospatha, Butia yatay, Euplassa nebularis, Myracrodruon balansae, Prosopis affinis, Prosopis nigra, Trithrinax brasiliensis*)

Pantanal

151,353 km²

The Pantanal is a geologically depressed region, which is gradually and heterogeneously filled with various sediments coming from its periphery, resulting in a mosaic of diverse environments. The sources of waters for the Pantanal are in the Cerrado, and its terrestrial biota is closely linked to the Cerrado biome. This vast sedimentary plain is located in the basin of the Paraguay River and includes territorial areas of three different countries: Brazil, Bolivia, and Paraguay. The water cycle controls life in the Pantanal, where the annual floods in the region are due to pluvial and fluvial water. The annual average rainfall is around 1,100 mm, with two well defined seasons: rainy, from October to March, and dry, from April to September. The main activity is beef cattle, with a herd of about four million heads. Arable farming is not very important in this region, except for subsistence crops. Other remarkably important economic activities are fishing, tourism, and mining. Despite its high economic potential, flora and fauna resources are not intensively explored. The Pantanal flora is constituted by species also found in the Cerrado, Atlantic Forest and Amazon, with few endemic species. Over 10,000 plant species have been catalogued in this biome, including around 200 used to feed humans and animals. The vegetation varies significantly and is determined by local soils and floods. Patches of vegetation are found around borders of temporary or permanent lakes of various sizes. One tree species, *Vochysia divergens*, prevails in flooded areas forming the peculiar "cambarazal", a flooded forest of one single species that blossoms uniformly once a year in intense yellow; "campos" or floodplains dominated by grasses, which are the most important elements in the Pantanal; and "capão" or patches of trees that form islands in the "campos".

Brazilian forests

Brazilian forests attract national and international attention because of its coverage extent and associated values, particularly in terms of diversity. The conservation and monitoring of genetic resources in Brazilian native forests is undoubtedly of great importance, but also important is the role of genetic diversity in Brazilian forest plantations, a very strategic source of economic development in Brazil.

A precise description of how large and diverse native forests and forest plantations are in Brazil has been one of the focuses of the recently created Brazilian Forest Service (SFB, 2011). Still, most of the information regarding forest resources has been produced at the sub-national level, and managed by several different state and federal institutions. A national effort, coordinated by the Ministry of Environment, to congregate different institutions and harmonize the gathering and processing of forest information, and to validate information officially requested by national and international organizations, has been assigned to the Brazilian Forest Service.

Created in 2006, under the Ministry of Environment (MMA), SFB is organizing and maintaining the National Forest Information System (SNIF). SNIF is being developed to collect, produce, organize, store, process and disseminate data, information and knowledge on forests to subsidize projects and policies that combine the use and conservation of forests in Brazil.

One way to simplify complexity is to categorize and subdivide the context in which information is viewed. This report treats the information describing the state of the forest genetic diversity in seven different contexts. Each one of the six major biotic regions in Brazil, characterized by different prevailing climates and dominant communities of plant forms, is referred to as a *biome*, and is used to categorize and organize the information provided about the respective forest genetic diversity. Therefore, whenever possible, this report referrers to the following six biomes: Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal and Pampa. A seventh context relates to industrial forests, or more specifically forest plantations and related forms of trees cultivation schemes.

There is an enormous amount of information currently available in Brazil dealing with all aspects of biological diversity. In fact, this is not a surprising outcome if taken into consideration the number of Universities, Research Institutions, Governmental and Non-Governmental Organizations and experts already established in the country. In less than ten years Brazil will reach a population of more than two hundred million people, and will be among the five largest GDPs in the world. Consistent investments made since the 50´s have developed science, technology and innovation in the country, which have matured and induced new waves of investments and developments. The consolidation of public and private institutions, and improvements in participatory governance systems, have also contributed to the existence and development of efficient, and very sophisticated public and private world class research facilities in Brazil. The outcome is an incredibly rich myriad of information dealing with several aspects of flora, fauna and mineral resources in the country. On the other side, studies have only barely scratched the surface of the mega diversity found in Brazil, and still there is a lot to be done.

Most of the work already done in studying biodiversity in Brazil is a beginning phase. Basically, the strategy used in this report to systematize the available information relies on an extensive literature review, meetings and correspondence with experts, processing of geographical data provided by the Brazilian Forest Service (SFB) and the Brazilian Geography and Statistics Institute (IBGE) and compilation of information published in governmental reports. Seminal reports have already been published by MMA, EMBRAPA and IPEF (Institute for Forest Research and Studies), and should be read in conjunction with this report for a more comprehensive treatment of the issues contemplated here. These documents are listed in the Bibliography section.

Complementary, the MMA has also issued the Administrative Ruling n° 9, of 23 January 2007, with the Priority Areas for the Conservation, Sustainable Use and Benefit Sharing of Brazilian Biological Diversity. This updated list of Priority Areas has been useful for guiding public policies, for licensing purposes, in bidding processes for concessions of oil extraction by the National Oil Agency – ANP, for guiding research and bidding processes for the Project on the Conservation and Sustainable Use of Brazilian Biological Diversity – PROBIO/MMA, and for the National Environment Fund – FNMA/MMA, and for the creation of new federal and state protected areas.

Table 1: FRA 2010 Categories and definitions

Category	Definition
Forest	Land spanning more than 0.5 hectare with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as "Forest", spanning more than 0.5 hectare; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds *in situ*; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as "Forest" or "Other wooded land".
Other land with tree cover	Land classified as "Other land", spanning more than 0.5 hectare with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

The PROBIO initiative has resulted also in the completion of a vegetation map known as the PROBIO map, or Map of the Vegetable Cover of Brazilian Biomes (MMA, 2007) in the scale of 1:250,000. The PROBIO map has been used as the main source of information for the FAO Global Forest Resources Assessment 2010 – Brazilian Country Report - FRA2010 (FAO, 2009). For the sake of consistency, data from FRA 2010 is reproduced here to summarize categories and definitions (Table 1, Table 2 and Table 5), forest type areas (Table 3), primary designated functions (Table 4) and forest ownership areas (Table 6).

Table 2: FAO Forest Categories and corresponding national classes and vegetation typologies

Categories	Definition (IBGE vegetation typologies)
Natural Forests	Dense Humid Forests (Alluvial, Lowland, Submontane, Montane or High Montane Dense Humid); Open Humid Forests (Alluvial, Lowland, Submontane or Montane Open Humid); Mixed Humid Forests (Alluvial, Submontane, Montane or High Montane Mixed Humid); Semi deciduous Seasonal Forests (Alluvial, Lowland, Submontane or Montane Semi Deciduous Seasonal); Decidual Seasonal Forests (Alluvial, Lowland, Submontane or Montane Deciduous Seasonal); Campinarana (Forested or Wooded); Savannah (Forested or Wooded); Steppe Savannah (Forested or Wooded); Steppe (Tree Steppe); Pioneer Formations (Forest Vegetation Marine or Fluviomarine Influenced); Transitional Zones (Humid to Mixed, Humid to Seasonal, Seasonal to Mixed, Seasonal to Pioneer, Campinarana to Humid, Savannah to Humid, Savannah to Mixed, Transition to Seasonal, Savannah to Steppe, Savannah to Pioneer or Restinga, Steppe Savannah to Seasonal, Steppe to Mixed, Steppe to Seasonal, Savannah to Steppe Savannah to Seasonal Forest); Secondary Vegetation; Forest Plantations
Other wooded land	Shrubby Campinarana, Fluvial and/or Lacustre Influenced Vegetation, Park Savannah, Park Steppe Savannah, Shrubby Vegetation Marine Influenced, and Montane, High Montane or Submontane Vegetational Refuge
Other land Anthropic Areas	Disturbed areas, Herbaceous Vegetation Marine and Fluviomarine Influenced, Woody-grass Campinarana, Savannah and Steppe Savannah, Park Steppe and Woody Grass Steppe
Inland water bodies	Rivers, lagoons, lakes, and reservoirs

The data on forest plantations for 1990 and 2000 was taken from the FRA 2005. For 2005 and 2010, it was calculated based on the data provided by the ABRAF Statistical Yearbooks of 2006, 2007, 2008, and 2009 (Brazilian Association of Forest Plantation Producers).

Table 3: Forest types and area

Forest types	Area (ha)			
	1990	2000	2005	2010
Natural Forests				
Amazon	379,938,052	367,725,556	359,535,618	354,389,794
Cerrado	90,335,526	79,578,029	74,651,865	70,007,832
Caatinga	53,128,701	49,860,012	48,294,387	46,774,120
Atlantic Forest	32,103,082	30,419,910	29,609,122	28,818,263
Pantanal	10,492,296	9,477,874	9,005,166	8,554,246
Pampa	3,856,966	3,706,028	3,632,615	3,560,541
Sub-total	**569,854,624**	**540,767,409**	**524,728,772**	**512,104,797**
Other Wooded Land				
Amazon	8,990,736	8,701,743	8,502,998	8,370,908
Cerrado	42,033,186	37,027,715	34,735,567	32,574,696
Caatinga	650,519	610,496	591,326	572,712
Atlantic Forest	903,298	855,938	833,124	810,872
Pantanal	1,338,051	1,208,684	1,148,401	1,090,897
Pampa	381,534	366,603	359,341	352,212
Sub-total	**54,297,324**	**48,771,180**	**46,170,758**	**43,772,295**
Planted forests				
Pinus spp	1,769,000	1,840,050	1,831,000	1,923,000
Eucalyptus spp	2,964,000	2,965,880	3,463,000	4,913,800
Araucaria angustifolia	18,000	13,341	24,235	8,200
Tectona sp	14,000	50,000	50,000	67,072
Mimosa scabrella	50,000	50,000	50,000	50,000
Populus sp	2,500	5,000	5,600	8,299
Acacia sp	100,000	150,000	178,377	184,304
Hevea brasiliensis	63,641	96,587	115,595	173,557
Schizolobioum amazonicum			41,100	82,252
Others	3,000	5,048	6,072	7,096
Sub-total	**4,984,141**	**5,175,906**	**5,764,979**	**7,417,580**
Total	**629,136,088**	**594,714,494**	**576,664,509**	**563,294,673**

Table 4 summarizes statistics on forested area according to primary designated functions. Basically, total areas should match values presented in Table 1, but differences still persist and convergence is in course as systematization methods are improved by Brazilian institutions. Anyhow, although slightly different values are still detected, an important trend can be observed in terms of total area assigned for biodiversity conservation.

Table 4: Primary designated function

Function category	Forested area (ha)			
	1990	2000	2005	2010
Production	12,754,000	15,215,000	20,322,000	34,251,000
Protection of soil and water	42,574,000	42,574,000	42,574,000	42,574,000
Conservation of biodiversity	19,869,000	22,746,000	35,464,000	46,966,000
Social services	30,331,000	94,848,000	115,260,000	119,193,000
Multiple use	2,113,000	13,845,000	17,195,000	20,776,000
No / unknown	467,197,000	356,715,000	299,678,000	255,760,000
Total	**574,839,000**	**545,943,000**	**530,494,000**	**519,522,000**

The increase in area for biodiversity conservation in Brazil is due to an expansion determined by the Federal Government in two groups of conservation units: Integral Protection Units (Ecological Stations, Biological Reserves, National Park, Natural Monuments and Wildlife Refuges) and Conservation Units for Multiple Use and for the provision of Sustainable Management and Social Services by Traditional Communities (Areas for Environmental Protection, Areas of Relevant Ecological Interest, National

Forests; Extractive Reserves; Wildlife Reserves, Sustainable Development Reserves and Natural Heritage Private Reserves).

Table 5: Forest ownership categories

Ownership Categories	Definition
Public	Forest owned by the State; or administrative units of the public administration; or by institutions or corporations owned by the public administration, including forests with management rights transferred to communities (group of individuals belonging to the same community residing within or in the vicinity of a forest area; community members are co-owners that share exclusive rights and duties, and benefits contribute to the community development; and indigenous/tribal communities)
Private	Forest owned by individuals and families, by communities (areas of quilombola communities with legal title), by private co-operatives, corporations and other business entities, by private religious and educational institutions, by pension or investment funds, NGOs, nature conservation associations and other private institutions (in such cases, woods and forests declared in recent census assessments as part of agricultural properties; also includes areas where ownership is unclear or disputed).
Holders of management rights on public forests	Public Administration or institutions or corporations owned by the Public Administration (retains management rights and responsibilities within the limits specified by the legislation); Individuals/households (rights and responsibilities are transferred from the Public Administration to individuals or households through long-term leases or management agreements); Private institutions (management rights and responsibilities are transferred from the Public Administration to corporations, other business entities, private cooperatives, private non-profit institutions and associations, etc., through long-term leases or management agreements); Communities (management rights and responsibilities are transferred from the Public Administration to local communities, including indigenous and tribal communities through long-term leases or management agreements); other form of management rights.

Information on forest ownership at the national level is not available from official land management agencies in Brazil. Area was indirectly estimated and calibrated using the sum of the areas of forests and woods of (private) agriculture and livestock establishments derived from the results of the Brazil-Agriculture and Livestock Census carried out by the IBGE. The results were submitted to FRA 2010 and are summarized in Table 6.

Table 6: Forest ownership and area

Forest Ownership Type	Area (ha)		
	1990	2000	2005
Public			
Public Administration	444,786,000	331,128,000	271,186,000
Holders of management rights			
Extractivist Federal Reserves	2,162,989	3,490,047	8,473,222
Extractivist State Reserves		49,001	887,937
Sustainable Development Federal Reserves			64,735
Sustainable Development State Reserves	1,310,802	4,398,809	9,572,548
Indigenous Lands [(1)]	28,458,000	91,861,000	105,485,000
Forest areas in agrarian reform settlements [(2)]	5,991,739	18,199,085	35,664,753
	482,709,000	**449,126,000**	**431,334,000**
Private	**92,130,000**	**96,817,000**	**99,160,000**
Total	**574,839,000**	**545,943,000**	**530,494,000**

(1) Indigenous lands in Brazil are considered of public ownership.

(2) The area of forests in agrarian reform settlements was estimated as 80% of the area of settlements located in the Legal Amazon region (this percentage corresponds to the area of legal reserve which must be maintained as forest by force of law). For the rest of the country, the area was estimated as 20% of the area of settlements (which corresponds to the area of legal reserve in other biomes).

The complexity of Brazil's biodiversity, both marine and terrestrial, has turned its description a very difficult task. It is distributed through biomes such as the Amazon, the world's largest remaining rain forest (40% of the world's tropical forest), 3.7 million km² of which lies within Brazil; the Cerrado of about 2 million km², including high altitude moorlands, the largest extent of savannah in any single country; the Atlantic forest, extending from the south to the north-east of Brazil over an area of more than 1 million km², including mountainous ecosystems, restingas (coastal forests and scrub on sandy soils), mangroves and the Araucaria forests and grasslands in the south, and one of the most important repositories of biodiversity in the country and in the world; the Caatinga, of about 1 million km², a vast semi-arid area in the northeast of Brazil, comprising thorn scrub and deciduous forest, as well as isolated rain forest patches (brejos); the Pantanal of Mato Grosso with about 140 thousand km² in Brazil, and one of the world's most significant wetlands; and the coastal and marine biomes, some 3.5 million km² under Brazilian jurisdiction, with cold waters off the south and south-eastern coasts (Argentinean zone) and warm waters off the eastern, north-eastern and northern coasts (Caribbean zone), supporting a wide range of coastal and offshore ecosystems which include coral reefs, dunes, wetlands, lagoons, estuaries and mangroves. There are numerous subsystems and ecosystems within these biomes, each with unique characteristics, and the conservation of ecotones between them is vital for the preservation of their biodiversity.

In the last few decades economic growth has been accompanied by a significant loss of biological diversity resulting from the occupation and destruction of previously untouched natural ecosystems, the extent of which varies from biome to biome. About 15% of the Amazon forest has now been destroyed, with the opening up of highways, through mining, colonization, and timber exploitation, and with the advance of the agricultural frontier. The loss of the native vegetation of the Cerrado has been estimated at over 40%, likewise through the expansion of agriculture and cattle-ranching, and the dramatic increase in human populations. They have increased six-fold in the past 40 years and now number around 20 million people. Suffering from prolonged droughts, desertification, and soil erosion and salinisation, the Caatinga has lost 50% of its native vegetation. The Atlantic Forest, originally extending along most of the coastal region and well inland in the past, suffers from the highest concentrations of human populations in Brazil. Its widespread destruction over the centuries, and especially over the past decades, now means that only about 8.75% of the original forest cover remains.

A large scale tendency in most of the environmentally hard pressed biomes, in order to ensure the conservation of a large number of forest species over time, is to involve farmers and rural communities in this process. The strategy focuses on the formation of active germplasm banks in the areas assigned by law for protection (permanently preserved areas) and sustainable use (forest legal reserve) in rural properties.

The conservation of exotic forest genetic resources has demanded a comprehensive strategy, involving public and private companies in order to join efforts to collect and store pollen and seeds, to develop and apply biotechnology techniques, such as micro and macro propagation, the conservation of population bases of all introduced species, including those of lower economic value. In addition, to conserve forest species in the field, a large area is required, as well as the maintenance and periodic monitoring and genetic characterization of a significant amount of accesses.

Trends, driving forces and future roles of FGR

The world is about to reach 8 billion people in a couple of decades, a staggering increase of around 2 billion people above the current population. Longer-term projections estimate the end of growth in terms of world population by the second half of the current century, as the world population may reach 9.2 billion in 2075. At the same time, more human beings will have access to food at an increasing rate. As a

result, the world demand for food, fiber, wood, bio fuels and other agricultural products will grow above the population rate.

Problems are foreseen for the world market for wood and fibers. FAO projections (Bruinsma, 2003) estimate that global demand for round wood will increase 60% above current levels in 2030, reaching almost 2.4 billion m3. Paper and paperboard consumption will also increase. On one side, wood-based products have been more efficiently used as in the case of lower volumes of fiber wood needed to produce panels, but, on the other side, its total consumption has doubled since 1970. Industrial round wood and sawn timber consumption has stabilized over the last years, but paper and paperboard has tripled. The main concern is how and where to attend future demand. One may say that the solution will come from planted forests. In such case, estimates are that wood production from planted forests will double from current 400 million m3 to 800 million m3 in 2030.

Demand will pressure the supply for new plantations and forest resources, as well as for cereals and meat. Cereals' production in some developed countries will not satisfy the domestic demand and, as a consequence, these countries will produce less than their needs, becoming even more dependent on imports of cereals, meat and milk.

Previous estimates, before the current global financial slowdown, was predicting a world GDP growing at an annual rate of 3% in between 2006 and 2030 (Silva, 2009), with an estimated 2.5% for developed countries and 4.2% for developing countries. Even now, with lower economic growth rates for developed countries, the net effect together with developing countries growth rates and population growth will still result in increasing food and fiber demands, including energy consumption. Energy demand is expected to grow at an annual rate of 1.2% in between 2005 and 2030. According to projections distributed by one of the largest fossil fuel producers in the world, the four largest energy consuming areas will be the energy generation sector, the industrial sector, transportation and residential, with an increasing demand for low carbon emission fuels, like natural gas and alternative fuels like bio fuels (EXXONMOBIL, 2011).

A promising possibility when analyzing future energy supply is the use of large amounts of biomass for its positive social and environmental impacts, mainly low carbon emission. Considering this increasing-demand scenario for forest and agricultural products, large producer countries, with plenty of arable land, water sufficiency and highly productive cattle ranching activities where efficiency can still be improved by means of subsidies, will be able to attend their domestic market and export their surplus.

And, consequently, it is under such driven forces that Brazil arises like an alternative. According to the Brazilian Institute for Geography and Statistics (IBGE), and the Brazilian Purveyance Company (Conab), agriculture in Brazil uses only 34% of the national territory, more specifically 64 million hectares for agriculture and 220 million hectares for livestock. Forests occupy 445 million hectares, in which only approximately 6 million hectares are planted forests. Available arable land not used yet is estimated to be around 71 million hectares. For the general public, Brazil is seen as the country that still has the possibility to expand its agriculture to almost 11% of its national territory. If only 50 million hectares were really incorporated, Brazilian agricultural output could reach 270 million tons of grains (90 million tons of soybeans included), 900 million tons of sugar cane, 16 million tons of vegetal oils (palm, sun flower and castor beans), 450 million m3 of timber and almost 40 million tons of meat (Scolari, 2006).

Forest wide, Brazil is second to Russia in terms of forested area. Brazilian biomes combined shelter the largest biodiversity in the planet, comprising a huge reservoir of carbon and inducing the country to assume a strategic role as the regional and global climate regulator. A drawback and a deadlock in all this is the fact that the conversion of natural forests into agriculture, cattle ranching, wood harvests, national infrastructure and urbanization result in undesirable levels of deforestation, undesirable net balance for carbon emissions and forest genetic diversity drainage.

Table 7: Brazilian potential to attend world deficits in 2030

Product	Increased world demand (million tons)	Increased Brazilian capacity (million tons)	Percentage of the increase to be potentially supplied by Brazil (%)
Meat	111.79	27.13	24.27
Poultry	33.76	10.92	32.35
Pork	43.60	2.51	5.75
Bovine	26.30	13.70	52.09
Coffee	1.68	1.02	60.71
Cereals	921.00	171.30	18.60
Fibers	7.87	4.30	54.64
Wood	746.50	406.90	54.51
Oil crops	155.96	66.49	42.63
Perennials	70.18	25.00	35.62
Annuals	85.78	41.49	48.37

Source: Scolari (2006)

In 2030, Brazil will be able to contribute with significant shares of the expected increases in world demand for meet, coffee, cereals, fibers, wood and oil crops. This information can be observed in Table 7.

The analysis of the Brazilian production obtained in 2005 and the estimation for 2030, together with the expansion and retraction of the cultivated area in this period, shows an increase in production of 4.46 million tons and a reduction of 0.362 million hectares in planted area. Oil crops and sugar cane for sugar production had jointly an increment of 16.48 million in planted area.

Brazil is also one of the main pulp and paper producers in the world, and a sector reference in terms of sustainable pulp wood production, which is 100% harvested from planted forests, mainly Eucalyptus and Pine. The productivity of these planted forests is the highest among all pulp producers in the market, with an annual average growth of 41 m3/ha/year for Eucalyptus and 35 m3/ha/year for pine plantations (BRACELPA, 2009). This is the result of 30 years of a successful research development and transfer process in a country where the climate is very favorable and private research institutes worked integrated with researchers in universities to generate genetically improved material and advanced silvicultural treatments.

The wood necessary to produce one million annual tons of pulp in Brazil is harvested in 100 thousand hectares. In other parts of the world, like Scandinavia and the Iberia Peninsula, 720 and 300 thousand would be respectively necessary to obtain the same amount. From the almost 6 million hectares with planted forests in Brazil, close to 1.1 million hectares, 0.2% of the national territory, are currently managed to produce pulp and paper.

From an extended projection to 2100, it is shown that starting in 2000 modernly processed biomass started to become one of the main sources of electricity or liquid and gasified fuels. In Brazil, since 1975, sugar cane has been used to produce ethanol as a bio fuel through a program called Pro-Alcool. After an annual investment of US$ 20 million, for a period of 20 years, productivity increased from 3,900 l/ha to 5,100 l/ha in the central and southeastern regions of Brazil. At this rate of investment and increase, productivity is expected to reach 6,000 l/ha in 2030. The Brazilian ProAlcool program can be also seen as a mitigation strategy that has contributed to reduce CO2 emissions by substituting fossil fuels and carbon sequestration in the plantations. From 1987 to 1996, 115.9 million units of ethanol were produced replacing 92.7 million units of gasoline. If burned, this amount of gasoline would transfer 79.5 million tons of carbon into the atmosphere. In terms of land use and carbon emission, the ethanol production

program in this period occupied 2.87 million hectares and transferred only 24.9 tons of carbon into the atmosphere.

Brazil is a forested country with 10% of the world forests (4.8 million km^2), the second largest national covered area after Russia. Brazilian forests are home to the largest biodiversity in the planet, distributed in six biomes. These six Brazilian biomes have already been differently affected by human activities. Rough estimates of highly aggregated data about the way these biomes have been affected do exist and can be briefly summarized. The largest biome, the Amazonian region, covers 49% of the Brazilian territory and is home to 50% of the world biodiversity that constitutes and recycles an average of 15 to 20 thousand tons of carbon per square kilometer in a complex interaction with the largest hydrological net of rivers representing 15% of the world superficial non-salty water. In the Amazon region, almost 17% of the forested area has already been converted to other uses. The Atlantic Forest biome, one of the most threatened in the world, occupies 13% of the Brazilian territory and after centuries of occupation and intensive use has contributed to produce most of the current wealth and development observed in the Brazilian economy. The Caatinga, Pantanal, and Pampa biomes, accounting for almost 14% of the national territory, have also contributed to the development of very different regions and cultures in Brazil by converting 40%, 14%, and 59%, respectively, of its natural cover type to other uses. Finally, the Cerrado, a Savannah like extensive area covering 23% of the Brazilian territory, has already converted more than 40% of its original cover type into other land uses and the conversion rate is estimated to be the highest in Brazil. In 15 years (1990 to 2005), Brazil has lost approximately 420 thousand km^2 of all its native forests, at an average annual rate of 28.4 thousand km^2.

In the six biomes, native forests have an essential role. They preserve natural biodiversity, provide environmental services and generate income and labor to millions of Brazilians. For instance, in the Amazon, wood and non-wood products are essential to the development of local communities and as a source of income and jobs, but its contribution to the national forest economy is almost insignificant. At the same time, the services provided by these natural forests result immensely valuable. Besides the tangible economical value, these forests are home to many vital environmental functions that preserve soils and water, and maintain a delicate climate balance that regulates water distribution over a huge network of rivers and govern rain fall in scales beyond each biome and even Brazilian borders. Forests also provide many social and cultural services, especially for traditional communities and native Indians.

In terms of tangible products, native forests in Brazil contribute with a complex web of economical activities that generate a gross annual income of R$ 75 billion. The main economical activity is the production of processed solid wood for the internal market. The Amazon region is responsible for processing approximately 85% of all national processed solid wood. In 2006, the forest sector as a whole, including planted forests, contributed with 3.5% to the national GDP and with 5.9% to exports, creating a commercial surplus of 14.5% (IBGE, 2007).

Economical pressure over native forests and degradation of natural resources, especially forests, come in different forms and intensity. The main sources of pressure are the expansion of agriculture, unregulated timber exploitation, mining, land reform and landless settlement projects, illegal occupation of lands, national infrastructure expansion, industrialization, urbanization, uncontrolled burning and unregulated extraction of non-wood products. Main impacts are deforestation, carbon emission, forest fragmentation, degradation of natural resources and climate changes. Social impacts are poverty, life and cultural degradation and the collapse of local economies bases in forest activities.

As a response to these pressures and resulting impacts, improvements must be promoted to accelerate the development of more adequate legal frameworks and public participation processes to build a more solid institutional arrangement. These improvements promote more rational environmental laws, the creation

of conservation units, more efficient silvicultural practices, reforestation programs, monitoring and control of illegal activities, environmental education and better dissemination of environmental information.

The most affected biomes in Brazil are Amazon, Cerrado and Atlantic Forest. Deforestation in these three biomes has been characterized by the intensive growth in population and urbanization, and expansion of the agricultural and ranching frontier to increase bio fuels and grains production and cattle.

Forest conservation is done in private properties and public lands. Land use in private properties, in Brazil, is constrained by law. The Forest Code in Brazil, depending on the biome where the property is located, establishes a minimum proportion of the property, called Forest Reserve (Reserva Florestal - RL), that must remain covered with native forests. In the Amazon, for instance, 80% of any property must be set aside as Forest Reserve. The Brazilian Forest Core also declares riparian areas, sensitive slopes and top of hills as Permanente Preservation Areas (Areas de Preservação Permanente - APP) and prohibits its use for agricultural purposes.

The Federal Government, States and Municipalities can also submit the assignment of highly sensitive areas as one of the conservation units predicted in the National System of Conservation Units (Sistema National de Unidades de Conservação – SNUC – Law 9989/2000). Currently, and according to the Brazilian Forest Service Registry of Public Forests (SFB, 2011), approximately 7% of the national territory (594 thousand km^2) is protected and assigned to one of the ten SNUC conservation unit types.

The management of public forests in Brazil has steadily evolved over the years, and many federal, state and municipal agencies are involved. At the beginning, these institutions were under the umbrella of the Ministry of Agriculture. Currently they respond to the Ministry of Environment, whom is in charge of formulating policies, and to the Brazilian Forest Service, responsible for the management and financial support of these public forests. Two other agencies also participate, IBAMA (the Brazilian Environmental Institute) is the law enforcement agency, and ICMBio (Chico Mendes Institute for Biodiversity) is the manager of the conservation units, in which most of the forest management operations and forest concession happen.

After evaluating the different paths taken by recent policies and tendencies, reports have emphasized the role of agribusiness in the Economy and how these activities have impacted Brazil´s forest resources. Expectations are that improved governance, as previously defined in this paper, and the consolidation of environmental services will decisively operate as important deterrents to mitigate negative impacts.

Depending on the success of these deterrents, three scenarios will emerge:

I) A situation with minimized negative impacts where the society has created effective mechanisms that prevent the degradation of natural resources by means of a strong governance that has institutionalized public presence and the consolidation of real market structures that in large scales capture stakeholders willingness to pay for environmental services.

II) A situation where some negative impacts are still observed, either because public governance has not been consolidated and is replaced by mechanisms that capture payments for environmental services and operate at all scales effectively; or because the absence of fully operational markets for environmental services has been replaced by the effective presence of public governance.

III) The most extreme situation of a business as usual scenario where large scale degradation and very negative impacts are still observed, because either alternatives failed. Public governance has not become consolidated and there are no markets capturing the value of the forests in terms of their environmental services.

In 2030, developing countries will remain responsible for most of the observed increase in human population that, due to their increased average income, will add significantly to current consuming levels. Consequently, the world demand for food, fibers and energy will have a significant increase. Brazil is the country with the highest potential to contribute with the fastest growth rate on producing these commodities. Trade barriers must be eliminate though, and technology development tendencies and as well as infrastructure investment patterns have to be maintained. Meanwhile, it is vital not to overlook the environmental, social and cultural value of the natural resources currently found in all six Brazilian biomes. The expansion of agribusiness and the production of increasing agricultural surpluses cannot happen at the cost of essential environmental services provided by the rich biodiversity and extent of the Brazilian tropical forests.

Future developments

Brazilian public forests, effectively assigned as conservation units, either in integral protection units or sustainable use units, represent an immensely diverse basis for *in situ* genetic conservation projects in Brazil. Areas for biodiversity conservation in all six Brazilian biomes have already been prioritized based on the PROBIO large scale national assessment project. Large infrastructure investments, like hydroelectrically power plants and mining operations, have been obliged, for licensing purposes, to protect sufficiently large tracks of forest resources with the specific object of managing and monitoring *in situ* genetic diversity, and are probably among the few programs entirely designed and regularly managed as *in situ* genetic conservation projects.

These actions have resulted in important steps and exercises towards a higher level of governance in terms of forest genetic resources management and conservation. But the scale of the task at a National level still requires further steps including a national concerted plan to create a really comprehensive network of *in situ* FGR conservation sites. In fact, a nationally concerted plan with such scope, and designed to effectively conserve forest genetic diversity in all Brazilian biomes, does not exist yet.

A more precise quantification and qualification of the ongoing projects on improvement and conservation of FGR is needed. Thus, catalogue of *in situ* and *ex situ* Forest Genetic Resources conservation and improvement projects should be developed within SNIF, integrated with other environmental information systems. The services that such catalogue would provide are similar to the services currently provided by the National Register of Public Forests (CNPF) and the National Register of Conservation Units (CNUC). Public managers, researchers and non-governmental organizations that depend on reliable and consistent sources of information, would more efficiently coordinate actions towards a higher level of governance over FGRs.

Such a catalogue assumes an even more important role in the light of another recent and important federal initiative in Brazil. The Ministry of Agriculture, Livestock and Food Supply (MAPA) has recently issued normative guidelines (Instrução Normativa no. 56. Dec 8 2011) that promotes a more adequate management of FGR and contributes to a more transparent and effective stewardship over FGR by means of a comprehensive and detailed set of rules for the production, distribution and utilization of native and planted forest seeds and seedlings (BRASIL, 2011). Among several provisions, these official guidelines require that individuals and legal entities involved in activities of production, processing, storage, packaging and marketing of seeds and seedlings of native and exotic forest must register on the National Register of Seeds and Sapling (RENASEM), as well as individuals and companies involved in carrying out activities of technical responsibility, sampling, collection, laboratory analysis and certification of seeds and seedlings of native and exotic tree species.

Once implemented, the catalogue would provide the updated information necessary to define new FGR conservation policies and strategies in *fora* such as the CONAFLOR, DFLOR or CONABIO, for instance. The identification of gaps and priorities would also be greatly facilitated, since a more integrated and comprehensive monitoring, both quantitatively and qualitatively, of the ongoing initiatives FGR would always be available in real time.

1.1. Diversity within and between forest tree species

This section presents intra specific variation studies (1.3); species characterization (1.2); Variation assessment (1.4.); variation surveys and inventories (1.5); information systems for variation patterns (1.6); improving the understanding of variation (1.7); capacity-building needs to assess and monitor (1.8).

Brazil is considered a mega diverse country due to the variety of vegetation and ecosystems, which houses one of the most diverse floras and lush on the planet. Recent studies point to the existence of at least 7880 forest tree species native to Brazil, that number probably represents only 80% of the existing total (FAO, 2005). Recently some authors estimated that there are about 11,120 species of trees only in the Amazon forest (Hubbell et al., 2008).

Studies in Plant Taxonomy are essential to the understanding of biodiversity, to inventory the flora, to provide subsidies to other areas of botany and related fields, and to bolster conservation programs. Taxonomists have to work on a concerted manner, to facilitate the establishment of collaborative projects and to avoid duplication and overlapping of work.

The Dendrogene project, for instance, sets the main strategies for botanical identification, including training and production of identification sheets and folders. Hosted at the Embrapa Eastern Amazon research station in Belém, Pará, Brazil, the Dendrogene Project has relied on a multidisciplinary approach and multi institutional participation (Kanashiro *et al.*, 2002). An expected product is Dendrobase, a database of genetic information for tropical tree species that organizes and systematizes existing information, flowering and fruiting, sexual system, pollination, genetic information and seed dispersers.

Another example is the Rapid Assessment Program (RAP) created by the nongovernmental organization Conservation International in 1992. The RAP method addresses the need to generate fast information, accurate and quantitatively significant when time and resources for a more detailed assessment are not available. This method serves to fulfill several objectives, estimating species richness in areas that are highly threatened with loss of diversity. Thus, the method is fast and simple, because the most important variable is time.

The list of projects involving species characterization in Brazil would be very long. The Biodiversity Assessment of the Aporé-Sucuriú Complex in the Amazon biome could be cited as an example. The goal was to provide descriptive information about the ecology and silvicultural aspects of one hundred forest tree species in the site. Vegetation formations are described by means of direct observation. Basic information about the structure of the vegetation was recorded in descriptive cards specifically designed for this purpose. The analysis of the floristic composition was performed by means of observations and collections of botanical material in sampling sites.

Brazil is implementing a variety of projects that contribute to the achievement of the objectives of the CBD. For instance, projects PROBIO I and II, supported by the GEF, are designed specifically to address the implementation of the CBD. The first PROBIO project (Project on the Conservation and Sustainable Use of Brazilian Biodiversity) had the objective of identifying priority actions to be implemented through its subprojects, promoting public-private partnerships and generating and disseminating biodiversity knowledge and information. Its outcomes included the preparation of the first national map of priority areas for the conservation, sustainable use and sharing of benefits from Brazilian biodiversity. The updated version (2007) of this map is broadly used to guide biodiversity-related actions and to inform the

development and implementation of public and private policies and investments in the environment and other sectors. The first PROBIO also represented an important effort to promote the generation and dissemination of biodiversity knowledge through its subprojects, producing over 30 books, reports and publications on priority areas, traditional knowledge, alien invasive species, species inventories, and information on specific biomes/ecosystems, among others. For more information, refer to the Fourth CBD Report.

Currently, PROBIO II (National Biodiversity Mainstreaming Project) intends to push forward the transformation of the production, consumption and land occupation models, starting with the agricultural, science, fisheries, forest, and health sectors. Its overarching objective is to promote public-private partnerships to overcome the borders between territories under ecological management and the landscapes dominated by economic sectors responsible for large-scale negative environmental impacts, to convert such landscapes into sustainable territories.

Brazil has developed a set of National Biodiversity Indicators to monitor the state of the country's biodiversity, based on previous large-scale initiatives that began in the early 1970s with the project RADAMBRASIL. That project mapped the natural vegetation and the scale of 1:1,000,000 and was followed in mid-1980 by the current project in the Amazon Deforestation Monitoring (with a resolution of 30 meters) and the National Project for Monitoring Fires (with a resolution of 1 km). These initiatives were complemented in the 1990s and 2000 with the Mapping Vegetation Cover and Land Use all the biomes in 1:250,000 scale, the National Coral Reef Monitoring (Reef Check Brazil), the First National Inventory of Invasive Alien Species, the National Database of Protected Areas, the periodic updating of national lists of Endangered Species of Wild Fauna and Flora, National Indicators of Sustainability, GEOBrasil Environmental Reports; national reports on Water Resources and national reports on the Millennium Development Goals, and the Latin American and Caribbean Sustainable Development Initiative (ILAC). In 2006 the National Commission on Biodiversity (CONABIO) adopted a comprehensive set of National Biodiversity Targets for 2010 (CONABIO Resolution 3 / 2006) that sets the national indicators relevant to biodiversity. Currently, the Ministry of Environment has initiated a process to consolidate a single standardized list of environmental indicators, to be used uniformly by all institutions and all reports.

However, this set of national targets, developed under a broad participatory process, is even more ambitious than the global targets. To improve and better measure the national progress toward these biodiversity targets it is necessary to refine the three main instruments developed for CBD implementation – the National Biodiversity Policy (PNB), the Action Plan for PNB Implementation (PAN - Bio) and the set of National Biodiversity Targets – reorganizing and improving differentiation among targets, directives and actions included in each instrument to define an enhanced set of measurable biodiversity targets and indicators linked to clearly identified actors, budget sources and deadlines.

1.2. Main value of forest genetic resources

As a result of pressure on forests, many ecosystems are altered or even destroyed, which leads many species to survive under very critical conditions. Research on ecology, current dispersion status and effective diversity level of fauna and flora, has been developed to determine which and how many species are threatened with extinction. These initiatives depend on partnerships established between federal and state governments, research institutions and NGOs. The Red List of the International Union for Conservation of Nature (IUCN) is published annually and is one of the most well known around the world. The list divides the species into threat categories as depicted in Figure 3 (IUCN, 2011).

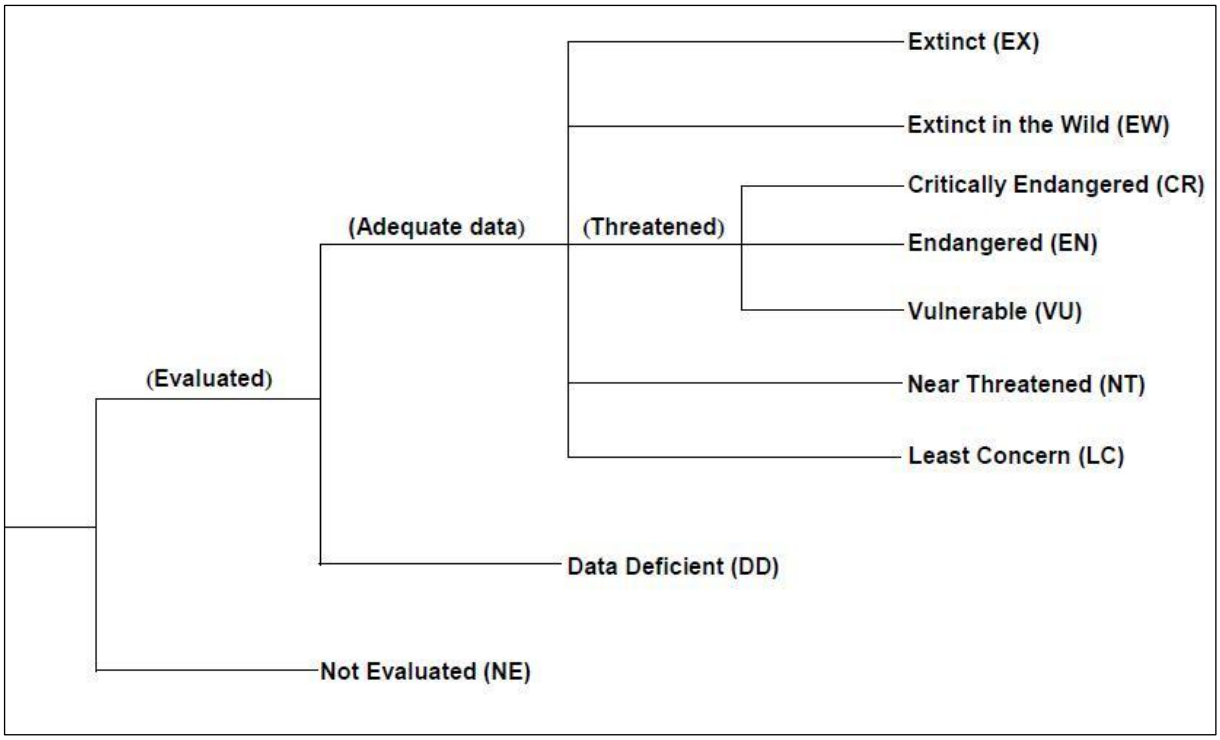

Figure 3: Structure of the IUCN Red List Categories for threatened species

IUCN offers a mechanism to search the database. For the purpose of this report, a set of species critically endangered (CR), endangered (EN) and vulnerable (VU) was produced using the following filtering search strategy: show taxa: species; search by taxonomy: plantae; search by location: Brazil (Native); search by assessment: CR, EN, VU; search by life history: tree - large, tree - size unknown and tree - small. The result shows 37 "critically endangered" tree species, 102 "endangered" tree species and 196 "vulnerable" tree species.

Table 8: Tree species officially listed as threatened with extinction by the Brazilian Government

Species	Local Name	Family	Biome
Amburana acreana	Cerejeira	Fabaceae	Amazônia
Araucaria angustifolia	Pinheiro-do-paraná, Pinheiro-brasileiro	Araucariaceae	Atlantic Forest
Bertholletia excelsa	Castanheira	Lecythidaceae	Amazônia
Caesalpinia echinata	Pau-brasil	Fabaceae	Atlantic Forest
Dalbergia nigra	Jacarandá-da-Bahia	Fabaceae	Atlantic Forest
Euxylophora paraensis	Pau-amarelo	Rutaceae	Amazônia
Melanoxylon brauna	Braúna	Fabaceae	Atlantic Forest
Myracrodruon urundeuva	Aroeira, Aroeira do Sertão	Anacardiaceae	Cerrado/Caatinga
Ocotea catharinensis	Canela-preta	Lauraceae	Atlantic Forest
Ocotea odorifera	Canela-sassafrás	Lauraceae	Atlantic Forest
Ocotea porosa	Imbuia	Lauraceae	Atlantic Forest
Peltogyne maranhensis	Pau-roxo	Fabaceae	Amazônia
Schinopsis brasiliensis	Baraúna	Anacardiaceae	Cerrado/Caatinga
Swietenia macrophylla	Mogno	Meliaceae	Amazônia

Source: BRASIL (2008) Instrução Normativa No 6, September 23 2008.

Officially, the Brazilian list released by the Ministry of Environment in 23 of September 2008 shows 14 "endangered" tree species. The official list was made public through a normative instruction (I.N. no. 6, MMA), in which the species are divided into two categories "endangered" and "data deficient". The normative instruction refers to a total of 472 plant species threatened with extinction, distributed as follows: 276 in the Atlantic Forest, 131 in the Cerrado, 46 in the Caatinga, 24 in the Amazon, 17 in the

Pampa and 2 in the Pantanal. Among these plants, the fourteen tree species categorized as threatened with extinction are listed in Table 8.

For mahogany (*Swietenia macrophylla*), one of the tree species listed in Table 8, Brazil has prohibited its harvesting (Decree 6472, June 05 2008). Although not listed as threatened, the harvest of other two tree species has also been banned: castanheira (*Bertholetia excelsa*) and seringueira (*Hevea* spp) through Decree 5975 dated November 30 2006.

Biological diversity. Brazil's forests contain a significant share of the world's biodiversity, including an estimated 56 000–62 000 higher plant (not including mosses, lichens and fungi) and mammal species. The Amazon is home to about 20% of the world's plant species, 20% of bird species and 10% of mammal species. Sixty-four mammals, 78 birds, five reptiles, 24 amphibians, eight arthropods and 14 plants found in Brazil's forests are listed as critically endangered, endangered or vulnerable on the IUCN red list of threatened species (IUCN 2010). Wood species in the Amazon considered endangered or threatened with extinction are *Amburana acreana* (Cerejeira), *Peltogyne maranhensis* (pau-roxo), *Bertholletia excelsa* (castanheira), *Swietenia macrophylla* (Mogno – also known as mahogany) and *Euxylophora paraensis* (pau-amarelo). There are also seven such species in the Atlantic Forest biome and two in the Cerrado/caatinga.

Brazil has 28 plant species listed in CITES Appendix I, 429 in Appendix II and 3 in Appendix III (UNEP-WCMC 2011), including mogno, cedro and a few other tree species for which production and trade is animal. The Brazilian National Policy and Strategy for Biodiversity and the National Biodiversity Program are designed to address the situation through *in situ* and *ex situ* measures and the management of biotechnology.

Species listed in Table 9 are a subset of the group of species listed in Table . The higher priority assigned to these species is merely statistical, and is based mainly on the number of times they were referred during the assessment implemented for the preparation of this report. Table 10 also refers to a list of prioritized species based on potential use and vulnerability to extinction. Many would the criteria to prioritize a given species for genetic studies and conservation programs. Considering the scope and amount of species demanding conservation programs, it is fair to say that Brazil has formally coordinated very few *ex situ* and *in situ* initiatives for the conservation of forest genetic resources. And many initiatives haven´t been sustainable for the lack of continuity, financial resources and adequate infrastructure. Therefore, a much larger effort would be needed to guarantee the erosion of the vastly rich forest genetic resources still covering all Brazilian biomes.

Table 9: Prioritized tree species for genetic conservation initiatives in Brazil

Species	Amazon	Caatinga	Atlantic Forest	Cerrado	Pantanal	Pampa
Amburana acreana	X					
Amburana cearensis	X	X				
Anadenanthera colubrina		X		X	X	
Aniba rosaeodora	X					
Araucaria angustifolia			X			
Astronium fraxinifolium				X	X	
Astronium urundeuva				X		
Bactris gasipaes	X					
Bertholletia excelsa	X					
Butia eriospatha						X
Caesalpinia echinata			X			
Cariniana estrellensis		X				
Cariniana legalis		X	X			
Caryocar villosum	X					
Cedrela fissilis			X			
Cedrela odorata	X					
Copernicia prunifera		X				

Table 9: Prioritized tree species for genetic conservation initiatives in Brazil

Species	Amazon	Caatinga	Atlantic Forest	Cerrado	Pantanal	Pampa
Couratari guianensis	X					
Dalbergia nigra			X			
Dipteryx odorata	X					
Euterpe edulis			X			
Euxylophora paraensis	X					
Gleditsia amorphoides						X
Guazuma ulmifolia				X		
Handroanthus heptaphyllus						X
Handroanthus impetiginosus			X		X	
Hymenaea courbaril	X		X	X	X	
Machaerium hirtum					X	
Manilkara huberi	X					
Marmaroxylon racemosum	X					
Melanoxylon brauna			X			
Mezilaurus itauba	X					
Mimosa scabrella					X	
Mollinedia glabra			X			
Myracrodruon urundeuva		X	X	X	X	
Ocotea catharinensis			X			
Ocotea odorifera			X			
Ocotea porosa			X			
Orbignya phalerata		X				
Peltogyne maranhensis	X					
Peltophorum dubium		X				
Piptadenia gonoacantha	X	X				
Plathymenia reticulata		X		X	X	
Podocarpus lambertii			X			
Schefflera morototoni	X			X		
Schinopsis brasiliensis		X		X		
Sclerolobium paniculatum		X		X		
Simarouba amara	X	X				
Swietenia macrophylla	X					
Tabebuia aurea		X		X		
Tabebuia serratifolia	X					
Tectona grandis	X			X	X	
Trithrinax brasiliensis						X
Virola surinamensis	X					
Vochysia divergens					X	
Vouacapoua americana	X					
Zeyheria tuberculosa		X				

The main cause of depletion of the natural stocks of pau-rosa, mogno, cerejeira and freijó-cinza is the over exploitation and illegal logging of these resources for timber production. Another cause is deforestation caused by the expansion of cattle ranching in the region. For species like mogno, virola and castanha a legal ban on harvesting intended to protect and mitigate the degradation has been imposed. The creation of many Conservation Units in the region has increased the level of protection of large forested areas from illegal logging. But management plans, developed in real consonance with local communities and stakeholders, are still missing in these conservation units, and turn the conservation effectiveness of these initiatives almost negligible. The involvement of local communities on the elaboration of management plans, and their approval, is essential for the successful management of these conservation units. The consideration of local interests and guarantees are vital for the conservation and sustainable use of the genetic forest resources encountered in all conservation units that have been created in the Amazon.

Table 10: Prioritized native tree species

Species	Forest Type / Biome	Reasons for priority			
		Econ.	Social	Cult.	Vulnerable
Aniba rosaeodora and *Aniba dukei*	Amazon	X	X		X
Amburana acreana	Amazon	X	X		X
Cordia goeldiana	Amazon	X			X
Euxylophora paraensis	Amazon	X			X
Vouacapoua americana	Amazon	X			
Swietenia macrophylla	Amazon	X			X
Virola surinamensis	Amazon	X			X
Bertholletia exelsa	Amazon	X	X		
Caryocar villosum	Amazon	X	X		X
Cedrela odorata	Amazon	X			X
Dipteryx odorata	Amazon	X	X		X
Hymenaea courbaril	Amazon	X	X		
Manilkara huberi	Amazon	X			
Peltogyne paniculata	Amazon	X			
Carapa guianensis	Amazon	X	X		
Parahancornia amapa	Amazon	X	X		
Brosimum parinarioides	Amazon	X	X		
Copaifera spp	Amazon	X	X		
Tabebuia spp	Amazon	X			X
Astrocaryum tucuma	Amazon	X	X		
Astrocaryum vulgare	Amazon	X	oil		
Euterpe oleraceae	Amazon	X	X		
Bactris gasipaes	Amazon	X	X		
Hevea brasiliensis	Amazon and Atlantic Forest	X			
Schizolobium amazonicum	Amazon	X			
Araucaria angustifolia	Atlantic Forest	X	X	X	X
Ilex paraguariensis	Atlantic Forest	X	X		
Myracrodruon urundeuva	Cerrado / Caatinga	X			X
Schinopsis brasiliensis	Cerrado / Caatinga	X			X
Caesalpinia echinata	Atlantic Forest	X			X
Dalbergia nigra	Atlantic Forest	X			X
Melanoxylon brauna	Atlantic Forest	X			X
Peltogyne maranhensis	Amazon	X			X
Ocotea catharinensis	Atlantic Forest	X			X
Ocotea odorifera	Atlantic Forest	X			X
Ocotea porosa	Atlantic Forest	X			X
Bertholletia excelsa	Amazon	X			X
Swietenia macrophylla	Amazon	X			X
Euxylophora paraensis	Amazon	X			X
Cordia trichotoma	Atlantic Forest	X			
Mimosa scabrella	Atlantic Forest	X			
Calophyllum brasiliense	Atlantic Forest	X			
Podocarpus lambertii	Atlantic Forest	X		X	

Table 11: Main uses of prioritized tree native species

Specie	Forest type	Main uses				
		Econ.	Timber	Non timber use	AFS	Plantation
Aniba rosaeodora and *A. dukei*	Amazon	X		Oil		
Amburana acreana	Amazon	X	X	Seeds		
Cordia goeldiana	Amazon	X	X		X	
Euxylophora paraensis	Amazon	X	X			
Vouacapoua Americana	Amazon	X	X			
Swietenia macrophylla	Amazon	X	X		X	
Virola surinamensis	Amazon	X	X			X
Bertholletia exelsa	Amazon	X	X	Food	X	X
Caryocar villosum	Amazon	X	X	Food	X	
Cedrela odorata	Amazon	X	X		X	
Dipteryx odorata	Amazon	X	X	Cumarine	X	

Table 11: Main uses of prioritized tree native species

Specie	Forest type	Main uses				
		Econ.	Timber	Non timber use	AFS	Plantation
Hymenaea courbaril	Amazon	X	X			X
Manilkara huberi	Amazon	X	X			
Peltogyne paniculata	Amazon	X	X			
Carapa guianensis	Amazon	X	X	Oil	X	
Parahancornia amapa	Amazon		X	Milk		
Brosimum parinarioides	Amazon	X	X	Milk		
Copaifera spp	Amazon	X	X	Oil	X	
Tabebuia spp	Amazon	X	X	Medicinal	X	
Astrocaryum tucumã	Amazon	X		Food		
Astrocaryum vulgare	Amazon	X		Oil		X
Euterpe oleraceae	Amazon	X		Food	X	X
Bactris gasipaes	Amazon	X		Food	X	X
Hevea brasiliensis	Amazon	X	X	Latex	X	X
Schizolobium amazonicum	Amazon	X	X		X	X
Araucaria angustifolia	Atlantic Forest	X	X	Food		X
Ilex paraguariensis	Atlantic Forest	X		Food	X	X
Cordia trichotoma	Atlantic Forest		X			X
Mimosa scabrella	Atlantic Forest	X	X			X
Podocarpus lambertii	Atlantic Forest	X	X			X

For forest plantations *Eucalyptus spp* are the most planted tree species in the country, occupying an area of over 4.75 million hectares. The wood volume productivity averages above 35 m^3 per hectare per year, and most of it is destined for pulp and paper production, power generation, as charcoal in steel mills, as fiber for wood panels production, and as round wood for timber processing. More recently, with the development of new technologies, Eucalyptus has been also considered as raw material for the production of bio-oil, gas and alcohol.

Table 12: List of most common Eucalyptus species planted in Brazil (involves analysis of Table 30)

E. grandis	*E. urophyla*
E. benthamii	*E. badjensis*
E. dunnii	*E. urograndis (híbrido de E. urophylla e . grandis)*
E. globulus	*E. maidenii*
E. smithii	*E. calmadulensis*
E. terenticornis	*E. urocam (híbrido de E. urophylla e . camaldulensis)*
E. pellita	*E. crebra*
E. cleoziana	*E. pilularis*
E. saligna	

Table 13: Eucalyptus species introduced by EMBRAPA since 1985

Species	Instittutions	First introduction	Area (ha)	Top trees
E. grandis	7	1985	131,55	561
E. terenticornis	1	1985	1,94	55
E. pellita	2	1985	1,85	46
E. resinífera	2	1985	1,30	25
E. pilularis	4	1989	8,80	53
E. viminalis	3	1986	3,01	65
E. deanei	1	1986	0,60	10
E. maculata	2	1985	4,00	75
E. cloeziana	3	1985	9,75	205

The genetic improvement of eucalyptus receives the largest investments from companies focused on forest-based pulp and paper manufacturing. These programs generally aim to increase the overall genetic gains that improve production performance during the industrial processing of the wood. Most of these breeding programs have evolved in close cooperation with Public Universities and EMBRAPA. Biotechnology has been also intensively used, and EMBRAPA is currently focusing also on the development of hybrids and improved multiple use trees for small and medium farmers. In such cases hybrid progenies of *E. urograndis*, *E. grandis*, *E. urophilla*, *E. dunni* and *E. benthamii* have been tested. New germplasm has been introduced, specially contemplating: *E. pellita*, *E. creba*, *E. cleoziana*, *E.pilularis*.

The genetic source predominantly in use today is the hybrid *E. urograndis*, which has been also crossed with *E. globules*, *E.maidenii*, *E.dunii* and *E. smithii* in some breeding programs in the country. Table 12 presents a list of the most commonly planted eucalyptus species in Brazil, and Table 13 summarizes some information about the genetic trials with material introduced by EMBRAPA during the 80´s. The genus *Pinus* now represents 27.2% of the total area of planted forests in Brazil (1.76 million ha), with 79.8% of the plantations concentrated in the South. In the last six years, as reported by ABRAF (2011), there has been a decrease in cultivated area, partly due to the replacement of these areas by eucalyptus, a species that grows faster and yields higher volumes than pine.

The seeds of tropical species of pine have been collected in Central America and Mexico, pine temperate species have been introduced from Southern United States, primarily. In the 1970s, an experimental network with pine species that was established in South Africa, Colombia, Zimbabwe, India, Honduras and Brazil, through an international cooperation program organized by the Mexican National Forest Research Institute (INIF) and Oxford Forestry Institute (OFI) to promote *ex situ* conservation. In 1980, the Central America and Mexico Resources Coniferous Cooperative (CAMCORE) was created to promote the conservation of native pine genetic resources *ex situ* to Central America and Mexico, with the specific objectives: to conserve native forest species and populations; test species sampled in different environmental conditions in the tropics and subtropics, and develop partnerships aimed at promoting breeding programs and genotype improvement. Embrapa Forestry, among other Brazilian public and private companies, participated actively in these cooperative programs, which allowed for the access to one of the world's largest collections of genetic material of *ex situ* Pinus. The CAMCORE program and OFI have been the two main institutions promoting the improvement of pine trees in Brazil.

From 1970 to 1990, provenance and progeny tests, including open pollination with local species were conducted in Brazil. To build capacity and the production of good quality seeds PRODEPEF (Project Development and Research Forest) was created. The purpose of this project was to organize and establish forest research at the national level, culminating with the deployment of the main lines of action for forest improvement programs. The initiative was supported by former IBDF, who managed the implementation of reforestation projects at the time, UNDP (United Nations Development Programme) and FAO.

Table 14: List of most common Pinus species planted in Brazil

Species	Participants	First introduction
Pinus tecunumanii	4	1988
P. caribaea var. bahamensis	1	1988
P. caribaea var. hondurensis	3	1988
P maximinoi	2	1988
P. elliottii	5	1975
P. patula	5	1988
P. taeda	3	1975
P. chiapensis	1	1988
P. greggii	3	1985
P. kesiya	1	1980
P. oocarpa	3	1983
P. palustris	1	1983
P. merkusii	1	1967

This chapter presents the list of target species included and actively managed within *in situ* conservation programs (2.1); the list for categories of *in situ* conservation areas established with managed production forests, provenance zones, strictly protected areas (2.2); the actions that have been taken for sustaining *in situ* collections and actions that have been taken to improve inventories and surveys of forest genetic resources (2.3); the actions taken for promoting *in situ* conservation (2.4); the greatest constraints to improve *in situ* conservation in the country (2.5); the priorities for future *in situ* conservation actions(2.6); the capacity-building needs and priorities for *in situ* conservation actions (2.7); the establishment of national/regional fora for stakeholders involved with *in situ* conservation that are recognized by the National Forest Program (2.8); the research priorities to support *in situ* conservation; and the priorities for policy development to support *in situ* conservation actions (2.9).

2.1. Scope of *in situ* conservation programs in Brazil

In situ conservation of genetic resources is the more effective strategy, especially when the main goal is the conservation of entire communities of tree species, as the Brazilian tropical forests. In these cases, trees of other species than the target ones must be included in the genetic conservation scheme, including their pollinators, seed dispersers and predators.

The conservation of forest genetic resources in Brazil involves a large scale *in situ* scheme, and for that purpose a national scale strategy had to be implemented. The creation of a significant amount of conservation units, as well spread over the national territory as possible, synchronized with a national strategy for biological diversity had to be tackled by the Brazilian Government.

The permanent vast forest estate, comprising 286 million hectares, represents 33% of the country and includes approximately 213 million acres of federal forests and 73 million hectares of forests state. About 28% of the total area of federal public forests, approximately 59 million hectares, has been assigned to some type of Federal Conservation Unit known as the *Sistema Nacional de Unidades de Conservação da Natureza* (SNUC), including 32 million ha assigned as protected areas and 27 million hectares assigned for sustainable use (SFB, 2011).

Brazil has formulated a National Strategy for Biological Diversity as a vital first step to provide the necessary framework for implementing the Convention on Biodiversity and to ensure funds, whether national or international, for the consistent and integrated conservation and sustainable use of natural resources manner throughout the country (CBD, 2010). The Ministry of Environment - MMA was given the task of co-coordinating and implementing the CBD, ratified by the National Congress in February 1994. In 1996, the MMA outlined a proposal for the elaboration of the National Strategy. This project has been sponsored by the United Nations Development Program - UNDP, has also secured financial support from the GEF and was granted matching contributions from the Federal Government.

A central coordination was established in 1994 within the Brazilian Ministry of Environment, in order to plan, co-ordinate, monitor and evaluate measures relating to the conservation and sustainable use of the Brazilian biodiversity, especially those in the ambit of the National Biodiversity Program (Programa Nacional de Diversidade Biológica - PRONABIO).

A detailed report on how Brazil evolved over the last ten years in terms of building a large scale strategy for the conservation of its mega biodiversity can be found in the four national reports to the CBD (MMA, 1998; MMA, 2004; MMA, 2006 and CBD, 2010).

After playing a decisive part in the negotiation, adoption, and approval of the Convention on Biological Diversity (CBD), during the Conference on Environment and Development - UNCED held in Rio de Janeiro in June 1992, Brazil became the first signatory of the convention and found grounds to pursue in the orchestration process that these commitments would require.

The United Nations Development Program – UNDP has provided technical and administrative support to PRONABIO through its project 'Brazilian Biodiversity Management'. Financial and technical support for the implementation of PRONABIO has come also from two complementary projects funded by the Brazilian Government, the private sector and by the GEF (through International Bank for Reconstruction and Development - IBRD). Conditions concerning partnerships in conservation and the sustainable use of biodiversity have been established between the Government, nongovernmental organizations, academic institutions and the private sector. All are represented in the coordinating Commission of PRONABIO.

Two main projects have steered several initiatives over the last ten years:

1. Conservation and Sustainable Use of Brazilian Biological Diversity (Projeto de Conservação e Utilização Sustentável da Diversidade Biológica Brasileira - PROBIO), a US$ 20 million project allows the Government and society to organize and disseminate information for decision-making in the area of conservation and sustainable use of biodiversity, as well as to support a series of biodiversity surveys in each of the major Brazilian biomes and the establishment of an Information Network on Brazilian Biodiversity. Five initial subprojects are under way with the participation of members of the scientific community, conservationists and environmentalists, as well as the suppliers and users of biological resources and representatives of governmental agencies at federal, state and local levels. Information on the Amazon forest, the Atlantic forest, the Cerrado, the Pantanal, the Caatinga, and the coastal areas are being evaluated to propose priorities for conservation activities.
2. Brazilian Biodiversity Fund (Fundo Brasileiro para a Biodiversidade - FUNBIO), also an initially project set to offer US$ 20 million provided by the GEF with contributions from the private sector as well as interest arising from its investment. In the beginning administered by the Getúlio Vargas Foundation (Fundação Getúlio Vargas - FGV), FUNBIO became a privet fund with the mission of providing long-term support to biodiversity conservation.. Support for biodiversity research and conservation has also been available through the National Environment Fund (Fundo Nacional do Meio Ambiente - FNMA), the National Environment Program (Programa Nacional do Meio Ambiente - PNMA), and the Pilot Program for the Conservation of Tropical Rain Forests (Programa Piloto para a Proteção das Florestas Tropicais do Brasil – PPG-7). As a result, considerable progress has been achieved in such areas as the establishment of information networks and data bases, administrational infrastructure, in the implantation and consolidation of protected areas, in geographic and diagnostic research for the principal biomes, in setting up germplasm banks, in testing new models, and in increasing incentives for the sustainable use of biodiversity.

Important improvements in the legal framework have also supported the national large scale strategy for conservation. Currently the legislation makes provision for a National Environmental Policy, a National Policy for Water Resources (Política Nacional de Recursos Hídricos), a Land Statute (Estatuto da Terra), a Forest Code (Código Florestal), a Law for the Protection of the Fauna (Lei de Proteção à Fauna), a Decree-Law for the Protection and Promotion of Fisheries (Decreto-Lei de Proteção e Estímulo à Pesca), a Law of Biosafety (Lei de Biossegurança), a Law for the Protection of Cultivars (Lei de Proteção de Cultivares), a Law of Industrial Property (Lei de Propriedade Industrial), a Law of Environmental Crime (Lei de Crimes Ambientais), which defines liability and civic-public action to be taken in the event of damage caused to the environment, and for the existence of the National Council for the Environment (Conselho Nacional do Meio Ambiente - CONAMA).

More recently, Brazil has been working on the development of a set of National Biodiversity Indicators to monitor the status of the country's biodiversity in the 2000's with the Map of Priority Areas for Biodiversity Conservation and Sustainable Use; the Vegetation Cover and Land Use Map of all Brazilian biomes at the 1:250,000 scale; the First National Survey of Alien Invasive Species; the National Protected Areas Database; the continuing updating of National Lists of Threatened Species of Fauna and Flora; the National Sustainability Indicators; the GEOBrazil Environmental Reports; the National Water Resources Reports; and the national reports for the Millennium Development Goals and for the Sustainable Development Initiative for Latin America and the Caribbean (ILAC). The adoption in 2006 by the National Biodiversity Commission (CONABIO) of a comprehensive set of National Biodiversity Goals for 2010 (CONABIO Resolution 3/2006) automatically defined the relevant national biodiversity indicators.

All these actions set the context in which the national large scale *in situ* conservation proccess of forest genetic resources has evolved in Brazil. Basically, two sources of information are essential: (i) the map of priority areas for biodiversity conservation and sustainable use; and (ii) the infrastructure consolidation for the adequate operation of all conservation units already created at the federal, state and municipal levels. Maps in the following pages present a summary of these essential definitions.

Brazil defined in 2004 and revised in 2007 its Priority Areas for the Conservation and Sustainable Use of Biodiversity, to guide conservation and development actions and policies. These 3,190 areas distributed throughout all biomes include areas that are already protected in officially protected areas (under the National Conservation Units System – SNUC) and Indigenous Lands, as well as areas that were identified as important for biodiversity and where conservation is urgent. These areas were defined and are periodically revised through a participatory process at regional workshops specifically directed to each biome and with the contribution of a large number of experts. The methodology applied to define and assess each area uses the IBGE Map of Brazilian Biomes as the main base and incorporates the principles of systematic planning for biodiversity conservation and its basic criteria (representativeness, environmental persistence and vulnerability). The current list is officially recognized through a legal document (MMA Administrative Ruling no 9, of 03 January 2007) and the use of the Map of Priority Areas as a management instrument has increased in the past several years, including in sectors other than the environmental sector.

The Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) initiated in 2010 an assessment of the integrity of current Priority Areas, through its new biome deforestation monitoring system. The results and future periodic updates will contribute to the next revision of the Priority Areas. However, a different study on the current protection status of the vegetation located in private properties, and a preliminary analysis of the remaining vegetation cover in Priority Areas, provide preliminary parameters to estimate the degree of maintenance of the capacity of Brazilian ecosystems to provide environmental goods and services in each biome.

Sparovek (2010) assessed the protection status of natural vegetation according to requirements of the Brazilian Forest Code and found that the area legally designated as Permanent Preservation Areas (APPs) and the Legal Reserves (RLs) in rural private lands cover, respectively, 12% and 30% of the national territory, which together correspond to over two times the area currently covered by officially protected areas. According to the legislation, the original vegetation cover of these areas should be maintained by land owners. However, 42% of the APPs present illegal deforestation, as do 16.5% of the RLs. Additionally, 3% of the protected areas and indigenous lands also suffered illegal deforestation. This study also found that the effectiveness of the protection required by law in private properties varies according to geographical region and biome.

In addition to this study on APPs and RLs, data from the Project for Satellite Monitoring of Deforestation in Brazilian Biomes (PMDBBS6) available for the Cerrado, Caatinga, Pantanal and Pampas biomes, overlapped with the Map of Priority Areas for Biodiversity contributed to a preliminary estimate8 of the maintenance of the vegetation cover in Priority Areas and, indirectly, of the capacity of ecosystems in these areas to provide environmental goods and services. The Priority Areas of the Cerrado still maintain, on average, 65.9% of their original vegetation cover.

However, there is large variation among them, with the most deforested areas being located in the south of the biome (area of strong agricultural expansion) and the best conserved to the north, varying between 0.3% remaining cover to 100% cover in each Priority Area. The Pampas Priority Areas maintain on average 63.3% of their original vegetation cover, varying from 7.0% to 100%. The average remaining cover in the Caatinga is 70.5%, varying from 4.2% to 100%. The Priority Areas of the Pantanal present the highest average of the analyzed biomes (89.7%), suggesting better maintenance of the vegetation, but all Priority Areas in this biome have already suffered some measure of deforestation, with the remaining original vegetation cover varying from 28.0% to 99.9%.

The Priority Areas were classified according to their priority for conservation (high, very high, or extremely high) and their biological or ecological importance (high, very high, extremely high or insufficiently known). The preliminary analysis of the remaining vegetation cover in Priority Areas indicates that, while in some biome those areas with the highest conservation priority (extremely high) are also the best preserved areas, in other biomes these are the areas presenting the lowest percentage of remaining vegetation cover in Priority Areas, which may suggest an increase in the degree of urgency for their conservation or the need to define new conservation strategies for the least preserved Priority Areas. However, the variation in remaining vegetation cover in each of the two classes (priority and importance) is high.

2.2. Established categories of *in situ* conservation areas

Created in 2006, the National Register of Conservation Units (CNUC) is the official database on protected areas in Brazil (conservation units - UC). The CNUC is managed by the Ministry of Environment with the collaboration of federal administrative agencies, state and municipal governments, which make the register of conservation units under its management. This information is then validated by the Ministry of Environment. The registration process has been completed for federal conservation units, but is still being finalized for state and local conservation areas and for all Private Natural Heritage Reserves (RPPN).

The SNUC, which was established by Law 9985/00, is divided into two groups:

- Units of integral protection, whose purpose is to preserve nature – use does not involve the consumption, collection, damage or destruction of natural resources. Categories in this group are ecological stations, biological reserves, national parks, national monuments and wildlife refuges.
- Sustainable use units, which aim to reconcile nature conservation with sustainable use, involving the collection and use, commercial or otherwise, of a portion of a unit's natural resources. Categories in this group include national (state and municipal) forests (florestas nacionais – FLONAs), extractive reserves and sustainable development reserves.

Table 15 presents all categories

Table 15: Categories of conservation units

Conservation Unit	Description
	Integral Protection
Ecological Station	Area that aims to preserve nature and scientific research opportunities. Only indirect use of natural resources is allowed, that is uses that does not involve consumption, collection, damage or destruction of these resources. Public visitation is prohibited except for educational objectives, as set in the Management Plan or regulations specific to this category of conservation. Research permits depend on prior approval and conditions established by the Chico Mendes Institute (ICMBio).
Biological Reserve	This category of conservation aims to preserve the full biota and other natural attributes, without direct human intervention or environmental changes. The exception is recovery measures necessary to restore and preserve the natural balance, biological diversity and natural ecological processes. A public visitation is prohibited, except for education, according to the Management Plan defined in the unit. Research permits depend on prior approval and conditions established by the Chico Mendes Institute (ICMBio).
National Park	National park is the most popular category of protected areas. The goal, according to Brazilian law, is to preserve the ecosystem due to its ecological significance and scenic beauty, to carry out scientific research, to offer educational and environmental interpretation opportunities, recreation and ecotourism. The management plan of the parks, determined by the Institute Chico Mendes (ICMBio), determines the priorities for conservation of the natural ecosystem, scientific research, education, recreation and tourism. The system for public visitation is also defined in the Management Plan of the conservation unit.
Natural Monument	Aims to preserve basic rare natural sites, natural and / or scenic beauty. May consist of private properties, provided there is compatibility between the goals of the conservation unit and the land owners. Permits for visitation to natural monuments and research requires are granted by the Chico Mendes Institute (ICMBio).
Wildlife Refuge	These shelters protect natural environments that provide conditions for the existence and reproduction of specific species or communities of the local flora and fauna (resident or migratory). Legal requirements for this conservation unit are very similar to the ones required for natural monuments.
	Sustainable Use
Environmental Protection Area	Extensive area, with some degree of human occupation, where biotic, abiotic, aesthetic or cultural attributes confer importance to the quality of life and well-being of human populations. The goal is to protect biological diversity, discipline the process of occupation and ensure the sustainable use of natural resources.
Area of Relevant Ecological Interest	A generally small area, with little or no human occupation, featuring unique natural value or harboring rare examples of regional biota. Created to preserve these natural ecosystems of regional or local importance, as well as to regulate allowable uses, aligning it with the goals of nature conservation.
National (state or	Area predominantly covered with native forest species, established to provide

Conservation Unit	Description
municipal) Forest	sustainable multiple use of forest resources and scientific research, focused on the evaluation of methods for the sustainable management of these natural forests. Occupation by traditional peoples inhabiting the area previous to its creation is common, and foreseen in the management plan. Public visitation is allowed, but subject to provisions specified in the management plan. Research is allowed and encouraged, but also subject to prior approval by the Instituto Chico Mendes (ICMBio).
Extractive Reserves	Area used by traditional extractive communities, whose survival is based on the direct harvest of natural products from the environment, on subsistence agricultural activities and the steward of small animal herds. It was created to protect the livelihoods and culture of traditional communities, ensuring sustainable use of natural resources. People living in these units have the concession and effective right to use them, given that the area and access is maintained public. Public visitation is allowed, provided it is compatible with local residents and foreseen in the management plan. Research is allowed and encouraged, provided there is approval by the Instituto Chico Mendes (ICMBio).
Fauna Reserve	Natural area with animal populations of native species, terrestrial and aquatic resident or migrating, suitable for technical and scientific studies on the sustainability and economic management of wildlife resources. Public visitation is allowed, provided it is compatible with the management unit. Amateur or professional hunting is prohibited. Commercial use of by-products resulting from research is allowed if provisioned by the Management Plan and Legal Regulation. Instituto Chico Mendes (ICMBio) has not created any conservation area in this category yet.
Sustainable Development Reserve	Natural area that shelters traditional populations, who depend primarily on the management of local natural resources in an intergenerational manner, and ecologically adapted to local conditions. This category has a fundamental role in protecting nature, as well as the maintenance of biological diversity. Such use is governed, as in extractive reserves, by concession right to local residents, provided the area is maintained public.
Private Reserve of Natural Heritage	Protected areas established in private areas, registered in perpetuity, in order to conserve existent biological diversity. It allows for the effective engagement of private owners in the protection of Brazilian ecosystems. Incentives as tax exemptions are guaranteed.

Indian reserves (Land for Indigenous Peoples) have been set to shelter around 231 indigenous peoples in Brazil. The estimated total population is around 600,000 people with a high concentration in the Amazon biome. These peoples speak over 180 different languages and dialects. Estimates indicate that before the arrival of Europeans, approximately 1,000 languages and dialects were spoken at that time. The indigenous peoples in Brazil are very diverse in traditional knowledge, which is practically not officially documented. In addition to the indigenous peoples who originally inhabited the country, a variety of other traditional groups are present in Brazil. Like most indigenous peoples, these communities maintain their traditional knowledge embedded in their original ways of life, including the use of biodiversity and natural resources.

Under the Brazilian Forest Code (Law 4771/65), the following percentages (at least) of private land must be maintained under native vegetation (called 'legal reserves'), in addition to permanent protection areas (areas to be preserved along rivers, hills and others):

- 80% of rural properties located in forest areas in the Legal Amazon.
- 35% of rural properties located in savanna areas in the Legal Amazon.
- 20% of rural properties located in forest or other vegetation in other (i.e. non-Legal Amazon) regions.
- 20% of rural properties in native grasslands in any region.

Legal reserves are forest areas that may be harvested for timber and other products on the basis of sustainable forest management plans (planos de manejo florestal sustentável – PMFS). The extent to which these restrictions are adhered to is unclear.

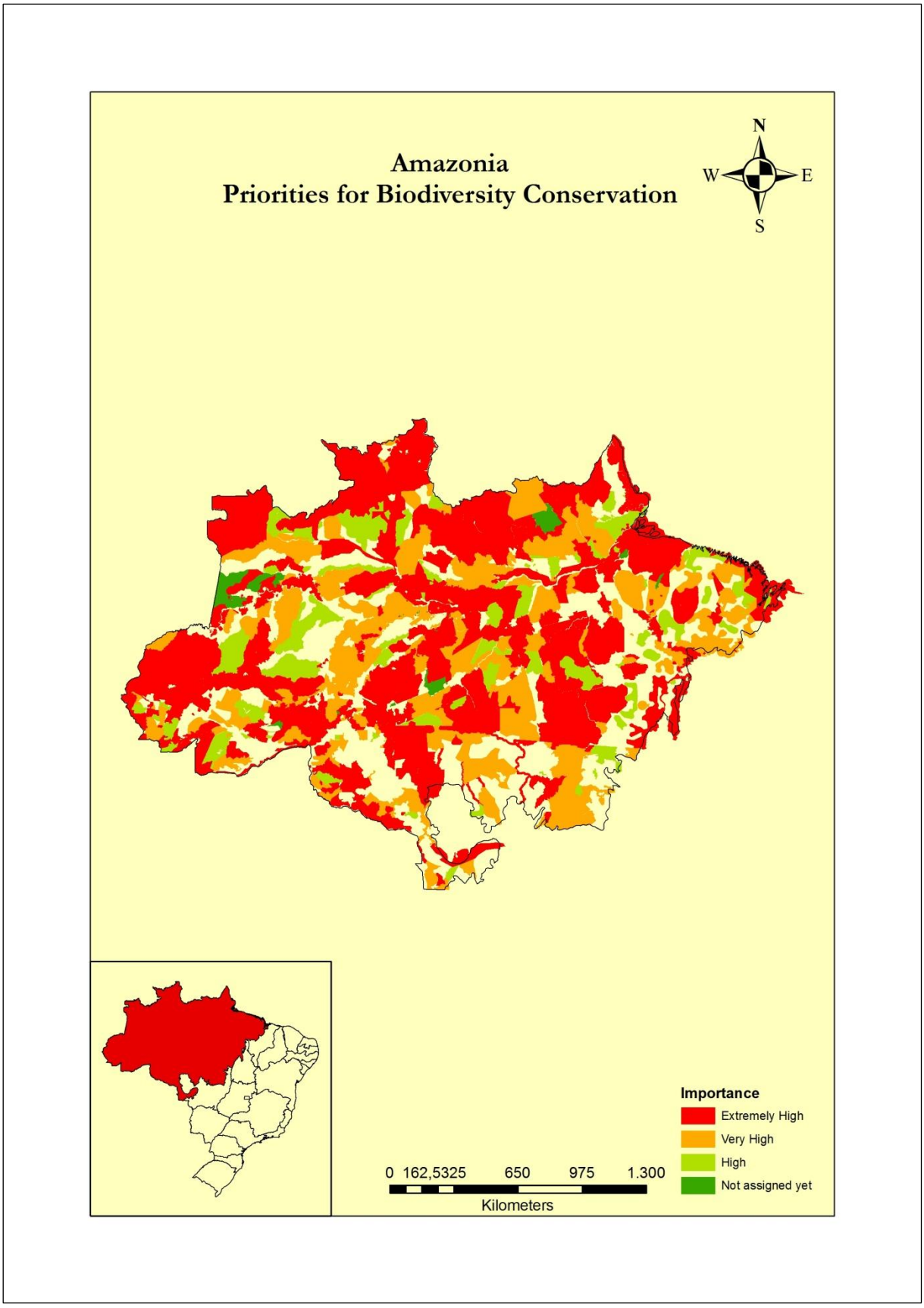

Figure 4: Priority areas for biodiversity conservation in the Amazon biome

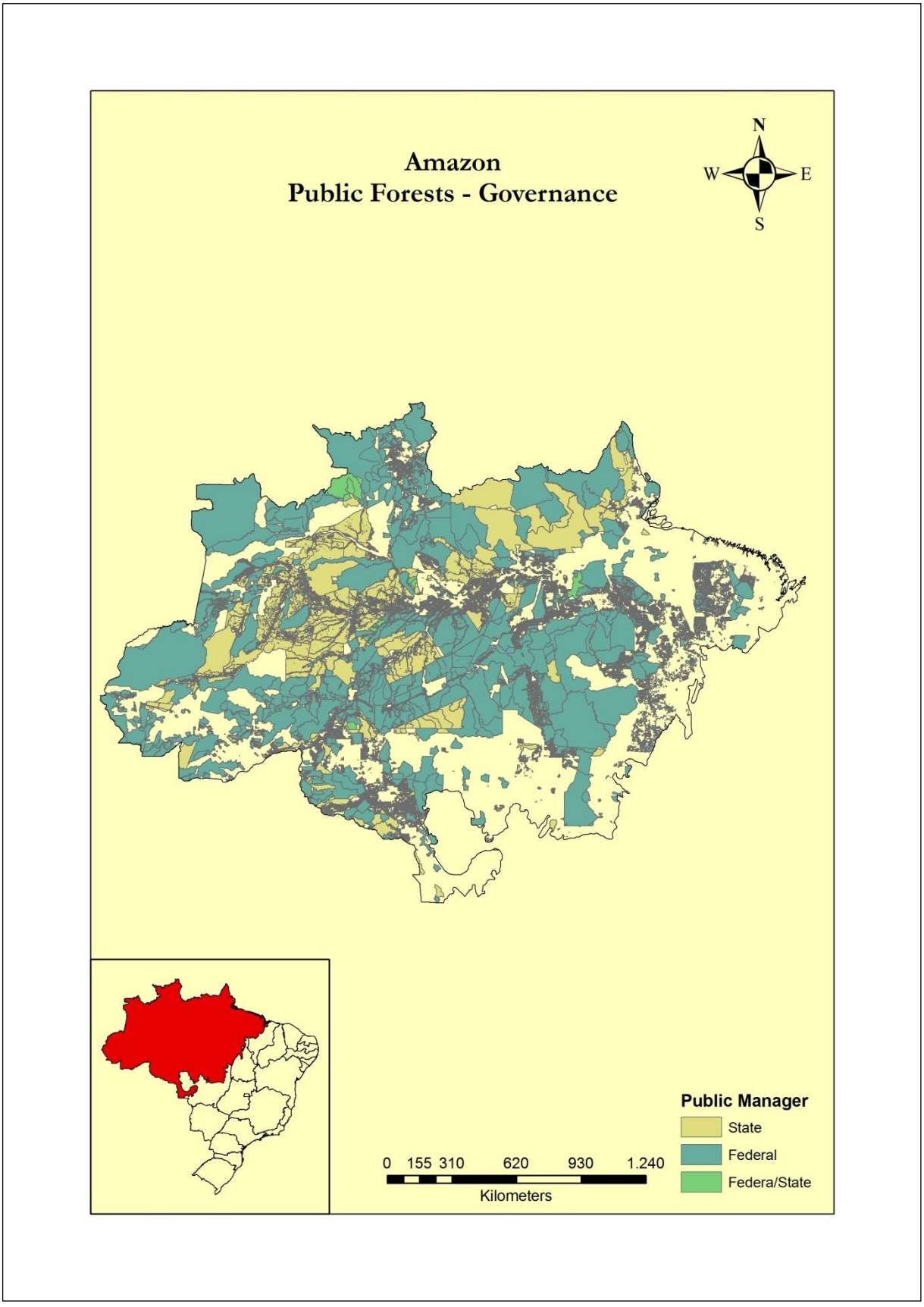

Figure 5: Public land with potential for *in situ* conservation in the Amazon

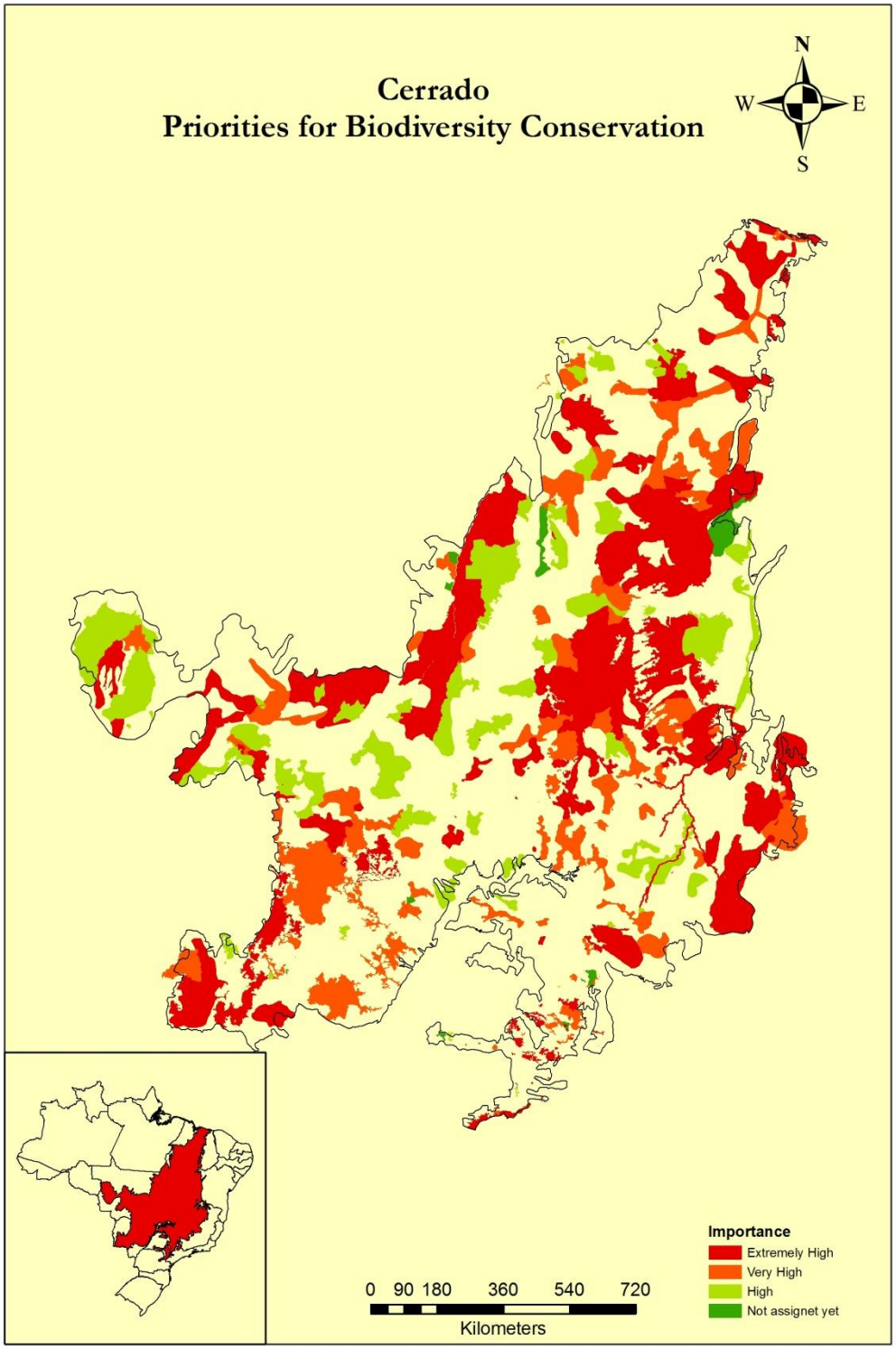

Figure 6: Priority areas for biodiversity conservation in the Cerrado biome

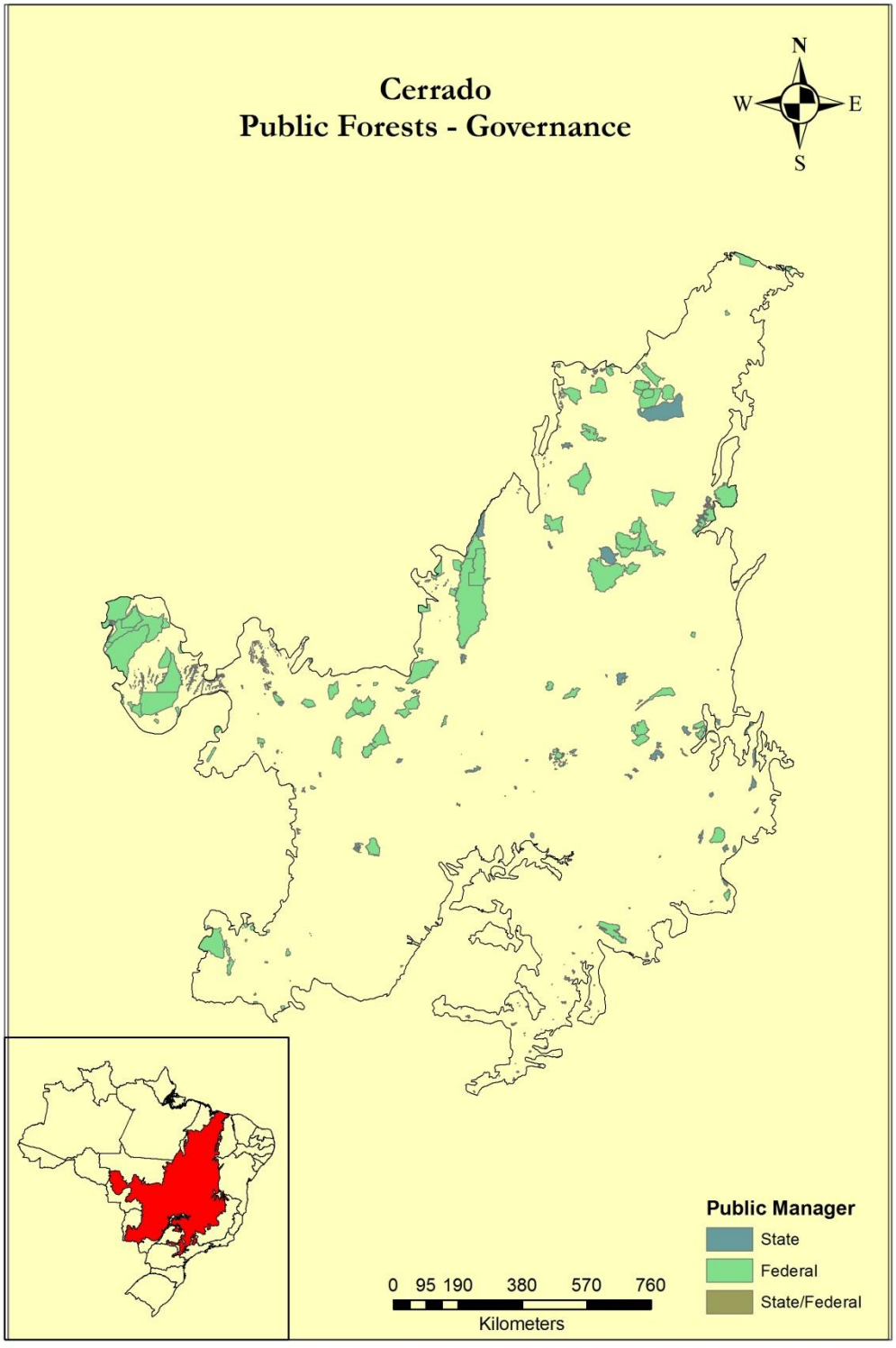

Figure 7: Public land with potential for *in situ* conservation in the Cerrado

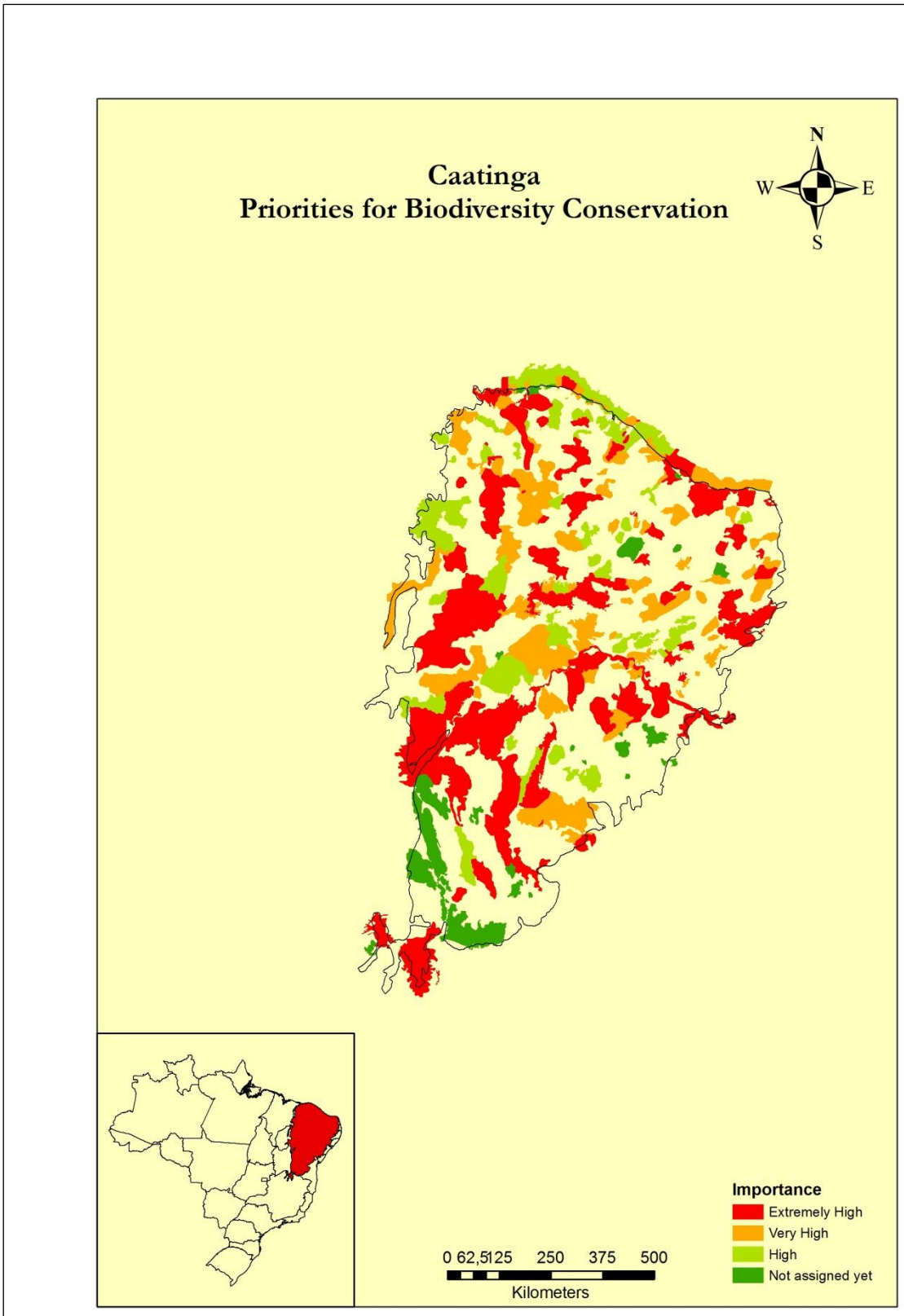

Figure 8: Priority areas for biodiversity conservation in the Caatinga biome

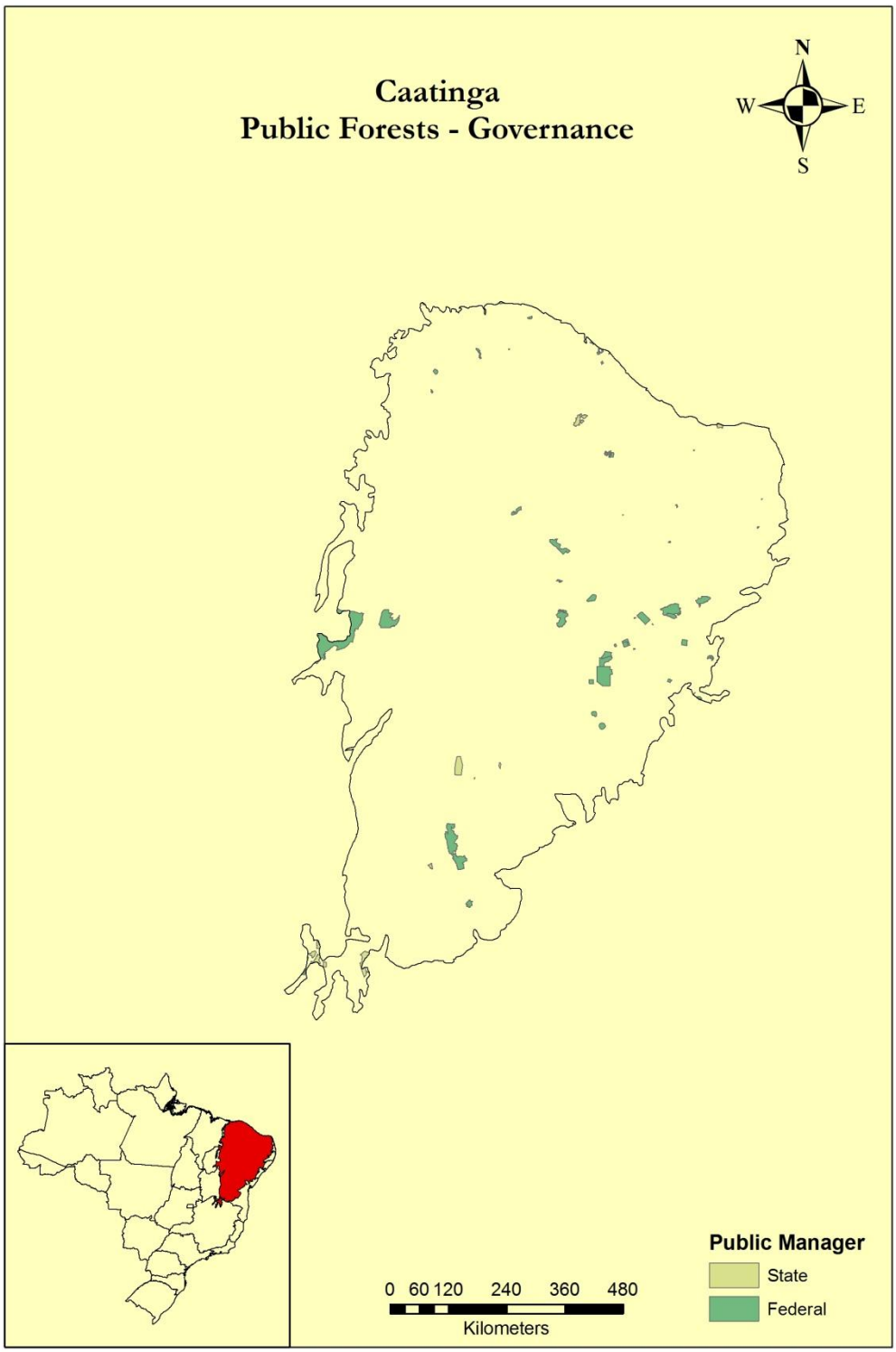

Figure 9: Public land with potential for *in situ* conservation in the Caatinga

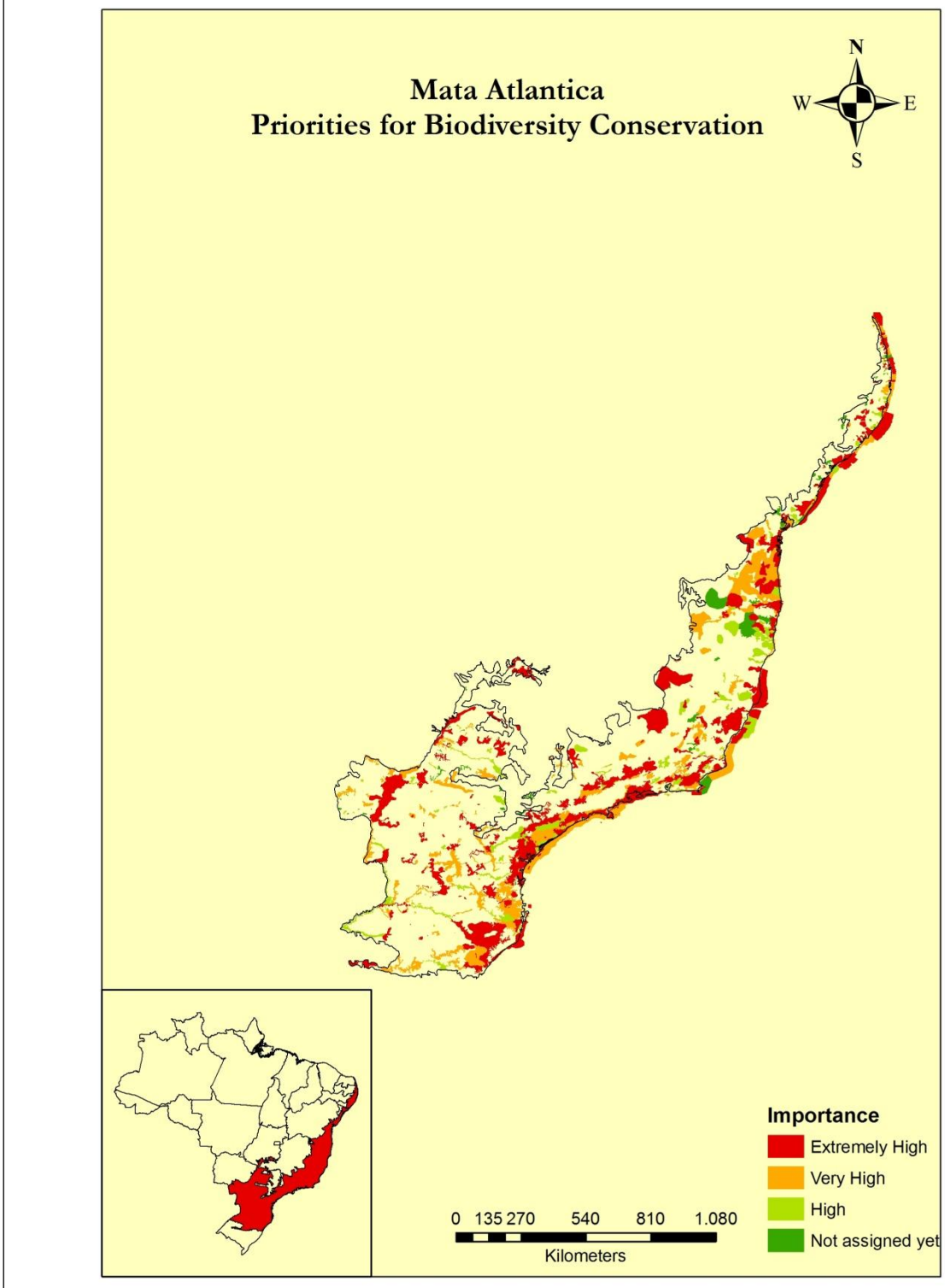

Figure 10: Priority areas for biodiversity conservation in the Atlantic Forest biome

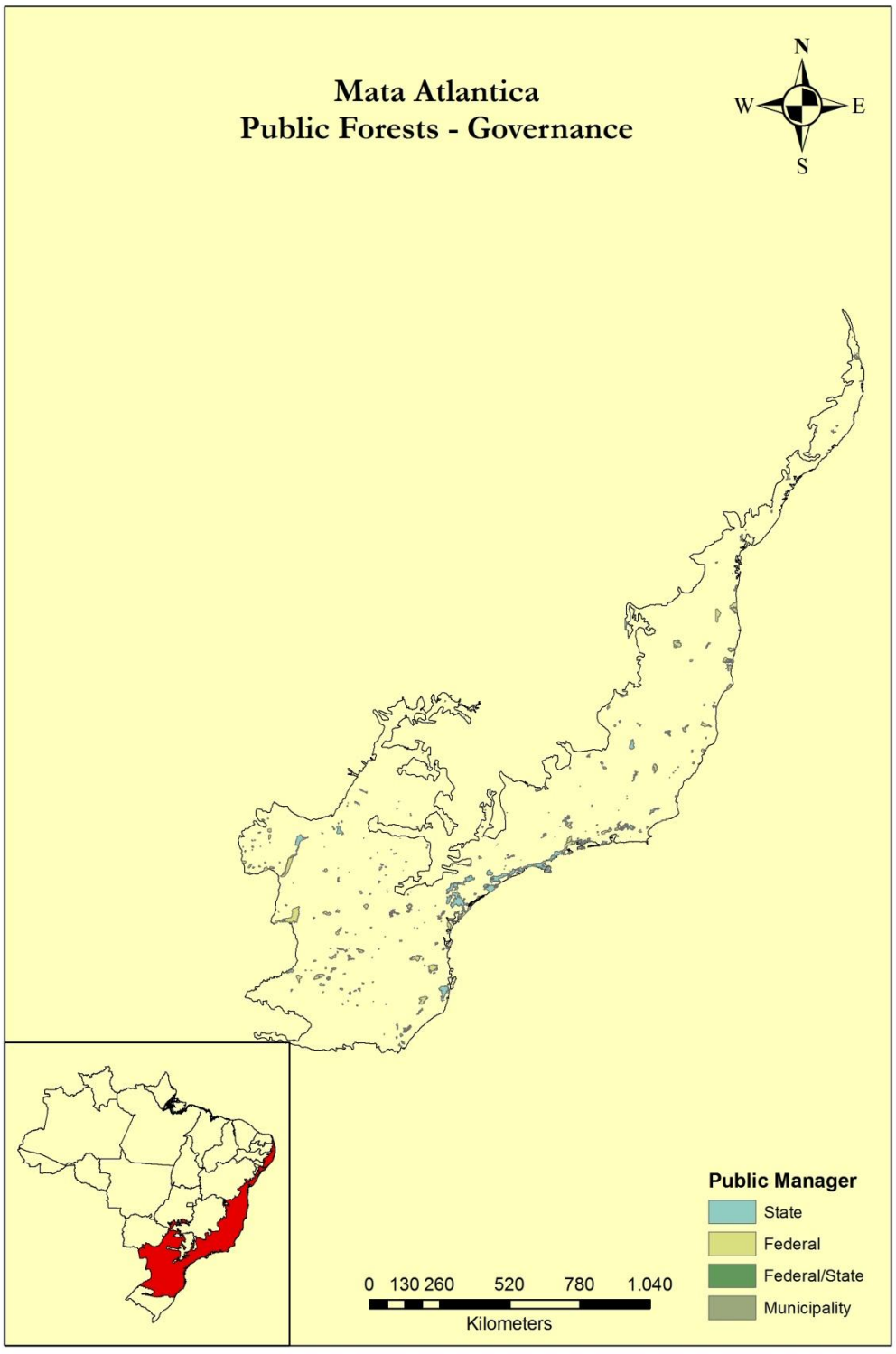

Figure 11: Public land with potential for *in situ* conservation in the Atlantic Forest

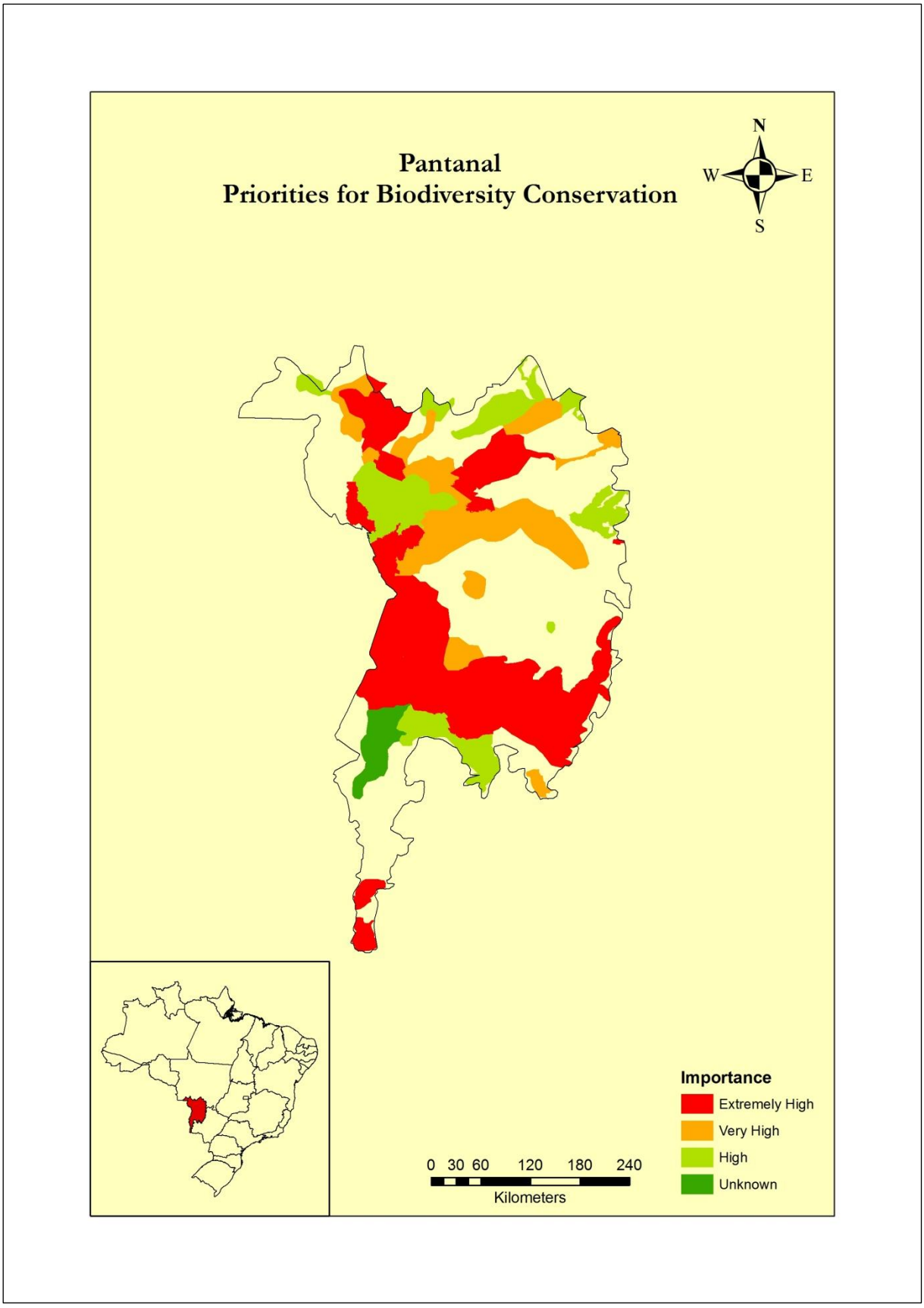

Figure 12: Priority areas for biodiversity conservation in the Pantanal biome

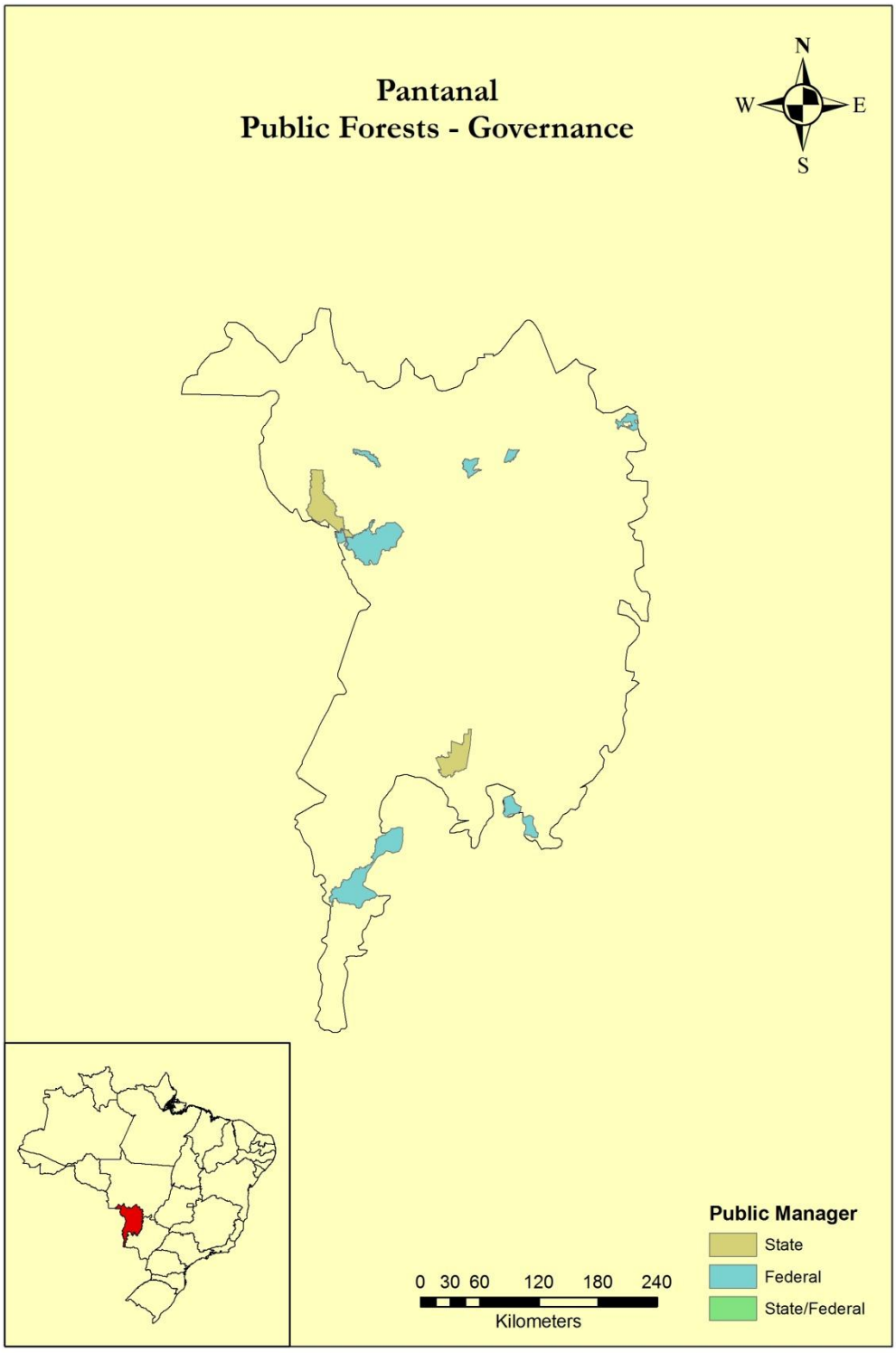

Figure 13: Public land with potential for *in situ* conservation in the Pantanal

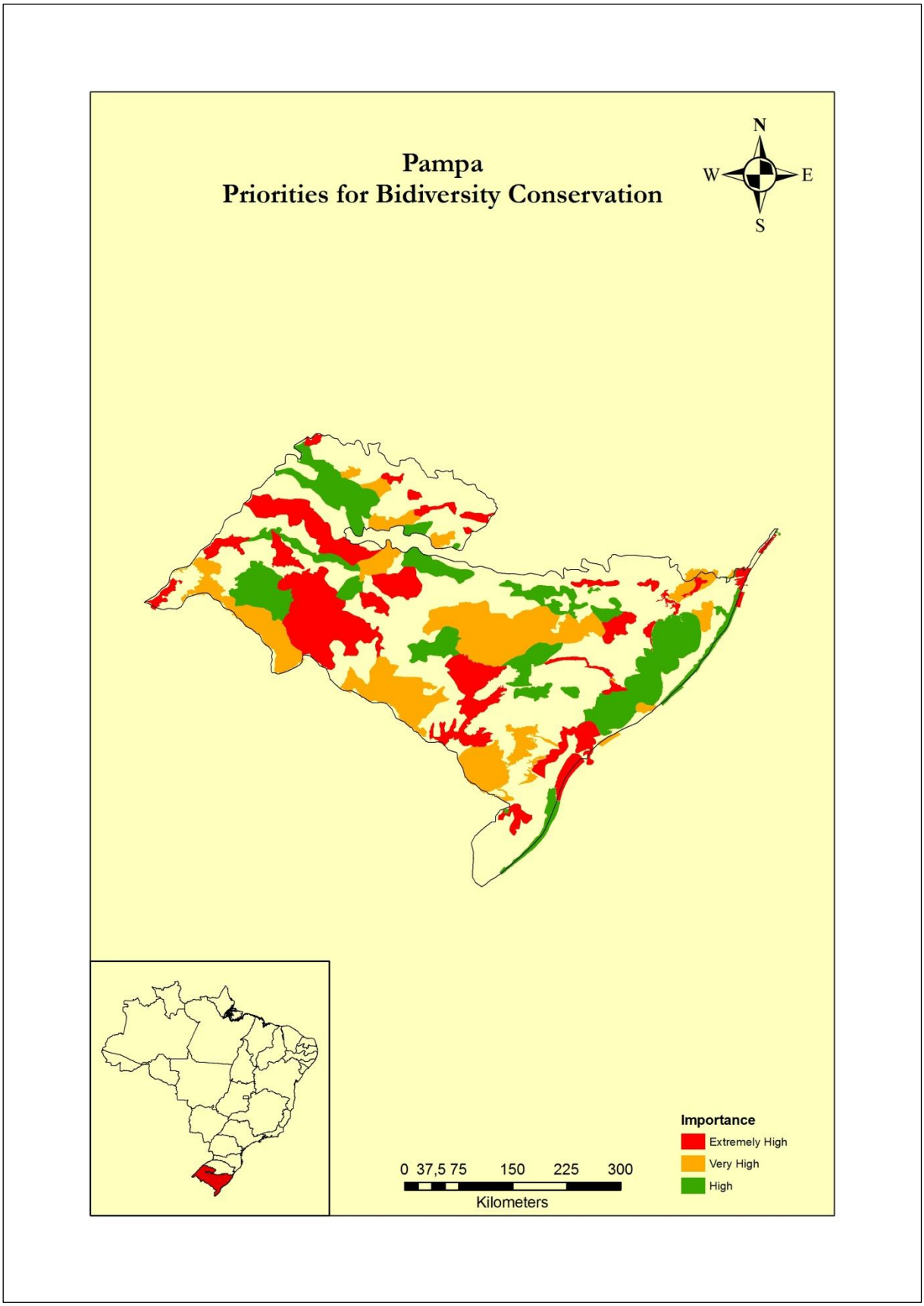

Figure 14: Priority areas for biodiversity conservation in the Pampa biome

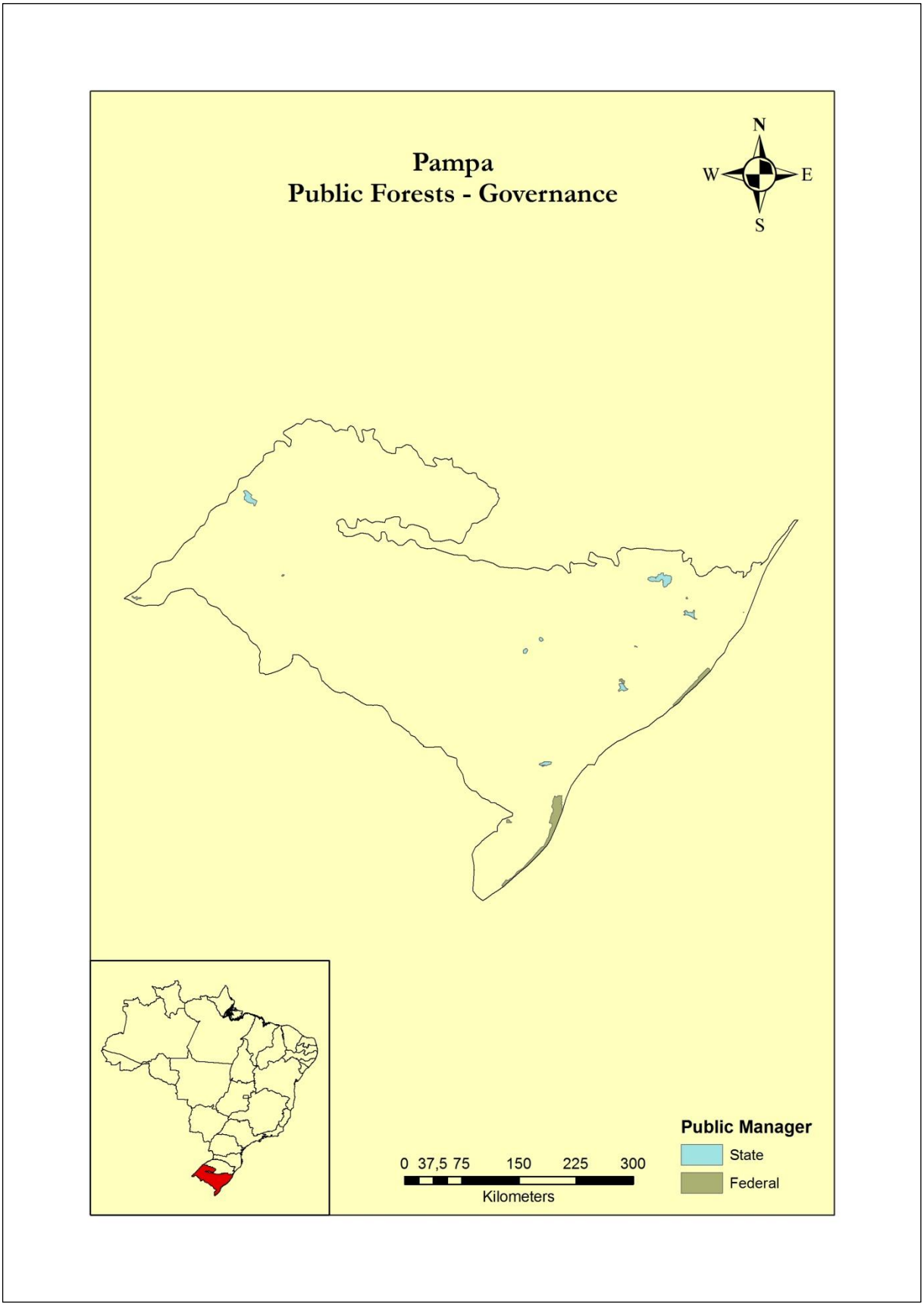

Figure 15: Public land with potential for *in situ* conservation in the Pampa

Uncountable initiatives using *ex situ* strategies have been used in Brazil for the maintenance of forest species genes or mix of genes under artificial conditions outside their natural habitat. This type of conservation has been implemented in the form of permanent pollen collections, seeds, tissue cultures or plant collections maintained in the field. The goal of *ex situ* genetic conservation strategies is to maintain representative samples of tree populations, with as many alleles and gene combinations possible, for use mainly in breeding or genetic improvement programs.

For tree species, *ex situ* conservation can be implemented by means of seed orchards, arboretums, progeny tests and tests of combined progenies and provenances. The conservation of native tree species genetic resources in gene banks has been the main strategy of the Forestry Institute of São Paulo, Embrapa Forestry (and other Embrapa units - Cpatu, Cenargen etc), Universities and research institutes like IPEF. The São Paulo Forest Institute has has deployed dozens of experiments in the form of progeny and origin tests for this purpose since the late 70´s (Sebbenn and Vilas Bôas, 2004; Sebbenn et al., 2009).

Active Germplasm Banks (BAG, Banco Ativo de Germoplasma) are implemented in Brazil to monitor how genetic variation is distributed between and within populations of target trees in natural ecosystems. In BAGs, trees are planted as openly-pollinated progeny tests for the production of good quality seed and for the assessment of quantitative genetic parameters, allowing for the precise monitoring of gen flows (Kageyama, 2002).

The construction of Hydroelectric Power Plants in Brazil has caused severe environmental impacts, especially in places where severely fragmented natural forests were still remaining. Significant fragments remains, where anthropocentric activity is very intense, in the four largest biomes, Amazon, Atlantic Forest, Cerrado and Caatinga, have been flooded to give space for the large reservoirs these plants require. In order to compensate for the loss of forest species in the area of flooding of the reservoir, some Active Germplasm Banks have been created in these biomes.

In the Cerrado biome, for instance, a project involving an electric power company (CESP) and researchers and graduate students from two Universities (USP and UNESP), and IPEF, allowed for the conservation of typical Cerrado tree species collected when the Sergio Motta Hydroelectric Plant was built in the Western part of the state of Sao Paulo. The project resulted in the creation of two BAGs (Table 16 and Table 17) where genetic material of more than 30 tree species in each one has been conserved.

Table 16: Semi deciduous forest species in the BAG for the Rosana area in the State of Sao Paulo

Species	Local Name	Family
Anadenanthera macrocarpa	Angico	Fabaceae
Astronium graveolens	Guaritá	Anacardiaceae
Cariniana estrellensis	Jequitiba branco	Lecythidaceae
Cedrella fissilis	Cedro	Meliaceae
Cedrella odorata	Cedro do brejo	Meliaceae
Celtis fluminensis	Grão de galo	Cannabaceae
Enterolobium contortisiliquum	Tamboril	Fabaceae
Eugenia uniflora	Pitanga	Myrtaceae
Ficus guaranítica	Figueira-branca	Moraceae
Gallesia integrifólia	Pau d'alho	Phytolaccaceae
Genipa americana	Jenipapo	Rubiaceae
Handroanthus impetiginosus	Ipê roxo	Bignoniaceae
Handroanthus umbellatus	Ipê amarelo do brejo	Bignoniaceae
Hymenaea courbaril	Jatobá	Fabaceae
Inga laurina	Ingá-miúdo	Fabaceae
Inga vera	Ingá-açu	Fabaceae
Luehea divaricata	Açoita cavalo	Tiliaceae

Species	Local Name	Family
Maclura tinctoria	Taiuva	Moraceae
Myracrodruon urundeuva	Aroeira	Anacardiaceae
Myroxylon peruiferum	Cabreúva	Fabaceae
Ormosia arbórea	Olho de cabra	Fabaceae
Patagonula americana	Guajuvira	Boraginaceae
Psidium sp	Araça	Myrtaceae
Pterogyne nitens	Jacarandá do campo	Fabaceae
Rheedia gardneriana	Bacupari	Guttiferae
Ruprechia laxiflora	Ruprechia	Polygonaceae
Sapindus saponaria	Sabão de soldado	Sapindaceae
Sidexorylon obtusifolium	Quixabeira	Sapotaceae
Tapirira guianensis	Peito de pomba	Anacardiaceae
Vitex montividensis	Tarumã	Lamiaceae

Source: Rodrigues, C.J. 2010.

Table 17: Cerrado forest species in the BAG in Anaurilândia in the State of Mato Grosso do Sul

Species	Local Name	Family
Alibertia sessilis	Marmelo	Rubiaceae
Annona coriacea	Marolo	Annonaceae
Apuleia leiocarpa	Garapa	Caesalpineaceae
Aspidosperma subincanum	Guatambu	Apocynaceae
Astronium fraxinifolium	Gonçalo-alves	Anacardiaceae
Attalea phalerata	Bacuri	Arecaceae
Campomanesia sp	Gabiroba	Myrtaceae
Campomanesia guazumaefolia	Araçá-grande	Myrtaceae
Chrysophyllum gonocarpum	Maçã-de- pacu	Sapotaceae
Cupania vernalis	Camboatã	Sapindaceae
Dipteryx alata	Baru	Fabaceae
Eriotheca pubescens	Paineira-do- cerrado	Malvaceae
Eugenia florida	Guamirim	Myrtaceae
Gochnatia polymorpha	Candeia	Asteraceae
Hancornia speciosa	Mangaba	Apocynaceae
Jacaranda cuspidifolia	Jacaranda-caroba	Bignoniaceae
Mabea fistulifera	Canudo-de-pito	Euphorbiaceae
Machaerium paraguariense	Caterete	Fabaceae
Machaerium stipitatum	Sapuva	Fabaceae
Pouteria torta	Abio	Sapotaceae
Psidium rufum	Araçá – mirim	Myrtaceae
Qualea dichotoma	Pau-terra	Vochysiaceae
Rhamnidium elaeocarpus	Cafezinho	Rhamnaceae
Rheedia gardneriana	Limãozinho	Guttiferae
Solanum lycocarpum	Lobeira	Solanaceae
Sorocea sprucei	Mercúrio	Moraceae
Tabebuia aurea	Ipê-do-cerrado	Bignoniaceae
Handroanthus ocharaceus	Ipê-amarelo	Bignoniaceae
Tabebuia roseoalba	Ipê-branco	Bignoniaceae
Terminalia argentea	Capitão-do-campo	Combretaceae
Zanthoxylum rhoifolium	Mamica-de-porca	Rutaceae

Source: Rodrigues, C.J. 2010.

In the Mata Atlântica biome, the construction of Barra Grande Hydroelectric Power Plant caused the sinking of a large area of forest with remaining individuals of threatened and endemic species, contributing to reduce genetic variability of their populations. In order to minimize the impact, Embrapa has implemented a project for the conservation of plant germplasm in the area of influence of the dam, focusing on 14 key species (Table 18) (Medeiros and Cavalcanti, 2007).

Table 18. Target species for recovery of plant germplasm in Barra Grande Hydroelectric, SC, RS.

Family	Species	Local name	Actual and potential uses
Araucariaceae	*Araucaria angustifolia* (Bert.) O. Ktze	pinheiro brasileiro	Wood/fruit
Arecaceae	*Trithrinax brasiliensis* Mart.	buriti	Ornamental
Arecaceae	*Butia eriospatha* (Drude) Becc.	butiá-da-serra	Ornamental/fruit
Celastraceae	*Maytenus ilicifolia* Reissek	cancorosa	Medicinal
Clethraceae	*Clethra scabra* Pers.	caujuja	Wood
Dicksoniaceae	*Dicksonia selloviana* Hook.	xaxim	Ornamental
Fabaceae	*Apuleia leiocarpa* (Vogel) Macbr.	Grápia	Wood
Fabaceae	*Erythrina falcata* Benth.	corticeira	Wood
Fabaceae	*Myrocarpus frondosus* Allemão	cabreúva	Wood
Gesnericeae	*Sinningia lineata* (Hjelmq.) Chautems	rainha-do-abismo	Ornamental
Lauraceae	*Ocotea porosa* (Nees & C. Mart.) Barroso	Imbuia	Wood
Moraceae	*Dorstenia tenuis* Bureau	figuerrilha	Medicinal
Moraceae	*Ficus enormis* (Miq.) Mart.	figueira	Wood
Podocarpaceae	*Podocarpus sellowii* Endl.	pinheiro-bravo	Wood

Source: Medeiros and Cavalcanti (2007)

Another important initiative coordinated by the Forest Institute of the State of Sao Paulo, conserve in Active Germplasm Banks approximately 70 tree species, including native and exotic, organized in 250 trials installed in 21 experimental units maintained by the Forest Institute in different parts of the State of São Paulo (Garrido *et al.*, 1987).

Table19: Species in the Embrapa BAG program at Colombo, state of Paraná

Species	**Family**
Araucaria angustifolia	Araucariacea
Maytenus ilicifolia	Celastraceae
Mimosa scabrella	Leguminosae – Mimosoideae
Calophyllum brasiliense	Clusiaceae
Ocotea porosa	Lauraceae
Bactris gasipaes	Palmae
Swietenia macrophylla	Meliaceae
Ilex paraguariensis	Aquifoliaceae

The Convention on Biological Diversity (CBD) is a milestone for the protection of nature primarily because it has materialized the desire of many in the establishment of global environmental objectives for biodiversity conservation as a common international agreement.

The process of negotiation of the Convention began in 1991 and ended in Nairobi in May 1992. The adoption by the countries took place in the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, and came into force the following year.

It was the first time that biodiversity was addressed objectively, and includes subjects such as access to and use of genetic resources, technology transfer, biosafety, the creation of a mechanism to provide funds for developing countries to assist them on implementing the CBD, and addressed the need for new and additional resources to flow from North to South

Especially important was the rejection of the idea that biodiversity was a common human asset. Instead, the emphasis was on national sovereignty over biological resources present in their territories, while it was recognized that the conservation of biological diversity was a concern of humanity. This concern should result in shared responsibility, and biodiversity should be addressed in all its components - ecosystems, species and genes.

According to the CBD, countries should develop national strategies and plans to integrate biodiversity and its sustainable use in relevant sectors in multi-sectoral plans, programs and policies, and processes of decision making. Countries were also urged to know their heritage and set priorities for conservation and sustainable use, based on the best scientific resources available. As for the conservation and sustainable use of biodiversity, it was acknowledged the role of indigenous peoples and traditional communities and respect to their customs, practices and culture. It encouraged the sharing of benefits arising from the use of their knowledge.

As an indirect result, and even though tropical forests have continued to be lost at a rapid pace, records show that deforestation has slowed recently in some countries and improvements have also been noted in terms of protected areas. Currently over 13.5% of the surface of the Brazilian territory is protected.

The following are the main institutional advances made since the ratification of the CBD in Brazil, although not exhaustive and focusing only Federal Government initiatives:

Policies: National Policy on Biodiversity (Decree no4.339/02) National Policy for Sustainable Development of Traditional Communities (Decree No 6. 040/07), National Water Resources Policy (Law 9433/97), National Policy on Climate Change (Law 12.187/09).

Programs: National Biodiversity Program (Pronabio) (Decree 1.354/94, revised by Decree 4.703/03) National Program for Sustainable Use and Conservation of the Cerrado Biome (Decree 5.577/05) "Mais Ambiente" Programme (Decree No. 7029 / 09), the National Forest Programme (NFP) (Decree 3.420/00), the National Coral Reef Monitoring, Water Producer Program (NAA) Program Long Term Ecological Research (LTER) Program of Research Biodiversity (PPBio) (MCT Ordinance No. 268/04, as amended by Decree No. 383/05 MCT), National Program for Family and Community Forest Management (Decree 6.874/2009).

Plans and Projects: National Protected Areas (PNAP) (Decree No. 5.758/06), Sustainable Amazon Plan (PAS), National Plan for Prevention and Control of Deforestation in the Amazon (PPCDAM) Plan of Action to Prevent and Control Deforestation and Fires in the Cerrado (PPCerrado) National Plan for the Promotion of Production Chains socio-biodiversity Systems: the National Environment (Sisnama)

National System of Conservation Units (SNUC), National Environmental Information System (Sinim) Authorization System and Information on Biodiversity (Sisbio) National System for Biodiversity Research (Sisbiota-Brazil).

Councils: National Commission on Biodiversity (CONABIO) (Decree 4.703/03) Board of Management of Genetic Resources (Cgen) (Measure 2186-16/01), the National Forests Comission (CONAFLOR) (Decree 3.420/00), Commission of Public Forest Management (Cgflop) National Commission of Sustainable Cerrado Program (CONACER) (Decree No. 5.577/05), National Technical Commission on Biosafety (CTNBio) (Law 11.105/05).

4.1. Forest genetic resources conservation institutions

Table 20 presents the main organizations that contribute to the research and development of forest science, technology and innovation in Brazil.

Table 20: Research Institutions with some forest scientific or technological productivity in Brazil

Acronym	Institution
CEFET/PB	Centro Federal de Educação Tecnológica
CENA	Centro de Energia Nuclear na Agricultura
CEPEC	Centro de Estudos e Pesquisas Clínicas de São Paulo
CEPEF	Centro de Pesquisas Florestais
CEPLAC	Comissão Executiva do Plano da Lavoura Cacaueira
CETEC	Fundação Centro Tecnológico de Minas Gerais
CNEN	Comissão Nacional de Energia Nuclear
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária
EPAGRI	Emp. de Pesq. Agrop. e Extensão Rural de Santa Catarina
EPAMIG	Empresa de Pesquisa Agropecuária de Minas Gerais
FECOTROP	Fundação Eco Tropical
FEE	Fundação de Economia e Estatística
FFT	Fundação Floresta Tropical
FIOCRUZ	Fundação Oswaldo Cruz
FTROPAT	Fund. Tropical de Pesquisas e Tecnologia "André Tosello"
FUNAI	Fundação Nacional do Índio
FUNDACENTRO	Fund. Jorge Duprat Figueiredo Seg. e Medicina do Trabalho
FUNED	Fundação Ezequiel Dias
FUNTAC	Fundação de Tecnologia do Estado do Acre
FUPEF	Fundação de Pesquisas Florestais do Paraná
FVA	Fundação Vitória Amazônica
IAC	Instituto Agronômico de Campinas
IAL	Instituto Adolfo Lutz
IAP	Instituto Ambiental do Paraná
IAPAR	Instituto Agronômico do Paraná
IBAMA	Instituto do Meio Ambiente e Recursos Naturais Renováveis
IBGE	Instituto Brasileiro de Geografia e Estatística
IBT	Instituto de Botânica
IBU	Instituto Butantan
IEC	Instituto Evandro Chagas
IEF	Instituto de Estudos Florestais

Acronym	Institution
IESB	Instituto Estudos Socioambientais Sul Bahia
IF	Instituto Florestal
IMAFLORA	Instituto de Manejo e Certificação Florestal e Agrícola
IMAZON	Instituto do Homem e Meio Ambiente da Amazônia
INPA	Instituto Nacional de Pesquisas da Amazônia
INPE	Instituto Nacional de Pesquisas Espaciais
IPAM	Instituto de Pesquisa Ambiental da Amazônia
IPE	Instituto de Pesquisas Ecológicas
IPEA	Instituto de Pesquisa Econômica Aplicada
IPEF	Instituto de Pesquisas e Estudos Florestais
IPEN	Instituto de Pesquisas Energéticas e Nucleares
IQ	Instituto de Química
IQSP	Instituto de Química de São Paulo
ISA	Instituto Socioambiental
JBRJ	Instituto de Pesquisas Jardim Botânico do Rio de Janeiro
MBML	Museu de Biologia Prof. Mello Leitão - ES
MHNPR	Museu Hist. Nacional - PR
MPEG	Museu Paraense Emílio Goeldi
Museu Nacional	Museu Nacional
RFL	CVRD - Reserva Florestal de Linhares
SFMCN	Sociedade Fritz Muller Ciências Naturais
SIF	Sociedade de Investigações Florestais
WWF	Fundo Mundial para Natureza
Total	54

Table 21 provides information about the number of professionals working for publically funded forest research centers. It does not include faculty in forest engineering courses at the university level.

Table 21: Professionals working in publicly funded forest research centers

Degree	2000	2005	2008
Doctor (PhD)	87	100	116
Master's (MSc)	45	47	38
Bachelor' (BSc) or equivalent	42	45	54

Graduation data presented in Table refers to the number of students that have successfully completed a Bachelor's or higher degree or achieved a certificate or diploma as forest technician. Numbers of Masters or equivalent reflect only the number of people with a Master's Degree (MSc) from institutions recognized by the Ministry of Education (MEC). However, there are in the country people with a Doctor's degree in the area, which were not included in the table.

Table22: Graduation of student in forest-related education

Degree	2000	2005	2008
Master's (MSc) or equivalent	150	181	200
Bachelor's (BSc) or equivalent	333	679	1048
Forest technician certificate	n.a.	245	253

Table 2323 presents information for the universe of researchers working for the Emilio Goeldi Museum in the State of Pará – MPEG; Laboratory of Forest Products in Brasília, DF – LPF; Embrapa Forests in Colombo, PR; Embrapa Western in the Amazon Region; Embrapa Rondônia; Technological Research Institute of the State of São Paulo – IPT; National Research Institute for the Amazon Region in Manaus, AM – INPA.

Table 23: Researchers in the research centers

Degree	2000				2005				2008			
	Male	**Female**	**Total**	**%Fem**	**Male**	**Female**	**Total**	**%Fem**	**Male**	**Female**	**Total**	**%Fem**
Doctor	59	28	87	32,18	68	32	100	32,00	75	41	116	35,34
Master	32	13	45	28,89	31	16	47	34,04	23	15	38	39,47
Bachelor	25	17	42	40,48	25	20	45	44,44	29	25	54	46,30

Data presented in Table 2424 shows people with a Bachelor's degree that have emailed the National Institute of Educational Statistics and Research (INEP) during the period of 1990 to 2006.

Table 24: Bachelor graduations

Year	Female	Male	Total	% Female
1990	49	118	167	29,34
1991	73	158	231	31,60
1992	90	140	230	39,13
1993	90	143	233	38,63
1994	79	182	261	30,27
1995	104	155	259	40,15
1996	81	163	244	33,20
1997	110	173	283	38,87
1998	129	187	316	40,82
1999	150	239	389	38,56
2000	128	205	333	38,44
2001	170	249	419	40,57
2002	180	267	447	40,27
2003	225	353	578	38,93
2004	236	340	576	40,97
2005	272	407	679	40,06
2006	341	541	882	38,66

Table 2525 presents number masters graduated in Forest Sciences according to the Council for the Improvement on Higher Education (CAPES).

Table 25: Graduated Masters

Years	Total
1996	85
1997	84
1998	87
1999	101
2000	150
2001	113
2002	179
2003	137
2004	157
2005	181
2006	200
2007	177
2008	199

(5.1 a 5.4) Related and actively engaged in conservation and management (governmental/non-governmental, research, universities, industry etc. / field and laboratory); Education, research and training (5.15 - 5.23: including budget for research, needs, priorities, obstacles, strategies, internationalization and patents); Information management systems (5.27 – 5.30: including use of standard formats to facilitate data exchange, needs, priorities and challenges)

For a sectorial analysis of the state of science, technology and innovation in Brazil, Rodriguez (2002) provides a reasonably updated overview. The infrastructure for training forest professionals, specifically foresters, has increased significantly over the last 10 years (Figure 16) when 38 new undergraduate university courses were created.

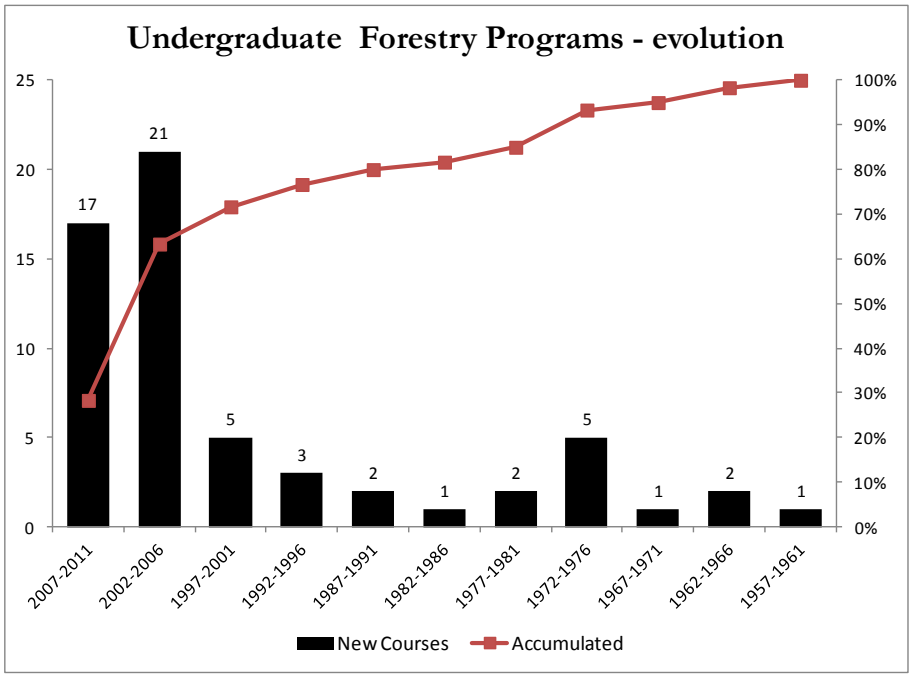

Figure 16: Creation of new undergraduate Forestry courses in Brazil

These schools, private and public, have an annual capacity to receive close to four thousand new forestry students. Half will probably graduate, in average. The distribution of these courses and opportunities among the six biomes in Brazil is reasonably good (Table26).

Table26: Forestry education – annual recruitment opportunities and undergraduate courses per biome

Biome	Forestry Programs Undergraduate level	Annual recruitment (vacancies opened for new students)
Amazonia	17	1219
Caatinga	9	696
Cerrado	12	690
Atlantic Forest	16	1043
Pantanal	3	140
Pampa	3	176
Total	60	3964

Source: Ministry of Education. (2011, December 27). Instituições de Educação Superior e Cursos Cadastrados. Retrieved from http://emec.mec.gov.br/

4.2. Forest genetic resources conservation national programs

The Brazilian National Platform project for genetic resources was approved in 2009. This project consists of four major networks: Plant Network, Animal Network, Microbial Network and the Network for the Integration of Genetic Resources. Tree species are included in Active Germplasm Bank of the forest species and palms component, subdivided in eleven action plans (eleven bags of different forest species and palms). The objective of this project is to improve, maintain, evaluate, characterize and document the active banks and of germplasm collections of forest species and native palms in existing national research organizations. Another objective is the morphological and physiological characterization of native species seeds from the Amazon for the effective conservation and exchange of germplasm and information for multiple uses.

4.3. National networks

Efforts have been made to standardize vernacular (local) and scientific names. The correct identification of tree species still deserves special attention at a national level. National networks of botanists and taxonomists have been organized to overcome the recurrent problem of a certain tree species receiving many local names, and vice-versa, different species being designated by one single vernacular name. Good examples of initiatives supported by a network of institutions and collaborators are: the Dendrogene initiative already mentioned in this report; the work done by the Brazilian Forest Service and the Forest Products Laboratory, in which more than 4,000 are presented in the book "Trees of Brazil" containing about 15,000 common and comercial local or vernacular names with their respective scientific names of species for all six Brazilian biomes; the organization of regular workshops like the "Relevance of Botanic Identification for the Amazonian Forest" and congresses like the "II Brazilian Congress of Genetic Resources - Amazonia: genetic resources and sustainability" (Embrapa Eastern Amazon and the Brazilian Society of Genetic Resources).

Eucalyptus and Pine Forest plantations have benefited for a long time, since the 70´s, from pioneering cooperative network genetic research and improvement programs. Currently IPEF, associated with the Forest Sciences Department of the University of São Paulo, is leading an effort to "rescue" most of the information scattered all over the country regarding genetic improvement programs for Eucalyptus, Pine and other exotic tree species.

Brazilian experts from various institutions are organizing a new meeting in 2012 (II Congresso Brasileiro de Recursos Genéticos – 24 to 28 of September) to discuss the current state and prospects in the conservation and use of genetic resources in Brazil. Hosted by Embrapa and the Brazilian Society of Genetic Resources in Belém, state of Pará in Brazil, the meeting focuses this time in the sustainable use of the Amazonian genetic resources. The event offers an excellent opportunity to establish research priorities and institutional commitments.

4.4. Awareness of the roles and values

Awareness about the economic importance of biodiversity and the need for its conservation and sustainable use is satisfactory and increasingly more pervasive among Brazilians. Increasing awareness and concern led the country be the first to sign the Convention on Biological Diversity (CBD) in 1992 and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) years later. Following the entry into force of these instruments, research institutions using native biodiversity and/or associated traditional knowledge have been induced to introduce the necessary changes into their activities. In order to conduct research involving access to genetic resources, as well as to send materials

abroad with research purposes, institutions are required to have a government permit, issued by a national authority. Access to and availability of associated conventional knowledge are now regulated and require holders' previous approval and a government-issued permit.

Hubbell et al. (2008), working with a dataset referred by ter Steege (2006) in the Amazon Basin comprising 288,973 individual trees classified into 514 genera, concluded that the Brazilian portion of the Amazon Basin has approximately 11,210 tree species that reach sizes >10 cm DBH. Of these, 3,248 are common species with population sizes above one million individuals. At the other end of the abundance spectrum, however, his estimates predict the existence of 5,308 rare species that are expected to suffer nearly a 50% extinction rate under non optimistic deforestation scenarios and a 37% loss rate under optimistic scenarios.

Their results show that large percentages of rare and endemic species will probably go extinct. More specifically, the number of rare tree species at risk of extinction from habitat loss may reach the hundreds to several thousand. Uncertainty exists because the real value depends on a precise estimate of how many rare species effectively exist in the Amazon.

It is also not clear how many survivors of habitat loss will survive the novel climates forecast for the Amazon predicted by Williams et al. (2007), which include significantly warmer temperatures and more variability in rainfall, accompanied by longer and more severe droughts.

The adequate management of forest genetic resources in Brazil demands a well structured database. Registering, monitoring and reporting the evolution of how these resources evolve is impossible without such systems. And this is so because the amount of information, the number of species, organizations and actions involved, and the scope of all initiatives dealing with the management of forest genetic resources is simply too big. To deal with this huge amount of data, Brazilian Government created the National System of Forest Information (SNIF), by the Law 11.248/2006. The strengthening of the SNIF is essential not only to facilitate the completion of reports like this, but mainly for the development and implementation of forest policies in Brazil. Once improved and adapted to host a well designed and integrated database, the SNIF will easily provide the list of species currently subject to tree improvement programs, the main improvement objectives of these programs (timber, pulpwood, fuel wood, non-wood products, other), the list of provenances, plus trees, seedling progenies and clones tested in field trials for each tree species improvement and tree breeding program, and a more detail list of national seed improvement programs and participatory tree breeding programs and approaches.

5.1. Improvement programs

Two examples are presented to illustrate some Brazilian efforts on improvement programs of native forest tree species:

1. **The use of native genetic resources and conventional knowledge in peach-palm breeding (*Bactris gasipaes*, Palmae)**: Peach-palm was domesticated by the first settlers of South Eastern Amazon, probably for timber. Later it became important for its oil-rich fruit and, at the height of its domestication, for its amylaceous fruit (Figure 15), perfect for fermentation, celebrating festive occasions. It was a crucial item for the subsistence of peoples from Western Amazon, North Western South America and Southern Central America before the conquest of the continent by the Europeans –according to the ethnicity, as important as maize and/or cassava. It was less important in Central and Eastern Amazon, characterized by different indigenous peoples and genetic resources. After the European conquest, peach-palm gradually lost its importance, as peoples who used it were decimated or acculturated. In the course of the 20th century, its potential as energy, oil, starch, fiber and beta-carotene rich food was acclaimed, chiefly because its yield potential in South-American soils is much higher than maize's, which has similar chemical-nutritional composition. In the last quarter of the 20th century, Victor Manuel Patiño (Colombia, died in 2001) and Jorge Mora Urpí (Costa Rica, died in 2008) led a multinational research and development (R&D) effort on peach-palm. In the late 1970s, Brazil joined this effort through a partnership between the Amazon National Research Institute (Inpa) and Embrapa Genetic Resources and Biotechnology. Therefore, today Brazilian and Costa Rican institutions lead the work on this species, which also includes activities in Bolivia, Colombia, Ecuador, Panama, Peru and Venezuela. A primitive race, known as Pampa Hermosa, was identified in the Yurimaguas region, Loreto, Peru. It grows rapidly and has an ideal ideotype to obtain the heart of palm, a gourmet product extracted from the palm tree growth point. Today, this race is cultivated in 80 % or more of Latin-American farms where it is harvested to meet the growing global demand for this gourmet vegetable. In Brazil, Pampa Hermosa accession introductions –as well as identification of other populations such as primitive Putumayo race, has made the prosperity of the agribusiness sector growing peach palm for heart of palm production. A breeding programs lead by Embrapa, Campinas Agronomical Institute (IAC – Campinas, São Paulo state) and Inpa

perform progeny assays for the identification of elite germplasm for heart of palm production in Brazilian South East and North regions.

2. **The use of native Southern Brazilian fruit tree genetic resources:** The native Southern Brazilian fruit tree species germplasm active bank (GAB-Natives South), at Embrapa Temperate Climate, holds 12 native and two introduced species. They are: guabiroba (*Campomanesia xanthocarpa*); Surinam Cherry (*Eugenia uniflora*); Strawberry Guava (*Psidium catleyanum*); feijoa (*Acca sellowiana*); ingá (*Inga uruguensis*); guabiju (*Myrcianthes pungens*); araticum (*Rollinia sylvatica*); Jelly Palm (*Butia capitata.*); camass (*Eugenia pyriformis*); cherry of the Rio Grande (*Eugenia involucrata*); jabuticaba (*Plinia cauliflora*); were recently added to the collection *Rubus sp.* accessions. Exotic species are Para Guava (*Psidium acutangulum*) and Japanese raisin tree (*Hovenia dulcis*). Parallel to field evaluations and laboratory determinations, new processing methods have been tested with a view to better use of these fruit trees. Furthermore, an evaluation of their value as functional food is ongoing based on a joint initiative with the College of Pharmacy (Rio Grande do Sul Federal University). Essential oils have already been identified and phenolic compounds, anthocyans and antioxidant power determination is currently being conducted. Initial studies carried out at GAB-Natives South concerned Strawberry Guava, involving research on reproduction mode, chromosome number, characterization (shape, skin color, flavor, mean weight, soluble solids content, wall thickness, pulp firmness and fruit general aspect; size; seed number and size) and best accessions selection. Most interesting germplasm is also evaluated for yield; two clones have been selected and propagated: Yacy - of yellow skin fruit and Irapuã - of deep-red skin fruit. Research conducted at GAB-Natives South interested both primary sector and industry. For instance, over 30 thousand strawberry guava plants were made available over the years, and micro and small industries in the area intend to process Surinam Cherry, Strawberry Guava and feijoa, among others. The establishment of orchards with these native species will benefit local fruit growers, as this ensures them complementary income −some of the latter, such as Strawberry Guava and some types of Surinam Cherry, fruit after peach and plum harvest. At the same time, it will benefit industry and consumers, who will have new product options, which eventually contributes to species conservation.

The domestication of native species is a great opportunity to be explored; included here are species already known and marketed by local and regional populations but whose national or international market penetration is low. Nevertheless, this wealth remains underused in Brazil, particularly due to imposed and deeply rooted cultural patterns that privilege exotic products and crops. Nevertheless, the most significant –national and international- markets are eager for new products: this is why Brazil's genetic and biological resources hold great potential to meet this market demand and generate wealth.

Responding to this, the Ministry of Environment coordinated a project to identify species of the Brazilian flora of current and potential economic value used at local and regional levels called "Plants for the Future" and developed in 2005-2007 with the aim to a) prioritize new commercially underused species of the Brazilian flora, providing possibilities of use by small farmers; b) create new investment opportunities for entrepreneurs in the development of new products; c) identify the degree of use of and gaps in scientific-technological knowledge about species locally and regionally used; d) value biodiversity, clearly demonstrating to society possibilities of use of these important resources; and) enhance food security, broadening previously available options.

Five subprojects, one in each geopolitical region of the country, were contracted in order to achieve these goals. The results of this effort were the prioritization of 775 species from different Brazilian regions: 255 species from the South, 128 from the South East, 131 from the Center West, 162 from the North East

and 99 from the North. The species included in this list were organized in 12 use groups: food plants, fruit-bearing plants, medicinal plants, aromatic wood, ornamental plants, oil-rich plants, timber, apiculture plants, fiber plants, forage, toxic/biocide and environmental species. For some species there already is a certain degree of prominence in the national scenario like açai (*Euterpe oleracea*) and cupuaçu (*Theobroma grandiflorum*). Others, despite their great potential, like feijoa (*Acca sellowiana*), are only known at local and regional levels. As a first regional product of the iniciative, was edited on 2011 the book "Plants for the Future - South Region" (Coradin *et al.* 2011).

Progress in knowledge, conservation and enhancement of the use of these native genetic resources is also instrumental to minimize vulnerability of the global food system. In addition, this initiative is decisively contributing to the development of components relating to improved training and strengthened capacities of both researchers and undergraduate / graduate students. Parallel to these five subprojects, five regional seminars were held, one in each region, and presentations made in national and international scientific events.

Representatives of governmental and non-governmental, academic-scientific and business sectors attended these regional seminars. All the information gained by this survey is being systematized for publishing, which will provide each one of the regions with a portfolio of native species of current and potential economic value. This initiative is considered crucial for the implementation of the engagements taken by Brazil as a signatory of FAO International Treaty on Plant Genetic Resources for Food and Agriculture. New actions are being prepared that aim at continuing this work that include specific meetings involving businesses and academic-scientific sectors; this will afford an opportunity to present results already achieved and new possibilities for a wider use of these species, particularly as food, medicinal and ornamental plants and aromatic wood.

5.2. Use of improved reproductive materials, access and benefit-sharing

Access to genetically improved trees for forest plantation is available in institutions like IPEF and EMBRAPA. For native forest species, though, information on access to genetic resources and benefit-sharing is dispersed, not standardized and incomplete.

The preparation of a list of species for which the sources of seed, pollen, scions and other improved reproductive materials are known is an ongoing project in Brazil.

6.1. International agreement, treaties, convention, or trade agreement

Over the last decade, Brazil has taken both unilateral and multilateral measures at the international, national and regional levels to protect, promote and preserve traditional knowledge. One of the most positive factors for the conservation and sustainable use of biodiversity, as well as for the protection of traditional knowledge, is the fact that Brazil signed and ratified the Convention on Biological Diversity. As a signatory to the CBD and one of the countries with the richest biodiversities in the world, Brazil has adapted its public policies in order to ensure the sustainable use and the conservation of biological resources; this has been done chiefly through the National Biodiversity Policy.

Another important measure taken by Brazil–together with China, Colombia, Costa Rica, Ecuador, India, Indonesia, Kenya, Mexico, Peru, South Africa and Venezuela, was the creation of the group called Like-minded Mega diverse Countries (LMMC), recorded in the Cancun Declaration. Later on, other countries, such as Bolivia, Malaysia and the Democratic Republic of Congo, joined the group. Over 70% of the global biodiversity is found in the territories of these 15 countries. The LMMC was established as a special mechanism for mutual consultation and cooperation and aims at promoting common interests and priorities regarding the preservation and the sustainable use of biodiversity among its member countries. Brazil chaired the LMMC for the first time in the 2009-2010 period and coordinated the member countries defense of sensitive areas during the preparatory meetings for the CBD's COP 10. During these two years, the group played an active role in discussing the International Regimen on Access and Benefit-sharing, involving the sustainable use of biodiversity and associated traditional knowledge.

6.2. Forest genetic resources international programs

International cooperation is an essential tool to foster a country's development and to build technical and commercial capacity of companies, universities and research institutes, combining the search for the well-being of national populations and the need for competitiveness in the new global economy. Furthermore, international cooperation, either directly between institutions from different countries or with the mediation of an international organization, which might provide financial and administrative support to actions, is a safe and effective tool to increase contact and strengthen politico-economic ties between the involved countries. In Brazil, the Ministry of Foreign Affairs is responsible for the coordination of foreign policy-making in the matters concerning science and technology, defending the country's positions in negotiations and implementation of bilateral and multilateral cooperation programs.

The Brazilian Cooperation Agency (Agência Brasileira de Cooperação – ABC) is the MRE's cooperative arm and plays a decisive role in this process. This agency is in charge of the coordination and supervision of technical cooperation programs in which Brazil is involved. Programs and projects are negotiated and implemented based on agreements signed by Brazil with partner-countries and international organizations. In order to fulfill its mission, the Brazilian Cooperation Agency steers its work pursuant to Brazilian foreign policy, within the competence of the MRE, and to national development priorities, defined by governmental plans and programs for different sectors. Technical cooperation programs and projects are developed along two major lines: horizontal cooperation and cooperation from abroad. Horizontal cooperation is the technical cooperation implemented between Brazil and other developing countries. Cooperation from abroad encompasses bilateral and multilateral technical cooperation services received.

Two examples involving the conservation of forests are:

- The Amazon Cooperation Treaty was signed in 1978 by Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela with the goal to foster joint actions aiming at the harmonious development of the Amazon. The Amazon Cooperation Treaty Organization-ACTO was created in 1995 in order to strengthen and implement its objectives. In 2002, the ACTO Permanent Secretariat was established, with its headquarters in Brasilia. This institution has worked on the common commitment to the preservation of the environment and the rational use of the Amazon natural resources.
- The Atlantic Forest Program was created in the framework of the Brazil-Germany Cooperation Agreement with the following goals: inducing the generation and consolidation of a scientific and technological base allowing the inclusion of the environmental dimension into the Brazilian sustainable development process, ensuring capacity building of high-end research in Brazil, entering the international competitive scenario and fostering cooperation in bilateral projects. In Brazil, the Ministry of Environment coordinates this program; during its first phase (2001-2005) 7 projects were provided support whose outcomes led to extension of the program.

Basically, there are three cooperation modes depending on the knowledge flow: (i) received cooperation services, meeting an internal need or demand; (ii) provided cooperation, meeting external needs and demands, and (iii) mutual cooperation, consisting in knowledge and product exchange, benefiting both parties. As far as its political outreach is concerned, cooperation is bilateral (between two countries' governments and institutions) or multilateral (when involving international organizations or several countries).

Received Bilateral or Multilateral Technical Cooperation

Brazil is a party to several bilateral or multilateral conventions and agreements. The Received Multilateral Technical Cooperation (Cooperação Técnica Recebida Multilateral - CTRM) agreements include: the agreement signed in 1959 with the IADB - Inter-American Development Bank; the agreement signed in 1984 with the IICA – Inter-American Institute for Cooperation on Agriculture; the agreement signed in 1992 with the European Economic Community; and the agreement signed in 1964 with the OAS – Organization of the American States. As far as Received Bilateral Technical Cooperation (RBTC) is concerned, Brazil has signed Agreements with the following countries: Canada, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, the United Kingdom, and the United States.

Technical Cooperation between Developing Countries/TCDC

Our country also has also signed technical cooperation agreements with other nations from different continents, as follows: a) Africa: Algeria, Angola, Benin, Cameroon, Cape Verde, Egypt, Gabon, Ghana, Guinea-Bissau, Ivory Coast, Mali, Morocco, Mozambique, Namibia, Nigeria, Kenya, São Tomé and Príncipe, Senegal, South Africa (under negotiation), Togo, Zaire and Zimbabwe; b) Latin America and the Caribbean: Argentina, Bolivia, Chile, Costa Rica, Colombia, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela; c) Asia and Eastern Europe: China, Iraq, Israel, Kuwait, Lebanon, Palestine, Russia (under negotiation) Saudi Arabia, and Thailand.

Collaboration within the Southern Cone Common Market

The Southern Cone Common Market (MERCOSUR) was originally constituted by Brazil, Argentina, Uruguay and Paraguay, with Chile as a partner in plant health. The first step leading to its creation was the Program on Integration and Economic Cooperation signed by Brazil and Argentina in 1986. In 1991, the Asuncion International Treaty established December 31, 1994, as the date when the clauses governing relations between these countries would entry into force. MERCOSUR major goals are: free circulation of

products, services and means of production between member countries; suppression of customs duties and other hindrances to the circulation of economic factors; creation of a Common External Tariff (CET) to be applied to non member countries; coordination of member countries' common positions in regional and international economic forums; policy coordination: industrial, agricultural, fiscal, monetary, currency exchange, customs regarding foreign trade, transportation and communications; policy coordination aiming at measuring reasonable competitive conditions between member countries; legislation harmonization in all above mentioned policy areas to facilitate economic integration of member countries; achieving economic stability and overcoming its member countries' typical underdevelopment. This "unification" affects germplasm exchange, as it has both a positive sense of free circulation benefiting all member countries and a negative aspect of lowering quarantine security, since non-tariff barriers tend, as all other barriers, to be more flexible.

6.3. Forest genetic resources international networks

Brazil has explored intensively the benefits of becoming part of regional sub-regional international networks. The development and strengthen of international networks and programs on the conservation of forest genetic resources have been coordinated by more than one institution in Brazil, including initiatives linked to universities like the cooperative program with pulp and paper industries coordinated by IPEF. But, certainly, EMBRAPA is the largest organization with several experiences in this area.

EMBRAPA has been strongly involved in networks dealing with forest genetic resources. For instance, genetic resources of exotic forest species have been enriched with the importation from Australia of a collection of myrtaceous species made up of 107 accessions of *Angophora*, *Corymbia*, *Eucalyptus* and *Melaleuca* genera. *Eucalyptus* and *Corymbia* genera have also been introduced, with the following species: *E. grandis*, *E. saligna*, *E. viminalis*, *E. cloeziana*, *E. deanei*, *E. camaldulensis*, *E. pilularis*, *E. resinifera*, *E. pellita*, *E. tereticornis* and *Corymbia maculata*. A wide variety of arboreal species of conifers or exotic leafy species have also been introduced, in the form of seed, cutting or pollen. These included: *Abies grandis*, *Acer platanoides*, *Aesculus hippocastrum*, *Betula platyphylla*, *Carpinus betulus*, *Cedrus atlantica glauca*, *Cedrus deodar*, *Clematis viticella*, *Fagus sylvatica*, *Gingko biloba*, *Laurus nobilis*, *Mucuna deeringiana*, *Nyssa sylvatica*, *Liriodendron tulipeira*, *Pseudotsuga menziessii*, *Quercus coccinea*, *Sequoia sempervirens*, *Sequoiadendron gigantum*, *Araucaria cunninghamii*, clones de *Pinus taeda*; *Cryptomeria japonica*, *Fagus sylvatica*, álamo-grisalho (*Populus tremula* x *Populus alba*), *Khaya anthothec*, among others.

6.4. Needs and priorities for future international collaboration

As emphasized by the ITPGRFA (FAO, 2011), no country is self-sufficient in plant genetic resources. All depend on genetic diversity from other countries and regions. Evidently international cooperation and open exchange of genetic resources are therefore essential for food, fiber and energy security. And that is when information systems and the use of information technology come necessary, for its capacity to support and facilitate the management of large scale databases as biodiversity and genomic datasets usually are. The inclusion of forest species in the list of species mentioned in the Annex of the International Treaty on Plant Genetic Resources for Food and Agriculture could be discussed to promote international cooperation and exchange of forest genetic resources.

Another priority issue demanding international coordination is the program dealing with invasive species and implementation of Article 8(h) of the Convention of Biodiversity. For instance, experts from Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, the French Guiana, Paraguay, Peru, Suriname, Uruguay and Venezuela, met in 2001 on alien invasive species and signed the following declaration:

a) Invasive alien species, which include pests, diseases and weeds, besides causing enormous economic damage, mainly to agriculture, constitute one of the main threats to biodiversity and to natural ecosystems, in addition to risks to human health.

b) Increasing globalization, with increases in international transport, trade and tourism, and the initiation of climate changes due to the greenhouse effect and changes in land use, enhance the opportunities for the introduction and spread of invasive alien species in the region.

c) South America harbors half of the tropical forests and more than a third of the biodiversity of the world, an immense and valuable natural asset, in large part shared by 13 countries, many of which are mega diverse; biodiversity is the basis for sustainability of environmental services, forestry and fisheries, agriculture and the new industry of biotechnology. About 50% of Brazil's Gross National Product, for example, is derived from the direct use of biodiversity and its genetic resources. The loss caused by invasive alien species in South America's agricultural production exceeds several billion dollars annually. As an example, in Argentina the Mediterranean fruit fly costs US$ 10 million dollars per year in control programs, plus 15-20% of production in direct loss annually, equivalent to US$ 90 million dollars per year, and incalculable indirect economic and social impact with the reduced production and loss of export markets.

f) As they share the same continent, only separated by political boundaries, the South American countries share the same destiny in the event of introduction of invasive alien species – it is essential, therefore, to promote greater cooperation among the countries of the region to keep off of combat a common enemy.

g) The importance of full implementation in the region of Decision V/8 of the 5th Conference of the Parties to the Convention on Biological Diversity is recognized, which established guiding principles for the prevention and control of invasive alien species that threaten ecosystems, habitats or species.

h) There is a need to promote greater exchange of information, starting with the elaboration of national assessments on this problem, research, capacity building, institutional strengthening, public awareness, coordination of actions and harmonization of legislation.

i) Without prejudice to other themes identified in national assessments, the introduction of invasive alien species in the different hydrographic basins of the region and transboundary ecosystems deserves urgent attention.

j) Better coordination and cooperation is needed between the national agricultural, forestry, fishery and environmental sectors in the treatment of this issue, including the establishment of national committees on invasive alien species, and involving other sectors related to the issue such as health, tourism, transport and commerce, as well as the private sector.

k) It is essential, therefore, to promote greater cooperation among the countries of the region to keep off or combat a common enemy, as well as to cooperate, led by FAO, CBD and GISP, with the other countries of the Americas and with the global effort to solve a common problem.

l) It is recognized, however, the lack of public awareness about the importance of this issue, which facilitates the accidental introduction of invasive alien species.

m) The effective prevention and control of invasive alien species in South America will need adequate financial and technical support.

Necessário mencionar a iniciativa projeto regional "Marco de Sanidade Florestal para os Países do Cone Sul"

Today Brazil has a number of control mechanisms. Any intended utilization of genetic material, native and exotic alike, must comply with specific laws and regulations. The import, export, research and improvement of plant genetic resources are regulated by phytosanitary, environmental, access, benefit-sharing and intellectual property legislation.

7.1. Forest policy and legal framework

The Brazilian Federative Republic congregates a federal district and 26 states that govern over more than 5500 local municipalities. The adoption of a new constitution in 1988 prompted decentralization in the management of natural resources and the implementation of development programs. Considerable political and tax power and fiscal revenue have shifted from the central government to states and municipalities, and privatization and economic liberalization policies have also been pursued. Basically, main forest-related legislation includes (*Table 27*27 for more details):

- Law 4771 (1965) – Forest Act (and amendments).
- Law 5197 (1967) – Protection of Fauna.
- Law 6938 (1981) – National Environmental Policy.
- Law 9433 (1997) – Water Resources Policy.
- Law 9605 (1998) – Environmental Crimes.
- Decree 3179 (1999), which establishes penalties for forest crimes.
- Decree 3420 (2000), creating the National Forest Programme.
- Decree 4340 (2002), which regulates articles of Law 4771 and various other laws. It also provides regulations for the exploitation, suppression and clear-cutting of forests and succeeding formations; PMFSs; forest replanting; and licenses to transport forest by-products.
- Law 11284 (2006) (the Public Forest Management Law), which provides for public forest management for sustainable production, creates the Brazilian Forest Service within the structure of the Brazilian Ministry of the Environment, establishes the National Forest Development Fund (Fundo Nacional de Desenvolvimento Florestal – FNDF), and makes other provisions.
- Resolution 378 (2006), which defines undertakings that may potentially cause national or regional environmental impact and makes other provisions; and subjects forest exploitation to permits issued by the Brazilian Institute of Environment and Renewable Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA).
- Resolution 379 (2006), which creates and regulates the database on forest management at the National Environmental System (Sistema Nacional do Meio Ambiente) level.
- Decree 6063 (2007), which regulates, at the federal level, provisions of Law 11 284.
- Resolution 406 (2009), which establishes technical standards to be adopted in the formulation, presentation, technical evaluation and implementation of PMFSs for logging purposes in native forests and their succeeding formations in the Amazon biome.
- A number of normative instructions relating to forest use, such as the recent normative instruction 56 Dec 8 2011 (BRASIL, 2011)

The enactment of the Public Forests Management Law in 2006 was a significant achievement. Giving its importance and indirect role as manager of *in situ* forest genetic resources, it is relevant to describe with some details the origin and attributes of the Brazilian Forest Service and the context in which it works. Access to FGR and sharing of benefits can be strongly affected depending on how the Brazilian Forest Service evolves and consolidates its role.

Before the existence of the Public Forests Management Law, there was no regulatory framework to specifically and adequately deal with the management of large tracks of land covered with public forests. It was difficult for the government to establish policies that could ensure the maintenance of those forests as a national asset. In the case of the Amazon the situation was even more worrisome because for decades the advance of agriculture had led to large losses of forest cover and illegal occupations of public land. In 2004, the federal government initiated the formulation of a legal framework to allow for the management of public forests in a way that would halt land-grabbing, introduce a forest concessions system to maintain the capacity of the forests to provide goods and services in perpetuity, and serve as a socioeconomic development alternative. The 2006 law and subsequent resolutions, decrees and instructions were the result.

In 2004 the Government of Brazil announced its Action Plan to Prevent and Control Deforestation in the Amazon involving eleven ministries led by the President's Cabinet. The action plan comprised 144 actions under three main strategies: land-tenure and territory planning; environmental monitoring and control; and incentives for sustainable production. Under the action plan, by 2008 ten million hectares of Indigenous territories, 20 million hectares of protected areas and 3.9 million hectares of 'sustainable settlement' projects had been created and 66,000 illegal land titles had been cancelled.

Forestry issues in Brazil are handled by the Ministry of Environment (MMA) which is also responsible for planning, coordinating and controlling activities related to the national environment policy and policies for developing the Amazon. It supervises the activities of IBAMA and the Brazilian Forest Service, chairs the National Council for the Environment (CONAMA) and takes part in the President's Chamber for Natural Resources Policies, which coordinates various aspects related to forests.

The National Forest Commission (Comissão Nacional de Florestas – CONAFLOR), which was established by Decree 3420/2000, is composed of 39 representatives distributed between the government (20 representatives) and civil society (19 representatives), including federal government agencies and entities, state environmental agencies, civil-society groups, forest industry, NGOs, educational and research institutions. CONAFLOR provides guidelines for the implementation of procedures in national forests and enables the participation of various interest groups in developing public policies for the forest sector.

The Public Forest Management Law (2006) established the basis for the creation of the Brazilian Forest Service as an agency of the federal government under the MMA, to manage the sustainable use of public forests. The Brazilian Forest Service is also responsible for managing the FNDF, the National Catalogue of Public Forests (Cadastro Nacional de Florestas Públicas) and the National Sistem of Forest Information (SNIF). The goal of the National Catalogue is to set up a database of geo-referenced public forests in order to provide public managers and the population in general with a reliable database on forest management.

The main instruments used by the Brazilian Forest Service for the sustainable production and management of federal public forests are forest concessions and allotment to local communities. A forest concession is a chargeable warrant for the right to practice sustainable forest management for the exploitation of a forest's products and services. The allotment of public forests to local communities is carried out through the identification of areas occupied by traditional populations, such as Indigenous communities, slave-descendant communities (known as quilombolas) and settlements. The Brazilian Forest Service assists in the identification of those populations and encourages and promotes community forest management by providing technical support and capacity-building.

The Commission on Public Forest Management (Comissão de Gestão de Florestas Públicas – CGFLOP) is an advisory body of the Brazilian Forest Service which aims to advise, evaluate and propose guidelines

for the management of public forests in Brazil, especially regarding the Annual Forest Concessions Plan (Plano Annual de Outorga Florestal). The CGFLOP, which was established by Law 11284/06 and regulated by Decree 5795/06, is composed of 24 representatives appointed by the holders of the respective agencies, groups, organizations and sectors involved in the process and designated by the Minister of State for the Environment. The Commission meets at least twice a year or as requested by its chairman or at least one-third of its members.

Other funds than the regular federal budget are needed to finance the conservation of natural resources like FGR. Two alternatives would be the FNDF and the Amazon Fund. Its main source of funds is the revenue generated by forest concessions in compliance with the percentages outlined in the Public Forests Management Law (2006). Moreover, the FNDF may receive donations from national and international public and private entities. The FNDF is meant to foster the development of forest-based sustainable activities in Brazil and to promote technological innovation in the sector. Current guidelines establish priorities in the following areas: technological research and development in forest management; technical assistance and forest extension; recovery of degraded areas with native species; rational and sustainable economic use of forest resources; control and monitoring of forest activities and deforestation; capacity-building in forest management; environmental education; and environmental protection and natural resources conservation. The Amazon Fund, which was established in 2008 by Decree No 6527, aims to attract donations for non-refundable investments in deforestation prevention, monitoring and combat, and also to promote the conservation and sustainable use of forests in the Amazon biome. Specifically it is designed to support projects dealing with the management of public forests and protected areas; environmental monitoring and law enforcement; sustainable forest management; economic activities developed as a result of forest sustainable use; ecological–economic zoning; land-use planning and land regulation; biodiversity conservation and sustainable use; and the recovery of degraded areas.

7.2. Access to genetically improved forest resources

Germplasm collections and conservation of plant species of some economical interest in the Amazon can be traced back to 1945, when the Northern Agronomical Institute (IAN) focused on *Hevea spp.* Later, in 1976, the collection was expanded by the Rubber Tree National Research Center (CNPSe), and complemented by efforts coordinated by the Northern Agricultural Institute for Research and Experimentation (IPEAN) that succeeded IAN and augmented the collections including *Theobroma cacao* (cacau), *Bertholletia excelsa* (castanha-do-brasil), *Elaeis oleifera* (caiaué), *Theobroma grandiflorum* (cupuaçu), *Paullinia cupana* (guaraná) and *Bactris gasipaes* (pupunha) among others (Paiva, 1994). After 1975 most of the activities involving collection and conservation of germplasm were implemented by the Amazonian Research National Institute (INPA) and EMBRAPA regional centers.

There are two systems of germplasm curators in Brazil, to which forest genetic resources are linked. The Agronomic Institute of Campinas (IAC) started to organize their collections in the 1930s and today retains approximately 32,543 samples of 5,104 plant species. This system supports hundreds of public and private programs for genetic improvement developed in Brazil.

The establishment of the National Agricultural Research System (NARS), coordinated by EMBRAPA, and composed of federal and state public institutions, universities, private companies and foundations to conduct cooperative research in different geographical areas and different crops, has ensured the safe introduction of resources genetic considered strategic for the country. In this context, a system called the National Platform for Genetic Resources secured from 1976 to 2007, the exchange of germplasm and quarantine involving more than 500,000 samples. This system fostered a network of 350 and a Genebank

Collection Base (long-term conservation) composed of 212 genera, 668 species and more than 107,000 accesses.

During the last decade, the EMBRAPA system has been enhanced to define, organize and integrate all activities necessary for the management, conservation and use of germplasm. By 2008, there were 38 Curators of Products or Product Groups, 35 Assistant Curators; 111 Genebank Curators and ad hoc Curators, making a total of approximately 200 people involved in curatorial germplasm activities. Group 6 in this system deals specifically with forest, lacticiferous and palms, including native forest species of the Caatinga, Amazon, Cerrado and Pantanal, Atlantic Forest, exotic forest species, laticiferous species, palms and bamboos.

Today Brazil has a modern environmental legislation; several regulating standards having been enacted in recent years. Brazilian environmental legal framework for the use of plant genetic resources is made up of laws and regulations including: Law no. 4,771/65 and Decree no. 5,975/06 (Forestry Act); Law no. 6,938/81 and Decree no. 99,274/90 (National Environmental Policy); Law no. 9,605/98 (Environmental Crime Law); Decree no. 6,514/08 (Infractions and administrative sanctions - Environment);; Law no. 9,985/00 (National System of Nature Conservation Units); Decree no. 4,703/03 (National Biodiversity Policy); Decree no. 4,703/03 (National Biodiversity Committee); Law no. 11,105/05 and Decree no. 5.591/05 (National Biosecurity Policy);

Although the Brazilian Forestry Code has been adopted in 1965 through Law no. 771, it has been updated by the means of "Provisional Measures". Law 6938/85 establishes the National Environmental Policy, its goals, as well as its formulation and enforcement mechanisms, the National Environmental System (Sistema Nacional do Meio Ambiente - Sisnama) and the Environmental Defense Register. The National Environmental Policy has the goal to preserve, improve and recover environmental quality fit for life in order to ensure the conditions allowing socioeconomic development, national security and protection of human life dignity in Brazil. Agencies and organizations within federal, state, Federal District and county administrations, as well as foundations established by these latter that are responsible for the protection and improvement of environmental quality make up the National Environmental System – SISNAMA. This Law was regulated by Decree no. 99,274/90.

Law no. 9,605/98 provides legal and administrative sanctions to behaviors and activities that damage the environment. Decree no. 6,514/08 provides infractions and administrative sanctions regarding the environment, establishing the federal fact finding administrative procedures to be implemented. Law no. 9,985/00 established the National System of Nature Conservation Units – SNUC, defining criteria and standards for the creation, implementation and management of conservation units.

Decree no. 4,339/02 established principles and directives for the implementation of the National Biodiversity Policy. This policy has the general goal to promote, in an integrated way, conservation of biodiversity and sustainable use of its components, with fair and equitable sharing of the benefits arising from the use of genetic resources, components of genetic heritage and traditional knowledge associated to these resources. It includes seven thematic components: (i) biodiversity knowledge; (ii) biodiversity conservation; (iii) sustainable use of biodiversity components; (iv) monitoring, evaluation, prevention and mitigation of impacts on biodiversity; (v) access to genetic resources and traditional knowledge on biodiversity, as well as benefit-sharing; (vi) education and public awareness, and (vii) legal and institutional strengthening toward biodiversity management.

Decree no. 4,703/03 changed the name of the National Biodiversity Program to National Biodiversity Commission – CONABIO, defining its structure as a matrix, with seven thematic components (the same as in the National Biodiversity Policy) and seven biogeographical components (Brazilian biome sets: Amazon; Caatinga, Costal and Marine Areas; Atlantic Forest and Southern Fields; Cerrado and Pantanal).

Law no. 11,105/05 established security standards and inspection mechanisms applicable to activities involving genetically modified organisms (OGMs) and their derivates. Furthermore, it created the National Council for Biosecurity (Conselho Nacional de Biosegurança – CNBS) through the restructuring of the National Technical Committee for Biosecurity (Comissão Técnica Nacional de Biossegurança – CTNBio). This Law provides the National Biosecurity Policy and was regulated by Decree no. 5,591/05.

Permits must be obtained previously to access and/or transfer, and are granted only to national institutions conducting research and development activities on biology and similar areas, as provided by Provisional Measure no. 2,186-16/01 and other legal instruments. Permits may be simple or special. The difference between them stems from their object - access to genetic heritage or to associate conventional knowledge- and from their purpose –scientific research, bioprospection or technology development.

Permit demands for scientific research purposes can be filed with the Brazilian Institute for Environment and Natural Renewable Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA), registered with CGEN in 2003 and recently restructured as the Chico Mendes Institute. Permits involving access to associated traditional knowledge or that will be used with the goal to perform bioprospection and/or technology development must be filed directly with the CGEN.

There are general conditions to be observed for permits, whatever their purpose, such as institutional corroboration, research project and deposit of samples at an accredited institution. Specific requirements are established according to the permit's purpose. The Brazilian legal framework for access to genetic resources and associated traditional knowledge is made up of laws and regulations including: Statute no. 2/94 and Decree no. 2,519/98 (Convention on Biological Diversity); Provisional Measure no. 2,181-16/01 and Decree no. 3,945/01 (Access to Genetic Resources and Associated Traditional Knowledge); Statute no. 70/06 and Decree no. 6,476/08 (International Treaty on Plant Genetic Resources for Food and Agriculture), Decree no. 5,459/05 (administrative sanctions disposed by the Access Provisional Measure); and Resolutions, determinations and technical guidelines issued by the Council for the Management of Genetic Heritage (CGEN).

The Convention on Biological Diversity (CBD) was approved by the Brazilian Parliament through Statute no. 2/94 and incorporated into the national legislation by Decree no. 2,519/98. The Brazilian government deposited the instrument of ratification of the Convention on February 28, 1994; it entered into force in Brazil in May 29, 1994, as disposed by its article 36.

The legal framework developed for the implementation of CBD regarding access to genetic resources and associated conventional knowledge involves a number of not easily understandable technical, legal and economic aspects. The legislation includes specific points, such as building previous consent with indigenous, local or quilombola communities; negotiating contracts for the use of components of genetic heritage and associated conventional knowledge and benefit-sharing; and controlling the transfer of germplasm and of associated traditional knowledge.

Also related to access and benefit-sharing, but concerning specifically plant genetic material for food and agriculture, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) was approved by the Brazilian Parliament through Statute no. 70/06 and enacted by Decree no. 6,476/08. The Brazilian government deposited the instrument of ratification on May 22, 2006; it entered into force in Brazil in August 21, 2006, as provided by its article 28.

7.3. Benefits arising from the use of forest genetic resources

Knowledge of potentially useful genes and their incorporation into elite cultivars have been very important to promote the use of genetic resources and broaden the genetic base for breeding programs. Research involving the exploration, conservation and characterization of germplasm has become strategically important for Brazil.

In this context, the Ministry of Environment (MMA) has pioneered the identification and mapping of local races and wild relatives of some of the most important crops in Brazil. This is a uniquely important and complex task that requires the involvement of various sectors of Brazilian society. Among the seven sub-projects, one involves an important Amazonian forest palm species: pupunha (*Bactris gasipaes*).

Also within the PROBIO, MMA has coordinated the identification of species of flora of current or potential economic value used locally and regionally - the project Plants for the Future. This project was executed from 2005 to 2007 with the following objectives: (i) prioritize new commercially underutilized species of flora, providing potential uses for small farmers, (ii) create new investment opportunities for entrepreneurs in developing new products; (iii) identify the degree of use and gaps in scientific knowledge / technology on the species used in local and regional scale, (iv) to enhance biodiversity, clearly demonstrating the importance to society and the possible uses of these resources, and (v) improving food security, widening the options previously available. The results show the importance of this project, as 755 species have been prioritized: 255 in the South, 128 in the Southeast, 131 in the Midwest, 162 in the Northeast and 99 in the North.

Awareness about the economic importance of biodiversity and the need for its conservation and sustainable use are relatively recent among the international community. Increasing awareness and concern led to the establishment of an international legal framework, in which stand out the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

Early initiatives to regulate access to genetic resources and associated traditional knowledge in Brazil date back from 1995, with the Bill 306/95. In the following legislative process, a reviewed version was adopted by the Senate in 1998, as Bill 4,842/98. Two other Bills, were also forwarded to the Parliament that same year, (Bill 4,579/98 and Bill 4,751/98, respectively). The Proposed Constitutional Amendment No. 618/98 was introduced together with the Executive's Bill. While all these Bills were being debated by the congressmen, a contract signed in 2000 between a Social Organization -Bioamazônia- and the Novartis Corporation was publicly disclosed and considered unacceptable by both the society and the Presidential Chief of Staff. Realizing that this matter would not be legislated urgently, the government resorted to one legal tool to swiftly enact a new Law, the Provisional Measure. Once this was done, the text was reviewed and modified several times before reaching its final version in Provisional Measure 2,186-16/01, still in force.

Provisional Measure no. 2,186-16, of August 23, 2001, regulates articles 1, 8, section "j", 10, section "c", 15 and 16, sections 3 and 4 of the Convention on Biological Diversity, with the goal to provide access to genetic heritage, protection of and access to associated conventional knowledge, benefit-sharing and access to technology, as well as technology transfer aimed at its conservation and use. This Provisional Measure has the goal to regulate rights and obligations concerning access to components of the genetic heritage and to the associated conventional knowledge for purposes of scientific research and technology development, bioprospection or conservation for their industrial or otherwise application.

The expression "Genetic Heritage" is used to designate genetic resources, in the strict compliance with the provisions established by the Brazilian Constitution in its article 225, subparagraph II. According to this

definition, the Genetic Heritage encompasses the whole biodiversity originating from the country. Nevertheless, is it restricted enough not to confuse genetic heritage with other resources used in economic activities such as, for instance, those involved in agriculture and agribusiness (domestic animal husbandry, grain, vegetable and fruit growing), timber, fisheries and others. So, it is broad enough to ensure the desired protection, but narrow enough so as not to interfere in lawful and essential activities for the country's economy, such as agriculture, industry and trade.

Regarding knowledge associated to components of the genetic heritage, only the conventional knowledge is included. It does not claim to encompass either passport data pertaining to harvesting or characterization data or modern technologies linked to materials, not even those protected by intellectual property rights. The concept of conventional knowledge associated to genetic heritage it adopts means individual or collective information or practices of a local or indigenous community with actual or potential value. This legal text also includes the idea that this community-based knowledge associated to components of the genetic heritage has existed continuously, for generations; this allows its application only in the case of communities that actually hold this knowledge, not allowing opportunistic appropriations that might directly or indirectly vitiate recognition and benefit sharing.

Provisional Measure no. 2,186-16/01 grants holders the right to decide on access of third parties to conventional knowledge associated to components of the genetic heritage. Therefore, the free will of local and indigenous communities is guaranteed, and cultural characteristics that will define, on a case by case basis, whether the aforementioned knowledge should be disseminated or not are respected. In order to ensure improved control and, at the same time, promote the development of lawful access activities in the country, Provisional Measure no. 2,186-16/01 establishes that access permit to samples of components of genetic heritage be exclusively granted to a public or private national institution performing research and development on biology or similar areas. Foreign institutions interested in access samples of components of genetic heritage should associate with the national public institution that will mandatorily coordinate these activities.

The absence of an international regime or standard ensuring the compliance of the national legislations of all party countries to the Convention on Biological Diversity and the application of the principles of fair and equitable sharing of benefits arising from the utilization of samples of the genetic heritage accessed has induced the option for contracts, the only current way to enforce the Law, which must apply to Brazilian and foreign citizens alike.

The Contract for the Utilization of Genetic Heritage and for Benefit-sharing is signed by the research institution and the provider or providing institution, and must be approved by the Federal Government, represented by the authority ensuring the enforcement of this Law. If a given institution obtain or invent a process or a product whose obtainment or variation derives from the accessed component of the genetic heritage, it should share the benefits eventually obtained.

Benefit-sharing can take various forms, negotiable on a case by case basis by the research institution that signs the Contract for the Use of Genetic Heritage and Benefit-sharing. These forms include: benefit or royalties-sharing; technology transfer; product and process licensing, free of charge, for Brazil; and capacity building. Provisional Measure no. 2,186-16/01 bestows on the federal government the competence to establish standards, grant permits and inspect access and utilization of genetic resources.

It creates, under the Ministry of Environment, the National Council for the Management of Genetic Heritage, made up of federal agencies' representatives. It is regulated by two Decrees enacted in 2001 and 2005 - Decrees no. 3,945 and no. 5,459, respectively.

Decree no. 3,945 was modified by three subsequent decrees: Decree no. 4,946, December 31, 2003; Decree no. 5,439, May 3, 2005; and Decree no. 6,159, July 17, 2007. Decree no. 4,946/03 deeply modified Decree no. 3,945/01 regarding requirements to obtain access and transfer permits provided by Provisional Measure no. 2,186-16/01. It added a new special permit mode for accessing genetic heritage with the purpose to constitute and integrate *ex situ* collections for activities with potential economic use, such as bioprospection or technology development. Decree no. 5,439/05 introduced only punctual modifications into composition and quorum of the Council for the Management of Genetic Heritage. Decree no. 6,159/07 regulated special permits for bioprospection and allowed contracts to be filed after application for access permits are filed.

Decree no. 5,459, of June 7, 2005, disciplines sanctions applicable to behaviors and activities that damage the genetic heritage and associated conventional knowledge. Following its enactment, institutions performing research using components of the Brazilian biodiversity without the Council for the Management of Genetic Heritage's authorization are liable to administrative proceedings which can cause the establishment to be shut and subject to fines.

The access and transfer activities that are regulated by Provisional Measure no. 2186-16/01 and that require a permit issued by the Federal Government are those which use: native animal, microbial, fungi or plant materials, or exotic domesticated material which has developed characteristic properties; and traditional knowledge associated to genetic resources held by local or indigenous communities.

It should be stressed that access permits are not required for access activities using materials from international banks or foreign countries, as long as not harvested in Brazil. Associated traditional knowledge are individual or collective information or practices of a local or indigenous community that have actual or potential value and is associated to genetic heritage. In addition to these first two requirements, access activities are required to use information on genetic origin and must be carried out with research, bioprospection or technology development purposes.

For the transfer of genetic heritage components samples to foreign countries, a previous Material Transfer Agreement (MTA) in compliance with specific conditions must be signed by legal representatives of the relevant institutions. MTA is the instrument the recipient institution must sign prior to any transfer of genetic heritage components samples; MTA should indicate if associated conventional knowledge was accessed.

The transport of genetic heritage components samples to foreign countries requires a previous Material Transport Agreement (MTrA), signed by legal representatives of the institutions involved and in compliance with specific conditions. Following the adoption of the FAO International Treaty on Plant Genetic Resources for Food and Agriculture, species in the Multilateral System on Access and Benefit-sharing (listed in its Annex I) are utilized in compliance with standards established by the Governing Body, pursuant to article 19 of Provisional Measure no. 2,186-16/01. It must be stressed that Brazil is one of the few, or the only country whose legislation, specifically adopted for the implementation of the CBD, already took into account in 2000 the future implementation of FAO International Treaty, which was then under discussion. Article 19 allowed the country to implement the International Treaty without having to enact new specific legislation, thus avoiding conflicts like those facing, for example, countries in the Andean Community of Nations.

This chapter was written as a complement to excerpts taken from EMBRAPA´s "Sate of Brazil´s Plant Genetic Resources – second national report" (Mariante, 2009), a reference which this report complements and expands focusing on forest genetic resources.

Throughout centuries, Brazil's development model has evolved from extractive activities and subsistence agriculture to an intensive agro industrial exploitation based on modern technologies and uncontrolled occupation of the territory and utilization of environmental resources. Currently, the agribusiness sector in Brazil has been pressured to grow and expand. The path taken until now is heavily dependent on non renewable mineral fertilizer sources and conventional technologies, and consequently not fully compatible with alternatives that could steer the country towards more sustainable production models.

On the other hand, Brazil has been a leader on new silvicultural approaches like reduced soil impact planting techniques, which significantly decreases erosion and improves soil quality and groundwater recharge; biological mineral nutrients fixation, to decreasing the amount of chemical fertilizers and water resources contamination with nitrates or other harmful elements; biological control, to reduce the need for chemical insect and disease control with positive impacts on environment, rural workers' quality of life and products' safety and quality; and genetic breeding programs that over the last decades have proved viable to adapt top highly productive trees to environmental stresses, different latitudes, acid and unfertile soils and other biotic factors that are especially severe in tropical regions.

Complementary, a new market demands and technologies are shaping the forest sector that, besides raw material production, has been also designed to meet service and social demands. These requirements include attention to (i) the environmental services needed to maintain and enhance the sustainability and productivity of the agricultural sector; (ii) the production of competitive products whose added value stems from differentiation and specialization; (iii) the production of renewable energy, feedstock and bioactive molecules for different industrial branches, so broadening the genetic resources' scope of usefulness and, additionally, creating opportunities for agriculture to increase its participation in the rising bioindustry.

Genetic improvement and breeding programs, combined with innovative biotechnology techniques, are expected to offer new alternative uses for the existent forest genetic resources that will help the country meet the important challenges facing Brazilian and global needs.

8.1. Contributions to food security and poverty alleviation

Brazil is facing the challenge to simultaneously expand food diversity, enhance environmental sustainability and increase the productivity of its natural resources' base. The way forest genetic resources will contribute to overcome these challenges in the future rely on: (i) the use of production systems based on biological inputs and processes; (ii) the search for more differentiated, specialized and valuable competitive products; (iii) efforts to overcome sanitary, environmental and social barriers to market access; (iv) the application of modern information and biotechnology.

The maintenance and conservation of the current levels of forest genetics diversity increase the chances to find successful strategies to mitigate the risks associated with global climate changes, and the resulting increases on biotic and abiotic stresses, especially in the tropics. A national consensus on the need of concerted actions to establish a large scale forest genetic resources program is strongly recommended, and one possible principle to establish priorities would be based on food security, poverty alleviation and

sustainable development criteria. Nevertheless, the assignment of any level of priority to a certain species should also reasonably balance anthropogenic indicators with indicators measuring rareness and extinction risks.

8.2. Contributions to sustainable development

Brazil has been pointed out as the country where surpluses of food, fiber and fuel are still possible to mitigate the effects of some Malthusian theories about the future of the world. A simple expansion of its agricultural frontier would be enough. After all, Brazil uses only 34% of its national territory to maintain 64 million hectares with agricultural activities and 220 million with livestock; has 445 million hectares of forests of which only 6 million are planted. The remaining area, discounted the inaccessible and protected areas, would still offer another 71 million hectares for new agricultural activities.

More enthusiasm can also be felt when the Brazilian energy matrix and research capacity in agriculture and forestry are considered. After all, the country show a basically renewable energy matrix, a solid bio-fuels industry, the possibility of replanting areas previously degraded with significantly more productive crops, and the dissemination of technological improvements generated by the network of EMBRAPA, state and universities research facilities.

However, in light of the precautionary principle, and to accommodate reasonable levels of national security, environmental and institutional, we must ensure that the basic natural ecological processes remain functional in all Brazilian biomes. The optimistic scenarios rely on the intensive use and expansion of agricultural areas in the Caatinga, Cerrado, Pampas and Pantanal biomes, consequently putting more pressure and reducing the natural biodiversity in these already intensively degraded regions. That would seriously endanger our national, environmental and institutional security. Another question remains: would the increase in productivity in crops planted in the Atlantic Forest and Cerrado biomes remain sustainable if deforestation in the Amazon and the continuous release of greenhouse gases in the atmosphere that affect rainfall regimes become more common, generating catastrophic widespread events of drought and flood?

Preserved forest genetic resources strengthens the country capacity to face future challenges, but it is important to take into consideration the impacts that the pursuit for national, environmental, economic, institutional and food security in planetary levels will have on land use and occupation in Brazil. Long periods of positive development and conservation can be expected if these five dimensions of security are well balanced. Payments for environmental services mechanisms, and other equally creative market approaches, may improve governance arrangements and might offer more control over the forces that actually govern our relationship with the environment.

ABRAF (2006). Anuário estatístico da ABRAF 2006: ano base 2005. <http://www.abraflor.org.br/estatisticas/anuario-ABRAF-2006.pdf> Access date: 27 Dez. 2011.

ABRAF (2007). Anuário estatístico da ABRAF 2007: ano base 2006. <http://www.abraflor.org.br/estatisticas/yearbook-ABRAF-2007.pdf> Access date: 27 Dez. 2011.

ABRAF (2008). Anuário estatístico da ABRAF 2008: ano base 2007. <http://www.abraflor.org.br/estatisticas/ABRAF08-EN.pdf> Access date: 27 Dez. 2011.

ABRAF (2009). Anuário estatístico da ABRAF 2009: ano base 2008. <http://www.abraflor.org.br/estatisticas/ABRAF09-EN.pdf> Access date: 27 Dez. 2011.

Blaser, J., Sarre, A., Poore, D. & Johnson, S. (2011). Status of Tropical Forest Management. ITTO Technical Series No 38. International Tropical Timber Organization, Yokohama, Japan. 418 p.

BRACELPA. (2009) Setor de celulose e papel do Brasil é referência mundial. Associação Brasileira de Celulose e Papel. 2 p. <http://www.bracelpa.org.br/bra/releases_bracelpa/Florestas_Plantadas_sao_referencia_mundial_02%2009%20_2_.pdf> Access date: 17 Jan. 2012. Comunicação Corporativa

BRASIL (1992). Portaria 37-N, de 03 de abril de 1992. Lista Oficial de Espécies da Flora Brasileira Ameaçadas de Extinção. Diário Oficial da União, Brasília, Edição 66, p. 4302-4303, 06 abr. 1992. Seção 1. <http://www.in.gov.br/imprensa/visualiza/index.jsp?jornal=1&pagina=14&data=06/04/1992> Access date: 15/01/2012.

BRASIL (2006). Lei 11.428, de 22 de dezembro de 2006. Lista as formações e dispõe sobre a utilização e proteção da vegetação nativa do Bioma Atlantic Forest. Diário Oficial da União, Brasília, Edição 246, p. 1-4, 26 dez. 2006. Seção 1. <http://www.in.gov.br/imprensa/visualiza/index.jsp?jornal=1&pagina=1&data=26/12/2006> Access date: 20/01/2012.

BRASIL (2008). Instrução Normativa , de 23 de setembro de 2008. Lista as espécies da flora brasileira ameaçadas de extinção. Diário Oficial da União, Brasília, Edição 185, p. 75-83, 24 set. 2008. Seção 1. <http://www.in.gov.br/imprensa/visualiza/index.jsp?jornal=1&pagina=75&data=24/09/2008> Access date: 15/01/2012.

BRASIL (2011). Instrução Normativa 56, de 08 de dezembro de 2011. Regulamenta a produção, a comercialização e a utilização de sementes e mudas de espécies florestais, nativas exóticas, visando garantir sua procedência, identidade e qualidade. Diário Oficial da União, Brasília, Edição 236, p. 34-36, 9 dez. 2011. Seção 1. <http://www.in.gov.br/imprensa/visualiza/index.jsp?jornal=1&pagina=34&data=09/12/2011> Access date: 15/01/2012.

Bruinsma J., (ed.) (2003), World Agriculture: Towards 2015/30, an FAO Perspective, London: Earthscan and Rome: FAO. <http://www.fao.org/economic/esa/esag/en/> Access date: 17 Jan. 2012.

Silva, E.V.G. (2009) Perspectivas de evolução macroeconômica setorial da economia mundial a longo prazo. Ministério de Minas e Energia. Secretaria de geologia, mineração e transformação mineral, supported by International Bank for Reconstruction and Development (IBRD). <http://www.mme.gov.br/portalmme/opencms/sgm/galerias/arquivos/plano_duo_decenal/estudos_economia_setor_mineral/P01_RT02_Perspectivas_de_evoluxo_macroeconxmica_setorial_da_economia_mundial_a_longo_prazo_-_Cxpia.pdf>. Access date: 16 Jan. 2012.

CBD (2010). Forth National Report to the Convention on Biological Diversity – Brazil. CBD National Reports. 286 p. <http://www.cbd.int/doc/world/br/br-nr-04-en.pdf> Access date: 27 Dez. 2011.

Coradin, L.; Siminski, A.; Reis, A. (2011). Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro – Região Sul. Brasília: MMA. 934p.

El-Kassaby, Y. (2004). Feasibility and proposed outline of a global review of forest biotechnology. Forest Genetic Resources Working Paper FGR/77E. Forest Resources Development Service, Forest Resources Division. FAO, Rome.

EXXONMOBIL. The outlook for energy: a view to 2030, 2011. <http://www.exxonmobil.com/Corporate/Files/news_pub_eo2012.pdf> . Access date: 16/01/2012.

FAO (2009) Global Forest Resources Assessment 2010 – Brazil Country Report. Forestry Department. Food and Agriculture Organization of the United Nations. Rome, 111 p. <http://www.fao.org/docrep/013/al464E/al464E.pdf > Access date: 27 Dez. 2011.

FAO (2011) The International Treaty on Plant Genetic Resources for Food and Agriculture. <http://www.planttreaty.org/> Access date: 18 Jan 2012.

Garrido, L.M.A.G.; Siqueira, A.C.M.F.; Cruz, S.F.; Romanelli, R.C.; Ettori, L.C.; Crestana, C.S.M.; Silva, A.A.; Morais, E.; Scatena, A.C. and Sato, A.S. (1997) Programa de Melhoramento Genético Florestal do Instituto Florestal Instituto Florestal (Acervo). SãoPaulo: Série Registros, n.18.

Hubbell, S.P.; He, F., Condit, R.; Borda-de-Agua, L.; Kellner, J. and ter Steege, H. (2008) How many tree species are there in the Amazon and how many of them will go extinct? Proceedings of the National Academy of Sciences of the United States of America, PNAS, v. 105 (1):11498–11504. <http://www.pnas.org/content/105/suppl.1/11498.full.pdf+html>

IBGE (1992) Manual Técnico da Vegetação Brasileira. Departamento de Recursos Naturais e Estudos Ambientais do IBGE. Série Manuais Técnicos em Geociências, Rio de Janeiro. 92 p. <http://biblioteca.ibge.gov.br/visualizacao/monografias/GEBIS%20-%20RJ/ManuaisdeGeociencias/Manual%20Tecnico%20da%20Vegetacao%20Brasileira%20n.1.pdf> Access date: 20 Jan. 2012.

IBGE (2004) Mapa de Biomas do Brasil do Instituto Brasileiro de Geografia e Estatística. <http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=169> Access date: 17 Jan. 2012.

IBGE (2011a) Censo Demográfico 2010 <http://www.ibge.gov.br/home/estatistica/populacao/censo2010/default.shtm> Access date: 27 Dez. 2011

IBGE (2011b) Mapa da Área de Aplicação da Lei no 11.428 de 2006. <http://www.ibge.gov.br/home/geociencias/recursosnaturais/mapas_doc6.shtm> Access data: 20 Jan. 2012

International Board for Plant Genetic Resources (IBPGR, comp.). 1991. Elsevier's Dictionary of Plant Genetic Resources. IBPGR Secretariat, Rome, Italy.

IUCN Standards and Petitions Subcommittee. 2011. Guidelines for Using the IUCN Red List Categories and Criteria. Version 9.0. Prepared by the Standards and Petitions Subcommittee. http://www.iucnredlist.org/documents/RedListGuidelines.pdf. Access date: 12 Jan. 2012

Kageyama, P.Y.(2002) Projeto banco ativo de germoplasma. Relatório, Convênio CESP – ESALQ –IPEF. Piracicaba: USP/ESALQ, 2002. 22p.

Kanashiro, M.; Thompson, I.S.; Yared, J.A.G.; Loveless, M.D.; Coventry, P.; Martins-da-Silva, R.C.V.; Degen, B. and Amaral, W. (2002) Improving conservation values of managed forests: the Dendrogene Project in the Brazilian Amazon. Unasylva 209, Vol. 53, p. 25-33. <http://www.fao.org/docrep/004/y3582e/y3582e06.htm#f or ftp://ftp.fao.org/docrep/fao/004/y3582e/y3582e03.pdf> Access date: 17 Jan. 2012.

Mariante, A.S.; Sampaio, M.J.A.; Inglis, M.C.V. Org. (2010) Brazil: The State of Brazil s Plant Genetic Resources 2009 – Second National Report – Conservation and Sustainable Utilization for Food and Agriculture. Brasília: EMBRAPA. 236 p. <http://www.fao.org/docrep/013/i1500e/Brazil.pdf> Access date: 27 Dez. 2011.

Medeiros, M. B. & Cavalcanti, T. B. (2007). Resgate de Germoplasma Vegetal de Espécies-Alvo na Área de Influência do Aproveitamento Hidrelétrico Barra Grande (RS,SC). Documentos 223. Brasília, DF: Embrapa Recursos Genáticos e Biotecnologia. 45p. <http://www.infoteca.cnptia.embrapa.br/bitstream/doc/189510/1/doc223.pdf> Access date: 07 Fev 2012

MMA (1998). First National Report for the Convention on Biological Diversity – Brazil. Secretaria de Biodiversidade e Florestas – Publicações DCBIO. 283 p. <http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=14&idConteudo=1876> Access date: 27 Dez. 2011.

MMA (2004). Second National Report to the Convention on Biological Diversity – Brazil. Secretaria de Biodiversidade e Florestas – Publicações DCBIO. 347 p. <http://www.mma.gov.br/sitio/index.php?ido=conteudo.monta&idEstrutura=14&idConteudo=1913> Access date: 27 Dez. 2011.

MMA (2006). Third National Report to the Convention on Biological Diversity – Brazil.. Secretaria de Biodiversidade e Florestas – Publicações DCBIO. 368 p <http://www.mma.gov.br/estruturas/chm/_arquivos/Terceiro%20Relatorio%20Ingles.pdf> Access date: 27 Dez. 2011.

MMA (2007). Priority Areas for the Conservation, Sustainable Use and Benefit Sharing of Brazilian Biological Diversity. Secretaria de Biodiversidade e Florestas. Brasília. 346 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/Prioritary_Area_Book.pdf> Access date: 27 Dez. 2011.

MMA (2007). Biodiversidade do Cerrado e Pantanal: áreas e ações prioritárias para conservação. Secretaria de Biodiversidade e Florestas – Publicações DCBIO. 540 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/cerrado_pantanal.pdf> Access date: 27 Dez. 2011.

MMA (2006) Probio: dez anos de atuação. Secretaria de Biodiversidade e Florestas. Secretaria de Biodiversidade e Florestas. Brasília, 154 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/Prioritary_Area_Book.pdf> Access date: 27 Dez. 2011.

MMA (2006) Relatório de Atividades – PROBIO - 2002 – 2004. Secretaria de Biodiversidade e Florestas. Brasília, 58 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/Prioritary_Area_Book.pdf> Access date: 27 Dez. 2011.

MMA (2002) Relatório de Atividades – PROBIO - 1996 – 2002. Secretaria de Biodiversidade e Florestas. Brasília, 75 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/Pioritary_Area_Book.pdf> Access date: 27 Dez. 2011.

MMA (2008) Comissão Nacional de Biodiversidade: CONABIO 05 anos. Secretaria de Biodiversidade e Florestas. Brasília: Serie Biodiversidade no. 32. 317 p. <http://www.mma.gov.br/estruturas/chm/_arquivos/livro_conabio_completo.pdf> Access date: 27 Dez. 2011.

Paludzyszyn Filho, E. and Santos, P.E.T. (2011). Programa de melhoramento genético de eucalipto da Embrapa Florestas: resultados e perspectivas. Embrapa Florestas, Colombo. Documentos 214. 66 p. <http://www.cnpf.embrapa.br/publica/seriedoc/edicoes/Doc214.pdf> Access date: 27 Dez. 2011.

Scolari, D.D.G (2006) Produção agrícola mundial: o potencial do Brasil. In: Visão progressista do agronegócio brasileiro. Brasília, DF: Fundação Milton Campos, 2006. Revista da Fundação Milton Campos, n. 25, p. 9-86. < http://www.alice.cnptia.embrapa.br/handle/doc/417182> Access date: 17/01/2012.

Souza, I.C.G.; Vieira, I.G.; Lima, K. and Ferreira. M. (2005) Resgate, conservação e fornecimento de materiais genéticos de Eucalyptus spp (raças locais) em diferentes regiões edafoclimáticas do Brasil – Relatório Fase I. IPEF / EMBRAPA. Piracicaba. 139 p. <http://www.ipef.br/publicacoes/relatorios/relatorio_projeto_resgate.pdf> Access date: 27 Dez. 2011.

Sparovek, G. et al., 2010. Brazilian agriculture and environmental legislation: status and future challenges. Sci. Technol. 44: 6046–6053. <http://pubs.acs.org/doi/pdf/10.1021/es1007824> Access date: 30 Dez. 2011.

Ratter, J.A.; Bridgewater, S.; Atkinson, R. and Ribeiro, J.F., 1996. Analysis of the floristic composition of the Brazilian Cerrado vegetation II: comparison of the woody vegetation of 98 areas. Edinburgh Journal of Botany. v.53, n.2.

Rodrigues, C.J. 2010 Variação genética para caracteres silviculturais em banco ativo de germoplasma de espécies arbóreas do cerrado e da floresta estacional semidecidual. Thesis, UNESP - Faculdade de Engenharia de Ilha Solteira. 187 p.

Rodriguez, L.C.E. (2002). Ciência e Tecnologia no Setor Florestal Brasileiro – diagnóstico, prioridades e modelo de financiamento. IPEF / MCT. Piracicaba. 187 p. <http://www.cgee.org.br/busca/ConsultaProdutoNcomTopo.php?f=1&idProduto=1661> Access date: 27 Dez. 2011.

Schmidt, L. 1997. Tree improvement glossary. Technical Note No. 46. Danida Forest Seed Centre, Humlebæk, Denmark.

Sebbenn, A.M.; Vilas Bôas, O. Conservação *ex situ* de Angico *Anadenanthera falcata* (Benth.) Speg., em Assis, Estado de São Paulo. In: Vilas Bôas, O; Durigan, G. Pesquisas em conservação e recuperação ambiental no Oeste Paulista. São Paulo: [s.n.], 2004. 484p.

Sebbenn, A.M.; Freitas, M.L.M.; Zanatto, M.C.S.; Morais, E.; Moraes, M.A. (2009) Comportamento da variação genética entre e dentro de procedências e progênies de Gallesia integrifolia Vell. Moq. Para caracteres quantitativos. Revista do Instituto Florestal, São Paulo, v.21, n. 2, p. 151-163

Sena, C.M. (2008) Sementes florestais: colheita, beneficiamento e armazenamento. Natal: MMA. Secretaria de Biodiversidade e Florestas. Departamento de Florestas. Programa Nacional de Florestas. Unidade DP PNF no Nordeste, 2008. 28p.

SFB (2011) Plano anual de outorga florestal 2012. Ministério do Meio Ambiente, Serviço Florestal Brasileiro. – Brasília: SFB, 2011. 130 p. <http://www.sfb.gov.br/index.php?option=com_k2&view=item&task=download&id=120> Access date: 27 Jan. 2012.

Stape, J.L.; Souza, V.C.; Torrado, P.V. and Rodriguez, L.C.E. (2011) Estimativas das taxas de sequestro de carbono na Reserva Particular do Patrimônio Natural SESC Pantanal. SESC, Rio de Janeiro. 144 p. <http://www.sescpantanal.com.br/userfiles/file/biblioteca/conpant8-carbono.pdf> Access date: 27 Dez. 2011.

United Nations Environment Programme (UNEP). 1992. The Convention on Biological Diversity. Article 2. Environmental Law and Institutions Programme Activity Centre. United Nations, New York and Geneva.

Williams, J.W.; Jackson, S.T.; Kurtzbach, J.E. (2007) Projected distributions of novel and disappearing climates by 2100 AD. Proc Natl Acad Sci USA 104:5739–5742. <http://www.pnas.org/content/104/14/5738.full.pdf+html > Access date: 17 Jan. 2012.

World Bank. 2006. Global Economic Prospects - Economic Implications of Remittances and Migration. World Bank, Washington, DC. 157 p. <http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/11/14/000112742_20051114174928/Rendered/PDF/343200GEP02006.pdf> Access date: 17 Jan. 2012.

World Bank. 2011. Global Economic Prospects - Maintaining progress amid turmoil. World Bank, Washington, DC. Volume 3, June 2011. 141 p. <http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2005/11/14/000112742_20051114174928/Rendered/PDF/343200GEP02006.pdf> Access date: 17 Jan. 2012.

Table 27: Legal framework related to the conservation of forest genetic resources

Legal Doc	Date	Descripttion
Law No. 4.504	30 November 1964	Rules on the Land Statute and rules on other subjects.
Law No. 4.771	15 September 1965	Forest Code – rules on the protection of forests and other vegetation formations.
Law No. 6.513	20 December 1977	Rules on special areas and locations of touristic interest.
Law No. 6.766	19 December 1979	Rules on the parceling of urban land, and rules on other subjects.
Law No. 6.902	27 April 1981	Rules on the creation of ecological stations, environmental protection areas, and rules on other subjects.
Law No. 6.938	31 August 1981	Rules on the National Environment Policy, its purposes, development and application mechanisms, and rules on other subjects.
Law No. 7.797	10 July 1989	Creates the National Environment Fund and rules on other subjects.
Law No. 9.479	12 August 1997	Rules on the concession of economic subventions to natural rubber producers, and rules on other subjects.
Law No. 9.985	18 July 2000	Regulates article 225, paragraph 1, items I, II, III and VII of the Federal Constitution, institutes the National Nature Protection Areas System, and rules on other subjects.
Law No. 10.711	05 August 2003	Rules on the National Seeds and Seedlings System and rules on other subjects.
Law No. 11.284	02 March 2006	Rules on the management of public forests for sustainable production; institutes the Brazilian Forest Service – SFB within the structure of the Ministry of the Environment; and creates the National Forest Development Fund – FNDF.
Law No. 11.428	22 December 2006	Rules on the use and protection of the native vegetation of the Atlantic Forest Biome.
Complementary Law No. 124	3 January 2007	Institutes, according to article 43 of the Federal Constitution, the Amazon Development Superintendence – SUDAM; establishes its composition, legal status, objectives, mandate and implementation, of 24 August 2001.instruments; rules on the Amazon Development Fund – FDA; and alters Provisional Ruling No. 2.157-5
Law No. 11.516	28 August 2007	Rules on the creation of the Chico Mendes Institute of Biodiversity Conservation – the Chico Mendes Institute.
Law No. 11.828	20 November 2008	Rules on the tax measures applicable to monetary donations received by public financial institutions controlled by the federal government and intended for actions of deforestation prevention, monitoring and combat, and actions to promote the conservation and sustainable use of Brazilian forests.
MP No. 2.186-16	23 August 2001	Rules on the access to genetic heritage, protection of and access to the associated traditional knowledge, benefit sharing, and access to technology.
Decree No. 59.566	14 November 1966	Regulates Sections I, II and III of Chapter IV under Title III of Law No. 4.504, of 30 November 1964 – the Land Statute.
Decree No. 84.017	21 September 1979	Regulates the Brazilian National Parks.
Decree No. 89.336	31 January 1984	Rules on ecological reserves and areas of relevant ecological interest, and rules on other subjects.
Decree No. 96.944	12 October 1988	Creates the Program for the Defense of the Legal Amazon Ecosystem Complex, and rules on other subjects.
Decree No. 97.635	10 April 1989	Creates the National System for the Prevention and Control of Forest Fires – PREVFOGO.
Decree No. 98.161	21 September 1989	Rules on the administration of the National Environment Fund, and rules on other subjects.
Decree No. 98.897	30 January 1990	Rules on extractive reserves and rules on other subjects.
Decree No. 99.274	6 June 1990	Regulates Law No. 6.902, of 27 April 1981 and Law No. 6.938, of 31 August 1981, which respectively rule on the creation of ecological stations and environmental protection areas, and on the National Environment Policy, and rule on other subjects.

Legal Doc	Date	Descripttion
Decree No. 99.971	11 January 1991	Creates the Special Commission to promote the revision of rules and criteria related to the demarcation and protection of indigenous lands.
Decree No. 22	04 February 1991	Rules on the administrative process for the demarcation of indigenous lands and rules on other subjects.
Decree No. 24	04 February 1991	Rules on environmental protection actions in indigenous lands.
Decree No. 318	31 October 1991	Promulgates the new text of the International Convention on Plant Protection.
Decree No. 964	22 October 1993	Regulates the National Legal Amazon Council.
Decree No. 1.298	27 October 1994	Approves the Regulation of the National Forests and rules on other subjects.
Decree No. 1.354	29 December 1994	Institutes the National Biological Diversity Program under the Ministry of the Environment and the Legal Amazon, and rules on other subjects.
Decree No. 1.541	27 June 1995	Regulates the National Legal Amazon Council – CONAMAZ.
Decree No. 1.709	20 November 1995	Declares the permanent preservation of forests and other autochthonous vegetation formations located in the land property it addresses.
Decree No. 1.752	20 December 1995	Rules on the connection, responsibilities and composition of the National Technical Commission on Biosafety – CNTBio, and rules on other subjects.
Decree No. 1.775	08 January 1996	Rules on the administrative procedure for demarcating indigenous lands and rules on other subjects.
Decree No. 2.119	13 January 1997	Rules on the Pilot Program for the Protection of Brazilian Tropical Forests and on its Coordinating Commission, and rules on other subjects.
Decree No. 2.473	26 January 1998	Creates the National Forests Program and rules on other subjects.
Decree No. 2.662	08 July 1998	Rules on the measures to be implemented in the Legal Amazon region for the monitoring, prevention, environmental education and combat of forest fires.
Decree No. 2.707	04 August 1998	Promulgates the International Tropical Timber Agreement.
Decree No. 2.959	10 February 1999	Rules on the measures to be implemented in the Legal Amazon region for the monitoring, prevention, environmental education and combat of forest fires.
Decree No. 3.420	20 April 2000	Rules on the creation of the National Forests Program – PNF, and rules on other subjects.
Decree No. 3.607	21 September 2000	Rules on the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES, and rules on other subjects.
Decree No. 3.743	05 February 2001	Regulates Law No. 6.431, of 11 July 1977, which authorizes the donation of portions of unoccupied public lands to Municipalities located in the Legal Amazon region, for purposes specified by this instrument, and rules on other subjects.
Decree No. 4.281	25 June 2002	Regulates Law no 9.795, of 27 April 1999, which institutes the National Environmental Education Policy, and rules on other subjects.
Decree No. 4.326	08 August 2002	Institutes the Amazon Protected Areas Program – ARPA under the Ministry of the Environment, and rules on other subjects.
Decree No. 4.339	22 August 2002	Institutes principles and directives for the implementation of the National Biodiversity Policy.
Decree No. 4.519	13 December 2002	Rules on the voluntary service in Federal Protected Areas, and rules on other subjects.
Decree No. 4.703	21 May 2003	Rules on the National Biological Diversity Program – PRONABIO and the National Biodiversity Commission, and rules on other subjects.
Decree No. 4.704	21 May 2003	Rules on the National Biological Diversity Program – PRONABIO and the National Biodiversity Commission, and rules on other subjects.
Decree No. 4.722	05 June 2003	Establishes criteria for exploring the species Swietenia macrophylla King (mahogany), and rules on other subjects.
Decree No. 5.153	23 July 2004	Approves the regulation of Law No. 10.711, which rules on the National System of Seeds and Seedlings – SNSM, and rules on other subjects.
Decree No. 5.160	28 July 2004	Promulgates the Financial Cooperation Agreement related to the

Legal Doc	Date	Descripttion
		projects "Group A Demonstration Projects – PD/A – Atlantic Forest Subprogram" (PN 2001.6657.9) and "Amazon Region Protected Areas – ARPA" (PN 2002.6551.2), executed in Brasília, on 10 June 2003, between the Federative Republic of Brazil and the Federative Republic of Germany.
Decree No. 5.445	12 May 2005	Promulgates the Kyoto Protocol of the United Nations Framework Convention on Climate Change, opened to signatures at the city of Kyoto, Japan, on 11 December 1997, during the Third Conference of the Parties of the United Nations Framework Convention on Climate Change.
Decree No. 5.577	08 November 2005	Institutes the National Program for the Conservation and Sustainable Use of the Cerrado Biome – Sustainable Cerrado Program, under the Ministry of the Environment, and rules on other subjects.
Decree No. 5.746	05 April 2006	Regulates article 21 of Law No. 9.985, of 18 July 2000, which rules on the National System of Nature Protection Areas.
Decree No. 5.752	12 April 2006	Promulgates the Memorandum of Understanding between the Governments of the Federative Republic of Brazil and of the Republic of Peru on the Cooperation on Amazon Protection and Vigilance Matters, adopted in Lima, on 25 August 2003.
Decree No. 5.759	17 April 2006	Promulgates the revised text of the International Plant Protection Convention (IPPC).
Decree No. 5.795	05 June 2006	Rules on the composition and functioning of the Public Forests Management Commission, and rules on other subjects.
Decree No. 5.813	22 June 2006	Approves the National Policy on Medicinal Plants and Phytotherapics, and rules on other subjects.
Decree No. 5.819	26 June 2006	Promulgates the Headquarters Agreement between the Federative Republic of Brazil and the Organization of the Amazon Cooperation Treaty, adopted in Brasília, on 13 December 2002.
Decree No. 5.875	15 August 2006	Adopts Recommendation no 003, of 22 February 2006, of the National Environment Council – CONAMA.
Decree No. 5.950	31 October 2006	Regulates article 57-A of Law no 9.985, of 18 July 2000, to establish the thresholds for planting Genetically Modified Organisms in areas surrounding officially protected areas under SNUC.
Decree No. 5.975	30 November 2006	Rules on the sustainable forest management.
Decree No. 6.100	26 April 2007	Approves the Regimental Structure and the Demonstrative Framework of the Commissioned Posts and the Gratified Functions of the Chico Mendes Institute for Biodiversity Conservation, and rules on other subjects.
Decree No. 6.263	21 November 2007	Institutes the Inter-ministerial Committee on Climate Change – CIM, guides the preparation of the National Plan on Climate Change, and rules on other subjects.
Decree No. 6.290	06 December 2007	Institutes the Regional Sustainable Development Plan for the Area of Influence of Highway BR-163 in the Section Cuiabá/MT - Santarém/PA – Sustainable BR-163 Plan, and rules on other subjects.
Decree No. 6.321	21 December 2007	Rules on actions related to the prevention, monitoring and control of deforestation in the Amazon Biome, and alters and adds provisions to Decree no 3.179, of 21 September 1999, which rules on the specification of the applicable penalties to conducts and activities harmful to the environment, and rules on other subjects.
Decree No. 6.469	30 May 2008	Adopts the Recommendation No. 007, of 28 May 2008, by the National Environment Council – CONAMA, which authorizes the reduction of the area allotted to the legal reserve, for recomposition purposes, to up to 50 per cent of the properties located within Zone 1, as defined by the Ecological Economic Zoning of the State of Acre.
Decree No. 6.565	15 September 2008	Rules on the tax measures applicable to the monetary donations received by public financial institutions controlled by the Federal Government and earmarked for actions on deforestation prevention, monitoring and combat, and promotion of the conservation and sustainable use of Brazilian forests.
Decree No. 6.660	21 November 2008	Regulates provisions in Law No. 11.428, of 22 December 2006, which rules on the use and protection of the native vegetation of the Atlantic

Legal Doc	Date	Descripttion
		Forest Biome.
Decree No. 6.829	27 April 2009	Regulates Provisional Ruling No. 458, of 10 February 2009, ruling on the land tenure regularization of urban areas located in public lands within the Legal Amazon, defined by Complementary Law No. 124, of 3 January 2007, and rules on other subjects.
Decree No. 6.830	27 April 2009	Regulates Provisional Measure No. 458, of 10 February 2009, ruling on the land tenure regularization of rural areas in public lands claimed by the National Institute for Colonization and Agrarian Reform (Instituto Nacional de Colonização e Reforma Agrária – INCRA), within the Legal Amazon region, defined by Complementary Law No. 124, of 3 January 2007, and rules about other subjects.

Table28: Endangered tree species in the Brazilian Biomes (critically endangered, endangered and vulnerable)

Biome	Category	***Species***
Amazonia	CR	*Nycticalanthus speciosus*
	EN	*Aniba rosaeodora, Pilocarpus microphyllus*
	VU	*Amburana cearensis, Bertholletia excelsa, Dicypellium caryophyllaceum, Eschweilera piresii, Eschweilera subcordata, Gustavia erythrocarpa, Rhodostemonodaphne parvifolia, Rhodostemonodaphne recurva, Swietenia macrophylla*
Caatinga	CR	*Jacaranda rugosa, Pilosocereus azulensis, Sparattosperma catingae, Tabebuia selachidentata*
	EN	*Byrsonima blanchetiana, Espostoopsis dybowskii*
	VU	*Amburana cearensis, Chloroleucon extortum, Erythroxylum maracasense, Facheiroa cephaliomelana, Godmania dardanoi, Leucochloron limae, Paralychnophora bicolor, Pereskia aureiflora, Schinopsis brasiliensis, Simira gardneriana, Tabebuia spongiosa*
Cerrado	CR	*Dimorphandra wilsonii*
	EN	*Pilocarpus microphyllus, Vellozia gigantea*
	VU	*Byrsonima macrophylla, Christiana macrodon, Eremanthus argenteus, E. seidelii, Euplassa semicostata, Huberia piranii, Hyptidendron claussenii, Lychnophora ericoides, Paralychnophora bicolor, Pilocarpus trachylophus, Pilosocereus fulvilanatus, Schinopsis brasiliensis, Syagrus ruschiana, Wunderlichia crulsiana*
Atlantic Forest	CR	*Duguetia restingae, Malmea obovata, Plinia complanata, Trattinnickia ferruginea*
	EN	*Araucaria angustifolia, Buchenavia pabstii, Caesalpinia echinata, Cariniana parvifolia, Chionanthus subsessilis, Chrysophyllum imperiale, Conchocarpus cauliflorus, Dicksonia selloviana, Duguetia magnolioidea, D. reticulata, Erythroxylum mattossilvae, E. membranaceum, Eugenia myrciariifolia, E. peruibensis, Euterpe edulis, Faramea coerulea, Hirtella insignis, Hornschuchia cauliflora, H. obliqua, Jacaranda crassifolia, Macropeplus friburgensis, Manilkara dardanoi, Marlierea sucrei, Metrodorea maracasana, Persea punctata, Plinia ilhensis, Raulinoa echinata, Rhodostemonodaphne capixabensis, Rudgea erythrocarpa, R. insignis, R. interrupta, R. macrophylla, R. nobilis, R. reflexa, R. vellerea, Solanum restingae, Swartzia glazioviana, S. pickelii, Syagrus macrocarpa, Symplocos organensis, Tabebuia botelhensis, T. catarinensis, T. cristata, Trattinnickia mensalis*
	VU	*Attalea funifera, Bactris pickelii, Berberis camposportoi, Brosimum glaucum, Buchenavia rabelloana, Bunchosia itacarensis, B. pernambucana, Byrsonima alvimii, B. bahiana, B. cacaophila, Calyptranthes dryadica, C. restingae, Campomanesia espiritosantensis, Cedrela lilloi, Couratari asterotricha, Dalbergia elegans, D. nigra, Duguetia salicifolia, D. sooretamae, Erythroxylum catharinense, E. compressum, E. distortum, E. substriatum, Eschweilera alvimii, E. tetrapetala, Eugenia itacarensis, Faramea monantha, Gaylussacia caparoensis, Guatteria reflexa, Huberia carvalhoi, H. espiritosantensis, Jacaranda grandifoliolata, J. microcalyx, J. subalpina, Lonchocarpus torrensis, Machaerium obovatum, Macrotorus utriculatus, Marlierea skortzoviana, Melanopsidium nigrum, Melanoxylon brauna, Miconia longicuspis, Mollinedia boracensis, M. gilgiana, M. glabra, M. lamprophylla, M. salicifolia, Myrceugenia brevipedicellata, M. foveolata, M. smithii, Myrcia follii, M. gilsoniana, M. isaiana, M. limae, M. riodocensis, Myrsine villosissima, Nectandra micranthera, Neomitranthes nitida, N. obtusa, Ocotea basicordatifolia, O. catharinensis, O. cryptocarpa, O. odorifera, O. porosa, O. serrana, Pavonia alnifolia, Phyllostemonodaphne geminiflora, Picramnia coccinea, Pilocarpus jaborandi, Plinia callosa, P. hatschbachii, P. muricata, P. renatiana, Protium bahianum, Rinorea ramiziana, Rollinia ferruginea, R. maritima, Rudgea crassifolia, R. umbrosa, Schefflera aurata, S. succinea, Siphoneugena kuhlmannii, Solanum santosii, Syagrus picrophylla, Tabebuia arianeae, T. cassinoides, T. obtusifolia, T. riodocensis, Terminalia kuhlmannii, Tetragastris occhionii, Trigynaea axilliflora, Unonopsis riedeliana, Urbanodendron bahiense*
Pampa	EN	*Gleditsia amorphoides*
	VU	*Butia eriospatha, Butia yatay, Euplassa nebularis, Myracrodruon balansae, Prosopis affinis, Prosopis nigra, Trithrinax brasiliensis*

Table 29: List of tree species recommended for genetic conservation initiatives in Brazil

ID_SPP	*SCIENTIFIC_NAME*	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
200478	*Abarema cochliacarpos*	200846	*Apeiba echinata*	201013	*Bowdichyia virgilioides*
200479	*Abarema filamentosa*	200028	*Apeiba tiborbou*	200468	*Bowdickia nitida*
200480	*Abarema obovata*	200029	*Aporosella chacoënsis*	200054	*Brasiliopuntia brasiliensis*
200481	*Abarema turbinata*	200030	*Apuleia leiocarpa*	200854	*Brosimum acutifolium*
201049	*Acacia mangium*	201065	*Apuleia molaris*	200855	*Brosimum alicastrum*
201050	*Acacia melanoxylon*	200491	*Arapatiella psilophylla*	200055	*Brosimum gaudichaudii*
200001	*Acacia paniculata*	200436	*Araucaria angustifolia*	201098	*Brosimum glaucum*
200002	*Acacia polyphylla*	201053	*Araucaria cunninghamii*	200497	*Brosimum glaziovii*
200003	*Acacia velutina*	200357	*Archontophoenix alexandrae*	200056	*Brosimum lactescens*
200836	*Acioa edulis*	200031	*Aspidosperma australe*	200796	*Brosimum parinarioides*
200004	*Acosmium cardenasii*	200032	*Aspidosperma cuspa*	200856	*Brosimum potabile*
200005	*Acosmium dasycarpum*	200033	*Aspidosperma cylindrocarpon*	200857	*Brosimum rubescens*
200006	*Acosmium subelegans*	200847	*Aspidosperma desmanthum*	200858	*Brosimum utile*
200007	*Acrocomia aculeata*	200034	*Aspidosperma macrocarpon*	200859	*Buchenavia capitata*
200008	*Actinostemon conceptionis*	200035	*Aspidosperma parvifolium*	200860	*Buchenavia cf. viridiflora*
200009	*Aegiphila klotzkiana*	200036	*Aspidosperma polyneuron*	200861	*Buchenavia grandis*
200355	*Aegiphila sellowiana*	200037	*Aspidosperma pyrifolium*	200862	*Buchenavia huberi*
200010	*Agonandra brasiliensis*	200038	*Aspidosperma quebracho-blanco*	200498	*Buchenavia iguaratensis*
200482	*Aiouea bracteata*	200039	*Aspidosperma subincanum*	200499	*Buchenavia pabstii*
200483	*Aiouea macedoana*	200040	*Aspidosperma tomentosum*	200500	*Buchenavia rabelloana*
200484	*Albizia burkartiana*	200492	*Astrocaryum minus*	200057	*Buchenavia tetraphylla*
200485	*Albizia edwarllii*	200789	*Astrocaryum tucuma*	200058	*Buchenavia tomentosa*
200011	*Albizia inundata*	200790	*Astrocaryum vulgare*	200059	*Bulnesia sarmientoi*
200012	*Albizia niopioides*	200041	*Astronium fraxinifolium*	201099	*Bunchosia itacarensis*
200013	*Alchornea discolor*	200848	*Astronium gracile*	201100	*Bunchosia pernambucana*
200014	*Alchornea triplinervia*	200042	*Astronium graveolens*	200501	*Butia eriospatha*
200837	*Alexa grandiflora*	200849	*Astronium lecointei*	200502	*Butia purpurascens*
200015	*Alibertia sessilis*	200850	*Astronium ulei*	201234	*Butia yatay*
200838	*Allantoma lineata*	200447	*Astronium urundeuva*	201101	*Byrsonima alvimii*
200356	*Allophyllus edulis*	201096	*Attalea funifera*	201102	*Byrsonima bahiana*
200016	*Allophylus pauciflorus*	200043	*Attalea phalerata*	200060	*Byrsonima basiloba*
200017	*Aloysia virgata*	200044	*Attalea speciosa*	201232	*Byrsonima blanchetiana*
200018	*Amaioua guianensis*	200791	*Auxemma oncocalyx*	201103	*Byrsonima cacaophila*
200486	*Amburana acreana*	200045	*Averrhoidium paraguayense*	200061	*Byrsonima coccolobifolia*
200019	*Amburana cearensis*	200046	*Bactris cuyabensis*	200062	*Byrsonima crassa*
200839	*Anacardium giganteum*	200792	*Bactris gasipaes*	200797	*Byrsonima crassifolia*
200840	*Anacardium microcarpum*	200493	*Bactris pickelii*	201201	*Byrsonima macrophylla*
200841	*Anacardium parvifolium*	200793	*Bagassa guianensis*	200063	*Byrsonima verbascifolia*
200842	*Anacardium spruceanum*	200047	*Balfourodendron riedelianum*	200064	*Cabralea canjerana*
200843	*Anacardium tenuifolium*	200048	*Banana arguta*	200437	*Caesalpinia echinata*
200020	*Anadenanthera colubrina*	200794	*Banara arguta*	200798	*Caesalpinia ferrea*
201051	*Anadenanthera colubrina cebil*	200494	*Banara brasiliensis*	200065	*Caesalpinia paraguariensis*
200021	*Anadenanthera peregrina*	200049	*Bastardiopsis densiflora*	201006	*Caesalpinia pyramidalis*
200022	*Andira cuyabensis*	200477	*Bauhinia forficata*	200066	*Caesalpinia taubertiana*
201010	*Andira fraxinifolia*	200495	*Bauhinia integerrima*	200067	*Callisthene fasciculata*
200023	*Andira inermis*	200467	*Bauhinia smilacina*	200799	*Callisthene fasciculate*
200844	*Andira retusa*	200851	*Beilschmiedia brasiliensis*	200068	*Callisthene hasslerii*
200024	*Andira vermifuga*	200358	*Beilschmiedia emarginata*	200069	*Callisthene major*
200845	*Aniba canelilla*	201097	*Berberis camposportoi*	200070	*Calophyllum brasiliense*
201052	*Aniba duckei*	200050	*Bergeronia sericea*	200071	*Calycophyllum multiflorum*
200788	*Aniba dukei*	200444	*Bertholletia excelsa*	200503	*Calycorectes australis*
200487	*Aniba ferrea*	200795	*Bertholletia excelsa*	200504	*Calycorectes duarteanus*
200488	*Aniba intermedia*	200496	*Bicuiba oleifera*	200505	*Calycorectes schottianus*
200489	*Aniba pedicellata*	200852	*Bixa arborea*	200506	*Calycorectes sellowianus*
200435	*Aniba rosaeodora*	200359	*Bixa orelana*	201104	*Calyptranthes dryadica*
200457	*Aniba roseodora*	200051	*Blepharocalyx salicifolius*	201105	*Calyptranthes restingae*
200490	*Aniba santalodora*	201066	*Bombacopsis nervosa*	200507	*Campomanesia aromatica*
200025	*Annona cacans*	200052	*Bougainvillea campanulata*	200508	*Campomanesia espiritosantensis*
200026	*Annona crassiflora*	200853	*Bowdichia nitida*	200509	*Campomanesia hirsuta*
200027	*Annona montana*	200053	*Bowdichia virgilioides*	200510	*Campomanesia laurifolia*

Table 29: List of tree species recommended for genetic conservation initiatives in Brazil

ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
200511	*Campomanesia neriiflora*	200094	*Chionanthus trichotomus*	200114	*Coutarea hexandra*
200512	*Campomanesia phaea*	200529	*Chloroleucon extortum*	200115	*Crataeva tapia*
200513	*Campomanesia viatoris*	200530	*Chloroleucon tortum*	200550	*Cratylia bahiensis*
200072	*Capparis prisca*	200095	*Chorisia speciosa*	200116	*Croton floribundus*
200073	*Capparis speciosa*	201202	*Christiana macrodon*	200808	*Croton sonderianus*
200863	*Caraipa densifolia*	200531	*Chrysophyllum acreanum*	200117	*Croton urucurana*
200800	*Carapa guianensis*	200532	*Chrysophyllum durifructum*	200364	*Cryptocarya mandioccana*
200074	*Carica quercifolia*	200533	*Chrysophyllum imperiale*	201055	*Cryptomeria japonica*
200075	*Cariniana estrellensis*	200096	*Chrysophyllum marginatum*	200365	*Cunninghamia lanceolata*
200801	*Cariniana extrellensis*	200534	*Chrysophyllum paranaense*	200118	*Cupania castaneifolia*
200514	*Cariniana ianeirensis*	200871	*Chrysophyllum prieurii*	201056	*Cupressus lusitanica*
200515	*Cariniana integrifolia*	200535	*Chrysophyllum splendens*	200119	*Curatella americana*
200516	*Cariniana kuhlmannii*	200536	*Chrysophyllum subspinosum*	200120	*Cybistax antisphilitica*
200517	*Cariniana legalis*	200537	*Chrysophyllum superbum*	200121	*Cynometra bauhinioides*
200864	*Cariniana micrantha*	200872	*Clarisia racemosa*	200366	*Cytharexyllum myrianthum*
200518	*Cariniana pachyantha*	200097	*Cnidosculus cnicodendron*	200367	*Cytharexyllum solanaceum*
201106	*Cariniana parvifolia*	200098	*Coccoloba cujabensis*	201108	*Dalbergia elegans*
200519	*Cariniana pauciramosa*	200099	*Coccoloba mollis*	200122	*Dalbergia miscolobium*
200520	*Cariniana penduliflora*	200100	*Colubrina glandulosa*	200438	*Dalbergia nigra*
200521	*Cariniana uaupensis*	200101	*Combretum leprosum*	200123	*Dendropanax cuneatum*
200076	*Caryocar brasiliense*	200102	*Combretum melifluum*	200881	*Dialium guianense*
200522	*Caryocar coriaceum*	200103	*Commiphora leptophloeos*	201069	*Dialium guianenses*
200865	*Caryocar glabrum*	201107	*Conchocarpus cauliflorus*	200124	*Diatenopteryx sorbifolia*
201067	*Caryocar microglabrum*	200804	*Connarus suberosus*	201109	*Dicksonia sellowiana*
200802	*Caryocar villosum*	200873	*Copaifera duckei*	200882	*Diclinanona calycina*
201064	*Casearia decandra*	200104	*Copaifera landsgorffii*	200883	*Dicorynia guianensis*
200077	*Casearia gossypiosperma*	201054	*Copaifera langsdorffii*	200551	*Dicypellium caryophyllaceum*
200078	*Casearia rupestris*	200874	*Copaifera multijuga*	200464	*Dicypellium caryophyllatum*
200079	*Casearia silvestris*	200875	*Copaifera reticulata*	200125	*Dilodendron bipinnatum*
200360	*Casearia sylvestris*	200805	*Copaifera spp*	200809	*Dimorphandra mollis*
200080	*Casimirella beckii*	200105	*Copernicia alba*	200552	*Dimorphandra wilsonii*
200866	*Cassia fastuosa*	200806	*Copernicia prunifera*	200810	*Dinizia excelsa*
200081	*Cassia grandis*	200106	*Cordia alliadora*	200126	*Diospyros obovata*
200361	*Cassia leptophylla*	200876	*Cordia bicolor*	200127	*Diplokeleba floribunda*
200867	*Cassia scleroxylon*	200107	*Cordia glabrata*	200884	*Diploon venezuelana*
200868	*Castilla ulei*	200807	*Cordia goeldiana*	200885	*Diplotropis purpurea*
200362	*Casuarina equisetifolia*	200877	*Cordia sagotii*	200128	*Dipteryx alata*
200082	*Cecropia pachystachya*	200108	*Cordia sellowiana*	201095	*Dipteryx magnifica*
200083	*Cecropia saxalitis*	200109	*Cordia trichotoma*	200811	*Dipteryx odorata*
200803	*Cecropia spp*	200363	*Cordyline spectabilis*	201058	*Dipteryxa lata*
200084	*Cedrela fissilis*	200110	*Couepia grandiflora*	200129	*Diptychandra aurantiaca*
200523	*Cedrela lilloi*	200538	*Couepia joaquinae*	200886	*Drypetes variabilis*
200524	*Cedrela odorata*	200878	*Couepia robusta*	201110	*Duguetia magnolioidea*
200869	*Cedrelinga catenaeformis*	200539	*Couepia schottii*	201111	*Duguetia restingae*
201068	*Cedrilinga catenaeformis*	200111	*Couepia uiti*	201112	*Duguetia reticulata*
200870	*Ceiba pentandra*	200462	*Coupeia schottii*	201113	*Duguetia salicifolia*
200085	*Ceiba pubiflora*	200540	*Couratari asterophora*	201114	*Duguetia sooretamae*
200086	*Ceiba samauna*	200541	*Couratari asterotricha*	200553	*Ecclinusa lancifolia*
200087	*Celtis iguanea*	200542	*Couratari atrovinosa*	200130	*Emmotum nitens*
200088	*Celtis pubescens*	200543	*Couratari guianensis*	200887	*Endopleura uchi*
200089	*Cenostigma macrophyllum*	200544	*Couratari longipedicellata*	201012	*Enterelobium contortisiliquum*
201011	*Centrolobium microchaete*	200879	*Couratari oblongifolia*	201057	*Enterolobium contortisiliquum*
200090	*Centrolobium tomentosum*	200545	*Couratari prancei*	200888	*Enterolobium maximum*
200091	*Cestrum laevigatum*	200546	*Couratari pyramidata*	200889	*Enterolobium schomburgkii*
200092	*Chaetocarpus echinocarpus*	200880	*Couratari stellata*	201070	*Ephendranthus guianensis*
200525	*Chionanthus fluminensis*	200547	*Couratari tauari*	201203	*Eremanthus argenteus*
200526	*Chionanthus micranthus*	200112	*Couroupita sp.*	201204	*Eremanthus seidelii*
200093	*Chionanthus spathulata*	200548	*Coussapoa curranii*	200131	*Eriotheca gracilipes*
200527	*Chionanthus subsessilis*	200549	*Coussapoa floccosa*	200890	*Eriotheca longipedicellata*
200528	*Chionanthus tenuis*	200113	*Coussarea hydrangeifolia*	200132	*Eriotheca marginatum*

Table 29: List of tree species recommended for genetic conservation initiatives in Brazil

ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
200133	*Eriotheca roseorum*	200385	*Eucalyptus paniculata*	201061	*Gallesia integrifólia*
200134	*Eriotheca tomentosum*	200386	*Eucalyptus pellita*	201126	*Gaylussacia caparoensis*
200812	*Erisma uncinatum*	200387	*Eucalyptus pellita x sp.*	200159	*Genipa americana*
200135	*Erythrina cristagalli*	200388	*Eucalyptus phaeotricha*	200160	*Geoffroea striata*
200136	*Erythrina dominguezii*	200389	*Eucalyptus pilularis*	200161	*Gleditsia amorphoides*
200137	*Erythrina falcata*	200390	*Eucalyptus propinqua*	200896	*Glycydendron amazonicum*
200138	*Erythrina fusca*	200391	*Eucalyptus propinqua x sp.*	201026	*Gmelina arborea*
201005	*Erythrina velutina*	200392	*Eucalyptus resinifera*	201219	*Godmania dardanoi*
200139	*Erythroxylum anguifugum*	200393	*Eucalyptus robusta*	200162	*Goldmania paragüensis*
201115	*Erythroxylum catharinense*	201020	*Eucalyptus saligna*	200163	*Gomideisa palustris*
201116	*Erythroxylum compressum*	201021	*Eucalyptus tereticornis*	200578	*Gomidesia mugnifolia*
201117	*Erythroxylum distortum*	200394	*Eucalyptus tereticornis x brassiana*	200814	*Goupia glabra*
201230	*Erythroxylum maracasense*	200395	*E. tereticornis x camaldulensis*	200164	*Guadua paniculata*
201118	*Erythroxylum mattossilvae*	201022	*Eucalyptus torelliana*	200579	*Guarea convergens*
201119	*Erythroxylum membranaceum*	200396	*Eucalyptus urophylla*	200580	*Guarea crispa*
200140	*Erythroxylum pelleterianum*	200397	*Eucalyptus urophylla x grandis*	200581	*Guarea cristata*
200141	*Erythroxylum suberosum*	201023	*Eucalyptus viminalis*	200582	*Guarea guentheri*
201120	*Erythroxylum substriatum*	200565	*Eugenia arianae*	200165	*Guarea guidonea*
200142	*Erythroxylum tortuosum*	200145	*Eugenia aurata*	201072	*Guarea guidonia*
200554	*Eschweilera alvimii*	200146	*Eugenia dysenterica*	200583	*Guarea humaitensis*
200555	*Eschweilera amazonicaformis*	200147	*Eugenia florida*	200584	*Guarea juglandiformis*
200556	*Eschweilera carinata*	200398	*Eugenia involucrata*	200166	*Guarea macrophylla*
200891	*Eschweilera cf. fracta*	201121	*Eugenia itacarensis*	200585	*Guarea sprucei*
200557	*Eschweilera compressa*	200566	*Eugenia microcarpa*	200586	*Guarea trunciflora*
200892	*Eschweilera coriacea*	201122	*Eugenia myrciariifolia*	200587	*Guarea velutina*
200893	*Eschweilera longipes*	201123	*Eugenia peruibensis*	200897	*Guatteria olivacea*
200143	*Eschweilera nana*	200148	*Eugenia pitanga*	201073	*Guatteria poeppigiana*
200894	*Eschweilera odora*	200567	*Eugenia prasina*	200898	*Guatteria procera*
201071	*Eschweilera parviflora*	200399	*Eugenia uniflora*	201127	*Guatteria reflexa*
201214	*Eschweilera piresii*	201235	*Euplassa nebularis*	200815	*Guazuma spp*
200558	*Eschweilera rabeliana*	201205	*Euplassa semicostata*	200167	*Guazuma ulmifolia*
200559	*Eschweilera rhododendrifolia*	201024	*Euterpe edulis*	200168	*Guettarda viburnoides*
200560	*Eschweilera rionegrense*	201025	*Euterpe oleracea*	200588	*Gustavia acuminata*
200561	*Eschweilera rodriguesiana*	200813	*Euterpe oleraceae*	200589	*Gustavia erythrocarpa*
200562	*Eschweilera roraimensis*	200446	*Euxylophora paraensis*	200590	*Gustavia longepetiolata*
200563	*Eschweilera subcordata*	201225	*Facheiroa cephaliomelana*	200591	*Gustavia santanderiensis*
200564	*Eschweilera tetrapetala*	201124	*Faramea coerulea*	200169	*Hancornia speciosa*
200144	*Esenbeckia leiocarpa*	201125	*Faramea monantha*	200592	*Helicostylis heterotricha*
201224	*Espostoopsis dybowskii*	200568	*Ficus aripuanensis*	200170	*Helicteres lhotzkyana*
200368	*Eucalyptus acmenoides*	200569	*Ficus blepharophylla*	201014	*Hevea brasiliensis*
201016	*Eucalyptus alba*	200149	*Ficus calyptroceras*	201074	*Himatanthus sucuuba*
200369	*Eucalyptus botryoides*	200570	*Ficus cyclophylla*	200171	*Hirtella gracilipes*
200370	*Eucalyptus brassiana*	200150	*Ficus dendrocida*	200449	*Hirtella insignis*
200371	*Eucalyptus brassiana x pellita*	200151	*Ficus enormis*	200450	*Hirtella parviunguis*
200372	*Eucalyptus brassiana x spp*	200152	*Ficus eximia*	200451	*Hirtella samtosii*
200373	*Eucalyptus brassiana x tereticornis*	200153	*Ficus gardneriana*	201128	*Hornschuchia cauliflora*
200374	*Eucalyptus camaldulensis*	200154	*Ficus guaranitica*	201129	*Hornschuchia obliqua*
200375	*Eucalyptus citriodora*	200155	*Ficus insipida*	201130	*Huberia carvalhoi*
200376	*Eucalyptus cloeziana*	200400	*Ficus luschnathiana*	201131	*Huberia espiritosantensis*
200377	*Eucalyptus deanei*	200156	*Ficus lutschnathiana*	201206	*Huberia piranii*
201017	*Eucalyptus dunnii*	200571	*Ficus mexiae*	200899	*Hura crepitans*
200378	*Eucalyptus dunnii x Eucalyptyus spp.*	200572	*Ficus pakkensis*	200172	*Hymenaea courbaril*
200379	*Eucalyptus exserta*	200157	*Ficus pertusa*	200900	*Hymenaea parvifolia*
201018	*Eucalyptus globulus*	200573	*Ficus pulchella*	200816	*Hymenaea spp*
200380	*Eucalyptus grandis*	200574	*Ficus ramiflora*	200173	*Hymenaea stigonocarpa*
200381	*Eucalyptus grandis x camaldulensis*	200575	*Ficus roraimensis*	201094	*Hymenolobium excelsum*
200382	*Eucalyptus grandis x urophylla*	200576	*Ficus salzmanniana*	200901	*Hymenolobium modestum*
201019	*Eucalyptus maculata*	200577	*Ficus ursina*	200902	*Hymenolobium nitidum*
200383	*Eucalyptus microcorys*	200895	*Franchetella gongripii*	200903	*Hymenolobium petraeum*
200384	Eucalyptus muellerana	200158	*Gallesia integrifolia*	200904	*Hymenolobium pulcherrimum*

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ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
201207	*Hyptidendron claussenii*	200401	*Koelrenteria paniculata*	201140	*Malmea obovata*
200174	*Ilex affinis*	200181	*Lacistema aggreatum*	200920	*Malouetia duckei*
200593	*Ilex attenuata*	200910	*Laetia procera*	200820	*Manihot caerulescens*
200594	*Ilex neblinensis*	200182	*Lafoensia densiflora*	200921	*Manilkara amazonica*
200175	*Ilex paraguariensis*	200183	*Lafoensia pacari*	200644	*Manilkara bella*
200905	*Inga alba*	200631	*Lafoensia replicata*	200645	*Manilkara cavalcantei*
200595	*Inga aptera*	200184	*Lagenbergia cujabensis*	200646	*Manilkara dardanoi*
200596	*Inga arenicola*	200632	*Lecythis barnebyi*	200647	*Manilkara decrescens*
200597	*Inga bicoloriflora*	200633	*Lecythis brancoensis*	200648	*Manilkara elata*
200598	*Inga blanchetiana*	200911	*Lecythis idatimon*	200649	*Manilkara excelsa*
200599	*Inga bollandii*	200634	*Lecythis parvifructa*	200821	*Manilkara huberi*
200600	*Inga bullata*	200912	*Lecythis pisonis subsp. usitata*	200650	*Manilkara longifolia*
200601	*Inga bullatorugosa*	200635	*Lecythis prancei*	200651	*Manilkara maxima*
200602	*Inga cabelo*	200636	*Lecythis schomburgkii*	200652	*Manilkara multifida*
200603	*Inga calantha*	200637	*Lecythis schwackei*	201009	*Manilkara salzmanii*
200604	*Inga caudata*	201027	*Leucaena leucocephala*	200203	*Maprounea guianensis*
200605	*Inga enterolobioides*	200638	*Leucochloron foederale*	200922	*Maquira sclerophylla*
200606	*Inga exfoliata*	201231	*Leucochloron limae*	201141	*Marlierea skortzoviana*
200607	*Inga exilis*	200402	*Leuehea divaricata*	201142	*Marlierea sucrei*
200608	*Inga grazielae*	200452	*Licania bellingtonii*	201077	*Marmaroxylom racemosum*
201075	*Inga heterophylla*	200639	*Licania conferruminata*	200470	*Marmaroxylon racemosum*
200609	*Inga hispida*	200185	*Licania gardneri*	201078	*Martiodendron elatum*
200610	*Inga lanceifolia*	200913	*Licania gracilipes*	200204	*Matayba guianensis*
200611	*Inga lenticellata*	200453	*Licania indurata*	200205	*Mauritia flexuosa*
200612	*Inga lentiscifolia*	200186	*Licania minutiflora*	200206	*Maytenus sp.*
200613	*Inga leptantha*	200914	*Licania oblongifolia*	200404	*Melaleuca leucadendron*
200176	*Inga marginata*	200915	*Licania octandra*	201143	*Melanopsidium nigrum*
200614	*Inga maritima*	201060	*Licania parviflora*	200439	*Melanoxylon brauna*
200615	*Inga mendoncaei*	200187	*Licania parvifolia*	200822	*Melanoxylon braúna*
200616	*Inga microcalyx*	200817	*Licania rigida*	200469	*Melanoxylon braunia*
200906	*Inga paraensis*	200818	*Licania spp*	201028	*Melia azedarach*
200617	*Inga pedunculata*	200188	*Lihrea molleoides*	200207	*Melicoccus lepidopetalus*
200618	*Inga platyptera*	200189	*Lonchocarpus filipes*	201144	*Metrodorea maracasana*
200619	*Inga pleiogyna*	200190	*Lonchocarpus guilleminianus*	200653	*Mezilaurus itauba*
200620	*Inga praegnans*	200191	*Lonchocarpus nueblenbergianus*	200923	*Mezilaurus lindaviana*
200621	*Inga salicifoliola*	201136	*Lonchocarpus torrensis*	200654	*Mezilaurus navalium*
200622	*Inga santaremnensis*	200640	*Ludwigia anastomosans*	200208	*Mezilaurus sp.*
200623	*Inga sellowiana*	200192	*Luehea divaricata*	200405	*Michelia champaca*
200624	*Inga suberosa*	200193	*Luehea grandiflora*	200406	*Miconia cinerascens*
200625	*Inga suborbicularis*	200194	*Luehea paniculata*	201145	*Miconia longicuspis*
200626	*Inga unica*	200917	*Lueheopsis duckeana*	200924	*Micrandra minor*
200177	*Inga vera*	200195	*Luetzenburgia sp.*	200925	*Micrandra rossiana*
200627	*Inga xinguensis*	200463	*Lychnophora ericoides*	200655	*Micropholis caudata*
200455	*Ipomoea carajaensis*	200196	*Mabea fistulifera*	200656	*Micropholis compta*
200456	*Ipomoea cavalcantei*	200197	*Mabea paniculata*	200657	*Micropholis emarginata*
200628	*Iryanthera campinae*	200198	*Machaerium aculeatum*	200658	*Micropholis grandiflora*
200907	*Iryanthera grandis*	200199	*Machaerium acutifolium*	200926	*Micropholis guyanensis*
200629	*Iryanthera obovata*	200200	*Machaerium hirtum*	200927	*Micropholis mensalis*
201076	*Iryanthera ulei*	201137	*Machaerium obovatum*	200659	*Micropholis resinifera*
200908	*Jacaranda copaia*	200403	*Machaerium stipitatum*	200660	*Micropholis retusa*
201132	*Jacaranda crassifolia*	200641	*Machaerium villosum*	200661	*Micropholis submarginalis*
200178	*Jacaranda cuspidifolia*	200201	*Maclura tinctoria*	200928	*Micropholis venulosa*
201133	*Jacaranda grandifoliolata*	200918	*Macrolobium acacifolium*	200662	*Mimosa caesalpiniaefolia*
201134	*Jacaranda microcalyx*	201138	*Macropeplus friburgensis*	201029	*Mimosa caesalpiniifolia*
201220	*Jacaranda rugosa*	200642	*Macrosamanea macrocalyx*	200209	*Mimosa lacticifera*
201135	*Jacaranda subalpina*	200919	*Macrosamanea pedicellaris*	201007	*Mimosa ophthalmocentra*
200179	*Jacaratia spinosa*	200643	*Macrosamanea prancei*	200824	*Mimosa scabrella*
200909	*Joannesia heveoides*	201139	*Macrotorus utriculatus*	201004	*Mimosa tenuiflora*
200630	*Joannesia princeps*	200202	*Magonia glabrata*	201079	*Minquartia guianensis*
200180	*Kielmeyera coriacea*	200819	*Magonia pubescens*	200210	*Mollia burchelli*

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201146	*Mollinedia boracensis*	201156	*Neomitranthes nitida*	200696	*Phyllostemonodaphne geminiflora*
200663	*Mollinedia engleriana*	201157	*Neomitranthes obtusa*	200235	*Phyllostylon rhamnoides*
200664	*Mollinedia gilgiana*	201215	*Nycticalanthus speciosus*	200236	*Physocalymma scaberrimum*
200460	*Mollinedia glabra*	200931	*Ocotea barcellensis*	200237	*Phytolacca dioica*
200475	*Mollinedia lamprophylla*	200693	*Ocotea basicordatifolia*	201161	*Picramnia coccinea*
200665	*Mollinedia longicuspidata*	200441	*Ocotea catharinensis*	201162	*Pilocarpus jaborandi*
200666	*Mollinedia marquetiana*	200221	*Ocotea cernua*	200476	*Pilocarpus microphyllus*
201147	*Mollinedia salicifolia*	200932	*Ocotea costulata*	201209	*Pilocarpus trachylophus*
200461	*Mollinedia stenophylla*	201158	*Ocotea cryptocarpa*	201227	*Pilosocereus azulensis*
200407	*Mollinedia uleana*	200465	*Ocotea cymbarum*	201210	*Pilosocereus fulvilanatus*
201080	*Moronobea coccinea*	200222	*Ocotea diospyrifolia*	201030	*Pinus caribaea*
200929	*Mouriri callocarpa*	201082	*Ocotea dissimilis*	201031	*Pinus caribaea var bahamensis*
200211	*Mouriri elliptica*	200933	*Ocotea fragrantissima*	201032	*Pinus caribaea var caribaea*
200212	*Mouriri guianensis*	200466	*Ocotea langsdorffii*	201033	*Pinus caribaea var hondurensis*
201236	*Myracrodruon balansae*	200223	*Ocotea minarum*	201034	*Pinus elliottii*
200213	*Myracrodruon urundeuva*	200934	*Ocotea neesiana*	200434	*Pinus elliottii var. elliottii*
200667	*Myrceugenia bracteosa*	200442	*Ocotea odorifera*	201035	*Pinus kesiya*
200668	*Myrceugenia brevipedicellata*	200825	*Ocotea odorífera*	201036	*Pinus merkusii*
200669	*Myrceugenia campestris*	200443	*Ocotea porosa*	201037	*Pinus oocarpa*
201148	*Myrceugenia foveolata*	200448	*Ocotea pretiosa*	201038	*Pinus patula*
200670	*Myrceugenia franciscensis*	200224	*Ocotea puberula*	201039	*Pinus pseudostrobus*
200671	*Myrceugenia kleinii*	201083	*Ocotea rubra*	201040	*Pinus sp*
200672	*Myrceugenia pilotantha*	201159	*Ocotea serrana*	201041	*Pinus taeda*
200673	*Myrceugenia rufescens*	200225	*Ocotea velloziana*	200238	*Piptadenia gonoacantha*
200674	*Myrceugenia scutellata*	200935	*Onychopetalum amazonicum*	201008	*Piptadenia moniliformis*
201149	*Myrceugenia smithii*	201084	*Onychopetalum lucidum*	200410	*Piptadenia paniculata*
200675	*Myrcia almasensis*	200826	*Orbignya phalerata*	200239	*Piptadenia stipulacea*
201150	*Myrcia follii*	200226	*Orbignya speciosa*	200946	*Piptadenia suaveolens*
201151	*Myrcia gilsoniana*	200936	*Ormosia coccinea*	200240	*Piptadenia viridiflora*
200676	*Myrcia grandiflora*	200227	*Ormosia fastigiata*	200411	*Piptocarpha angustifolia*
201152	*Myrcia isaiana*	200937	*Ormosia paraensis*	200412	*Piptocarpha axillaris*
201153	*Myrcia limae*	200938	*Osteophloeum platyspermum*	200241	*Piptocarpha rotundifolia*
200677	*Myrcia lineata*	200228	*Ouratea behasperma*	200242	*Pisonia zapallo*
201154	*Myrcia riodocensis*	200827	*Parahancornia amapa*	200243	*Pithecelobium scalare*
200214	*Myrcia tomentosa*	201208	*Paralychnophora bicolor*	200697	*Plathymenia foliolosa*
200678	*Myrcianthes pungens*	200229	*Parapiptadenia rigida*	200244	*Plathymenia reticulata*
200215	*Myrciaria cauliflora*	200454	*Parinari brasiliensis*	200413	*Platymiscium floribundum*
200679	*Myrciaria cuspidata*	200939	*Parinari excelsa*	201088	*Platymiscium trinitatis*
200408	*Myrciaria jaboticaba*	200940	*Parkia gigantocarpa*	200245	*Platypodium elegans*
200680	*Myrciaria pliniodes*	201085	*Parkia montijuga*	200246	*Plenckia populnea*
200681	*Myrciaria silveirana*	200941	*Parkia multijuga*	201163	*Plinia callosa*
200216	*Myrocarpus frondosus*	200942	*Parkia oppositifolia*	201164	*Plinia complanata*
200217	*Myroxylon peruiferum*	200943	*Parkia paraensis*	201165	*Plinia hatschbachii*
201155	*Myrsine villosissima*	200944	*Parkia pendula*	201166	*Plinia ilhensis*
200682	*Naucleopsis oblongifolia*	200230	*Patagonula americana*	201167	*Plinia muricata*
200683	*Nectandra barbellata*	200472	*Pavonia alnifolia*	201168	*Plinia renatiana*
200218	*Nectandra cuspidata*	200945	*Peltogyne cf. subsessilis*	200829	*Podocarpus lambertii*
200684	*Nectandra debilis*	200231	*Peltogyne confertiflora*	200414	*Posoqueria latifolia*
200685	*Nectandra grisea*	201086	*Peltogyne excelsa*	200698	*Pouteria amapaensis*
200219	*Nectandra lanceolata*	200440	*Peltogyne maranhensis*	200699	*Pouteria andarahiensis*
200686	*Nectandra matogrossensis*	200828	*Peltogyne paniculata*	200947	*Pouteria anomala*
200220	*Nectandra megapotamica*	200232	*Peltophorum dubium*	200700	*Pouteria bapeba*
200687	*Nectandra micranthera*	201087	*Peotogeneo estelata*	200701	*Pouteria brevensis*
200688	*Nectandra paranaensis*	200233	*Pera glabrata*	200702	*Pouteria bullata*
200689	*Nectandra psammophila*	200694	*Perebea glabrifolia*	200703	*Pouteria butyrocarpa*
200930	*Nectandra rubra*	201226	*Pereskia aureiflora*	200948	*Pouteria caimito*
200690	*Nectandra weddellii*	200695	*Persea glabra*	200704	*Pouteria coelomatica*
201081	*Neea oppositifolia*	201160	*Persea punctata*	200705	*Pouteria crassiflora*
200691	*Neomitranthes cordifolia*	200409	*Persea pyrifolia*	200706	*Pouteria decussata*
200692	*Neomitranthes langsdorfii*	200234	*Peschiera fuchsiaefolia*	200949	*Pouteria egregia*

Table 29: List of tree species recommended for genetic conservation initiatives in Brazil

ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
200707	*Pouteria exstaminodia*	200262	*Pterodon emarginatus*	201181	*Schefflera aurata*
200708	*Pouteria fulva*	200263	*Pterogyne nitens*	200281	*Schefflera morototoni*
200709	*Pouteria furcata*	200955	*Qualea albiflora*	201182	*Schefflera succinea*
200247	*Pouteria gardneri*	200956	*Qualea brevipedicellata*	200282	*Schinopsis balansae*
200248	*Pouteria glomerata*	200957	*Qualea cf. lancifolia*	200283	*Schinopsis brasiliensis*
200950	*Pouteria guianensis*	200958	*Qualea dinizii*	200420	*Schinus molle*
200710	*Pouteria juruana*	200264	*Qualea grandiflora*	200421	*Schinus terebinthifolia*
200711	*Pouteria krukovii*	200265	*Qualea multiflora*	200963	*Schizolobium amazonicum*
200712	*Pouteria latianthera*	200266	*Qualea parviflora*	200422	*Schizolobium parahyba*
200713	*Pouteria lucens*	200418	*Rapanea ferruginea*	200284	*Sclerolobium aureum*
200714	*Pouteria macahensis*	200419	*Rapanea gardneriana*	200750	*Sclerolobium beaureipairei*
200715	*Pouteria macrocarpa*	200267	*Rapanea umbrellata*	200964	*Sclerolobium chrysophyllum*
200716	*Pouteria microstrigosa*	201170	*Raulinoa echinata*	200285	*Sclerolobium paniculatum*
200717	*Pouteria minima*	200959	*Rauvolfia paraensis*	200965	*Sclerolobium paraense*
200718	*Pouteria nudipetala*	200268	*Rhamnidium elaeocarpum*	200751	*Sclerolobium pilgerianum*
200951	*Pouteria oblanceolata*	200269	*Rheedia brasiliensis*	200966	*Sclerolobium poeppigianum*
200952	*Pouteria obscura*	201171	*Rhodostemonodaphne capixabensis*	200752	*Sclerolobium striatum*
200719	*Pouteria oppositifolia*	201216	*Rhodostemonodaphne parvifolia*	200286	*Sebastiania brasiliensis*
200720	*Pouteria oxypetala*	201217	*Rhodostemonodaphne recurva*	200287	*Seguieria paraguariensis*
200721	*Pouteria pachycalyx*	201043	*Ricinus communis*	200423	*Senna macranthera*
200953	*Pouteria pachycarpa*	200737	*Rinorea bicornuta*	200424	*Senna multijuga*
200722	*Pouteria pachyphylla*	200738	*Rinorea longistipulata*	200425	*Senna pendula*
200723	*Pouteria pallens*	200739	*Rinorea maximiliani*	200288	*Sideroxylon obtusifolium*
200724	*Pouteria petiolata*	200740	*Rinorea ramiziana*	200289	*Simaba trichilioides*
200725	*Pouteria polysepala*	200741	*Rinorea villosiflora*	200967	*Simarouba amara*
200474	*Pouteria psammophila*	200742	*Rollinia bahiensis*	200290	*Simarouba veriscolor*
200726	*Pouteria pubescens*	200743	*Rollinia calcarata*	200291	*Simira corumbaensis*
200727	*Pouteria putamen-ovi*	200270	*Rollinia emarginata*	201233	*Simira gardneriana*
200249	*Pouteria ramiflora*	200960	*Rollinia exsucca*	200292	*Siparuna guianensis*
200728	*Pouteria subsessilifolia*	200744	*Rollinia ferruginea*	201183	*Siphoneugena kuhlmannii*
200729	*Pouteria tarumanensis*	200745	*Rollinia helosioides*	200753	*Siphoneugenia densiflora*
200250	*Pouteria torta*	201172	*Rollinia maritima*	200754	*Siphoneugenia widgreniana*
200730	*Pouteria vernicosa*	200746	*Rollinia pickelii*	200293	*Sloanea garckeana*
200731	*Pradosia decipiens*	200830	*Roupala montana*	200968	*Sloanea nitida*
200732	*Pradosia granulosa*	200747	*Rudgea crassifolia*	200294	*Solanum caavurana*
200733	*Pradosia kuhlmannii*	201173	*Rudgea erythrocarpa*	200426	*Solanum lycocarpum*
200734	*Pradosia subverticillata*	201174	*Rudgea insignis*	200755	*Solanum paralum*
200735	*Pradosia verrucosa*	201175	*Rudgea interrupta*	200427	*Solanum pseudo-quina*
200251	*Priogymnanthus hasslerianus*	201176	*Rudgea macrophylla*	201184	*Solanum restingae*
201237	*Prosopis affinis*	201177	*Rudgea nobilis*	200428	*Solanum sanctaecatharinae*
201042	*Prosopis juliflora*	201178	*Rudgea reflexa*	201185	*Solanum santosii*
201238	*Prosopis nigra*	201179	*Rudgea umbrosa*	200756	*Sorocea guilleminiana*
200252	*Prosopis rubriflora*	201180	*Rudgea vellerea*	201221	*Sparattosperma catingae*
200253	*Prosopis ruscifolius*	200271	*Rudgea viburnoides*	200295	*Sparattosperma leucanthum*
201169	*Protium bahianum*	200272	*Ruprechtia brachysepala*	200296	*Spondias lutea*
200254	*Protium heptaphyllum*	200273	*Ruprechtia exploratricis*	201063	*Spondias lútea*
201089	*Protium robustum*	200274	*Saccelium lanceolatum*	200833	*Spondias tuberosa*
200954	*Protium tenuifolium*	200275	*Salacia elliptica*	200757	*Stephanopodium magnifolium*
200255	*Prunnus brasiliensis*	200276	*Salix humboldtiana*	200969	*Sterculia apeibophylla*
200415	*Prunus myrtifolia*	200831	*Salvertia convallariaeodora*	200297	*Sterculia apetala*
200416	*Prunus sellowi*	200277	*Salvertia convallariodora*	200970	*Sterculia pilosa*
200256	*Pseudobombax longiflorum*	200278	*Samanea tubulosa*	200971	*Sterculia speciosa*
200257	*Pseudocopaiva chodatiana*	200961	*Sapium aereum*	200298	*Sterculia striata*
200736	*Pseudolmedia hirtula*	200279	*Sapium haematospermum*	200429	*Strychnos brasiliensis*
201090	*Pseudolmedia laevis*	200962	*Sapium marmieri*	200299	*Strychnos pseudoquina*
200417	*Psidium guajava*	200280	*Sapium obovatum*	200300	*Stryphnodendron adstringens*
200258	*Psidium guineense*	200748	*Sarcaulus inflexus*	201092	*Stryphnodendron barbatimao*
200259	*Psidium sartorianum*	200749	*Sarcaulus vestitus*	200301	*Stryphnodendron obovatum*
200260	*Pterocarpus michelii*	201059	*Scheele aphalerata*	200972	*Stryphnodendron pulcherrimum*
200261	Pterocarpus rohrii	200832	*Scheelea phalerata*	200302	*Styrax camporum*

Table 29: List of tree species recommended for genetic conservation initiatives in Brazil

ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME	ID_SPP	SCIENTIFIC_NAME
200458	*Swartzia glazioviana*	201093	*Thyrsodium schomburgkianum*	200337	*Vochysia divergens*
201186	*Swartzia pickelii*	200431	*Tibouchina mutabilis*	200995	*Vochysia ferruginea*
200973	*Swartzia recurva*	200835	*Tocoyena formosa*	200996	*Vochysia guianensis*
200303	*Sweetia fruticosa*	200985	*Trattinnickia cf. burseraefolia*	200338	*Vochysia haenkeana*
200445	*Swietenia macrophylla*	201197	*Trattinnickia ferruginea*	200997	*Vochysia maxima*
200834	*Syagrus coronata*	201198	*Trattinnickia mensalis*	200998	*Vochysia melinoni*
200758	*Syagrus glaucescens*	200321	*Trema micranta*	200999	*Vochysia obidensis*
200759	*Syagrus macrocarpa*	201048	*Trema micrantha*	200339	*Vochysia pyramidalis*
200304	*Syagrus oleracea*	200765	*Trichilia areolata*	200340	*Vochysia rufa*
201187	*Syagrus picrophylla*	200766	*Trichilia blanchetii*	200341	*Vochysia tucanorum*
200305	*Syagrus romanzoffiana*	200767	*Trichilia bullata*	200459	*Vouacapoua americana*
201211	*Syagrus ruschiana*	200768	*Trichilia casaretti*	201213	*Wunderlichia crulsiana*
200974	*Symphonia globulifera*	200322	*Trichilia catigua*	200342	*Xylopia aromatica*
200306	*Symplocos nitens*	200323	*Trichilia clausenii*	200343	*Xylopia brasiliensis*
201188	*Symplocos organensis*	200769	*Trichilia discolor*	200344	*Xylopia emarginata*
201044	*Syzygium cumini*	200324	*Trichilia elegans*	201000	*Xylopia nitida*
201015	*Tabebuia alba*	200770	*Trichilia elsae*	200345	*Xylosma venosum*
201189	*Tabebuia arianeae*	200771	*Trichilia emarginata*	201062	*Zanthoxyllum riedelianum*
200307	*Tabebuia aurea*	200772	*Trichilia fasciculata*	200346	*Zanthoxylum caribeum*
201045	*Tabebuia avellanedae*	200773	*Trichilia florbranca*	200787	*Zanthoxylum flavum*
201190	*Tabebuia botelhensis*	200774	*Trichilia hispida*	201001	*Zanthoxylum regnelianum*
201191	*Tabebuia cassinoides*	200986	*Trichilia lecointei*	200347	*Zanthoxylum rhoifolium*
201192	*Tabebuia catarinensis*	200775	*Trichilia magnifoliola*	200348	*Zanthoxylum riedelianum*
200975	*Tabebuia cf. incana*	200776	*Trichilia micropetala*	200349	*Zanthoxylum rigidium*
201046	*Tabebuia chrysotricha*	200325	*Trichilia pallida*	200350	*Zeyheria tuberculosa*
201193	*Tabebuia cristata*	200326	*Trichilia quadrijuga*	201002	*Zizyphus itacaiunensis*
200308	*Tabebuia heptaphylla*	200777	*Trichilia ramalhoi*	200351	*Zizyphus oblongifolius*
200309	*Tabebuia impetiginosa*	200778	*Trichilia silvatica*	201003	*Zollernia paraensis*
200310	*Tabebuia insignis*	200779	*Trichilia solitudinis*	200352	*Zygia cauliflora*
200311	*Tabebuia nodosa*	200327	*Trichilia stellato-tomentosa*	200353	*Zygia inaequalis*
201194	*Tabebuia obtusifolia*	200780	*Trichilia surumuensis*	200354	*Zygia latifolia*
200312	*Tabebuia ochracea*	200781	*Trichilia tetrapetala*		
201195	*Tabebuia riodocensis*	200328	*Trigonia boliviana*		
200313	*Tabebuia roseo-alba*	201199	*Trigynaea axilliflora*		
201222	*Tabebuia selachidentata*	200329	*Triplaris americana*		
200976	*Tabebuia serratifolia*	200330	*Triplaris gardneriana*		
201223	*Tabebuia spongiosa*	200331	*Trithrinax brasiliensis*		
200314	*Tabebuia vellosoi*	200332	*Unonopsis lindmanii*		
200760	*Tabernaemontana cumata*	201200	*Unonopsis riedeliana*		
200761	*Tabernaemontana muricata*	200782	*Urbanodendron bahiense*		
200977	*Tachigali cavipes*	200783	*Urbanodendron macrophyllum*		
200978	*Tachigali cf. myrmecophila*	200784	*Urbanodendron verrucosum*		
200979	*Tachigali multijuga*	200987	*Vantanea parviflora*		
200980	*Tachigali myrmecophila*	200988	*Vatairea guianensis*		
200315	*Talauma ovata*	200333	*Vatairea macrocarpa*		
200316	*Talisia esculenta*	200989	*Vatairea paraensis*		
200317	*Tapirira guianensis*	200990	*Vatairea sericea*		
201047	*Tecoma stans*	200991	*Vataireopsis speciosa*		
200430	*Tectona grandis*	201212	*Vellozia gigantea*		
200981	*Terminalia amazonica*	200785	*Verbesina pseudoclausseni*		
200318	*Terminalia argentea*	200432	*Vernonia discolor*		
200982	*Terminalia cf. argentea*	200992	*Virola carinata*		
200319	*Terminalia fagifolia*	200993	*Virola michelii*		
200762	*Terminalia januariensis*	200994	*Virola multicostata*		
200763	*Terminalia kuhlmannii*	200433	*Virola oleifera*		
200764	*Terminalia reitzii*	200786	*Virola parvifolia*		
200320	*Terminalia triflora*	200334	*Virola sebifera*		
200983	*Tetragastris altissima*	200473	*Virola surinamensis*		
201196	*Tetragastris occhionii*	200335	*Vitex cymosa*		
200984	*Tetragastris panamensis*	200336	*Vochysia cinnamomea*		

Table 30: Important forest tree species classified according to conservation status and priority

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Nycticalanthus speciosus	Endangered	Amazon	High Priority	Conservation					
Amburana acreana	n.a.	Amazon	Priority	Potential Agro-forest Systems	X	X			
Astrocaryum tucuma	n.a.	Amazon	Priority	Economic		X			
Astrocaryum vulgare	n.a.	Amazon	Priority	Potential native Planted Forest		X			
Bactris gasipaes	n.a.	Amazon	Priority	Potential Agro-forest Systems		X			
Bertholletia exelsa	n.a.	Amazon	Priority	Potential native Planted Forest	X	X			
Brosimum parinarioides,Ducke	n.a.	Amazon	Priority	Economic	X	X			
Carapa guianensis	n.a.	Amazon	Priority	Potential Agro-forest Systems	X	X			
Caryocar villosum	n.a.	Amazon	Priority	Potential Agro-forest Systems	X	X			
Cedrela odorata	n.a.	Amazon	Priority	Potential Agro-forest Systems	X				
Copaifera spp	n.a.	Amazon	Priority	Potential Agro-forest Systems	X	X			
Cordia goeldiana	n.a.	Amazon	Priority	Potential Agro-forest Systems	X				
Dipteryx odorata	n.a.	Amazon	Priority	Potential Agro-forest Systems	X	X			
Euterpe oleraceae	n.a.	Amazon	Priority	Potential Agro-forest Systems		X			
Euxylophora paraensis	n.a.	Amazon	Priority	Conservation	X				
Manilkara huberi	n.a.	Amazon	Priority	Economic	X				
Parahancornia amapa	n.a.	Amazon	Priority	Economic	X	X			
Peltogyne maranhensis	n.a.	Amazon	Priority	Conservation	X				
Peltogyne paniculata	n.a.	Amazon	Priority	Economic	X				
Schizolobium amazonicum	n.a.	Amazon	Priority	Large native planted area	X				
Virola surinamensis	n.a.	Amazon	Priority	Potential native Planted Forest	X				
Vouacapoua americana	n.a.	Amazon	Priority	Economic	X				
Aniba rosaeodora	Threatened	Amazon	High Priority	Conservation	X	X			
Amburana cearensis	Vulnerable	Amazon	High Priority	Conservation					
Bertholletia excelsa	Vulnerable	Amazon	High Priority	Conservation	X	X			X
Dicypellium caryophyllaceum	Vulnerable	Amazon	High Priority	Conservation					
Eschweilera piresii	Vulnerable	Amazon	High Priority	Conservation					
Eschweilera subcordata	Vulnerable	Amazon	High Priority	Conservation					
Gustavia erythrocarpa	Vulnerable	Amazon	High Priority	Conservation					
Rhodostemonodaphne parvifolia	Vulnerable	Amazon	High Priority	Conservation					
Rhodostemonodaphne recurva	Vulnerable	Amazon	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Swietenia macrophylla	Vulnerable	Amazon	High Priority	Conservation	X				
Duguetia restingae	Endangered	Atlantic Forest	High Priority	Conservation					
Malmea obovata	Endangered	Atlantic Forest	High Priority	Conservation					
Plinia complanata	Endangered	Atlantic Forest	High Priority	Conservation					
Trattinnickia ferruginea	Endangered	Atlantic Forest	High Priority	Conservation					
Andira fraxinifolia	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Bowdichyia virgilioides	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Cariniana estrellensis	n.a.	Atlantic forest	Low Priority	Potential comercial uses	X				
Cariniana legalis	n.a.	Atlantic forest	Low Priority	Potential comercial uses	X				
Cedrela fissilis	n.a.	Atlantic forest	Priority	Economic	X				X
Centrolobium microchaete	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Centrolobium tomentosum	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Enterelobium contortisiliquum	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Hevea brasiliensis	n.a.	Atlantic forest	Priority	Large native planted area	X	X			X
Hymenaea courbaril	n.a.	Atlantic forest	Priority	Economic	X	X			X
Ilex paraguariensis	n.a.	Atlantic forest	Priority	Large native planted area		X			X
Manilkara salzmanii	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Miracrodruon urundeuva	n.a.	Atlantic forest	Priority	Economic	X				X
Ocotea catharinensis	n.a.	Atlantic forest	Priority	Economic	X	X			X
Ocotea odorifera	n.a.	Atlantic forest	Priority	Economic	X	X			
Peltophorum dubium	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Piptadenia gonoacantha	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Piptadenia paniculata	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Plathymenia reticulata/foliolosa	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Sclerolobium paniculatum	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Simarouba amara/versicolor	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Tabebuia Alba	n.a.	Atlantic forest	Priority	Economic	X				X
Zeyheria tuberculosa	n.a.	Atlantic forest	Low Priority	Potential comercial uses					
Araucaria angustifolia	Threatened	Atlantic forest	High Priority	Conservation	X	X			X
Buchenavia pabstii	Threatened	Atlantic forest	High Priority	Conservation					
Caesalpinia echinata	Threatened	Atlantic forest	High Priority	Conservation	X	X			X
Cariniana parvifolia	Threatened	Atlantic forest	High Priority	Conservation	X				

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Chionanthus subsessilis	Threatened	Atlantic forest	High Priority	Conservation					
Chrysophyllum imperiale	Threatened	Atlantic forest	High Priority	Conservation					
Conchocarpus cauliflorus	Threatened	Atlantic forest	High Priority	Conservation					
Dicksonia selloviana	Threatened	Atlantic forest	High Priority	Conservation					
Duguetia magnolioidea	Threatened	Atlantic forest	High Priority	Conservation					
Duguetia reticulata	Threatened	Atlantic forest	High Priority	Conservation					
Erythroxylum mattossilvae	Threatened	Atlantic forest	High Priority	Conservation					
Erythroxylum membranaceum	Threatened	Atlantic forest	High Priority	Conservation					
Eugenia myrciariifolia	Threatened	Atlantic forest	High Priority	Conservation					
Eugenia peruibensis	Threatened	Atlantic forest	High Priority	Conservation					
Euterpe edulis	Threatened	Atlantic forest	High Priority	Conservation					
Faramea coerulea	Threatened	Atlantic forest	High Priority	Conservation					
Hirtella insignis	Threatened	Atlantic forest	High Priority	Conservation					
Hornschuchia cauliflora	Threatened	Atlantic forest	High Priority	Conservation					
Hornschuchia obliqua	Threatened	Atlantic forest	High Priority	Conservation					
Jacaranda crassifolia	Threatened	Atlantic forest	High Priority	Conservation					
Macropeplus friburgensis	Threatened	Atlantic forest	High Priority	Conservation					
Manilkara dardanoi	Threatened	Atlantic forest	High Priority	Conservation					
Marlierea sucrei	Threatened	Atlantic forest	High Priority	Conservation					
Metrodorea maracasana	Threatened	Atlantic forest	High Priority	Conservation					
Persea punctata	Threatened	Atlantic forest	High Priority	Conservation					
Plinia ilhensis	Threatened	Atlantic forest	High Priority	Conservation					
Raulinoa echinata	Threatened	Atlantic forest	High Priority	Conservation					
Rhodostemonodaphne capixabensis	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea erythrocarpa	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea insignis	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea interrupta	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea macrophylla	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea nobilis	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea reflexa	Threatened	Atlantic forest	High Priority	Conservation					
Rudgea vellerea	Threatened	Atlantic forest	High Priority	Conservation					
Solanum restingae	Threatened	Atlantic forest	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Swartzia glazioviana	Threatened	Atlantic forest	High Priority	Conservation					
Swartzia pickelii	Threatened	Atlantic forest	High Priority	Conservation					
Syagrus macrocarpa	Threatened	Atlantic forest	High Priority	Conservation					
Symplocos organensis	Threatened	Atlantic forest	High Priority	Conservation					
Tabebuia botelhensis	Threatened	Atlantic forest	High Priority	Conservation					
Tabebuia catarinensis	Threatened	Atlantic forest	High Priority	Conservation					
Tabebuia cristata	Threatened	Atlantic forest	High Priority	Conservation					
Trattinnickia mensalis	Threatened	Atlantic forest	High Priority	Conservation					
Attalea funifera	Vulnerable	Atlantic forest	High Priority	Conservation					
Bactris pickelii	Vulnerable	Atlantic forest	High Priority	Conservation					
Berberis camposportoi	Vulnerable	Atlantic forest	High Priority	Conservation					
Brosimum glaucum	Vulnerable	Atlantic forest	High Priority	Conservation					
Buchenavia rabelloana	Vulnerable	Atlantic forest	High Priority	Conservation					
Bunchosia itacarensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Bunchosia pernambucana	Vulnerable	Atlantic forest	High Priority	Conservation					
Byrsonima alvimii	Vulnerable	Atlantic forest	High Priority	Conservation					
Byrsonima bahiana	Vulnerable	Atlantic forest	High Priority	Conservation					
Byrsonima cacaophila	Vulnerable	Atlantic forest	High Priority	Conservation					
Calyptranthes dryadica	Vulnerable	Atlantic forest	High Priority	Conservation					
Calyptranthes restingae	Vulnerable	Atlantic forest	High Priority	Conservation					
Campomanesia espiritosantensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Cedrela lilloi	Vulnerable	Atlantic forest	High Priority	Conservation	X				
Couratari asterotricha	Vulnerable	Atlantic forest	High Priority	Conservation					
Dalbergia elegans	Vulnerable	Atlantic forest	High Priority	Conservation					
Dalbergia nigra	Vulnerable	Atlantic forest	High Priority	Conservation					
Duguetia salicifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Duguetia sooretamae	Vulnerable	Atlantic forest	High Priority	Conservation					
Erythroxylum catharinense	Vulnerable	Atlantic forest	High Priority	Conservation					
Erythroxylum compressum	Vulnerable	Atlantic forest	High Priority	Conservation					
Erythroxylum distortum	Vulnerable	Atlantic forest	High Priority	Conservation					
Erythroxylum substriatum	Vulnerable	Atlantic forest	High Priority	Conservation					
Eschweilera alvimii	Vulnerable	Atlantic forest	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Eschweilera tetrapetala	Vulnerable	Atlantic forest	High Priority	Conservation					
Eugenia itacarensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Faramea monantha	Vulnerable	Atlantic forest	High Priority	Conservation					
Gaylussacia caparoensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Guatteria reflexa	Vulnerable	Atlantic forest	High Priority	Conservation					
Huberia carvalhoi	Vulnerable	Atlantic forest	High Priority	Conservation					
Huberia espiritosantensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Jacaranda grandifoliolata	Vulnerable	Atlantic forest	High Priority	Conservation					
Jacaranda microcalyx	Vulnerable	Atlantic forest	High Priority	Conservation					
Jacaranda subalpina	Vulnerable	Atlantic forest	High Priority	Conservation					
Lonchocarpus torrensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Machaerium obovatum	Vulnerable	Atlantic forest	High Priority	Conservation					
Macrotorus utriculatus	Vulnerable	Atlantic forest	High Priority	Conservation					
Marlierea skortzoviana	Vulnerable	Atlantic forest	High Priority	Conservation					
Melanopsidium nigrum	Vulnerable	Atlantic forest	High Priority	Conservation					
Melanoxylon brauna	Vulnerable	Atlantic forest	High Priority	Conservation					
Miconia longicuspis	Vulnerable	Atlantic forest	High Priority	Conservation					
Mollinedia boracensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Mollinedia gilgiana	Vulnerable	Atlantic forest	High Priority	Conservation					
Mollinedia glabra	Vulnerable	Atlantic forest	High Priority	Conservation					
Mollinedia lamprophylla	Vulnerable	Atlantic forest	High Priority	Conservation					
Mollinedia salicifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrceugenia brevipedicellata	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrceugenia foveolata	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrceugenia smithii	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrcia follii	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrcia gilsoniana	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrcia isaiana	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrcia limae	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrcia riodocensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Myrsine villosissima	Vulnerable	Atlantic forest	High Priority	Conservation					
Nectandra micranthera	Vulnerable	Atlantic forest	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Neomitranthes nitida	Vulnerable	Atlantic forest	High Priority	Conservation					
Neomitranthes obtusa	Vulnerable	Atlantic forest	High Priority	Conservation					
Ocotea basicordatifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Ocotea catharinensis	Vulnerable	Atlantic forest	High Priority	Conservation	X				X
Ocotea cryptocarpa	Vulnerable	Atlantic forest	High Priority	Conservation					
Ocotea odorifera	Vulnerable	Atlantic forest	High Priority	Conservation	X				X
Ocotea porosa	Vulnerable	Atlantic forest	High Priority	Conservation					
Ocotea serrana	Vulnerable	Atlantic forest	High Priority	Conservation					
Pavonia alnifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Phyllostemonodaphne geminiflora	Vulnerable	Atlantic forest	High Priority	Conservation					
Picramnia coccinea	Vulnerable	Atlantic forest	High Priority	Conservation					
Pilocarpus jaborandi	Vulnerable	Atlantic forest	High Priority	Conservation					
Plinia callosa	Vulnerable	Atlantic forest	High Priority	Conservation					
Plinia hatschbachii	Vulnerable	Atlantic forest	High Priority	Conservation					
Plinia muricata	Vulnerable	Atlantic forest	High Priority	Conservation					
Plinia renatiana	Vulnerable	Atlantic forest	High Priority	Conservation					
Protium bahianum	Vulnerable	Atlantic forest	High Priority	Conservation					
Rinorea ramiziana	Vulnerable	Atlantic forest	High Priority	Conservation					
Rollinia ferruginea	Vulnerable	Atlantic forest	High Priority	Conservation					
Rollinia maritima	Vulnerable	Atlantic forest	High Priority	Conservation					
Rudgea crassifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Rudgea umbrosa	Vulnerable	Atlantic forest	High Priority	Conservation					
Schefflera aurata	Vulnerable	Atlantic forest	High Priority	Conservation					
Schefflera succinea	Vulnerable	Atlantic forest	High Priority	Conservation					
Siphoneugena kuhlmannii	Vulnerable	Atlantic forest	High Priority	Conservation					
Solanum santosii	Vulnerable	Atlantic forest	High Priority	Conservation					
Syagrus picrophylla	Vulnerable	Atlantic forest	High Priority	Conservation					
Tabebuia arianeae	Vulnerable	Atlantic forest	High Priority	Conservation					
Tabebuia cassinoides	Vulnerable	Atlantic forest	High Priority	Conservation					
Tabebuia obtusifolia	Vulnerable	Atlantic forest	High Priority	Conservation					
Tabebuia riodocensis	Vulnerable	Atlantic forest	High Priority	Conservation					
Terminalia kuhlmannii	Vulnerable	Atlantic forest	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Tetragastris occhionii	Vulnerable	Atlantic forest	High Priority	Conservation					
Trigynaea axilliflora	Vulnerable	Atlantic forest	High Priority	Conservation					
Unonopsis riedeliana	Vulnerable	Atlantic forest	High Priority	Conservation					
Urbanodendron bahiense	Vulnerable	Atlantic forest	High Priority	Conservation					
Jacaranda rugosa	Endangered	Caatinga	High Priority	Conservation					
Pilosocereus azulensis	Endangered	Caatinga	High Priority	Conservation					
Sparattosperma catingae	Endangered	Caatinga	High Priority	Conservation					
Tabebuia selachidentata	Endangered	Caatinga	High Priority	Conservation					
Amburana cearensis	n.a.	Caatinga	Priority	Economic	X				
Anadenanthera colubrina	n.a.	Caatinga	High Priority	Economic	X	X	X		
Anadenanthera colubrina cebil	n.a.	Caatinga	High Priority	Economic					
Auxemma oncocalyx	n.a.	Caatinga	High Priority	Economic					
Auxemma oncocalyx/glazoviana	n.a.	Caatinga	Priority	Economic	X				
Byrsonima crassifolia	n.a.	Caatinga	High Priority	Economic					
Caesalpinia ferrea	n.a.	Caatinga	Priority	Economic	X		X		
Caesalpinia ferrea ferrea	n.a.	Caatinga	High Priority	Economic					
Caesalpinia pyramidalis	n.a.	Caatinga	Priority	Economic	X				
Cedrela odorata	n.a.	Caatinga	Low Priority	Potential to Planted Forest	X				
Commiphora leptophloeos	n.a.	Caatinga	High Priority	Economic	X	X			
Copernicia prunifera	n.a.	Caatinga	Priority	Economic					
Croton sonderianus	n.a.	Caatinga	High Priority	Economic					
Croton sonderianus	n.a.	Caatinga	Priority	Economic	X				
Dalbergia nigra	n.a.	Caatinga	Low Priority	Potential to Planted Forest					
Erythrina velutina	n.a.	Caatinga	Priority	Economic	X				
Genipa americana	n.a.	Caatinga	Low Priority	Potential to Planted Forest					
Hymenaea courbaril	n.a.	Caatinga	Low Priority	Potential to Planted Forest	X				
Licania rigida	n.a.	Caatinga	Priority	Economic					
Manihot caerulescens	n.a.	Caatinga	Priority	Economic					
Mimosa caesalpiniifolia	n.a.	Caatinga	High Priority	Economic	X		X	X	
Mimosa ophthalmocentra	n.a.	Caatinga	Priority	Economic	X		X		
Mimosa tenuiflora	n.a.	Caatinga	Priority	Economic	X	X			
Myracrodruon urundeuva	n.a.	Caatinga	High Priority	Economic					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Myracrodruon urundeuva	n.a.	Caatinga	High Priority	Economic	X	X	X		
Orbignya phalerata	n.a.	Caatinga	High Priority	Economic					
Piptadenia moniliformis	n.a.	Caatinga	Priority	Economic	X		X		
Schinopsis brasiliensis	n.a.	Caatinga	High Priority	Economic	X				
Spondias tuberosa	n.a.	Caatinga	High Priority	Economic					
Syagrus coronata	n.a.	Caatinga	Priority	Economic					
Tabebuia aurea	n.a.	Caatinga	High Priority	Economic					
Tabebuia aurea	n.a.	Caatinga	Priority	Economic	X				
Tabebuia heptaphylla	n.a.	Caatinga	Low Priority	Potential to Planted Forest					
Tabebuia impetiginosa	n.a.	Caatinga	High Priority	Economic	X				
Tabebuia impetiginosa	n.a.	Caatinga	Low Priority	Potential to Planted Forest					
Byrsonima blanchetiana	Threatened	Caatinga	High Priority	Conservation					
Espostoopsis dybowskii	Threatened	Caatinga	High Priority	Conservation					
Chloroleucon extortum	Vulnerable	Caatinga	High Priority	Conservation					
Erythroxylum distortum	Vulnerable	Caatinga	High Priority	Conservation					
Erythroxylum maracasense	Vulnerable	Caatinga	High Priority	Conservation					
Facheiroa cephaliomelana	Vulnerable	Caatinga	High Priority	Conservation					
Godmania dardanoi	Vulnerable	Caatinga	High Priority	Conservation					
Leucochloron limae	Vulnerable	Caatinga	High Priority	Conservation					
Paralychnophora bicolor	Vulnerable	Caatinga	High Priority	Conservation					
Pereskia aureiflora	Vulnerable	Caatinga	High Priority	Conservation					
Pilosocereus fulvilanatus	Vulnerable	Caatinga	High Priority	Conservation					
Simira gardneriana	Vulnerable	Caatinga	High Priority	Conservation					
Tabebuia spongiosa	Vulnerable	Caatinga	High Priority	Conservation					
Dimorphandra wilsonii	Endangered	Cerrado	High Priority	Conservation					
Pilocarpus microphyllus	Threatened	Cerrado	High Priority	Conservation					
Vellozia gigantea	Threatened	Cerrado	High Priority	Conservation					
Byrsonima macrophylla	Vulnerable	Cerrado	High Priority	Conservation					
Christiana macrodon	Vulnerable	Cerrado	High Priority	Conservation					
Eremanthus argenteus	Vulnerable	Cerrado	High Priority	Conservation					
Eremanthus seidelii	Vulnerable	Cerrado	High Priority	Conservation					
Euplassa semicostata	Vulnerable	Cerrado	High Priority	Conservation					

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Huberia piranii	Vulnerable	Cerrado	High Priority	Conservation					
Hyptidendron claussenii	Vulnerable	Cerrado	High Priority	Conservation					
Lychnophora ericoides	Vulnerable	Cerrado	High Priority	Conservation					
Paralychnophora bicolor	Vulnerable	Cerrado	High Priority	Conservation					
Pilocarpus trachylophus	Vulnerable	Cerrado	High Priority	Conservation					
Pilosocereus fulvilanatus	Vulnerable	Cerrado	High Priority	Conservation					
Schinopsis brasiliensis	Vulnerable	Cerrado	High Priority	Conservation					
Syagrus ruschiana	Vulnerable	Cerrado	High Priority	Conservation					
Wunderlichia crulsiana	Vulnerable	Cerrado	High Priority	Conservation					
Gleditsia amorphoides	Threatened	Pampa	High Priority	Conservation					
Butia eriospatha	Vulnerable	Pampa	High Priority	Conservation					
Butia yatay	Vulnerable	Pampa	High Priority	Conservation					
Euplassa nebularis	Vulnerable	Pampa	High Priority	Conservation					
Myracrodruon balansae	Vulnerable	Pampa	High Priority	Conservation					
Prosopis affinis	Vulnerable	Pampa	High Priority	Conservation					
Prosopis nigra	Vulnerable	Pampa	High Priority	Conservation					
Trithrinax brasiliensis	Vulnerable	Pampa	High Priority	Conservation					
Acacia mearnsi	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus badjensis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus benthamii	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus benthamii x Eucalyptus dunnii	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus calmadulensis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus cleoziana	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus crebra	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus dunnii	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus globulus	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus grandis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus maidenii	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus pellita	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus pilularis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus saligna	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus smithii	n.a.	Planted Forest	Priority	Economic	X				

Species	Conservation Status	Biome	Research Status	Reason	Wood	Pharm & food	Feed Stock	Bees	Cult.
Eucalyptus terenticornis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus urocam	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus urograndis	n.a.	Planted Forest	Priority	Economic	X				
Eucalyptus urophyla	n.a.	Planted Forest	Priority	Economic	X	X		X	
Pinus spp	n.a.	Planted Forest	Priority	Economic	X				
Populus tremuloides	n.a.	Planted Forest	Priority	Economic	X				
Tectona Grandis	n.a.	Planted Forest	Priority	Economic	X				