

## Background Paper – General Brazilian Context<sup>1</sup>

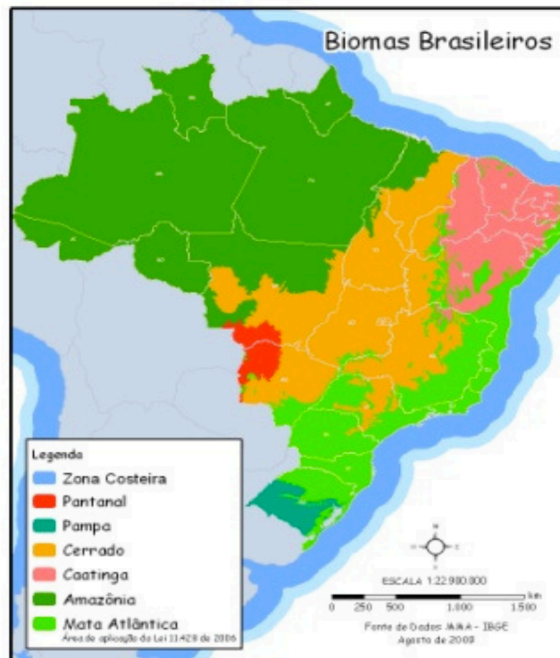
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### 1 – General overview of Brazil, its natural resources and the different sectors.

Brazil is recognized as the country with the world's greatest biological diversity. Estimates by the Ministry of the Environment indicate that Brazil has approximately 20% of the planet's biodiversity. Its territory of approximately 8.5 million km<sup>2</sup> is estimated to contain at least 103,870 animal species and between 43,000 and 49,000 plant species – not counting micro-organisms, algae and several biological groups that have never been studied.

This wealth is distributed among six terrestrial biomes (Figure 1) – the Amazon, Atlantic Forest, *Cerrado*, *Pantanal*, *Caatinga* and *Pampa* – and along a coastal and maritime zone extending 8,500 km from north to south. The magnitude of the biomes and their climatic variations has allowed the development of very different types of ecosystems, such as forests, savannas, prairies, coastal shrublands (*restingas*) and plant refuges typical of the higher altitudes. In the coastal and maritime zone there are coral reefs, dunes, mangroves (*manguezal*), lagoons and estuaries.

Figure 1 – Map of the Brazilian Biomes<sup>2</sup>.



With 194 million people, Brazil also displays large cultural diversity, represented by numerous Amerindian populations, *quilombolas* (descendents of former slaves), fishing communities, *caiçaras* (coastal dwellers), riverside communities, family farmers, and other diverse communities. What is more, Brazil is currently

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<sup>2</sup> Atlantic Forest limite as the Area Application Map of the Law 12.428 (IBGE)

counted among the five countries with the largest farming and livestock production in the world, and also the country mostly able to increase its production.

Given such a scenario, Brazil is an excellent stage for discussions about the relation between what are known as the 4Fs (forests, food, fibers and fuels), particularly if one intends to point out the challenges, relating to this theme, to the sustainable future of the planet. Bearing in mind that the first step to preserving the natural resources and for sustainable farming and silvicultural activities is appropriate land use, which must be planned according to its suitability, sustainability and economic productivity and in such a way as to optimize the potential from the use of natural resources, while at the same time ensuring their availability for the future generations.

### **A summary of the Brazilian Biomes**

#### **The Amazon**

The Amazon is one of the world's largest natural forested regions, containing one third of the planet's tropical forests. Covering almost 8 million km<sup>2</sup>, it extends into nine South American countries. The largest portion of the Amazon forest is found in Brazil, spread over nine states. In addition to forest, the Amazon region also contains *cerrado* and grassland.

It is in the Amazon that the planet's greatest biodiversity is found. Besides its natural wealth, the Amazon displays incredible cultural diversity. Its population is estimated at approximately 20 million. This includes 170 Amerindian peoples, numbering 180,000 individuals, 357 communities that were formerly *quilombos*, and hundreds of communities of rubber tappers, nut gatherers and river dwellers.

In climatic terms, the Amazon is also highly important to the planet's environmental stability, since the forest absorbs huge amounts of carbon emissions, thereby helping to mitigate global warming. In terms of hydrology, the rivers of the Amazon region contain 12% of all the world's surface freshwater.

Although it survived to the 21st century with most of its territory still preserved, the accelerated destruction of the forest is a serious concern. Over the last few decades, the Amazon has been occupied in a disorderly manner, with no respect for the traditional populations. As a result, 20% of the region has already suffered degradation. Most of the deforestation has been caused by the advance of farming frontiers, the predatory exploitation of wood, mining and large engineering projects such as highways and hydropower plants. There are also major conflicts over land possession and the illegal occupation and sale of Amerindian and other traditional communities' lands.

#### **The Atlantic Forest**

The Atlantic Forest totally or partially covers 17 Brazilian states and embraces 3,411 municipalities. In the northeast it includes pockets of forest and swampland; in the southeast it reaches as far inland as the states of Goiás and Mato Grosso do Sul; and in the south it extends into the interior, reaching into parts of Argentina and Paraguay.

The Atlantic Forest used to cover 15% of Brazil, an area of approximately 1,300,000 km<sup>2</sup>. Recent mapping by the Ministry of the Environment (2006) indicates remnants amounting to 27%, including the different stages of regeneration of all kinds of Atlantic Forest vegetation, namely: forests, natural grasslands, *restingas* and mangroves. However, the percentage of well preserved remnants is around just 8%

(fragments larger than 100 ha), a proportion ascertained by surveys conducted by the SOS Atlantic Forest Foundation and by the National Institute for Space Research (INPE).

Although much reduced and very fragmented, the Atlantic Forest still shelters more than 20,000 species of plants, 8,000 of which are endemic, in other words, species that cannot be found anywhere else on the planet. It is the richest forest in the world in terms of tree diversity per area unit. In southern Bahia, 454 different species were identified in a single hectare.

Currently, more than 110 million Brazilians benefit from the waters that originate in the Atlantic Forest and that form the various rivers that supply Brazilian cities and metropolises.

The Atlantic Forest also contains great cultural diversity, comprising Amerindian peoples, such as the *Guarani*, and traditional non-Amerindian cultures, such as the *caiçara*, the *quilombola*, backwoods peoples (*roceiro*) and riverside communities). The unrestrained development since the Europeans arrived in 1500 caused many of these peoples to be expelled from their original territories.

Deforestation, the disorderly urban growth, the construction of infrastructure projects and the advance of crop and livestock farming, as well as the planting of exotic tree species without adequate planning, continue to threaten the integrity of the Atlantic Forest.

### **The *Cerrado***

The *Cerrado* is the second largest Brazilian biome and also the second largest in South America. It covers a large part of central Brazil, representing approximately 22% of its territory.

Its fauna and flora are extremely rich. The region contains more than 10,000 species of plants. Endangered species such as the jaguar, the giant armadillo, the maned wolf, the crowned eagle and the bush dog can still be found in the *Cerrado*, thus confirming its great importance as a natural habitat.

The plateaus of the *Cerrado* contain the sources of South America's three largest river basins: the Amazon/Tocatins, the São Francisco and the Prata, which shows that, in addition to biodiversity, the *Cerrado* is extremely important to the conservation of the country's water resources.

Notwithstanding its size and importance, the *Cerrado* is one of the most endangered environments in the world. In fact, after the Atlantic Forest, it is the Brazilian biome that has suffered the most alteration due to human occupation. Studies conducted by researchers from International Conservation (CI-Brazil) indicate that the *Cerrado* is in danger of disappearing by 2030. Of the original 204 million hectares, 57% have already been completely destroyed and half the remaining areas have been considerably altered.

The expansion of crop and livestock farming is putting increasing pressure on the remaining areas, since it is the country's main agricultural frontier. The *Cerrado* deforestation is alarming, reaching 1.5%, or three million hectares, a year. The demand for biofuels is another growing pressure. Moreover, the *Cerrado* is also being destroyed for charcoal production.

### **The *Caatinga***

The *Caatinga* is an exclusively Brazilian biome. It occupies approximately 11% of the country's territory and it predominates in the northeast region. It is also the least known of our biomes. Nevertheless, it is an extremely important region for biodiversity, since many of the species of flora and fauna do not occur anywhere else. It is also in the *Caatinga* that Brazil's most important archeological sites can be found.

Almost 28 million people live in the *Caatinga*. Because they live in a semi-arid region, many of them are needy and depend on the natural resources for their survival. This is one of the reasons why 80% of its ecosystems have already been altered by human occupation, deforestation and burning. Desertification is currently one of the greatest problems the region is facing. Another severe problem is deforestation for the production of charcoal, for use in steel mills.

A few figures will give an idea of just how severe the problem is. In Brazil, 62% of the areas vulnerable to desertification are located in zones originally occupied by the *Caatinga*. This desertification process is causing the country enormous economic losses.

### **The Pampa**

With landscapes that contain ranges of hills and broad plains, the Pampa is an area of indigenous cold climate grasslands. A few forested areas can be found interlaced within the grassy landscape, particularly along the rivers, as well as clumps of bushes, groves of butia palms, marshes and rocky outcrops. In Brazil, it is limited to the state of Rio Grande do Sul, where it covers approximately 180,000 km<sup>2</sup>, representing about 2% of Brazilian territory. It also extends into Uruguay and Argentina.

It should be emphasized that under the Pampa lies a large portion of the Guarani Aquifer, the largest cross border source of fresh groundwater in the world and an important strategic reserve for supplying the population and for economic activities.

The Pampa, despite being the least complex of the Brazilian biomes, has very rich biodiversity, which in many cases has not even been described by science.

Estimates indicate more than 3,000 plant species, among which grasses stand out. The Pampa also plays a very important role in the southern people's culture, notably in the lifestyle and typical dress of the *gaúcho*, the South American cowboy. The main threats to the Pampa nowadays are from burning and its conversion into arable land and reforestation with exotic tree species.

### **The Pantanal**

The Pantanal is one of the largest floodplains in the world, covering an area of approximately 160,000 km<sup>2</sup>, 90% of which is in Brazil, in the states of Mato Grosso and Mato Grosso do Sul. The rest is in Bolivia and Paraguay. Its location means that it touches on other biomes, such as the Amazon, the *Cerrado* and the Bolivian *Chaco*, and gives the Pantanal an exuberant diversity of animal and plant species.

The Pantanal is a region in Brazil that is still reasonably well preserved. Approximately 83% of the plain is in a good state of conservation and contains important populations of endangered species. The annual flooding and low fertility of the soil are the main reasons why the Pantanal still retains this level of conservation, impeding to a certain extent any human occupation and the advance of the agricultural frontier.

Nevertheless, the Pantanal is still under constant threat, mainly due to deforestation in the *Cerrado*, since the sources of its main rivers are located on the plateaus and tablelands of the *Cerrado*. In addition to cattle raising, that turns forests into pastureland, other threats include mining, fishing and uncontrolled tourism.

### **The Coastal Zone**

The Brazilian coastline is 7,367 km long, or 9,200 km, if one includes all the estuaries and deltas between the mouth of the rivers Oiapoque, in Amapá, and Chuí, in Rio Grande do Sul. This huge extension gives the Brazilian Coastal Zone considerable biodiversity, since it includes a large variety of ecosystems and climate variations, from equatorial to tropical and subtropical. Notable among these ecosystems are the mangroves, which are the nurseries for several marine and freshwater species, and the coral reefs.

The Coastal Zone runs through 17 states and contains about 400 municipalities, with a total population of approximately 42 million inhabitants. Many communities living in this region gain their sustenance from the use of natural resources, as in the case of the *caiçaras* and traditional fishermen.

The Coastal Zone is mainly threatened by real estate speculation, overfishing (industrial and traditional), pollution of the beaches and estuaries, and disorderly tourism. An activity that has already affected 50% of the mangroves is carciniculture, or prawn farming, because the mangroves are cleared for the installation of ponds and chemical products are released into the water.

The Brazilian Coastal Zone is also likely to suffer great losses from the rising sea level caused by global warming. A study conducted by the Ministry of the Environment indicates that, due to the effect of climate change, constructions by the sea may disappear, ports may be destroyed, people may have to be relocated and hurricanes may start hitting the coast.

### **Overview of the different sectors of Agribusiness and Family Farming**

According to the report “*O Código Florestal e a Ciência*” [The Forest Code and Science], published in 2011 by the Brazilian Society for the Advancement of Science (SBPC) and the Brazilian Academy of Sciences (ABC), Brazil has a vast territorial expanse for crop and livestock production: there are approximately 5.5 million km<sup>2</sup> with the potential for use in growing many different types of crops and adopting different levels of farming technology. However, 76% of these lands have some kind of fragility due to the limitations of their soils –a situation that requires the careful planning of farming occupation, with the adoption of conservationist management practices that take into account the greenhouse emissions arising from such activities.

The latest Farming Census (2006) found that the Brazilian farming area amounted to 329.9 million hectares occupied by rural properties, corresponding to 38.7% of the country’s territory. Of the lands with farming potential (5.5 million km<sup>2</sup>), 42.6% (231 million ha) were devoted to the principal farming activities. Analysis of the country’s production structure revealed that the largest land area was given over to livestock farming, representing 18.6% of Brazilian territory (158.8 million ha), or 48.1% of the farming space, which is occupied by natural and planted pastureland, 2.7 times the amount of land devoted to permanent or temporary cultivation (59.8 million ha).

The data for livestock, soybeans, sugar cane and planted forest presented below were taken from the document entitled *“Caminhos para o agronegócio sustentável: Análise Integrada da Pecuária, Soja, Cana-de-açúcar e Florestas Plantadas”* [Paths to sustainable agribusiness: Integrated Analysis of...the abovementioned crops] – FOCUS/Visão Brasil, coordinated by the Funbio and the Arapyaú Institute (April, 2010).

The livestock, soybean, sugar cane and planted forest sectors occupy about 80% of the total area occupied by farming activities in the country. Altogether they also account for roughly 27% of Brazilian GDP. And the size of these sectors is not just a matter of the area they occupy. They have shown significant production growth rates in recent years and forecasts point to a continuation of this expansion (subject to the impact of climate change). Although part of this growth may come from increased productivity, the general trend is towards expansion of the areas occupied by these activities.

The absence of comparable data on the area required for expansion of each individual sector makes it difficult to forecast the total area required for the growth of these activities. The Ministry of Agriculture and Food Supplies (MAPA) predicts that an additional area of 15.5 million hectares will be needed in the next ten years for growing maize, soybeans, cotton, oranges, beans, wheat, rice, cassava, sugar cane and coffee. The survey does not, however, take into account the additional area that will be required for cattle raising or by the forestry sector, which are both calling for a significant expansion of their areas.

An estimate of the increase in the forestry sector's planted area (that considers the different segments of this sector) released by the Sectorial Chamber for Silviculture (2009) predicted an increase of almost 1.5 million hectares for the period 2010-2014. MAPA also points to the increase in domestic consumption as an important stimulus to greater farming production. Thus, with the anticipated growth in all sectors, Brazil is expected to take a leading position in the world market for various agricultural products.

In the case of soybeans and livestock, growth in domestic consumption over the next 11 years is estimated at 45% and 50%, respectively.

Brazilian meat exports are expected to double their market share, jumping from 31% in 2008 to 60.6% of the world trade in 2018.

Except for ethanol, whose production growth is likely to exceed its export growth, Focus' analyses predict that exports by all the other sectors will grow faster than production and domestic consumption, following the trend in the recent years. This means that both domestic demand and exports will exert pressure for increased production and, as a result, on the demand for new areas, so this expansion can occur

### **Geographical Areas of Production Expansion**

Understanding of the main regions that have seen recent expansion and of those where growth of the sectors analyzed is predicted enables one to assess the effects of the simultaneous growth of those areas and determine possible overlapping and the regions that will be mostly vulnerable to the impacts likely to be caused by such growth.

### **Cattle Raising**

The Brazilian cattle population grew from 147 million head to around 200 million between 1990 and 2006. Most of this growth (80%) occurred in the legally defined Amazon region (Amazônia Legal), where the herd soared from 26 million (18% of the domestic total) to 73 million head (36% of the domestic total), making this region one of the principal locations of livestock expansion in Brazil.

The state of Mato Grosso has the largest number of cattle in the country. Its herd increased from 9 million to 27 million head between 1990 and 2005, an average growth rate of approximately 7.5% per year during the period. However, analyses show that Pará will soon have the largest cattle herd in Brazil (Arcadis-Tetraplan-2006). These two states together accounted for 60% of the region's total herd in 2006.

### **Soybeans**

Soybean cultivation occupies 21 million hectares and the fastest growing regions in the recent years have been the Mid-West (Mato Grosso, Mato Grosso do Sul and Goiás), the Northeast (Bahia, Maranhão and Piauí) and the North (Tocantins). This expansion has been occurring in *Cerrado* areas that were traditionally used for extensive livestock farming and, at a lesser degree, in forested areas. Mato Grosso leads the country's soybean production, with 27% of the total area planted with soybeans in Brazil (Conab, 2009).

According to the Strategic Management Service of the Ministry of Agriculture, soybean cultivation is likely to reach 26.5 million hectares in 2018/2019, 5.0 million hectares more than during the 2007/2008 harvest. The IBGE (Brazilian Institute for Geography and Statistics) points out that the *Cerrado* areas of Amazônia Legal, in the states of Mato Grosso, Tocantins and southern Maranhão, offer the greatest potential for the large scale cultivation of grains, due to their climate and level topography, which is suitable for mechanization. The central axis of the BR-163 highway (Cuiabá-Santarém) and the areas directly or indirectly reached by the BR-364 (Cuiabá-Porto Velho) are highlighted as areas where soybean cultivation can attain considerable territorial significance and attract a high level of capitalization. The IBGE also predicts the growth of soybean hubs in the vicinity of Santarém, Marabá and Redenção, in Pará, on account of the state's incentive policies for commercial planting.

### **Sugar cane**

Sugar cane is the crop that is likely to grow at the fastest pace and to occupy the largest additional area, among the sectors analyzed. This increase is expected to be around 7 million hectares by 2018/2019 (4.55% per year, on average).

The cane is cultivated close to the mills, due to the logistics of harvesting, storage and processing. In the case of ethanol, production needs to be close to the major consumer centers or export outlets. These factors drove sugar cane production to the state of São Paulo, which accounts for approximately 60% of domestic production. However, in the 2008/2009 harvest, Goiás was the state that showed the biggest increase in planted area (54.8%), as a result of less land being available in São Paulo. Next came Mato Grosso do Sul, with 30.1%. This made the Mid-West the region with the biggest growth in planted area at the latest harvest: 21.4%, against a national average of 9.5% (Conab, 2009).

### **Planted Forests**

The eucalyptus is the predominant species in cultivated forests of Brazil. The largest areas of eucalyptus forests are located in Minas Gerais (30% of the country's total planted area in 2008), São Paulo (21.9%) and



Bahia (13.8%). In the period 2004/2008, the states with the greatest increase in cultivated area were Mato Grosso do Sul (168.4%), Maranhão (92.1%) and Rio Grande do Sul (81.6%) (Zarnott et. al., 2009).

The Sectorial Chamber for Silviculture (2009) estimates that 1.44 million hectares were acquired between 2010 and 2014 by steel and pulp and paper companies, to meet the requirements of their expansion projects.

### **Family Farming**

The 2006 farming census, released in 2009, found that in Brazil there are about 4 million family farming establishments, accounting for the production of 70% of the food consumed in the country (87% of the cassava production, 70% of the beans, 67% of the goat's milk, 59% of the pork, 58% of the cow's milk, 50% of the poultry meat, 46% of the maize, 38% of the coffee, 34% of the rice, 30% of the beef, 21% of the wheat and 16% of the soybeans). Family farming establishments also make an important contribution to the production from planted forests, through sponsorship programs provided by major silviculture sector companies.

According to the census, family farming occupies an area of 80.25 million hectares, equivalent to 24.3% of the total area occupied by Brazilian farming establishments.

Banco do Brasil estimates that family farmers account for approximately 10% of the country's Gross Domestic Product (GDP), playing a crucial role in the economy of a great many municipalities, which makes it indispensable to Brazilian development. According to the Department of Family Farming, approximately 13 million people work in family farming establishments, which is 75% of all the people working in Brazilian agriculture.

The biggest problems currently facing family farming are the difficulty of marketing its products, the loss of biodiversity and the rural exodus associated with the aging of the rural population, given that, as a rule, the young tend to migrate to urban centers in search of study and work opportunities.

Tobacco growing is another issue that needs to be faced in family farming. Although Brazil is a signatory to the treaty for the elimination of tobacco growing, the production of this crop has been growing, year after year. According to data provided by Afubra (Brazilian Tobacco Growers Association) in 1980, 94,840 families were cultivating 171,080 hectares planted with tobacco. In 2011, those numbers had jumped to 186,810 families cultivating 372,930 hectares. Tobacco growing is concentrated in the three states of the south of Brazil.

### **Brazil and world agriculture**

According to José Roberto Mendonça de Barros (OESP – 2012/02/05) the world's agriculture, in terms of supply and demand, is currently concentrated in just five countries: the USA, Russia, China, India and Brazil. In this group, consumption is high and production is highly significant. And we are not talking just about food, but also about biofuels and production inputs.

China and India are already exploiting just about all their cultivable areas. Both also have severe problems with water supplies and their aquifers are being used well in excess of their natural replacement capacity. Hence, over time, they will be far more important in terms of demand growth than for production.



China, for example, is becoming an importer of maize, and will certainly increase its foreign purchases of chicken and pork. Russia and the United States can still increase their production, but they already use around 60% of their total cultivable area. Brazil is the country with the greatest possibility of increasing its production in response to increased local and, particularly, international demand.

He concludes that Brazil does not use more than 20% of the area available for cultivation and would not have to burn a single hectare of forest to raise its production, in addition to having an ample supply of water and other inputs, plenty of entrepreneurs and workers and, especially, having a flow of innovations being created that maintains a constant potential for increased productivity, although the combination of natural resource-based production and technological limitations still represents a challenge.

### **Population dynamics**

Currently in Brazil 85% of the population lives in urban areas. According to the report "State of the Latin American and Caribbean Cities", published in August 2012 by the United Nations Human Settlement Programme (UN-HABITAT), that figure will reach 90% by the year 2020. The report reveals that Latin America and the Caribbean form the most urbanized region in the world, with 80% of the total population (588 million people) living in cities.

The report also points out that, since the 1960s, the number of cities in the region has grown sixfold and that those urban centers are the economic drivers in Latin America and the Caribbean. The cities concentrate services and industry and they are reckoned to account for two thirds of the region's Gross Domestic Product (GDP). Brazil has become the sixth largest economy in the world, with GDP close to R\$ 4 trillion, suggesting that, in the next 40 years, Brazil, along with Russia, India and China, will begin to match the United States, in terms of GDP.

Despite these impressive results, one out of every four people in the urban areas is living in poverty. In Brazil there are 37 million poor people living in urban areas.

In the UNEP report "Global Environment Outlook 5 (GEO5)", released in June 2012, it shows that the processes of urbanization, demographic change and rising family income in countries such as Brazil indicate that changes in the pattern of food consumption are likely to have a strong impact on regional nutrition. Between 1997 and 2008, there was an increase of almost 5% in the daily calorie intake per person in Latin America and the Caribbean.

The growing world demand for meat has been an important driver of deforestation in Brazil, where forested areas are being cleared to make space for soybean cultivation as animal food.

Faced with this situation, it is necessary to ask not only where the food to meet this demand is going to be produced, but also, who is going to produce it and how.

### **Biodiversity, Protected Areas and Environmental Legislation**

Brazil is one the countries with the greatest biological diversity in the world and home to at least 20% of the species on the planet, as well as a high degree of endemism. This might open up a range of

opportunities, many of them economic (development of new foods, pharmaceuticals, biotherapies, woods and fibers, biomimetic technologies and ecological tourism), but it also means greater responsibility.

Brazil is a signatory of international commitments such as the Convention on Biological Diversity (CBD) and the Convention on Humid Areas (RAMSAR). Under the CBD, Brazil is committed to preserving in Fully Protected Conservation Areas 17% of the Amazon region and 10% of the other biomes. Under the terms of the United Nations Framework Convention on Climate Change (UNFCCC) it is also committed to cutting by 38% its greenhouse gas emissions, by the year 2020. Such commitments require not just compliance with the environmental legislation, but also remediation of the country's rural and urban environmental liabilities.

According to the National Register of Conservation Areas, in June 2012, the area set aside for the Conservation Areas that had already been demarcated amounted to approximately 140 million hectares, or 17% of the territory, divided into areas under full protection (approximately 6% of the territory) and areas for sustainable use (about 11%), including APAs (Environmental Protection Areas), a category with few restrictions on economic activities. As for Amerindian lands, the areas that had already been ratified amounted to roughly 98.47 million ha in 2010 (estimates by Embrapa Satellite Monitoring) or 11.6% of Brazilian territory.

These data show that Brazil is still a long way from meeting the CBD target, especially because, outside the Amazon, protection of the other biomes is still well below the stipulated target. What is more, the history of human occupation in Brazil reveals a scenario in which the appropriation of natural resources has always driven development policy. Thinking in terms of "the highest possible gains in the shortest possible time" led to the rapid transformation of natural environments, particularly along the coast, in areas originally occupied by the Atlantic Forest, where the first colonization settlements were established.

Environmental protection regulations appeared, timidly, in the 20<sup>th</sup> century, first through Federal Decree n° 23,793, in 1934, introducing the Brazilian Forest Code, drawn up with the collaboration of various naturalists who were already concerned, back in those days, about preserving the basic functions of the natural ecosystems and aware of the importance of conserving all kinds of native vegetation, and not just that which provided firewood or raw material for industry.

One of the major innovations of the 1934 Forest Code was the creation of a distinctive regime for the country's forests and other forms of native vegetation, which were raised to the status of "assets of common interest to all the inhabitants", with the exercising of property rights conditional on their rational utilization. The trouble is that these regulations were not very effective in practice, which led, in 1962, to the setting up of a working group, under the aegis of the Ministry of Agriculture, to develop a proposed new Forest Code, which was finally sanctioned in 1965, through Federal Law n° 4,771, which in turn was replaced, on May 25, 2012, by Federal Law n° 12,651 and Provisional Measure n° 571 (approved on September 25, 2012 and awaiting presidential ratification, with or without vetoes).

The 1965 Forest Code created the APPs (Permanent Preservation Areas), which include areas around bodies of water, on hill tops, steep hillsides, and others. Besides the APPs, it introduced the RL (Legal Reserve), a percentage of rural properties that must retain its native vegetation. In the Atlantic Forest, that proportion is 20%; in the Amazon Rainforest, 80%, and in the Amazon *Cerrado* region, it is 35%. In the country's other regions, it corresponds to 20% of the area of each rural property.

Enactment of the Federal Constitution, in 1988, consolidated some of the principles already introduced by the 1965 Forest Code, such as determining, in article 225, that everyone has the fundamental right to an ecologically balanced environment, and that it is up to the State and society, in collaboration, to preserve it for the present and future generations, which is to be achieved, among other means, by the creation of specially protected territorial areas, such as Conservation Areas, Permanent Preservation Areas and Legal Reserves.

The overhauling of the Forest Code resulted in an amnesty for environmental liabilities from illegal deforestation in Permanent Preservation Areas or Legal Reserves prior to July 22, 2008.

## **2 – Impacts, Debates and Trends**

Although farming and silviculture have been showing productivity growth in recent years, the pace of production expansion to meet both the export demands and those of domestic consumption has brought about a need for new areas to be cultivated. And deforestation is, undoubtedly, a major impact associated with the agribusiness expansion in Brazil. In addition to the loss of Brazilian biodiversity, deforestation has played a role in aggravating greenhouse gas (GHG) emissions. Approximately 80% of Brazilian GHG emissions are the result of farming activities. Of those, 55% are connected with changes in land use. Cattle raising, along with soybean cultivation, are considered to be the activities most responsible for the deforestation caused by farming activities in Brazil.

### **Deforestation**

The UNEP GEO5 Report shows that the Latin American and Caribbean region has been recording the highest deforestation rates in the world. The region lost four million hectares a year between 2005 and 2010.

In Brazil, although deforestation rates have been falling, it is still going on, particularly in the *Cerrado*, in the Amazon and even in some Atlantic Forest areas, mainly forest margins in Minas Gerais and the northeast.

According to analyses performed by the ISA (Socio-Environmental Institute), the general trend in the Brazilian Amazon is towards a decline in deforestation. However, forest degradation from the predatory exploitation of wood has considerably increased. There has been a 141% increase in degradation when comparing the month of September in 2009/2010. This analysis confirmed a process that was already under way: the forest degradation accumulated in the period from August 2010 to September 2010 totaled 2,055 km<sup>2</sup>, a highly significant increase (213%) compared to the same period a year earlier (August to September/2009), when forest degradation amounted to 657 km<sup>2</sup>.

Further to the ISA review, the creation of Conservation Areas and the recognition of Amerindian lands have shown to be highly significant actions in the prevention of deforestation. A survey published in 2010 concluded that, in the period 2005/06, the demarcation of Conservation Areas and Amerindian lands led to a 37% decline in deforestation, thereby helping to preserve the vegetation cover, biodiversity and ecological processes.

The Action Plan for Protection and Deforestation Control in the Amazon is cited as a Case Study in the GEO5 Report, pointing out action that has contributed to a decline in the rate of deforestation.

The perceived decline in the deforestation rate between 2004 and 2011 (from over 25,000 km<sup>2</sup> per year to a little over 5,000 km<sup>2</sup>) coincided with the adoption of new policies on the part of the Brazilian government, under the Action Plan for Protection and Deforestation Control in the Brazilian Amazon. The plan included the following measures, among others:

- Creation of new protected areas in regions with high deforestation rates
- Establishment of a program to monitor deforestation through satellite imaging
- An assertive strategy for application of the law that allows the seizure, confiscation or even destruction of rural buildings
- Withholding of public rural credit for producers that infringe environmental regulations
- Imposition on the municipalities of an obligation to cut deforestation rates to below a given threshold and to register protected areas in a database, with a view to making illegal deforestation rapidly visible.

The GEO5 report identifies three broad areas in the policy sphere that would require renewed focus to reverse land degradation: land use planning on multiple scales, sustainable farming and the restoration of degraded areas.

The case of the Atlantic Forest is a clear example of how specific legislation can act to protect an ecosystem. The slowdown in the pace of deforestation and even the recording of forest regeneration coincide with the issuing of rules for the protection of the Atlantic Forest; more specifically, Federal Decree n° 750, in 1993, and Law n° 11,428, in 2006.

That is why the result of the discussion of the new Forest Code is so important, since it will determine the model of development to be adopted to guide the future of Brazil. An example of the Forest Code discussions that are taking place in Brazil is shown in Box 1.

#### BOX 1

Preservation of natural resources as a pillar of sustainable agriculture. Text by Antônio Nobre and Ricardo Rodrigues – August 28, 2012.

*“Using scientific means, we have analyzed the claim that the restoration of riparian forest, the indispensable ecological fringes protecting bodies of water, will reduce the area available for food production. Studies conducted by Inpe (National Institute for Space Research) and Esalq (Luiz de Queiroz College of Agriculture), covering millions of hectares in various parts of the country, found that the area that was to be allocated to protecting riparian forests on private properties, according to the provisions of the repealed 1965 Forest Code, occupied just 7% to 9% of the total area; a mere 0.2% was added to protect all the headwaters. The area occupied by wetlands was estimated at 17%, double the size of this protected area. And wetlands, with their exposed water table, are unsuitable for most farming practices.*

*The irrigated production of rice, one of the few crops capable of growing in wetlands, has repeatedly been used as an example of the consolidated farming area, in an attempt to justify the widespread reduction of protected areas alongside the rivers. However, at approximately 1.3 million hectares, this crop occupies less than 1% of the 144 million hectares of wetlands and represents less than 0.5% of the area occupied by farming in Brazil. Meanwhile, the creeks, brooks and bayous (igarapés) of the upper reaches – less than 10 meters wide – represent 86% of the length of the rivers and have no significant impact on rice production, which takes place on the broad floodplains of the larger rivers.*

*The consequences of a relaxing of the law will have a massive adverse impact on this vast capillary system of watercourses. A small incursion by irrigated rice growing, or even smaller occupation by floodplain crops in the Amazon, cannot justify the wholesale reduced of protection that is being attempted.*

*There is, therefore, no scientific argument or agricultural interest, even in relation to small and medium sized properties, for not fully restoring the riparian forests and thus enabling them to play their vital role in purifying the water and protecting the rivers. Furthermore, a significant economic appreciation of the environmental services provided by natural forests is starting to appear on the horizon. A study conducted for the state of Georgia, in the USA, estimated at US\$ 37 billion the annual value of the environmental services provided by preserved forests on rural properties in that state, which is the size of Brazilian state of Acre. The economic reasoning is simple: making contaminated water drinkable can cost one hundred times more than the pure water provided by natural forests.*

### **Water consumption**

Another important factor to be considered is the matter of water consumption. According to a survey in the FOCUS study, Brazil is a privileged country, in terms of available freshwater. This is one of the strong reasons for the presence of large scale export monocultures and for Brazil's leading in beef exports, for example. Irrigation for agriculture accounted, in 2006, for 69% of the country's entire water consumption. Livestock alone accounted for 12% of the total consumption, surpassing urban consumption, which accounted for just 10% of Brazilian water consumption.

However, the use and contamination of the water by agricultural activities has not been the subject of systematic study that reliably shows the impact of such activities on the availability of water for other uses, or on biodiversity.

Brazil is a case in point, when we consider that the production of primary goods such as soybeans, sugar cane or even semi-manufactured goods such as cuts of beef, utilizes water in the production process that represents an environmental service that is not even considered or accounted for in the production costs. It is estimated that fifteen thousand liters of water are used to produce one kilo of beef. The São Paulo slaughterhouses use 2,600 liters of water to process each bovine carcass (Schlickmann and Schauman, 2007).

These factors, added to the deforestation from the clearing of new areas for cultivation (ruining springs and silting up rivers), water contamination by pesticides and the climate changes resulting from farming activities, impair the supply and availability of water from the catchment areas and highlight the need for the integration of the various economic and environmental policies, in order to regulate the use of and preservation of this resource over the long term.

### **Overlapping areas and concentration of power**

A study conducted by Aguirre Talento and Helton Simões Gomes and published in the newspaper Folha de São Paulo, on August 28, 2012, showed that one out of every four Brazilian municipalities has a larger area of rural properties registered than its own total territorial area, which is a clear indication of the illegal appropriation of property, known in Brazil as *grilagem*.

Data from Incra (National Institute for Settlement and Agrarian Reform) show that the situation occurs in 1,355 out of the 5,566 Brazilian municipalities (24.3%). In Rondônia, Mato Grosso do Sul and Goiás, this land ownership problem is so acute that the total land registrations exceeds the total area of the states themselves.

The overlapping of lands (when one property is registered in the same location as another registered property) is one of the fuels of agrarian conflicts. Of the 144 deaths due to agrarian disputes that have been recorded in the last five years by the CPT (Pastoral Land Commission), 45 (31%) occurred in municipalities where the registrations exceed the area of available land. The most significant case is that of the municipality of Ladário (Mato Grosso do Sul). The municipality has an area of 34,000 hectares, but the land registrations amount to 397,000 hectares (11 times the available total).

Alceu Luís Castilho, in his book *Partido da Terra* (a play on words, as *partido* can mean political party or game), shows that, in Brazil, there is a rural political system that goes far beyond what used to be called the “rural block”. It is responsible for tales of an archaic Brazil, that are not for foreigners’ ears: cases of slave labor, of deforestation, of threats to rural workers and Amerindians. The National Congress epitomizes these contradictions. The book shows that there are millions of hectares of land under the direct control of Brazilian politicians. Not to mention tens of millions in the hands of others who surround these power brokers. They form the spearhead of the exclusionary thinking that is such a feature of Brazil: inequality and land for the few. This is the reality that has provoked the agrarian conflicts in Brazil and has a significant influence on the form the country’s agricultural production takes.

### **Pesticides**

According to data from the FOCUS study, the use of pesticides is another environmental problem that is growing at the same rate as the expansion of cultivated areas. The use of these toxic substances has been increasing very rapidly in recent years in Brazil. Between 2007 and 2008 consumption grew by 25% and made Brazil, in 2008, the world’s leading pesticide consumer. But this increase is not accompanied by increased production, which grew at a slower rate during the period. The growing resistance of pests is cited as the reason behind this increased use of such substances, which may result in higher production costs.

Among the sectors analyzed in the FOCUS study, soybean growers lead the consumption, with 45.3% of the total volume of pesticides consumed in the country (US\$ 3.23 billion), followed by maize. In third places comes sugar cane, with 9.5% of the total volume consumed (Andef, 2009). Figures presented by Caporal (2009) show that spending on pesticides in 2008 represented 26.6% of the operating cost of soybean cultivation.

Moreover, 80% of the pesticide consumption and 81% of fertilizer consumption is concentrated in just six Brazilian states: São Paulo, Mato Grosso, Paraná, Rio Grande do Sul, Minas Gerais and Goiás (IBGE, 2008).

### **Climate change**

Despite the uncertainty over the actual impact that climate change may have on farming activities, a recent study conducted by Embrapa and Unicamp (2008) shows that, should the global warming forecasts be confirmed, the area that is suitable for a variety of crops will diminish. The soybean is the crop that will be most affected by climate change in Brazil.

According to the worst case scenario, soybean losses could amount to R\$ 7.6 billion in 2070. In the case of livestock, the increased frequency of droughts will mean a reduction in the area suitable for grazing, affecting production costs and the competitiveness of Brazilian beef in the international market. On the other hand, sugar cane should find the conditions ideal for expansion, since the suitable area for its cultivation may grow twofold in the coming decades. The study also shows that climate change is bound to jeopardize food production, leading to losses of up to R\$ 7.4 billion in 2020 and possibly reaching R\$ 14 billion in 2070.

The UNEP GEO5 report uses the Amazon again, to illustrate the scale of the problem. The Amazon is a vital component in the Earth's ecological system, since it contains the greatest diversity of terrestrial organisms on the planet and exchanges large volumes of water and energy with the atmosphere, thereby affecting local and regional climates, as well as being an important carbon sink, holding 90 billion tons of carbon – roughly one fifth of all the carbon contained in the world's tropical forests.

The Amazon has recently suffered two major droughts, of the kind that normally only occur once a century, in 2005 and 2010, that provoked the rapid and widespread death of trees and a large increase in carbon emission in regions that usually act as net carbon sinks. The droughts increased the vulnerability to forest fires, as they make the forests more inflammable and facilitate the spreading of fires. According to simulations that have been carried out, the effects of climate change alone may reduce the Amazon biome by one third, by 2100.

The report recommends the sustainable environmental management of forests and essential ecosystems; reduction of the local people's vulnerability through efficient adaptation measures; energy efficiency and the development of new renewable energy sources; ecoagriculture; and changes to the transportation systems, to be implemented on a socially and environmentally responsible basis and supported by international financial and economic mechanisms.

Considering the importance of farming to the Brazilian economy and the possible impact of climate change on various crops, the country should promote deeper studies of the issue and, immediately start preparing responses to the challenges arising from global warming. Brazil thus faces a major challenge in the coming years: to reconcile the expansion of agribusiness, a sector that is important to the country's economy, and the conservation of regions and the natural resources that are essential to sustaining those activities over the long term. On top of this, the country will also have to balance the GHG emissions that this growth will provoke, while at the same time guaranteeing food production to supply the domestic market.

## **Desertification**

Although combating desertification is essential to implementing a sound agenda for sustainable development, the issue is still not seen as a priority. That is the assessment of the chairman of the Committee on Science and Technology of the UNCCD (United Nations Convention to Combat Desertification), Antônio Rocha Magalhães (Combating desertification is not a priority for governments – Carta Capital magazine – September 2, 2012).

With approximately 1.3 million square kilometers of its territory at risk of being turned into desert, thinking about the proper use of land is increasingly urgent in Brazil. Data from Insa (National Institute for Semi-Arid Areas), a body linked to the Ministry of Science, Technology and Innovation, show that the susceptible area



represents 15% of the national territory and involves 1,488 municipalities in nine states in the semi-arid areas of the Brazilian northeast, northern Minas Gerais and Espírito Santo.

The impact of droughts is getting more and more severe and human interference, promoting deforestation and erosion, for example, helps to make things worse. The main consequences of the degradation of these lands include losses for the agricultural sector, with the jeopardizing of food production, the extinction of indigenous species and malnutrition amongst the local population.

### **3 – Challenges and Strategies**

Perhaps the greatest challenge that lies ahead is the integrated planning of the landscape and of the different sectors' activities. To that end, more detailed studies must be jointly carried out. It is vital that the zoning of farming and silviculture activities in Brazil be conducted in an integrated manner, bringing together those responsible for the decision making and for defining and implementing public policies. New strategies, such as the diversification of use, reutilization and recycling of biomass, particularly for bioenergy production, appear to be an important path to be discussed and followed.

Biomass currently accounts for 11% of all primary energy consumed around the world and its natural productivity is bolstered by new technology. However, this varies a great deal from country to country, due to differences in productivity and to subsidies. The average productivity of the biomass cultivated in tropical and subtropical climates is more than five times the biomass produced in temperate climate zones, and yet in those countries, particularly in Europe and North America, the subsidies and support to research are far greater, which often ends up compensating for the lower productivity.

In Brazil, recent initiatives for diversification, integration and supplementation of the use of silvicultural and agricultural products have thrown up at new strategic possibilities. The wood and biomass from planted forests and also from agricultural crops are being used not only for the production of fibers, animal feed and foods, but also for the production of biofuels, in an initiative that could be called the development of bioenergy strategies. These initiatives can certainly be applied to other sectors, which may shed new light on the proper use of land and of natural resources. The proper management and use of biomass and bioenergy also helps to define the role of the citizens and the communities as agents responsible for the resources left behind for future generations.

Another beneficial integration among the sectors relates to restoration of depredated areas, by planting native or exotic species. Tree planting has always been good business, both for the environment and for the economy. In Brazil's case, the forestry sector claims that it lacks forest raw materials and also the space to plant trees. Balanced against that, a significant portion of the farming sector has an environmental liability and areas that are either underutilized or of low productivity that could be used for planting trees. Partnership and mutual collaboration could resolve both the forestry sector's lack of raw materials and the farming sector's environmental liability.

Other paths may also be recommended, such as stepping up agricultural production and the use of new technology. According to the SBPC and the ABC, in recent years, there has been a trend in Brazilian farming towards systematic production growth, particularly due to constant productivity gains. As a result, from 1975 to 2010, the area devoted to grains increased by 45.6%, but production grew by 268%, almost six times faster than the planted area.

Although recent productivity gains have also been recorded in stock farming, the density of grazing areas for extensive stock farming is still low, at about 1.1 head/ha, according to the 2006 Farming Census. A small technological investment, especially in areas with a density of less than half a head per hectare, could augment the capacity, while freeing up lands for other production activities and avoiding further deforestation.

The existence of strict legislation and its effective application are emphasized in the GEO 5 report as being necessary to protect natural resources in Latin America and the Caribbean. To that end, monitoring tools such as the CAR (Rural Environmental Register), recently established by Law nº 12,651/2012, are crucial. The CAR is a nationwide computerized public record that is mandatory for all rural properties and aims to integrate environmental information on rural properties and tenures. It is also an important tool to assist in integrated landscape planning, for both the public sector and private enterprise.

Stemming the rural exodus and seeking ways to reverse the migratory shift, encouraging people not only to remain in the countryside, but a return to the rural areas, seems to be a strategy that, combined with the stimulus to expanding family farming, could contribute a great deal to solving the problem of a future food shortage. Family farming also provides fertile ground for developing what is known as agrobiodiversity, which is closely connected to the matter of food security, since it addresses the relations between human societies, cultivated plants and natural environments, while furthering social inclusion and sustainable local development. It is also worth pointing out that unconventional ideas, such as urban agriculture, could help solve food supply problems, given that they promote local production. A further possibility is the integration of silviculture with livestock farming, as experience shows that shaded pastures can be more productive than unshaded ones.

Once again, one must emphasize the importance of the environmental services to the development of sustainable agriculture. Support and incentives for projects involving payments for environmental services could be the driver of integration between environmental conservation and economic activities, since the maintaining and restoration of natural areas covers a broad range of services that are essential to sustaining the productivity of agricultural systems. If we take the example of pollination, scientific research confirms its benefits as an ecosystem service that ensures the productivity of important crops. Pollinators may be responsible for 50% of soybean production, between 45% and 75% of melon production, 40% of coffee production, 35% of orange production, 88% of cashew production and 43% of cotton production.

As a signatory to the most important international conventions, such as the Convention on Biological Diversity and the Convention on Climate Change, another important strategy is the effective implementation and expansion of protected areas, whether they be public or private. In addition to the essential environmental services provided by these areas, they can also boost the local economy and generate foreign exchange for the country.

Lastly, the expansion or incorporation of areas for farming or silviculture should adopt the basic premise of no deforestation or conversion of preserved native vegetation.

Brazil has major challenges ahead, but also immense possibilities. The responsibility for discussing and choosing the right strategies to ensure environmental conservation and not only the survival of the human species, but quality of life, is up to every single one of us.

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