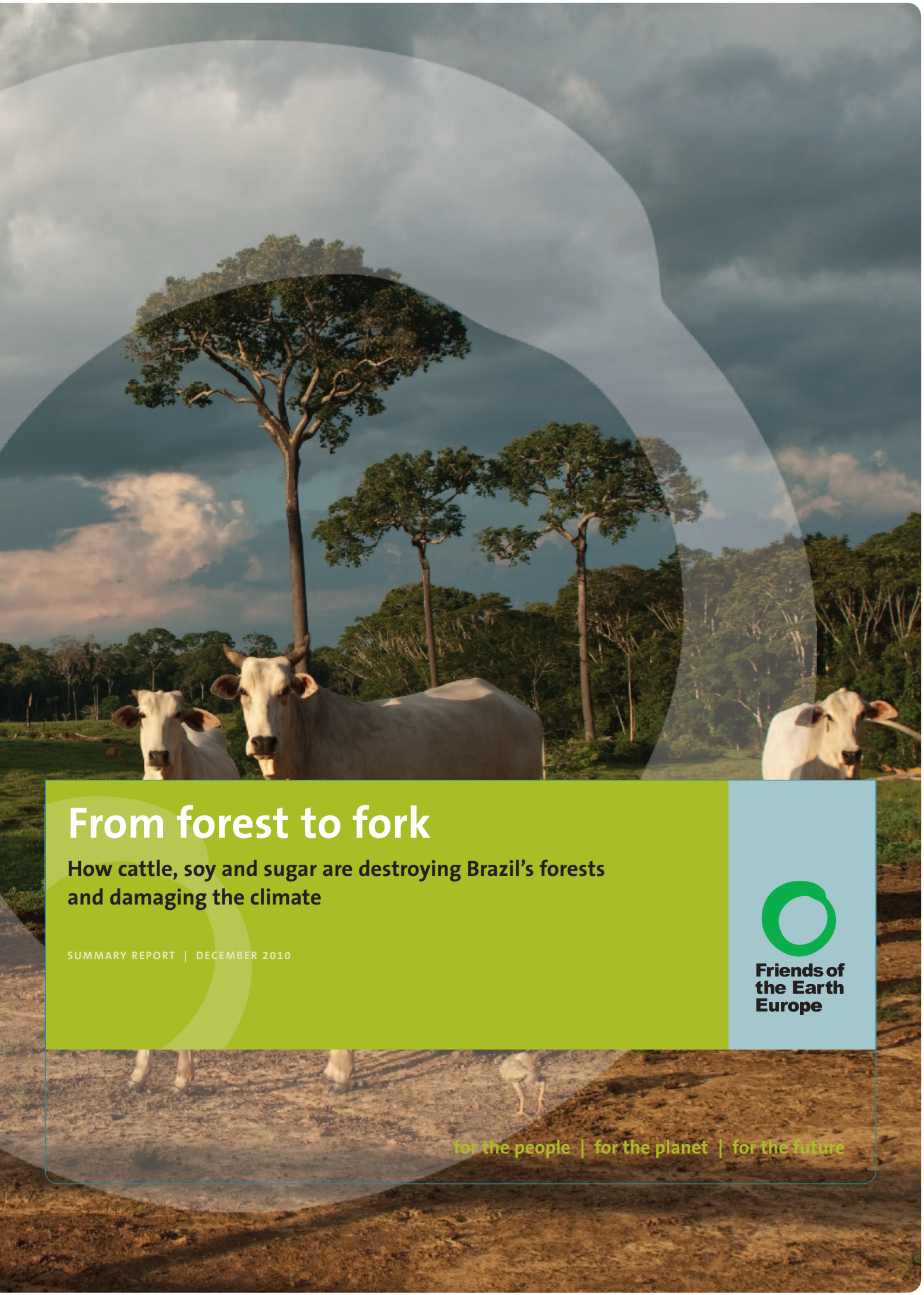

From forest to fork

How cattle, soy and sugar are destroying Brazil's forests and damaging the climate

SUMMARY REPORT | DECEMBER 2010

Friends of the Earth Europe

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Friends of the Earth Europe

Friends of the Earth Europe campaigns for sustainable and just societies and for the protection of the environment, unites more than 30 national organisations with thousands of local groups and is part of the world's largest grassroots environmental network, Friends of the Earth International.

This publication has been produced as part of the project Feeding and Fuelling Europe, with the financial assistance of the European Commission. The contents of this publication are the sole responsibility of Friends of the Earth Europe and Friends of the Earth Hungary and can under no circumstances be regarded as reflecting the position of the European Commission.

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Publishing date: December 2010

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Cover image:
© istock/brasil2

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From forest to fork

1. Key findings

- Brazil has some of the most unique wildlife on earth. But rapid expansion in large scale agriculture to fuel its economic growth means that Brazil is also the world's fourth largest emitter of climate-warming greenhouse gases (GHGs), mostly due to the burning of its forests and savannahs for agriculture.
- Agriculture and the deforestation caused by it are the major source (75%) of Brazil's greenhouse gas emissions.
- Soy, mainly for animal feed and biodiesel, and cattle ranching for beef, have historically alternated as the main drivers of deforestation in Brazil depending on the profitability of each at the time. Recently, the sugarcane sector has also started to expand rapidly, mainly for ethanol production to produce biofuels.
- Currently, soy is displacing cattle ranching, and sugarcane is displacing both soy and cattle ranching, creating a complex mix of drivers for deforestation. Soy farming and cattle ranching are being pushed into the forest frontiers.
- The combined expansion of soy, cattle ranching and sugarcane are thus placing huge pressures on the Midwest and Northern regions of the country – where the highly biodiverse Amazon and Cerrado habitats are located.
- Production of soy, sugarcane and cattle ranching already uses about 203 million hectares of land area in Brazil – 77% of Brazil's agricultural land.
- Soy production alone is predicted to expand by 5 million hectares by 2020, to 26.85 million hectares – the area of New Zealand. Sugarcane production is expected to expand by 25% by 2020 and cattle production is also predicted to expand by 25%, placing additional pressure on forests, ecosystems and livelihoods in Brazil.
- Cattle-ranching is already responsible for about half of Brazil's greenhouse gas emissions including large amounts of methane, due to the high numbers of cattle.
- Deforestation and emissions from soy and sugarcane are also connected to the production techniques currently used – high application of fertilizers and pesticides, burning of residues and single crop plantations.
- Family agriculture in Brazil is responsible for the majority of food production, and employs about 80% of the rural workforce, but it is under threat from large-scale industrial agriculture such as soy, sugarcane and cattle-ranching. In 2006 family agriculture occupied just a quarter of the agricultural land area.
- Europe is one of the biggest importers of Brazilian soy, the largest importer of ethanol and in the top four importers of beef from Brazil. European imports of soy, beef and ethanol are a driver of deforestation and emissions, and have destructive social impacts in Brazil.

Friends of the Earth calls for:

- Urgent measures in the European Union, including through current reform of European farming policy, to reduce Europe's dependence on imported animal feed and meat.
- Immediate abandonment of any volume targets for the use of biofuels in transport in the European Union.
- Support for the strengthening of land rights and land tenure for small farmers and indigenous peoples in Brazil.
- No weakening of existing forest laws in Brazil, and international support for better implementation of existing forest laws.
- Rejection of all schemes that allow rich countries to exchange domestic climate emission reduction measures for funding for forest conservation in developing countries.
- Rejection of trading in carbon credits from forests, including through Reducing Emissions from Deforestation in Developing Countries (REDD) schemes, with an immediate start on tackling the drivers of forest loss instead.
- Shifting international funding towards community-based forest governance measures and support for the development of agro-ecological farming systems in Brazil.

Burning forest in the Amazon due to the expansion of cattle ranches and soy cultivation, Brazil.

From forest to fork

2. Brazil's economy and environment are dominated by agriculture

Brazil's economy is overwhelmingly dominated by agriculture, which has a direct bearing on Brazil's forests and biodiversity, as well as the country's greenhouse gas emissions. Vast swathes of forest are cut as a result of cattle ranching and to plant soy and sugarcane.

Forests help to regulate the local and regional climate, triggering rainfall and keeping temperatures down. Intact forests and forest soils also absorb carbon from the atmosphere, acting as a 'carbon sink'. The vast Amazon forest is also an integral component of the planet's global climate regulation system. However, because of the impacts of agriculture, and climate change, the continued existence of the Amazon is in doubt. Deforestation is a major contributor to climate change: globally, deforestation accounts for some 18% of annual anthropogenic greenhouse gas emissions (IPCC, 2007).

The production of all three commodities already uses about 203 million hectares[1] (77%) of Brazil's agricultural land (CONAB, 2010) (FAO, 2010c) and all three sectors are expanding, partly because of increasing demand for exports (CONAB, 2010b) (FAO, 2010b). As a result there was a sharp increase in greenhouse gas emissions from Brazilian agriculture between 1994 and 2007 and this looks set to continue (MMA, 2009).

- Brazil is the largest exporter of coffee, sugar, ethanol, tobacco, soybeans, and orange juice, and a major producer and exporter of beef, maize, chicken meat, pig meat, pulp (for paper production) and tobacco (WTO, 2009).
- In 2007, Brazil's agriculture exports totalled US$48.2 billion, equal to 30% of its total exports (WTO, 2009).
- Brazil is the world's fourth highest emitter of CO_2, with 75% of these emissions down to industrial agriculture and 'changing land use' (which includes deforestation) (Empraba & Unicamp, 2008:21). This contrasts sharply with the global scenario, in which the supply and production of energy and industrial activities are the chief sources of greenhouse gases.
- Farming activities, excluding deforestation and burning to clear land, correspond to 22% of all Brazil's GHG emissions (MCT, 2009).
- Europe is a major trading partner of Brazil. It is one of the largest importers of Brazilian soy, the largest importer of Brazilian ethanol and in the top four importers of Brazilian beef (USDA, 2010).

Most of the growth in the area of land used for farming in Brazil from 1996 onwards can be attributed to soy (Brugnaro & Bacha, 2009) which currently occupies 23 million hectares of land in Brazil (CONAB, 2010b). In 2009 exports of soy beans, soy meal and soy oil constituted 11.3% of Brazil's total exports and more than 27% of its agricultural exports (Schlesinger, 2006). Brazil is also home to one of the world's largest herds of cattle, and is the world's main exporter of beef and veal (MAPA, 2010). Brazil's cattle herd occupied 172 million hectares in 2006 (IBGE, 2006 / 2009).

The Brazilian government is also firmly committed to supplying the growing foreign market for Brazilian ethanol, which is produced from sugar cane. It is already the world's largest producer of sugarcane; and sugarcane is currently the third largest crop in Brazil, with the 2010/11 harvest estimated at 8 million hectares (CONAB, 2010).

Each of the three agricultural commodities considered in this briefing contributes directly to deforestation and to Brazil's emissions of greenhouse gases (including carbon dioxide, nitrous oxide and methane) as a result of the characteristics and production techniques peculiar to each commodity. Expanding sugar and soy production also contribute indirectly to deforestation, by displacing cattle ranching to the forest frontier.

Table 1. Percentage growth of production and exports from 2008/09 to 2019/20

Sector	Production	Exports
Beef	27	83
Soy	44	37
Chicken meat	44	72
Swine meat	24	37
Sugar	48	52
Ethanol	127	223

Source: *MAPA (2010).*

1 This figure based on best available data for area occupied by cattle ranching in 2006, soy in 2009/10 harvest and sugarcane for 2010/11 harvest.

3. Beef expansion drives emissions

Cattle-ranching contributes to greenhouse gas emissions through deforestation, the burning of plant cover to form pastures, and livestock breeding (which generates two potent greenhouse gases, methane from the enteric process taking place in the rumen of cattle, and nitrous oxide from manure and animal waste management systems).

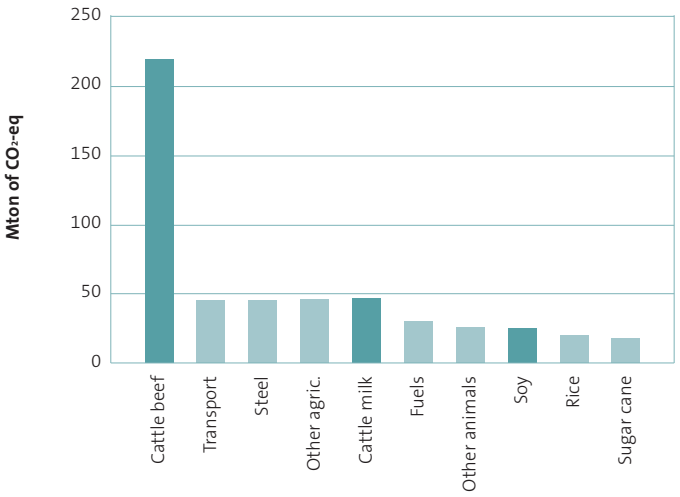
- Combining the emissions produced by deforestation, the burning of plant cover to form pastures, and livestock breeding, the total emissions produced by beef cattle ranching between 2003 and 2008 corresponds to an average of 1.1 Gton of CO_2-eq per year in round figures. This represents around half of Brazil's total GHG emissions (Bustamante *et al*, 2009).
- Deforestation for cattle ranching and pasture burning in the Amazon and Cerrado alone is responsible for over one third of Brazil's total emissions (Bustamante *et al*, 2009).

Brazil's largest cattle herds are in the states of Mato Grosso, Minas Gerais and Mato Grosso do Sul, which cover the Amazon, Pantanal and Cerrado habitats. Cattle-ranching is shifting, from the Southeast (especially São Paulo state) to the North and Midwest (IBGE, 2009c).

Overall, 80% of the growth reported between 1990 and 2006 took place in Legal Amazonia,[2] which has 36% of the total national herd. However Pará, in the Northern part of the Amazon, will soon have the largest beef cattle herd in the country (Arcadis-Tetraplan, 2006).

High prices and demand for beef are expected to intensify the ongoing expansion of cattle ranching in Brazil (Meat Market Monitor, 2010). Brazil expects beef production to have jumped 25% by 2020, to around 10 million tons. It also expects to export more than 3 million tons of beef, equivalent to 43% of the entire world trade (MAPA, 2010).

Figure 1. Emissions from main economic activities in Brazil excluding deforestation



Source: *Schlesinger (2010) based on Zen et al.*

Recently cut and burned rainforest turned into a cattle ranch in the Brazilian Amazon, where cattle ranching is the biggest cause of deforestation.

2 The concept of Legal Amazônia is used to define the boundaries of the Brazilian Amazon region. For administrative and planning purposes it comprises nine states: Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, as well as part of Tocantins and Maranhão. www.brazilink.org/tiki-download_file.php?fileId=200

From forest to fork

4. Soy, deforestation and climate change

Soy is Brazilian agribusiness's main product, and occupies more land than any other crop. Forest is frequently cleared for soybean fields, and soy farming sometimes displaces cattle-ranching pushing it towards forest frontiers (SEMA-MT, 2009).

Soy is also a significant direct source of greenhouse gases because it involves techniques that disturb the soil, increasing carbon loss and the activity of methane-producing micro-organisms. It also involves the use of nitrogen-based fertiliser, which contributes to the emission of nitrogen oxides, also significant greenhouse gases.

- Soy-farming activities, excluding deforestation, are responsible for around 22.7 Mton of CO_2-eq per year (based on Soares *et al,* 2009).
- Satellite images show that between 2001 and 2004, 540,000 hectares of forest and 939,600 hectares of grasslands were converted directly to soy fields (Morton *et al*, 2006).
- Production in 2010 is expected to be 10.4 million tons more than 2008/09, representing a remarkable growth rate of 18% (CONAB, 2010). Global soybean output is reported to have risen by 38% in Latin America in just one season (FAO, 2010b:29).
- By 2020 soy will cover an area of 26.85 million hectares, equivalent to the area of New Zealand.

By 2020 Brazil plans to have increased production by 25 million tons (compared with the 2008/09 harvest) reaching 82 million tons (MAPA, 2010). This represents an increase of 44%. Exports are also expected to grow to around 41% of world trade. Thus a large share of the growth in soy will be to meet export demand (MAPA, 2010).

Clearcutting for agriculture in Pantanal (Mato Grosso do Sul, Brazil).

5. Sugar cane production expanding

Brazil is the world's largest exporter of sugar and derivatives such as ethanol, and production is increasing rapidly, to supply both domestic and international demand for ethanol (WTO, 2009).

However, sugar cane farming is a direct source of greenhouse gases. One reason for this is the annual burning of cane fields, a habitual procedure in most areas where the crop is cultivated. This is done to facilitate harvesting (thereby keeping costs down) (Szmrecsányi 2008).

- It is estimated that total emissions from sugar cane are 21.776 Mton of CO_2-eq per year (Soares *et al* 2009).
- Brazilian sugar cane production jumped by 25.6% over just two years, between 2007 and 2009 (Schlesinger, 2010).
- Brazilian ethanol production also increased by 26.5% between the 2007/8 harvest and the (predicted results of the) 2010/11 harvest (CONAB, 2008, 2009 and 2010).
- If the 2010/11 harvest is as estimated, there will be a further increase of 9.2% in the cultivated surface area (CONAB, 2010).

Around 90% of the 2010/11 harvest will be produced in the Midsouth region and the remaining 10% in the North and Northeast regions. São Paulo state makes the largest contribution to sugar cane production (expected to be around 55% for the 2010/11 harvest).

São Paulo also shows the largest area of expansion in sugar production for this year (around 40% of the total nationally) (CONAB, 2010). By 2019/20 the area planted with sugar cane in São Paulo state is expected to increase by a further 46%, reaching 6.8 million hectares in 2019/20. Sugar cane is also expanding at high rates in states not traditionally associated with the crop, including Paraná, Mato Grosso, Minas Gerais and Goiás (MAPA, 2010).

Rapid expansion is leading to spiralling land values and a shortage of available suitable land. Much of this rapid expansion is expected to occur in the Midwest, home to the Cerrado, the most biodiverse savanna in the world: the area covered by sugar cane in the Cerrado is predicted to increase by 365% by 2035 (CONAB, 2008).

Studies show that sugar cane is also expanding into previously uncultivated areas, particularly in the Cerrado and Pantanal (Zuurbier and Vooren, 2008).

Brazil expects sugar and ethanol to be the most dynamic products in Brazilian agribusiness over the next ten years (boosted both by domestic consumption and exports). Production of sugar cane is expected to be 56% higher than the 2008/09 harvest. The forecasts for ethanol reflect substantial growth as well, with the predicted production more than doubling by 2019/20 (MAPA, 2010).

6. Expansion in any of the three sectors has impacts on the others

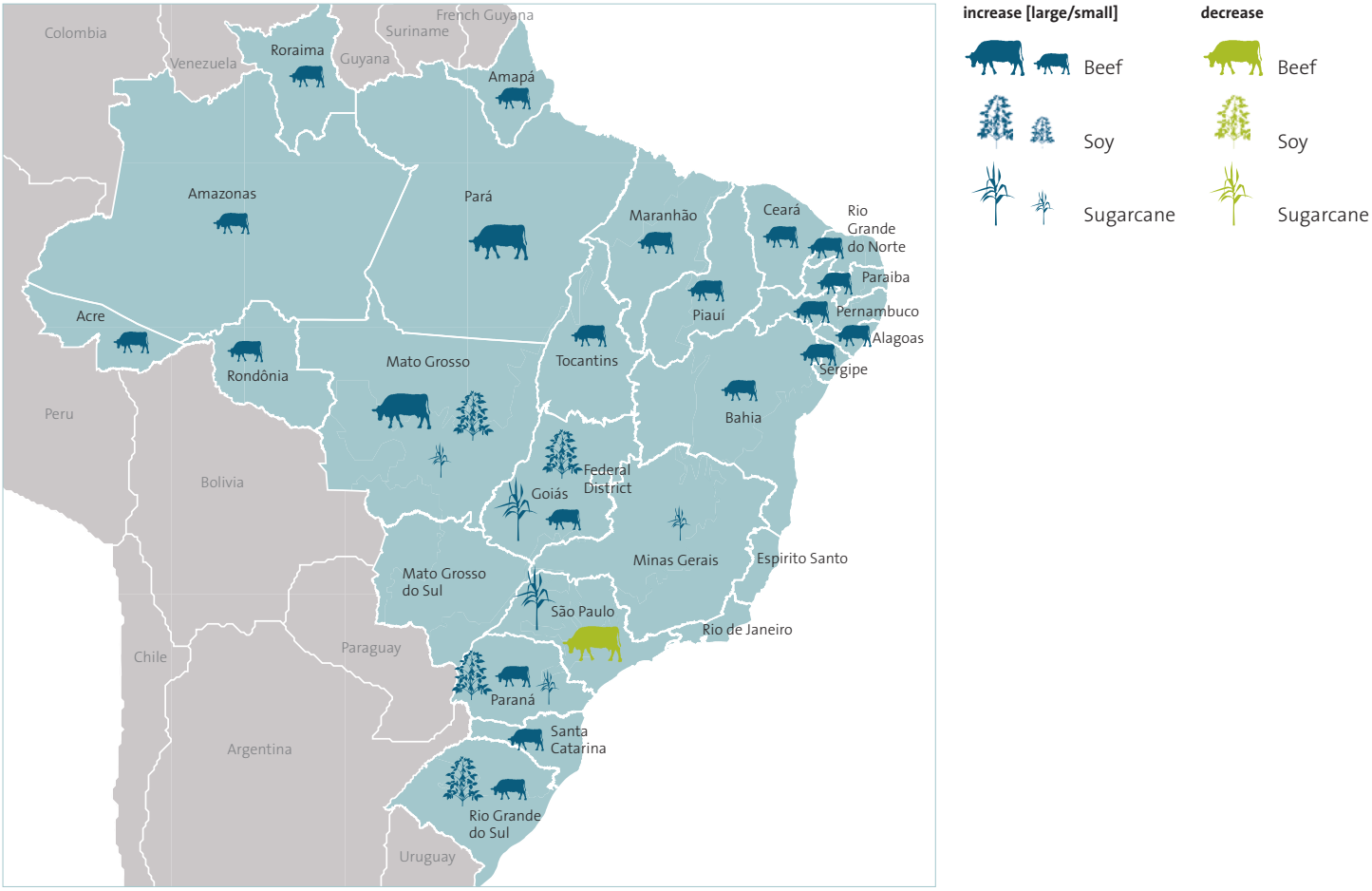
Cattle ranching and soy alternating culprits in the Amazon, Cerrado and Pantanal biomes

Cattle ranching and soy production have been the largest factors behind deforestation and vegetation burning, which occur mostly in the Amazon and Cerrado biomes, and also in the Pantanal. The two have been alternating as the main cause of deforestation, depending on the varying profitability of each sector at different times (Empraba, 2008) (SEMA-MT, 2009). In 2003, for example, when the price of soy on the international market hit its peak, direct conversion to soy production accounted for almost a quarter of the entire area deforested in Mato Grosso, the region where most of the destruction of the Amazonian Rainforest has taken place (Morton *et al.*, 2006).

In some areas, such as Mato Grosso, cattle pasture areas are also being converted into crop fields, pushing cattle-ranching to new frontiers, which leads to further deforestation (SEMA-MT, 2009).

Map 1. Key areas of beef, soy and sugarcane in Brazil

All three sectors are present in almost all Brazilian States, this map shows significant increases and decreases in production



Source: *Schlesinger (2010) based on CONAB (2010).*

From forest to fork

The expansion of sugar cane is pushing cattle and soy production into forest areas

The expansion of sugar cane is partly responsible for the growing presence of cattle and other crops in Amazonia, since these activities have been displaced from other regions in recent years.

This is particularly the case in the state of São Paulo, in Brazil's Southeast region. Studies have found that in the Midsouth region and in São Paulo, most of the growth in sugar cane had been in areas previously occupied by cattle. In the southern central region, 60% per cent of the expansion of sugar production has been on land previously used for grazing cattle (Zuurbier & Vooren, 2008). The cattle ranchers are moving on to regions where land is cheaper and where sugar cane, like soy, has yet to arrive (both are more profitable than cattle ranching) (Cogo, 2007).

Marcelo de Carvalho Dias, owner of the Cia. do Sal, an animal feed company, and a cattle rancher in Barretos explains that with the high cost of land in São Paulo, "cattle are going to head northwards, the pressure to clear pasture up there is going to be ever greater. The ranchers are tending to lease land to sugar cane here in São Paulo and then take the money to breed cattle in Amazonia." (Source: Schlesinger, 2010)

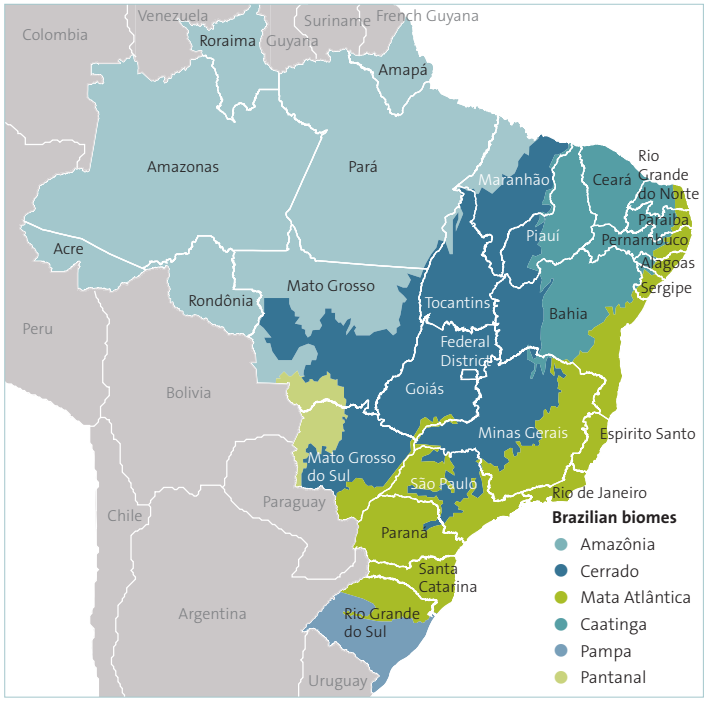
On the other hand in the state of Goiás, in the Cerrado biome, sugar cane cultivation is mainly replacing soy. With the opening of new processing plants, the ethanol industry in the state is expanding more quickly than in the rest of the country (CONAB, 2008).

Expansion of all three sectors will be felt most in Brazil's Midwest and Northern regions

Overall the simultaneous expansion of the three sectors will be felt most in the following areas (Schlesinger, 2009):

- The Midwest region, which has the largest beef cattle herd and the largest planted area of soy, both of which are expanding into areas of the Cerrado and Amazonian Rainforest. Sugar cane is also expanding into areas of the Cerrado.
- The Northern region, in particular the states of Pará and Rondônia covering the Amazon rainforest, where the areas occupied by beef cattle and soy are growing simultaneously. Another focal point is Tocantins state (again covering the Cerrado biome), which possesses the third largest beef cattle herd and the largest area planted with soy in the region.

Map 2. Brazilian biomes



Sources: *Wikipedia, MMA (2007).*

Brazil's Biomes Brazil is the world's most biodiverse country. It is thought to have more than 56,000 species of plants, 1,700 species of birds, 695 amphibians, 578 mammals, and 651 reptiles (Mongabay, 2010). The biomes considered in this report – the Amazon, the Cerrado, and the Pantanal wetlands, are all extremely biodiverse regions that are being impacted by agriculture.

The Amazon rainforest is the largest forest in the world, and incorporates the states of Amazonas, Pará, Rondonia and the northern part of Mato Grosso. The Amazon Biome is the largest body of rainforest on the planet, and is a vital component in the fight to prevent runaway climate change since it helps to regulate the global climate.

The neighbouring Cerrado savannah is often overlooked, but it is another extremely important ecosystem incorporating wooded areas and exceptional biodiversity. It includes the southern part of Matto Grosso, most of Mato Grosso do Sul, Goiás, Tocantins, and parts of Maranhão, Piauí, Bahia, Minas Gerais, and Saõ Paulo states.

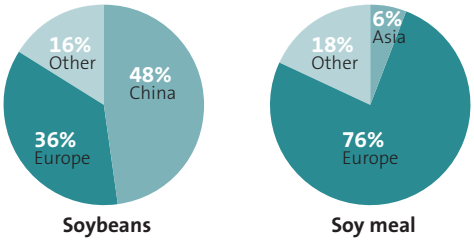
The Pantanal wetland is located in Mato Grosso and Mato Grosso do Sul. The Pantanal Biome is the world's largest freshwater wetland. It is also one of the world's most biodiverse ecosystems but is threatened by agricultural and industrial development, and climate change (Earth Observatory, 2005).

7. Europe's consumption of beef, soy and biofuels drives deforestation and climate change

The European Union is a major importer of Brazil's agricultural commodities—including soy for animal feed, beef, and ethanol and biodiesel for fuel. In total, the EU countries account for 34% of Brazil's agricultural exports (WTO, 2009b:215).

Europe, along with China, is the largest buyer of soybeans from Brazil. On the other hand, when it comes to soy meal, China buys relatively low quantities and it is the European Union that is the largest importer, in particular the Netherlands, France and Germany (Lovatelli, 2009) (USDA, 2009). Soy is mainly used use for animal feed (for cows, pigs and poultry), but also in processed foods such as margarine, and to produce biodiesel (Steinfield *et al,* 2006).

Figure 2. Soy consumption globally



Source: *Schlesinger (2010).*

Currently Europe's imports of soy are mainly for meal and it imports about a third of Brazil's harvest (MVO, 2009) (Profundo, 2008). However European imports of soy oil for biofuel from Latin America are also expected to increase significantly over the next few years, although mainly from Argentina (USDA 2009) (MVO, 2009).

The EU is the world's second largest consumer of beef and veal products, buying over 8 million tons in 2009. This equates to 14.3% of world production (USDA, 2010). The EU is also the third largest importer of Brazilian beef, after Russia and China. The UK is particularly keen on Brazilian beef, and is the world's fifth largest importer (ABIEC, 2009).

The EU is less concerned with imports of Brazilian sugar however, since it produces large quantities of sugar itself. Nevertheless, it is the largest importer of Brazilian ethanol, which is produced from Brazilian sugar. In 2009 the EU imported 26.5% of Brazil's ethanol exports (MAPA, 2009).

8. The social impacts of rapid expansion in beef, soy and sugar sectors

Destroying rural livelihoods

In addition to their impact on the environment, the beef, soy and sugar sectors have also had significant impacts on Brazil's rural population, especially on family farmers on small and medium-sized farms. Problems include the loss of small farms, diminishing production of food for domestic consumption, threats to the population's food security, and unemployment.

In Brazil 85% of farm establishments are family-based, but they occupy just 24.3% of the area occupied by Brazilian farms as a whole (IGBE, 2009b). However family agriculture is recorded as providing work for 13 million people - around 80% of the total rural workforce (IGBE, 2009b). That employment is threatened by the further expansion of cattle ranching and industrial agriculture.

Small farmers find it particularly difficult to keep up with technological innovations. Faced with this situation, two options remain: either rent neighbouring lands as a way of expanding the area under cultivation, or sell the landholding. This latter strategy allows small producers to purchase larger areas in more distant regions.

Undermining food security

In various regions of Brazil, soy and sugarcane expansion also threatens food security, since cultivation has prompted a decline in the cultivation of other foods important to the local diet, including beans, coffee, maize and certain fruits, such as oranges.

For example declines in staple food production well above the state, regional and national averages, occurred over the same period in which soy plantations expanded, in various municipalities in the state of Pará in Amazonia (Schlesinger & Noronha, 2006).

In 2006 family farming in Brazil was responsible for 87% of the national production of manioc, 70% of beans, 46% of maize, 38% of coffee, 34% of rice, 58% of milk, 59% of swine, 50% of poultry, 30% of beef and 21% of wheat. The crop with least involvement from family farming is soy (16%) (INCRA, 2009).

Spraying of crops.

From forest to fork

Land Prices

Another concern is the rapid increase in the value of land close to areas where large monocrops are expanding. The newspaper O Globo reported that the average rise in land values in Brazil, from July 2006 to June 2007, was 11.64% (O Globo, 2007). The regions showing the highest price rises were precisely those where sugar cane had expanded most. In Araraquara, located in the interior of São Paulo state, land prices even rose by 70% (Folha de São Paulo, 2008).

The value of land in Brazil also impedes moves towards land reform. The struggle for redistribution and re-appropriation of land for small farmers and indigenous communities remains an ongoing struggle in Brazil. They are demanding access to resources and opportunities for livelihoods and development through agrarian reform that was initially promised by President Lula but has been difficult to implement in part due to the rise of large scale industrial agriculture (MST, 2010).

Health

The fact that much of Brazil's soy is now genetically modified is also leading to serious health impacts for neighbouring communities. Recent data shows that the use of pesticides in Brazil has increased by nearly 80% between 2000 and 2005 (FoEI, 2008b), mainly due to weeds developing resistance to the herbicide glyphosate, which is used most widely along with GM soy in Brazil (Cerdeira *et al*, 2007). Researchers have found that glyphosate causes malformations in frog and chicken embryos and damage to human cells at doses far lower than those used in agricultural spraying (Carrasco, 2010) (Seralini, 2009).

9. Conclusions

Unless the underlying drivers of deforestation in Brazil are addressed there is little hope for protecting biodiversity or fighting climate change through maintaining forest carbon stocks. Governments are currently failing to tackle rapidly increasing global demand for meat and dairy products, which is causing an expansion in the production of animal feed crops like soy, and cattle ranching.

Climate policies which create additional demand for agricultural land, such as the use of biofuels produced from sugarcane and soy, are also exacerbating climate emissions by driving deforestation. Therefore any policies to tackle loss of forests and grasslands must include reduction in demand for these agricultural commodities.

As one of Brazil's largest agricultural trading partners, Europe must therefore play an essential role in reducing its demand for imported animal feed, bio diesel, meat and ethanol from Brazil.

Deforestation and emissions from soy and sugarcane are also connected to the production techniques currently used – high application of fertilizers and pesticides, burning of residues and single crop plantations. Moreover, industrial agriculture, while providing income for some parts of the Brazilian economy, is also causing large scale loss of livelihoods and loss of land tenure.

There is hope for Brazil's wildlife and people. It requires that current laws on protecting forests are maintained; and policies to reduce demand, and to change production systems, must be impemented, with a focus on funding and supporting community conservation of forests, and developing ecological farming systems and agro-forestry.

Sugar cane worker in Brazil after burning crop before harvest.

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