

# THINK PING

# Securing Brazil's food, water and energy with Proactive Investment in Natural Capital



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# EXECUTIVE SUMMARY

## Rationale for action to reduce risks

People’s wellbeing, including their food, water and energy security, depends upon goods and services such as clean water and crops provided by ecosystems.

Much as an investor will use financial capital to generate profits, a stock of trees, fish or fertile soils – natural capital – will provide a future flow of timber or food, which if used sustainably will provide long-term benefits to people.

The challenge facing society is to find the optimal balance between using land to produce agricultural commodities to meet growing domestic and global demand and keeping resilient ecosystems capable of supplying a diverse suite of goods and services in the face of climate change.

This balance can be found if governments and businesses Think PINC. PINC stands for Proactive Investment in Natural Capital. It means investing in activities that maintain natural capital across landscapes. It also means being proactive, investing sooner rather than later in order to build the resilience of landscapes – and the people that inhabit them – to global climate change.

Nowhere is PINC more relevant than in Brazil, a country that is not only a biodiversity superpower thanks to unique habitats such as the Cerrado, Atlantic Forest and Amazonia, but is also rapidly becoming an economic superpower, including through the export of commodities such as beef and soy produced from its abundant natural capital. At the same time, droughts and floods across the country have highlighted the potential for the degradation of natural capital and climate change to impact people’s security.

As the world’s population continues to rise, the global demand for food could double by 2050. Rapidly emerging economies such as Brazil are seeking to meet this demand through increasing agricultural production. Brazil will need to find 1.1 m hectares of land each year for the next three decades in order to meet the projected increase in production. A continuation of the historical development paradigm would mean the conversion of forests and savannahs to meet this need for land.

However, converting forests to pasture and agriculture will aggravate the impacts of climate change and ‘business-as-usual’ development is not seen by the Brazilian Government as being compatible with its aim of a low-carbon growth strategy.

## Three vital landscape strategies

So, an alternative PINC approach is needed. Three landscape-level strategies can help Brazil to meet the ongoing demand for land while conserving forests:

1. STOP deforestation
2. INTENSIFY cattle ranching
3. RESTORE forests

Taken together, these strategies should be sufficient to maintain natural capital across the landscape so that agricultural productivity can be maintained while ensuring a flow of vital ecosystem goods and services. Each strategy involves key actions, as follows:

STOP

- Conservation of forests in Protected Areas and Indigenous Lands;
- Conservation of forests in private lands; and
- Sustainable use of forests for timber and non-timber forest products.

INTENSIFY

- Intensify cattle ranching sustainably, thereby increasing the density of the cattle herd and reducing the area of land required.

RESTORE

- Reforestation, where the primary purpose is to make a financial return; and
- Native forest restoration, where the main motivation is to restore ecological functioning.

## Opportunities and challenges

Approximately US\$ 6 billion per year will be needed for the next 20 years in order to carry out the key actions in Amazonia and the Cerrado, where the pressures of deforestation are highest. These costs and investments can be met through a range of policies and measures:

**1. Use PES from hydropower to pay for forest conservation**

With Brazil planning to invest heavily in hydropower in Amazonia, a comparatively small investment in the maintenance of conservation units might generate

substantial financial savings to Brazil’s energy sector through hydrological regulation and soil erosion control. Hence, an important action is the regulation of SNUC Articles 47 and 48 that permits the government to levy fees on water users such as hydroelectric power stations.

**2. Support avoided deforestation in Indigenous Lands and private forests**

An important opportunity is the use of carbon finances to support forest communities’ and Indigenous Peoples’ avoided deforestation schemes, in which communities with long-term management plans for their lands are compensated by investors in carbon. This could pave the way for future REDD+ activities over larger areas once a new climate treaty is agreed within the UN Framework Convention on Climate Change (UNFCCC). In addition to Indigenous Lands, private forest conservation actions by landowners who commit to zero deforestation could also be compensated through REDD+ schemes.

**3. Regulate the Forest Code with a financial instrument**

Regulation of the Forest Code through the creation of mechanisms to generate financial incentives would encourage landowners to conserve a larger proportion of their property as Legal Reserve than required by law. This could include novel ‘environmental swaps’ in which landowners can trade excess forest areas. However, there is concern among some researchers that the current plan to allow swaps to occur among biomes would not be an effective means to protect sensitive areas such as riparian corridors in regions that are in Legal Reserve deficit.

**4. Transform rural credit and improve delivery**

The Brazilian Government allocates significant finances to rural credit. However, the culture and capacity among landowners and development banks limits the uptake of these loans for activities such as sustainable cattle intensification and forest restoration. There are two key actions. First, development banks can improve their lending practices, making it easier for landowners to access rural credit for sustainable activities. Second, banks can offer loans for sustainable properties – so-called ‘integrated

property loans’ – rather than the current focus on loans for production of individual goods that contribute to unsustainable land management.

**5. Create ‘green’ market demand for price premium commodities**

A key mechanism to support sustainable cattle intensification and sustainable forest management is the greening of commodity supply chains. Support through investors and supply chain companies for the responsible sourcing and certification of beef (as well as leather products, soy and timber) through feasible and reliable certification schemes, cadastral registration, commodity tracking and other chain of custody measures is vital. Financial investors in supply chain companies have an important role in applying economic pressure at the top of the supply chain.

**6. Reform and redirect subsidies**

Subsidised credit is focused at the bottom of the supply chain, where there is limited uptake by producers. One way to increase the uptake of credit among producers would be to redirect some of the subsidies up the supply chain, by providing tax incentives or investment capital to industrial actors to then channel funds or provide price premiums to their suppliers (producers). Redirecting subsidies towards industry in order to affect change among producers will require the implementation of minimum sustainability criteria, and stringent accounting and transparency mechanisms.

**Power-up PINC**

New financing mechanisms, such as water user levies and carbon finance, are needed to generate funds to STOP deforestation. Conversely, the significant funds available for INTENSIFY and RESTORE need to be delivered to where they are needed. With its abundant natural capital and its growing financial capacity, Brazil is well placed to take a PINC approach – investing in a set of actions that maintain natural capital in order to ensure more secure water, food and energy supplies. This has to be twinned with the strengthening of human capital and productive capacity in forest-based and rural sectors – the heart of the green economy.

# WHAT IS THIS REPORT ABOUT?

## Natural Capital

This report is about people's dependence on nature for their security. Ecological economists have adopted the term 'capital' to help them describe the resources and ability of ecosystems to provide flows of goods and services such as water, medicines and food. Flows of goods and services that benefit people are called 'ecosystem services' <sup>[1]</sup>. Much as an investor will use financial capital to generate profits, a stock of forest or fish – natural capital – will provide a future flow of timber or food, which if used sustainably will provide long-term benefits to people.

Forests, grasslands and fertile agricultural soils can be seen as natural capital spread across the landscape, providing a suite of goods and services ranging from food crops to clean water and from rainfall generation to ecotourism. Sustainable development and poverty eradication, whether at local or national levels, depend on natural capital. The challenge is to find the optimal balance between producing agricultural commodities to meet growing domestic and global demand and keeping resilient ecosystems capable of supplying a diverse suite of goods and services in the face of climate change.

Whereas agricultural commodities are traded on global markets, many other forms of ecosystem goods and services are not traded or priced. Therefore, they are often overlooked in decision-making, which tends to be dominated by the pursuit of economic growth. As a result of being hidden from economic view, ecosystems are being degraded <sup>[2]</sup>. Although there is uncertainty in our understanding of the links between ecosystems and the economy, tropical deforestation alone degrades natural capital worth an estimated \$2-5 trillion every year <sup>[3]</sup>. This cost to the global economy is not registered on balance sheets but it is likely to be putting the long-term food, water and energy security of billions of people at risk.

## Proactive Investment in Natural Capital (PINC)

A precautionary approach is needed that maintains natural capital. We can invest in stocks of natural capital, just as we might invest in maintaining or restoring any other form of capital <sup>[4]</sup>. The TEEB study has shown that the internal rate of return (IRR) for restoring certain ecosystems ranges between 40% and 80% <sup>[5]</sup>. In other words, it is well worth investing. And it is cheaper to be proactive and invest early

in maintaining healthy ecosystems, before natural capital has been diminished.

Based on the evidence of emerging security risks from the ongoing loss of natural capital, this report advocates a shift away from 'Business as usual' towards 'Sustainable ecosystem management' through Proactive Investment in Natural Capital (PINC) <sup>[6]</sup>. What does PINC mean? It means governments and businesses *investing* in activities that maintain *natural capital* across landscapes. It also means being *proactive*, investing sooner rather than later in order to build the resilience of landscapes – and the people that inhabit them – to global climate change.

Nowhere is PINC more relevant than in Brazil, a country that is not only a biodiversity superpower <sup>[7]</sup> thanks to unique habitats such as the Cerrado, Atlantic Forest and Amazonia, but is also rapidly becoming an economic superpower, including through the export of commodities produced from its abundant natural capital. At the same time, droughts and floods across the country have highlighted the potential for the degradation of natural capital and climate change to impact people's security.

Brazil has an opportunity to transition to a sustainable, but profitable, land use trajectory through investing in activities that maintain natural capital and support wealth creation. This report seeks to scope out this opportunity, with two key elements. First, it collates evidence from the scientific literature that supports the need for PINC. Second, it assesses a range of financing mechanisms currently in use in Brazil, validated through discussions with experts from public, private and non-profit sectors. The conclusion is clear: while there are challenges, there are a number of promising options for paying for PINC while promoting a more resilient, 'green' economy that promotes people's security as well as sustainable profits.

# RISKS TO NATURAL CAPITAL

## Meeting growing global demand

By 2050 the world’s population will have increased to about 9 billion. Furthermore, a rising proportion will have higher incomes, which means they will eat more, especially meat. The global demand for food will likely double. In some regions, the expansion of biofuel production will compete with food crops for agricultural land. The ongoing pattern of converting forests to farmland and intensifying industrial farming in sensitive landscapes and watersheds will likely result in the continued release of greenhouse gases (GHGs), pollution of rivers, oceans and soil degradation. Climate change will make it harder to meet the growing demand for food by affecting crop yields, livestock, water supplies and ecosystem services upon which agriculture depends <sup>[8]</sup>.

Fifty years ago, when the world’s population was around half what it is now, the answer to looming famines was the so-called ‘green revolution’ – a massive increase in the use of hybrid seeds and chemical fertilisers. It worked, but at a great environmental price: we grow twice as much food as we did a generation ago, but we use three times as much water from rivers and underground supplies <sup>[9]</sup> and use large amounts of fossil fuels to produce fertilizers. Given these global challenges, the historical development paradigm of unsustainable resource extraction and land use – which depletes natural capital rather than living off its interest – is no longer a viable strategy for either industrial or industrialising economies <sup>[10] [11]</sup>.

## Climate change in Brazil

Recent climate model projections by Brazilian and UK researchers suggest that Brazil’s climate could warm by between 2 and 6.6 degrees Celsius (°C) towards the end of the century, depending on how greenhouse gas (GHG) emissions change <sup>[12]</sup>.

A majority of climate models used in the IPCC’s Fourth Assessment Report (‘AR4’, released in 2007) indicate a future drying trend to some extent over large parts of Amazonia for at least part of the year. Changes in dry season rainfall are particularly important in terms of how the forest will be affected since this is when trees are already under greater stress from a lack of water in the soil <sup>[13]</sup>.

Climate models also predict changes in the frequency

of extreme events in Amazonia. Severe droughts – as experienced in 2005 and 2010 – could be much more common and events by the end of the century <sup>[14]</sup>.

## Land use change in Brazil

Over the past 10 years, Brazil lost an average of 2.6 million hectares (m ha) of forest per year, compared to an average annual loss of 2.9 m ha during the 1990s <sup>[15]</sup>. This annual loss is roughly equivalent to 10 times the area of São Paulo. In total, around 18% of Brazilian Amazonia has already been deforested while in the Cerrado the estimated area of deforestation is between 39% and 57% of the total area <sup>[16]</sup>.

Land use and land use change are responsible for 75% of Brazilian greenhouse gas (GHG) emissions <sup>[17]</sup>, helping to make Brazil the fourth highest emitter in the world, with 6.5% of global emissions <sup>[18]</sup>.

In most cases, forests are converted to cattle pasture and agricultural land. Approximately three quarters of the 74 m ha of Amazonian forests that were cleared up to 2009 were converted to pasture, by both large- and small-scale farmers <sup>[19]</sup>. Similarly, of the 1.4 m ha of Cerrado cleared each year, most is used for pasture <sup>[20]</sup>.

Recently, the deforestation rate in Brazilian Amazonia has declined <sup>[21]</sup>. From August 2010 to July 2011, 0.62 m ha of Amazonian forest were cleared – a third of the ten-year annual average for the period ending in 2005. Brazil is officially committed to reducing deforestation rates in Amazonia by 80% and the Cerrado by 40% by 2020 against a baseline average (1996-2005).

## Increasing commodity production

The recent reduction in deforestation rates is a sign of increasing efforts to curtail illegal forest clearance. However, the trend towards increasing agricultural production could undo these gains and jeopardise the planned deforestation reductions.

The growth of Brazil’s agribusiness sector is an essential part of its rapid development, representing 30-40% of total exports and employment and accounting for 25% of national GDP <sup>[14]</sup>. Brazil is now among the world’s leading producers of orange juice, coffee, ethanol, sugar, soy and meat (mainly beef and chicken).

The area of land planted with soy almost doubled over the last 15 years, reaching 21 m ha in the 2006/7 season <sup>[22]</sup>.

Brazil is expected to become the dominant supplier of soy to meet growing international demand over the next decade <sup>[23]</sup>.

Between 1990 and 2008, livestock <sup>[24]</sup> in Amazonia rose from 21.1 to 71.4 million livestock. Cattle production in Brazil rose to 175 m head in 2008, with 90% of the growth in herd size occurring in Amazonia <sup>[25]</sup>.

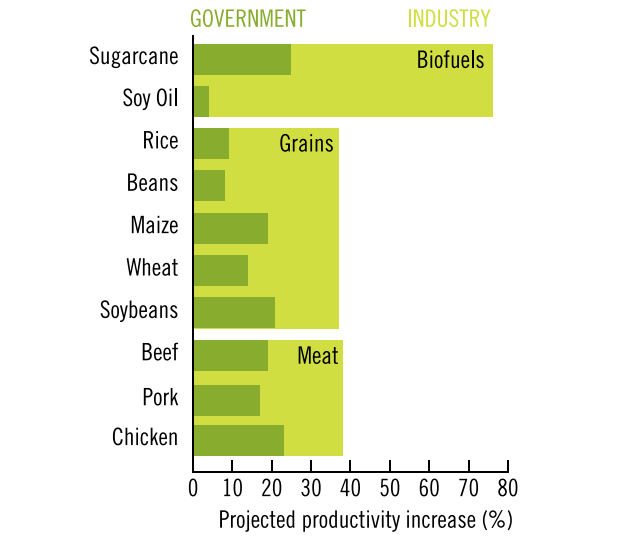


Figure 1. Government <sup>[26]</sup> and industry <sup>[27]</sup> projections of agricultural productivity (2010-2020). Industry figures are for sectors rather than commodities.\* Separate source for sugarcane <sup>[28]</sup>.

Brazil’s Ministry of Agriculture and the agribusiness sector aim to dramatically increase production of commodities (Fig 1). The Ministry of Agriculture forecasts that in the next decade livestock production will increase by 52% and that beef exports will increase 93%. This growth in demand for beef is due to increases in population and shifts in consumer preference linked to growing affluence in emerging markets such as China <sup>[29]</sup>.

Some of the major players on the supply side of the cattle industry are big Brazilian slaughterhouse groups, who distribute globally and are responsible for more than 50% of the processed beef sold worldwide. They have made large investments in modern new facilities inside the Amazon region <sup>[30]</sup>.

## Rising demand for land

Government and UN FAO data indicate that the total area of cropland, pastureland and plantation will increase by 1.1 m ha each year for the next three decades in order to meet the projected expansion in production <sup>[31]</sup>. Under Business as usual, this increasing area of land would be made available via the conversion of forests. However, alternative land use trajectories could be followed, which would reduce the amount of land deforested (Fig 2).

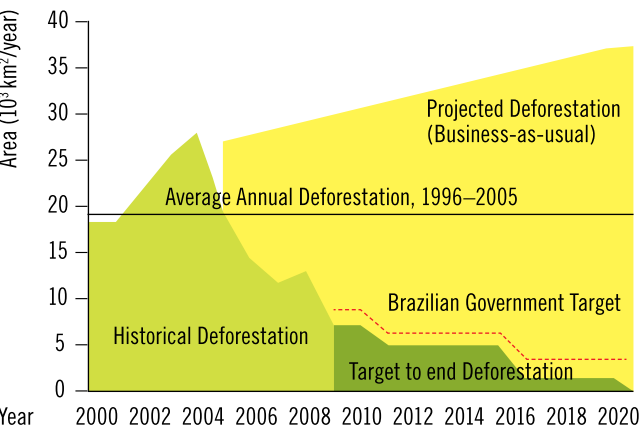


Figure 2. Deforestation rates in Amazonia and projections according to three different scenarios: Business as usual; Brazilian government target; and Target to end deforestation. Redrawn from the original <sup>[32]</sup>.

## Synergy between climate change and land use

Large expanses of intact moist tropical forest rarely experience fire, which are more common close to forest edges where the chances of fires being sparked by people are greater. The warming and drying associated with climate change will make fragmented forests more prone to fire, increasing the risk of forest loss <sup>[33]</sup>, as demonstrated during the Amazonian droughts of 2005 and 2010 <sup>[34]</sup>.

Some climate models suggest that if the area of Amazonian deforestation were to exceed 40% of the original forest extent or if global warming were to exceed 3–4°C, Amazonia – especially the south and south-east – could be tipped into a new climate-forest equilibrium, experiencing lower rainfall and with decreased forest cover <sup>[35]</sup>.



RISKS TO SECURITY

Water

Water flow regulation and clean water provision are particularly important ecosystem services for Brazil. Almost a tenth of drinking water is directly collected in conservation units, 26% is collected from sources downstream of conservation units, and 4% of the water used in agriculture and irrigation is taken from sources inside or downstream of protected areas<sup>[36]</sup>.

Research suggests that Amazonian deforestation may have varying impacts on rainfall depending on how much forest is lost and the degree of fragmentation<sup>[37]</sup>. Despite uncertainty over how changes in forest cover affect regional climate, it is thought that large-scale deforestation (over 100,000 km²) would lead to a reduction in regional rainfall due to a decrease in the quantity of water being evaporated from the forest. Conversely, Amazonian rainfall patterns may also be affected by deforestation occurring in the Cerrado<sup>[38]</sup>.

Amazonia's forests play a crucial role in the atmospheric transport of moisture across South America. The atmosphere above Amazonia is moist because of the inflow of water vapour from the Atlantic carried in the easterly

trade winds. Rainfall is recycled back into the atmosphere by the forests through evaporation, helping to keep the air masses moist as they continue from Amazonia towards the south of the country. In the wet season, this moisture 'conveyor belt' reaches far enough south to contribute to the rainfall in the La Plata river basin between December and February (Fig 3)<sup>[39]</sup>.

Rainfall is vital to the economy of the La Plata Basin, which accounts for 70% of the GDP of the five countries (Brazil, Paraguay, Uruguay, Argentina and Bolivia) sharing the basin<sup>[41]</sup>. In addition to providing drinking water and water for industry, rainfall underpins agriculture and hydropower. Agriculture accounts for between 62% (Brazil) and 96% (Uruguay) of national water consumption, with most agricultural land being rain-fed rather than irrigated.

It is hard to predict what would happen to moisture transport from Amazonia to the rest of Brazil as a result of continued deforestation and projected climate change. However, modelling studies suggest that loss of the forest would have a negative impact on regional rainfall patterns<sup>[42]</sup>.

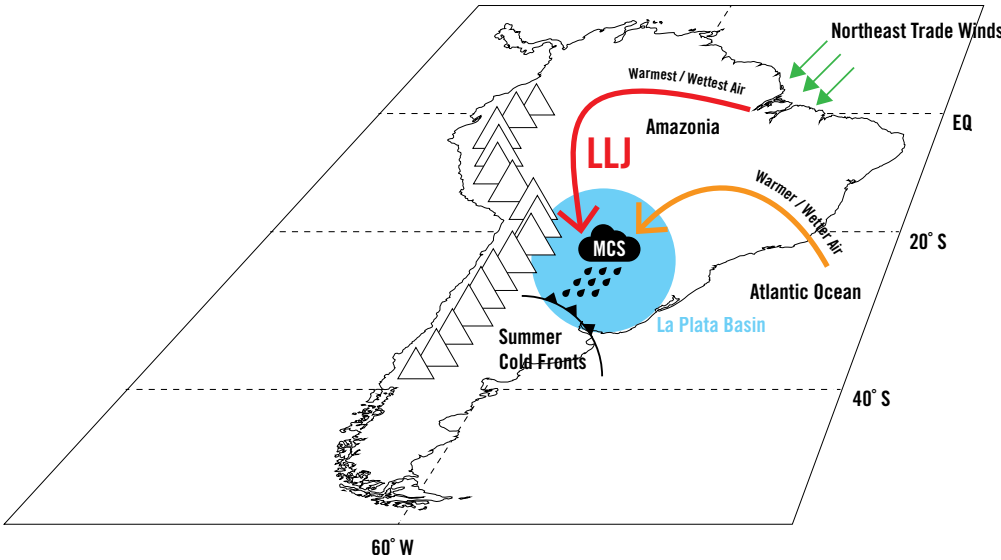


Figure 3. Conceptual model of climatic phenomena in South America (Summer). A Low Level Jet (LLJ) carries moisture from Amazonia to La Plata Basin where Mesoscale Convection Systems (MCS) generate rainfall. Redrawn from the original<sup>[40]</sup>.

Food

Climate trends over the last thirty years have had an impact on global crop yields, with some crops suffering losses while others have shown a positive response<sup>[43]</sup>. In 2010, drought in Brazil and Argentina increased soybean and corn prices by 50%<sup>[44]</sup>.

Although there is uncertainty, without adaptation measures soy is expected to suffer yield reductions by the middle of the century<sup>[45]</sup>. Climate change in Brazil is also projected to reduce the area of land that is suitable for growing crops<sup>[46]</sup>.

One study into the potential impacts of climate change on Brazil's agriculture sector showed that if no adaptive measures were taken then the reduction in GDP would be between US\$480 billion and US\$2.4 trillion by the middle of the century<sup>[47]</sup>.

Changing river levels as a result of variations in rainfall caused by climate change will impact the transportation of produce across Brazil. In 2010, for example, soy producers that rely on the Madeira river in Amazonas state to ship barges of the food product were forced to divert loads at great expense to ports in the southeast of the country some 2000 km away<sup>[48]</sup>.

Energy

Changing river flows will also affect water levels in reservoirs used to generate hydroelectricity. Some regions of Brazil, such as the South and Southeast are expected to be able to cope with such changes by adaptive water resource management, whereas the Northeast will be more adversely affected<sup>[49]</sup>.

A substantial portion of the river water that passes through dams in the Amazonian region of Brazil originates in protected areas (Table 1), indicating the importance of forests in regulating hydrological flows. Brazil and other Amazonian countries have plans to greatly increase the number of hydroelectric dams across Amazonia, which by global standards has a relatively low density of dams for its vast potential. If all the plans are implemented, Brazil could be receiving half of its energy from Amazonian hydroelectric stations within 30 years<sup>[50]</sup>. Hence, any expansion in hydroelectricity in the region will need to consider the potential impacts of deforestation and climate change on water supplies.

Table 1. Estimated percentage of water at Brazilian Amazonian dams that falls as rain on a Protected Area (PA) in the watershed of the dam<sup>[51]</sup>.

DAM	ESTREITO	TUCURUI	BALBINA	FERREIRA GOMES
PERCENTAGE OF WATER FALLING AS RAIN IN A PA UPSTREAM OF THE DAM	17	19	69	69
GENERATION CAPACITY OF THE DAM (MW)	1087	8370	250	252

# LANDSCAPE STRATEGIES FOR PING

As the first part of the report highlighted, climate change and land use change pose risks to Brazil’s natural capital and, therefore, human security and economic prosperity. Approaches are needed that build the resilience of landscapes to climate impacts so that they can continue to deliver ecosystem goods and services – supporting water, food, energy and climate security – in order to meet growing domestic and global demands.

### Stopping deforestation

The area of land used to produce crops, cattle and plantation forests is expected to grow by roughly 1.1 m ha each year over the next three decades<sup>[52]</sup>. A Business as usual land use pathway would entail continued deforestation to provide for this growing demand for land. In recent years, Brazil’s Federal and State governments have acted successfully to tackle deforestation. Enforcement has been strengthened to combat illegal logging; the credit approval process has been tightened to restrict the flow of funds for land conversion; 20 m ha of forest have become Conservation Units (Brazilian protected areas) and 18 m ha have been designated as Indigenous Lands; and restrictions have been placed on agricultural products from municipalities with high deforestation rates<sup>[53]</sup>.

### Intensifying cattle ranching


Although there is uncertainty, climate change might also reduce the suitability of current agricultural areas, increasing the pressure to clear new land. Therefore, there is an urgent need to find suitable land without having to clear forests. According to EMBRAPA, there are up to 200 m ha of degraded land in Brazil, resulting from deforestation and unsustainable agricultural and cattle practices. There are an estimated 50 to 80 m ha of degraded pasture land in the Cerrado and 24.4 m ha in Amazonia, of which 40% are highly degraded<sup>[54]</sup>. If this land could be brought into more productive use, through sustainable cattle intensification, it would enable pasture and agricultural activities to move away from the forest frontier where they contribute to deforestation.

### Restoring forests

In addition, there is a need to restore natural forests, especially in ecologically sensitive areas that provide vital services such as watershed protection. As part of its National Plan for Climate Change (PNMC)<sup>[55]</sup>, Brazil aims to increase the area of planted forest from 5.5 m ha to 11 m ha by 2020<sup>[56]</sup>. There are several large-scale restoration activities in the planning stages across Brazil, such as “The Atlantic Forest Restoration Pact”, an ambitious programme that aims to recover 15 m ha of the Brazilian Atlantic Forest by 2050<sup>[57]</sup>. The annual reforestation rate of native and commercial species in Brazil has been rising recently and it will be necessary to reforest 1.2 m ha/year by 2015 to achieve the doubling in forested area planned by the federal government.

Hence, to make the transition towards a more resilient land use scenario, three over-arching strategies are needed across the landscape:

- **Stop** deforestation;
- **Intensify** cattle ranching; and
- **Restore** forests.

STOP Deforestation	INTENSIFY Cattle ranching	RESTORE Forests
		
<b>ACTION</b> <ul style="list-style-type: none"><li>– Conservation of forests in Protected Areas and Indigenous Lands.</li><li>– Conservation of forests in private lands.</li><li>– Sustainable use of forests for timber and non-timber forest products.</li></ul>	<b>ACTION</b> <ul style="list-style-type: none"><li>– Intensify cattle ranching sustainably, thereby increasing the density of the cattle herd and reducing the area of land required.</li></ul>	<b>ACTION</b> <ul style="list-style-type: none"><li>– Reforestation, where the primary purpose is to make a financial return.</li><li>– Native forest restoration, where the main motivation is to restore ecological functioning.</li></ul>





# ASSESSMENT OF FINANCING OPTIONS

At an international level, there are about 17 different financing mechanisms that could be used to pay for biodiversity conservation, ranging from Domestic Budget Allocation to Green Taxes and Carbon Markets <sup>[58]</sup>. Hence, there are a number of options for paying for the transition to a more resilient land use trajectory. The following sections of the report assess the three landscape strategies and their associated key actions in terms of their potential costs, benefits, main financing options and their associated challenges and opportunities. Rather than providing an exhaustive assessment, the report highlights the important issues using a framework that consists of five elements.

**Financing instruments** can be split into three types of mechanism: those that Generate finance, those that Deliver finance and those that form Institutional Arrangements for managing finance <sup>[59]</sup>.

Hence, we can use this framework to pose the following questions:

- Cost**  
What is the cost of the action or the investment required?
- Generation**  
How is/could finance be raised to cover the costs?
- Delivery**  
How is/could finance be delivered to where it is needed?
- Institutional Arrangements**  
How are/would the finances be managed?
- Challenge/Opportunity**  
What are the challenges and opportunities of the action?





# STOP DEFORESTATION

## 1. Protected Areas and Indigenous Lands

Brazil has a track record of creating Protected Areas (PAs) and demarcating Indigenous Lands (ILs), with a total of 179 m ha in Amazonia and 148 m ha in the Cerrado under conservation <sup>[60]</sup>. This has proven to be an effective means of protecting forests and delivering ecosystem services <sup>[61]</sup><sup>[62]</sup>, although pressures such as demographic change and forest fires continue to grow <sup>[63]</sup>.

### Cost

The costs of law enforcement, monitoring and related activities are hard to estimate, as they depend on a myriad of socio-economic and cultural factors. Nevertheless, the costs of (i) protection of indigenous reserves; (ii) protection of conservation units; (iii) control along road networks; and (iv) remote sensing-based monitoring have been estimated at **US\$ 1.1 billion** per year <sup>[64]</sup><sup>[65]</sup>.

### Generation

Funds for conservation are generated through a range of financing mechanisms, including Domestic Budget Allocation, Taxes, Official Development Assistance (ODA), Philanthropy and Carbon Markets. ODA and international philanthropy are major sources of international finance for protected areas. Brazil's Amazon Fund has received important donations from Norway's sovereign wealth fund (US\$ 1 bn committed) and Germany's development bank (€21 m committed). In 2009, the ARPA (Amazon Region Protected Area) programme received international donations of US\$ 29 m from the Global Environment Facility (GEF); € 16.5 m from the German development bank, KfW; and US\$ 9.8 m from the WWF network.

One of the main domestic generation mechanisms is Ecological VAT (ICMS-Ecológico), in which 0.5-2.5% of state VAT revenues are allocated to the ICMS-Ecológico, to then compensate municipalities for tax income lost through the creation of protected areas and indigenous reserves. This system generated R\$417 m in 2009 <sup>[66]</sup>. The Environmental Compensation Fund (Fundo de Compensação Ambiental), generated via a levy on private companies whose projects have environmental impacts, is also worth highlighting since it could be increasingly important as Brazil's economy continues to grow.

### Delivery

A particularly successful approach to funding conservation areas has been the ARPA programme, which was launched by the government in 2002 to create and maintain PAs across 563,000 km² by 2016 <sup>[67]</sup>. However, while this delivery mechanism is well structured and effective, there is a lack of finance being generated to keep ARPA going.

### Institutional Arrangements

Finance delivered by the ARPA programme is managed by the Protected Areas Fund (Fundo de Áreas Protegidas - FAP), a form of Conservation Trust Fund, in turn managed by FUNBIO (Fundo Brasileiro para a Biodiversidade). 'Linked accounts' (Contas vinculadas) provide protected areas managers with easy and direct access to financial resources to implement their plans. Finances generated by the ICMS-Ecológico are not targeted directly to conservation activities, but are used by municipalities for activities such as education and sanitation.

### Challenges & Opportunities

It is clear that there is a funding gap between the US\$ 1.1 bn/year requirement over the coming decades and the current funds available. Although the network of PAs and ILs protects vast amounts of carbon, there is as yet no large-scale international climate financing mechanism – beyond ODA – that would compensate Brazil for its avoided emissions. Hence, while the ARPA institutional arrangements and delivery mechanism are solid, there is a need to find new sources of finance for ARPA and Indigenous Lands <sup>[68]</sup>. An ARPA 'Transition fund' is being designed that is intended to mobilize, in a single deal, all the financial and other commitments needed to complete the ARPA Programme and maintain it forever.

With appropriate safeguards, REDD+ could be an opportunity in the long term and, potentially, voluntary avoided deforestation schemes could be suitable in the short term for some Indigenous Lands (see page 19: Suruí Carbon Project). The Brazilian Government is considering generating conservation funds by applying a levy on hydroelectric power schemes in Amazonia that rely on water from upstream protected areas (see page 17: SNUC Law 9985; 47/48).

### SNUC Law 9985; 47/48

Eighty percent of Brazil's hydroelectricity comes from sources that have at least one tributary downstream of a conservation unit <sup>[36]</sup>. A large body of scientific research around the world has shown that well-protected forested watersheds can help provide a stable supply of clean water to downstream users <sup>[70]</sup>. Degradation of such forests results in poorer water quality and greater variation in river flow <sup>[71]</sup>. Articles 47 and 48 of the national system of conservation units (SNUC), enables the government to place a levy on water uses such as hydropower operators to contribute towards conservation actions <sup>[72]</sup>.

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## 2. Conservation of Private Forests

Under the rules of the Forest Code, 80% of a private property in Amazonia must remain as a ‘Legal Reserve’ (Reserva Legal), while in the Cerrado the figure is 35%. Full compliance with the Forest Code requires that about 254 m ha of private land, an area more than twice the size of the EU27 cropland area, would be Legal Reserve. However, it is estimated that Legal Reserves cover about 218 m ha, i.e. a deficit of about 36 m ha <sup>[73]</sup>.

There is debate over the necessity, efficiency and equity of compensating landowners for avoiding ‘legal’ deforestation. As the Forest Code is under revision, the areas that could be deforested legally might change in the near future. Nevertheless, there are a number of schemes aimed at incentivising private conservation.

### Cost

One way to assess the costs of conserving private forests is to estimate ‘opportunity’ costs. However, unclear property rights make it hard to estimate the area that could be legally deforested. Also, opportunity costs vary greatly depending on the alternative potential land use, which is hard to predict. We assume that 7.2 m ha could be legally deforested in Amazonia and 4.8 m ha in the Cerrado <sup>[74]</sup>. Recent studies provide a range of opportunity costs (US\$ 600 to US\$ 1687 per ha in Net Present Value) <sup>[75][76]</sup>. Taking an average annual return of US\$ 74/ha/yr from these different estimates results in **US\$ 961 million per year**.

### Generation

Currently, there are no significant sources of funds from Domestic Budget Allocation. There are plans and pilots underway to generate finance from domestic and international Carbon Markets. This could include California’s Emissions Trading Scheme, which may include international forest offsets, as well as a domestic cap-and-trade scheme (with offsets) among Amazon states and states in the southeast.

### Delivery

There are two key delivery mechanisms currently in use. First, the Brazilian Development Bank (BNDES) provides

concessional loans for Forest Compensation (Compensação Florestal) for farms that are currently in deficit in their area of Legal Reserve to purchase properties with forest areas that are in excess of the Legal Reserve requirement. A second potentially key mechanism could be through a bill (PLS 34/08) introduced to Congress that would provide a financial reward for landowners who maintain larger areas of their property as Legal Reserve than required under the Forest Code. An ‘environmental swap’ arrangement is being discussed to allow landowners on properties of up to 400 ha to compensate illegally deforested Legal Reserves with forest preserved elsewhere, while an amnesty is contemplated for those who have created pasture on Areas of Permanent Protection (APPs). Forest Reserve Certificates (CRF) would be issued for up to 200 ha per property, up to R\$ 10,000 a year. A third incentive worth noting is a form of Tax Credit in which rural property taxes (ITR) can be discounted for land owners complying with the legal reserve requirements and those that create natural reserves (Reserva Particular do Patrimônio Natural - RPPN).

### Institutional Arrangements

Incentive mechanisms such as concessional loans are managed by federal and state governments and banks working in partnership with BNDES. Although the system of environmental swaps has not been established, CRFs could be managed by an Environmental Market Exchange, such as the Bolsa Verde in Rio de Janeiro (BVRio).

### Challenges & Opportunities

Rural property taxes (ITR) are relatively small and so the discount provided for conservation action is unlikely to provide a significant incentive. ‘Environmental swaps’ allowing landowners to exchange Forest Reserve Certificates could be a key financing mechanism for conservation, however the regulations that create the mechanism need to be formulated and included in law in order to have an impact. Some researchers are concerned that allowing farmers to invest in forest conservation in other biomes does not deal with the problem of a deficit in the area of Legal Reserves in their own locale, where the deficit could be impacting water quality. REDD+ could be a key opportunity for creating incentives for conservation among private landowners <sup>[77]</sup> (see page 23: Incentives to

### Suruí Carbon Project

The Suruí Carbon Project was conceived in 2007 by the Metareilá Association, with support from environmental and indigenous organizations including Kanindé, Forest Trends, Amazon Conservation Team, IDESAM and FUNBIO. The project aims to strengthen cultural and environmental conservation in the 247,870 ha *Sete de Setembro* Indigenous Land, which is under continuous threat of invasion by loggers. The project is being implemented and has been yielding emissions reductions since 2009, with a projected total future carbon benefit of 6 m tonnes of CO<sub>2</sub> equivalent <sup>[69]</sup>.

Photo © IDESAM



reduce deforestation). All potential financing mechanisms depend on an expansion of land registry programmes (CAR: Cadastro Ambiental Rural) that will clarify land ownership and land use and can be used by financial institutions to check on legal compliance before offering land owners credit or the option to ‘swap’ forest areas.

### 3. Sustainable forest management (SFM)

One key way to halt deforestation is to “add value to the heart of the forest” through the creation of forest-friendly enterprises <sup>[78]</sup>. This can include a range of forms of SFM - for timber and non-timber forest products (NTFP). However, between 0.8 and 1.5 m ha of Brazilian Amazon forests are conventionally logged each year <sup>[79]</sup>. It is also estimated that 80-90% of Amazonian timber is illegally harvested, mostly supplying domestic consumers <sup>[80]</sup>. Brazil has almost 7 m ha of certified forest, half of which is in Amazonia <sup>[81]</sup>, but the total certified area in Amazonia represents only 0.7% of the total area of the basin <sup>[82]</sup>. Acre, known as ‘the forest state’, has the highest proportion of legally logged timber, with 80% sourced from managed forests. Its three largest suppliers, as well as four furniture manufacturers, are FSC-certified <sup>[83]</sup>.

#### Costs

Data on the costs of shifting towards sustainable production of timber and NTFPs are limited. Over the long term, it is the potential for recovering these upfront costs and generating profits from sustainable activities – adding value to the heart of the forest – that is of most concern. The Net Present Value (NPV) of sustainable forest management is US\$ 507/ha compared with US\$ 351/ha for conventional logging (assuming a 30-year cutting cycle and a 6% discount rate) <sup>[84]</sup>. In other words, sustainable management yields a higher economic return than conventional approaches.

#### Generation

Brazil tends to generate finance for sustainable forest management activities through Domestic Budget Allocation, with additional funding expected to be generated from ODA through the World Bank’s Forest Investment Program (FIP).

#### Delivery

NTFPs are subsidised at the federal and state levels through a range of mechanisms, including: (i) the Chico Mendes law, introduced by the government of Acre state; (ii) the federal PRODEX subsidised credit scheme for latex production; and (iii) federal support for Brazil nut production through the PRONAF credit line, CONAB marketing facilities and minimum price policies. At a more general level, sustainable forest management is supported through concessional loans (subsidised credit). Available finances can be substantial. For example, the PRONAF-Floresta programme which provides loans for agricultural families in agroforestry, extractivism and restoration of degraded lands and forests, had a budget of R\$ 11.2 bn in 2009-2010.

#### Institutional Arrangements

Most funds are managed by BNDES and development banks such as Banco do Brasil and Banco da Amazônia, as well as the Brazilian Forest Service (Serviço Florestal Brasileiro – SFB) in the case of the National Fund for Forest Development (FNDF).

#### Challenges & Opportunities

NTFP price subsidies are seen by the Government as a strongly implemented mechanism for delivering financial support to producers. One of the key opportunities for producers of timber and NTFPs is the aggregation of value in the supply chain, by bringing processing activities closer to the forest (see page 21: Sustainable rubber production). This requires investment and capacity-building. While there are substantial funds available for concessional loans for improving farming and forestry practices, these are often not being accessed by producers. The main challenges to the use of concessional loans are: (i) landowners are averse to using credit; and (ii) banks and government extension services are not effectively promoting concessional loans. Hence, compared with the situation in Protected Areas where the challenge is related to generation of finance, in the case of sustainable forest management, the challenge is instead one of delivering finance.

#### Sustainable rubber production

Rubber tapping is a traditional activity in Amazonia, particularly in Acre state. Normally, rubber tappers sell their raw product to intermediary factories outside the forest, who process it ready for end-users such as shoe manufacturers. Rubber tappers in Acre are pioneering a new technology to produce Ribbed Smoked Sheets (RSS) of rubber, which they can sell at twice the price of normal rubber by selling directly to the end-user factory. The transition to producing RSS rubber, including infrastructure and training, may cost up to R\$ 10,000 per family production unit. As a result of these start-up costs, government subsidies and payments for ecosystem services are seen as important elements to creating a sustainable production system that conserves forests and supports livelihoods <sup>[85]</sup>.

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# INTENSIFY CATTLE RANCHING

## Sustainable cattle intensification to free-up land

The 2006 agricultural census found that cattle ranching was Brazil's most extensive economic activity, occupying 172 m ha of land versus 77 m ha for agriculture <sup>[86]</sup>. With a herd of 74 m head <sup>[87]</sup>, and a density of 0.37 to 1.14 head/ha, the expansion of the beef production sector has largely been through land expansion especially in the Amazon and Cerrado biomes. Increasing the efficiency of cattle ranching would facilitate forest conservation by reducing the expansion process, while allowing increases in agricultural production <sup>[88]</sup> <sup>[89]</sup>.

## Costs

Data on the costs of sustainable cattle intensification are very limited. EMBRAPA research indicates that R\$ 1,135/ha (US\$ 624/ha) would be sufficient to both restore degraded pastures and divide them using electric fencing to allow cattle rotation, resulting in doubled productivity and a high return on investment <sup>[90]</sup>. Hence, the investment needed to release an average hectare of pasture to other uses is US\$ 624. So the investment needed to free-up 40 m ha for new cropland and forest plantations would be US\$ 24.96 billion over 20 years, or approximately **US\$ 1.25 billion** per year.

## Generation

As with finances for SFM, Brazil tends to generate finances for sustainable cattle intensification and degraded land restoration through Domestic Budget Allocation.

## Delivery

Two key mechanisms for delivering concessional loans to farmers are the Low Carbon Agriculture Programme (Programa ABC – Agricultura de Baixo Carbono) and PRONAF-Floresta. The 2011-2012 budget for the whole ABC programme is R\$ 3.15 bn (c. US\$ 1.8 bn). It provides loans of up to R\$ 1 m, at 5.5%/yr interest, with the aim of restoring degraded land. An example of the emerging trend towards Payment for Ecosystem Services (PES) for degraded land restoration is the PSA Carbono programme in Acre, which will increase small farmers' incomes by supporting land restoration, sustainable agrarian systems

and protection measures in six vulnerable areas <sup>[91]</sup>.

## Institutional Arrangements

Funds for concessional loans are normally managed by development banks such as Banco do Brasil and Banco da Amazonia.

## Challenges & Opportunities

Due to the higher investments required for implementing intensive systems and the low economic value of the activity, credit at low interest rates is key to sustainable cattle intensification. In addition, given that more intensive systems demand greater management, public policies that promote rural extension and training for cattle ranchers are important <sup>[92]</sup>. There are two main challenges to the use of concessional loans for improving cattle ranching practices: (i) there is a low demand for rural credit; and (ii) concessional loans are geared towards the promotion of land use change. The low demand for credit among ranchers has a number of causes, but the overall rationale is that cattle ranching generates such low profits that without strong incentives to improve land use, ranchers will continue to be averse to going into debt. In terms of the second challenge: rural credit policy is focused on growth in production rather than the optimisation of existing land for multiple goods and services. So if a change in land use is to be catalysed through concessional loans, it is crucial to change the vision of agricultural policy towards financing properties as a whole (rather than products), e.g. through 'integrated property loans'. Also, market demand for sustainable commodities must be generated through certification; working groups (e.g. the Brazilian Roundtable on Sustainable Livestock – GTPS, Grupo de Trabalho da Pecuaria Sustentavel) that promote compliance with the Forest Code and the creation of incentives for zero deforestation; and corporate disclosure activities backed by the finance sector, such as the Forest Footprint Disclosure (FFD) Project that encourage companies to understand and reduce their 'forest footprint' <sup>[93]</sup>.

## Incentives to reduce deforestation

Embrapa, the Brazilian Government Agricultural Research Agency, has developed a model (Good Practices for Beef Cattle) for moderate cattle intensification, that can double herd density through improved pasture management, enabling the cattle industry to grow while freeing up land which can be used for soya and reducing pressure for deforestation. If this is coupled with an agreement not to clear any additional forest, it offers win-win outcomes for ranch incomes and forest conservation. Outreach and training as well as financial support for the upfront costs, is needed for wide-scale implementation of improved pasture management methods. The Brazilian Roundtable on Sustainable Livestock is supporting this effort, which will be vital for Brazil to meet its GHG emissions reductions and cattle production targets. Source: GTPS.

Photo by National Wildlife Federation International Team, Creative Commons on Flickr

# RESTORE FORESTS

## Reforestation and Forest Restoration

The recent increase in reforestation in Brazil (Table 2) can be ascribed to a growing interest in this economic activity and an effort towards environmental regularisation in watersheds. However, there is still a very large area of private land that would need to be reforested in order to comply with the Forest Code (Table 3). In Mato Grosso, for example, where a large part of the recent agricultural expansion has taken place, the Legal Reserve deficit is about 9 m ha or 26% of the present area of agricultural land.

Table 2. Annual rate of reforestation in Brazil <sup>[94]</sup>.

YEAR	ANNUAL RATE OF REFORESTATION (HA/YEAR)
2002	320,000
2007	640,000
2011 (projection)	1,000,000
2015 (projection)	1,200,000

Table 3. Area of land, by Brazilian state, that would require reforestation in order to comply with the Forest Code <sup>[95]</sup>.

AMAZONIA	HECTARES	CERRADO	HECTARES
Rondônia	4,794,589	Bahia	242,079
Amapá	-	Goiás	2,611,730
Roraima	46,757	Distrito Federal	-
Amazonas	34,848	Maranhão	40,959
Acre	721,161	Mato Grosso do Sul	3,398,792
Pará	11,369,199	Minas Gerais	2,682,095
Mato Grosso	9,465,888	Piauí	-
		Tocantins	1,644,537
Total	26,432,442	Total	10,620,192

## Costs

The costs to restore forests vary widely based on the technique adopted. At one extreme, farmers would only need to isolate the area to be restored and allow natural regeneration to take its course. The cost of this option, including the fencing of the area and the clearance of invasive species (commonly pasture grass) is estimated at US\$ 1,623/ha. Alternatively, the farmer can adopt manual replanting aimed at developing a productive forest that can be sustainably managed. Upfront costs are very high, estimated at US\$ 5,700/ha. In the latter case, the farmer would receive economic returns, therefore improved access to credit and extension services should suffice to incentivize its adoption.

Here we assume that 9 m ha would be left for natural regeneration and 9 m ha would pursue restoration with economic benefits. As a result, the natural regeneration effort would cost **US\$ 730.4 million** per year and the planted restoration would require upfront financing of **US\$ 2.6 billion** per year over the next 20 years.

## Generation

Investment in reforestation activities is essentially generated from Domestic Budget Allocation and, to a lesser extent, from Carbon Markets such as the Clean Development Mechanism (CDM) for afforestation and reforestation (A/R) projects.

## Delivery

At least nine different concessional loan-based delivery mechanisms are currently in use in Brazil, including PRONAF-Florestal, BNDES Florestal, Programa FCO Rural and Programa ABC, amounting to several billion R\$ in funds available for both forest restoration and reforestation. Some of the investment capital for reforestation is also delivered through private equity funds (such as Fundo Vale Florestar led by Vale S.A.) <sup>[96]</sup>.

## Institutional Arrangements

As with other concessional loans, the funds are managed by development banks.

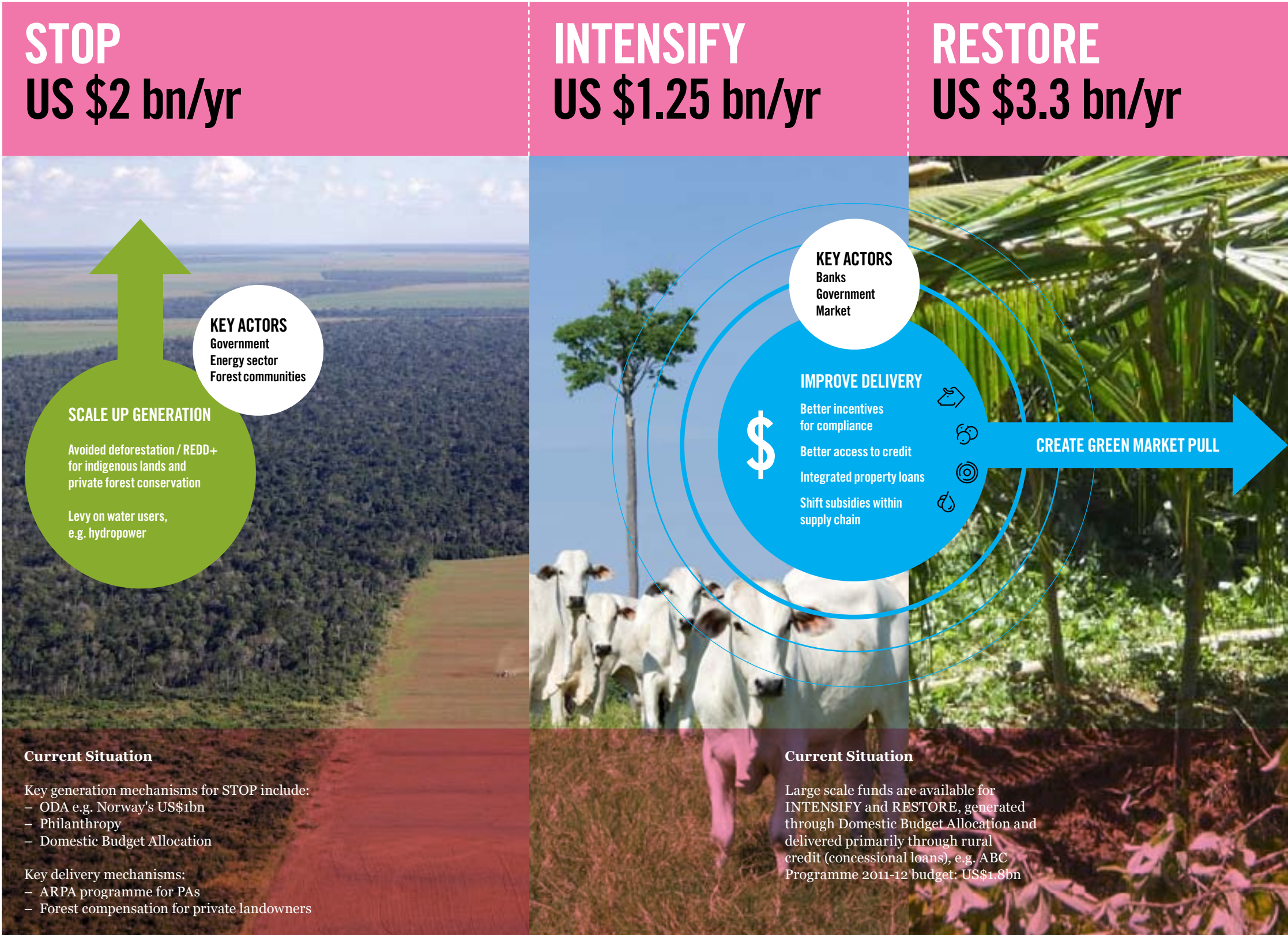
## Challenges and Opportunities

Tables 2 and 3 illustrate that there is a widespread need for reforestation and natural forest restoration, particularly in states at the forest frontier where land-use changes have led to a replacement of native forests with pastures and crops. From 2013, the EU Emissions Trading Scheme will only accept new carbon credits from Least Developed Countries (LDCs), excluding Brazil from selling A/R credits issued post-2012 into this market. This leaves concessional loans as currently the key delivery mechanism for restoration and reforestation. As seen with rural credit in general, while funds are available they are not necessarily being used to their full potential due to a lack of uptake. Nevertheless, the firm commitments towards reforestation and restoration made in Brazil’s National Plan for Climate Change (PNMC) indicate a potential opportunity if additional incentives such as PES, REDD+ and ‘environmental swaps’ can be created through new regulations.



# A POWER MAP FOR PING

Brazil has started to make the transition towards more sustainable land use and is investing in measures that will reduce deforestation while improving agricultural productivity. This transition needs to ‘power up’, by Generating and Delivering funds towards three key strategies across the landscape: Stopping deforestation, Intensifying cattle ranching and Restoring forests in sensitive areas and for economic uses. Although financing mechanisms alone will not be sufficient to catalyse the transition, they will play a vital role in combination with capacity-building law enforcement, land tenure reform and other governance and policy approaches.





# KEY OPPORTUNITIES AND CHALLENGES

A conflict could emerge between Brazil's aim of agricultural expansion and its climate commitments unless the former can be achieved without the burning and clearing of forests for land. There is scope for optimism since recent research suggests that enhanced prosperity in Brazil is more likely to be achieved through the expansion of 'green' economic activities with low environmental impacts<sup>[97]</sup>. This goes beyond carbon and payments for Reducing Emissions from Deforestation and forest Degradation (REDD). Based on the assessment of financing options currently in use in Brazil, this concluding section summarises the key challenges and opportunities for action in favour of Proactive Investment in Natural Capital (PINC).

## Use PES from hydropower to fund conservation

There is a need to raise additional finance for all three landscape strategies: Stop, Move and Restore. This is especially the case for Protected Areas and Indigenous Lands, which provide local, national and global benefits from the ecosystem services they deliver. With Brazil planning to invest heavily in hydropower in Amazonia, a comparatively small investment in the maintenance of conservation units – to help offset the US\$ 1.1 bn/yr conservation bill – might generate substantial financial savings to Brazil's energy sector through hydrological regulation and soil erosion control. Hence, an important action is the regulation of SNUC Articles 47 and 48 that permits the government to levy fees for water use by hydroelectric power stations.

## Support avoided deforestation in Indigenous Lands and private forests

Indigenous lands have been shown by Brazilian researchers to be very effective at reducing deforestation rates. With sufficient capacity-building and appropriate safeguards, another important opportunity is the use of carbon finances to support forest communities' and Indigenous Peoples' avoided deforestation schemes, such as the Suruí Carbon Project, in which communities with long-term management plans for their lands are compensated by investors in carbon. This could pave the way for future REDD+ activities over large areas once a new climate treaty is agreed within the UN Framework Convention on Climate Change (UNFCCC).

In addition to Indigenous Lands, private forest conservation actions by landowners who commit to zero deforestation could also be compensated through REDD+ schemes as is currently being trialled in several locations in Amazonia.

## Regulate the Forest Code with a financial instrument

The current debate in the Brazilian Congress over the revision of the Forest Code is symptomatic of the difficulty of reconciling environmental and economic development agendas. By linking access to rural credit to compliance with the Forest Code, the Government attempted to mainstream environmental criteria into agricultural development. This resulted in farmers' groups proposing a revision of the Forest Code to make it easier to comply. Hence, the result might be greater compliance to weaker regulations and an increase in 'legal' deforestation. Nevertheless, regulation of the Forest Code through the creation of mechanisms to generate financial incentives would encourage landowners to conserve a larger proportion of their property as Legal Reserve than required by law. This could include novel 'environmental swaps' in which landowners can trade excess forest areas on an Environmental Market Exchange. However, there is concern among some researchers that the current plan to allow swaps to occur among biomes would not be an effective means to protect sensitive areas such as riparian corridors in regions that are in Legal Reserve deficit.

## Transform rural credit and improve delivery

The Brazilian Government allocates significant finances to rural credit (Concessional Loans). However, the culture and capacity among landowners and development banks limits the uptake of these loans for activities such as sustainable cattle intensification and forest restoration. There are two key actions. First, development banks can improve their lending practices, making it easier for landowners to access rural credit for sustainable activities. As early as 1995, the Brazilian Government signed a 'green protocol' with official banks to promote environmentally friendly lending policies and these agreements were renewed in 2008 and 2009. Second, banks can offer loans for sustainable properties – so-called 'integrated property loans' – rather than the current focus on loans for production of individual goods

that contribute to unsustainable land management. This second measure requires a change in agricultural lending policy away from a productivity growth focus towards a sustainable land management focus. However, the inability of the World Trade Organisation to control the widespread use of agricultural subsidies in developed countries and the resulting depression in world food prices encourages emerging economies to produce competitively priced exports, potentially at the expense of sustainability criteria.

## Create 'green' market demand for Price Premium Commodities

A key mechanism to support sustainable cattle intensification and sustainable forest management is the greening of commodity supply chains. Support through investors and supply chain companies for the responsible sourcing and certification of beef (as well as leather products, soy and timber) through feasible and reliable certification schemes, cadastral registration, commodity tracking and other chain of custody measures is vital. An important set of actors is the financial sector, which through initiatives such as the GCP's Forest Footprint Disclosure Project is increasingly aware of 'forest risk commodities' such as beef, leather, soy, palm oil and timber. Uniquely, investors can apply economic pressure at the top of the supply chain, thereby generating a market pull towards 'greening' commodities.

## Reform and redirect subsidies

Brazil provided US\$ 2 bn in subsidised rural credit in 2009, with 99% aimed at agriculture and cattle ranching and 1% for forestry. There is scope for reversing this pattern. In addition, subsidised credit is focused at the bottom of the supply chain, where there is limited uptake by producers. One way to increase uptake among producers wishing to shift towards more sustainable practices would be to redirect some of the subsidies up the supply chain. If stringent accounting and transparency mechanisms were put in place, tax incentives or investment capital could be provided to industrial actors to then channel funds or provide price premiums to their suppliers (producers), based on the fulfilment of minimum sustainability criteria (e.g. legal and environmental compliance).

With its abundant natural capital and its growing financial capacity, Brazil is well placed to take a PINC approach – investing in a set of actions that maintain natural capital in order to ensure more secure water, food and energy supplies. This has to be twinned with the strengthening of human capital and productive capacity in forest-based and rural sectors – the heart of the green economy.

# GLOSSARY OF FINANCING MECHANISMS

## Generation

- **Domestic Budget Allocation**  
Funds generated from existing tax revenues and investment income of a forest country government.
- **Green taxes**  
Tax levied on the party damaging the forest, e.g. carbon tax or an ecological impact tax.
- **Subsidy reform**  
Redirecting subsidies towards activities that protect and restore the forest.
- **Markets**  
Finance from both cap-and-trade and baseline and credit systems, e.g. carbon markets.
- **Official Development Assistance (ODA)**  
Finance generated from domestic budget allocation of developed countries.
- **Philanthropy**  
Finance provided with no expectations of return by private individuals/organisations.
- **Price Premium Commodities**  
Finance from the sale of products with a sustainability price premium.

## Delivery

- **Tax Credit**  
A reduction in tax payable by the entity engaging in forest-friendly behaviour.
- **Concessional Loans**  
Loans with lower than market rates of interest for forest-friendly activities.
- **Payments for ecosystem services**  
Beneficiaries of a service pay the service providers for habitat conservation/restoration, such as REDD+ or payments for watershed services.
- **Subsidies**  
Government support to producers, e.g. through commodity price support.
- **Grant**  
Finance with no requirement of payback for forest-friendly activities.
- **Equity Investment**  
Finance in exchange for ownership in an enterprise or the ecosystem services.

## Institutional Arrangements

- **Conservation Trust Fund**  
An investment fund that is legally separate from the providers of finance.
- **Development Bank**  
A bank that provides finance for development purposes.
- **Environmental Market Exchange**  
A financial market exchange in which environmental property rights are traded.
- **Government**  
National or sub-national governmental departments or government-administered bodies.

These two annex tables highlight the key financing mechanisms currently in use across the three landscape strategies: Stop, Intensify and Restore.

**STOP** deforestation drivers such as logging and cattle ranching.

TYPE	NAME	DESCRIPTION
GENERATION MECHANISMS		
Domestic Budget Allocation	Ecological VAT (ICMS-E)	0.5-2.5% of State VAT (ICMS) revenues are allocated to the ICMS-Ecológico, which is used to compensate municipalities for tax income lost through the designation of standing forests as protected areas, including indigenous reserves. R\$417 m generated in 2009.
	Green FPE (State Participation Fund)	The federal government deposits 21.5% each of income tax (IR) and industrial products tax (IPI) in the 'state participation fund' (FPE). States with protected areas would be compensated via a 2% share of the FPE.
Green Tax	Environmental Compensation Fund	The Fundo de Compensação Ambiental is a levy on companies whose projects have a significant environment impact, used to fund conservation.
Philanthropy	Ecological Income Tax	Under this proposal, income tax liability could be offset against donations to environmental projects, creating an incentive for philanthropy.
	Petrobras donations	State-owned oil company Petrobras donated \$4.2 m for Amazon conservation in 2011. The funds will be used to reduce emissions from deforestation in Amazonia, via Amazon Fund-supported projects.
Carbon Markets (Baseline-and-Credit)	Juma Reserve REDD+ project, Amazonas	Companies such as Bradesco bank and Marriot buy carbon credits.
	Surui Carbon Project, Rondonia	The project is being implemented and has been yielding emissions reductions since 2009, with a projected total future carbon benefit of 6 m tonnes of CO2 equivalent
Carbon Markets (Domestic Cap-and-Trade)	Bolsa Verde (BVRio)	When established, the BVRio will include trading of emission allowances and offsetting credits, which could include offsets from forestry activities. In addition, the Forest Code allows for trading areas of Reserva Legal (RL), which could also be traded on the BVRio exchange/trade market.
Carbon Markets (International Cap-and-Trade)	California Emissions Trading Scheme	California's cap-and-trade scheme has a potential of 8-32 m tonnes of CO2 per year. Despite the new limitations on international offsetting, it could still be possible for a sector of a given region in Brazil (e.g. the Legal Amazon or Amazonian states separately) to be eligible for carbon offsetting, for instance through forest conservation/REDD credits.
Carbon Markets (Baseline-and-Credit)	Clean Development Mechanism (CDM)	Only Least Developed Countries (LDCs) are eligible for use as a compliance offset within the EU ETS from 2013. Since the EU ETS is by far the largest CDM credits market (CERs) in the world, this will limit the ability of Brazilian projects set up after 2012 to sell CDM credits.
Overseas Development Assistance	Bilateral REDD Readiness agreements	Donations from Norway's sovereign wealth fund (\$1 bn committed) and Germany's development bank (EU21 m committed). Brazil's national government has committed to reducing deforestation and provides (non-fungible) emissions reductions certificates to donors. Funds are used for a range of activities, e.g. capacity-building and setting up and protecting conservation areas via ARPA (Amazon Region Protected Areas programme).
DELIVERY		
Grants	ARPA (Amazon Region Protected Area)	Linked Accounts (Contas Vinculadas) provide easy access to finance the implementation of PA annual plans. ARPA is a particularly successful approach to delivering finance for conservation areas. Emissions avoided by ARPA PAs = 1.4±0.47 bn tonnes C by 2050.
INSTITUTIONAL ARRANGEMENTS		
Endowment Fund	FAP (FUNBIO) for ARPA	The Fundo de Áreas Protegidas (FAP) provides funds for long-term maintenance of PAs. In addition, a Transition Fund is being designed.

**INTENSIFY** cattle ranching and **RESTORE** forests in degraded areas, both for ecological and economic purposes.

TYPE	NAME	DESCRIPTION
GENERATION MECHANISMS		
Domestic Budget Allocation	BNDES and the bank sector (public and private)	The bulk of funds for Intensify and Restore are provided through concessional loans, generated by domestic budget allocation.
Carbon markets (baseline-and-credit)	REDD+ credits (voluntary international market)	<i>Please see STOP table above</i>
	Clean Development Mechanism – Afforestation and Reforestation (A/R)	<i>Please see STOP table above</i>
DELIVERY		
Concessional Loans	ABC Programme – GHG Emissions reduction in Agriculture	Loans for agriculture producers that engage in restoration of degraded areas, agroforestry, silviculture (including palm oil) and SFM.
	BNDES Compensação Florestal	Loans for agri-business below RL limit to purchase properties with forest reserve in excess of RL.
	BNDES Environmental Investments	Loans for public and private companies for the restoration of forests, CDM, water efficiency, restoration of contaminated land.
	BNDES Florestal	Loans for conservation in PAs, SFM, silviculture for energy and restoration of forests.
	FNE Verde	SFM, reforestation for energy timber uses, ILF, restoration of degraded land, machinery and equipment, integrated rural-industrial projects; market promotion
	FNE Pro-Environmental Restoration	Reforestation, agroforestry and regularization of degraded RL and APPs.
	FNO Biodiversidade – Sustainable businesses	Loans to communities, rural producers, agribusiness and associated cooperatives for forest management, agroforestry and silviculture or restoration of forests.
	Programa FCO Rural - Linha de Financiamento de Sistemas de Integração Lavoura-Pecuária	Loans for the agribusiness sector in the Centro-Oeste region for integrating agricultural and cattle production.
	Programa FCO Rural - Pronatureza	Loans to forest producers and its associations and cooperatives for SFM, restoration of forests and reforestation and silviculture.
	PRONAF ECO	Loans to small households for silviculture (for timber and NTFP purposes), soil conservation and renewable energy from biomass. (Total Pronaf funds available for agro-environmental credit in 2010-2011 <sup>[98]</sup> : US\$1bn.)
	PRONAF-Floresta for reforestation and restoration	Loans for agricultural families in agroforestry, extractivism and restoration of degraded lands and forests



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