

Macro effects in Brazil

The impacts of agroenergy crops in four areas of the country



Support



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1) Introduction

This study examines macroeffects on biofuel production in Brazil – including those already existing and those identified after specific case studies – as well as the role played by civil society organisations in monitoring or mitigating them.

Since President Lula's inauguration in 2003, biofuel production took on a new status in Brazil, having become once again a priority for energy policies, as it had been in the 1970s and part of the 1980s, when military governments encouraged production and mandated addition of alcohol to gasoline.

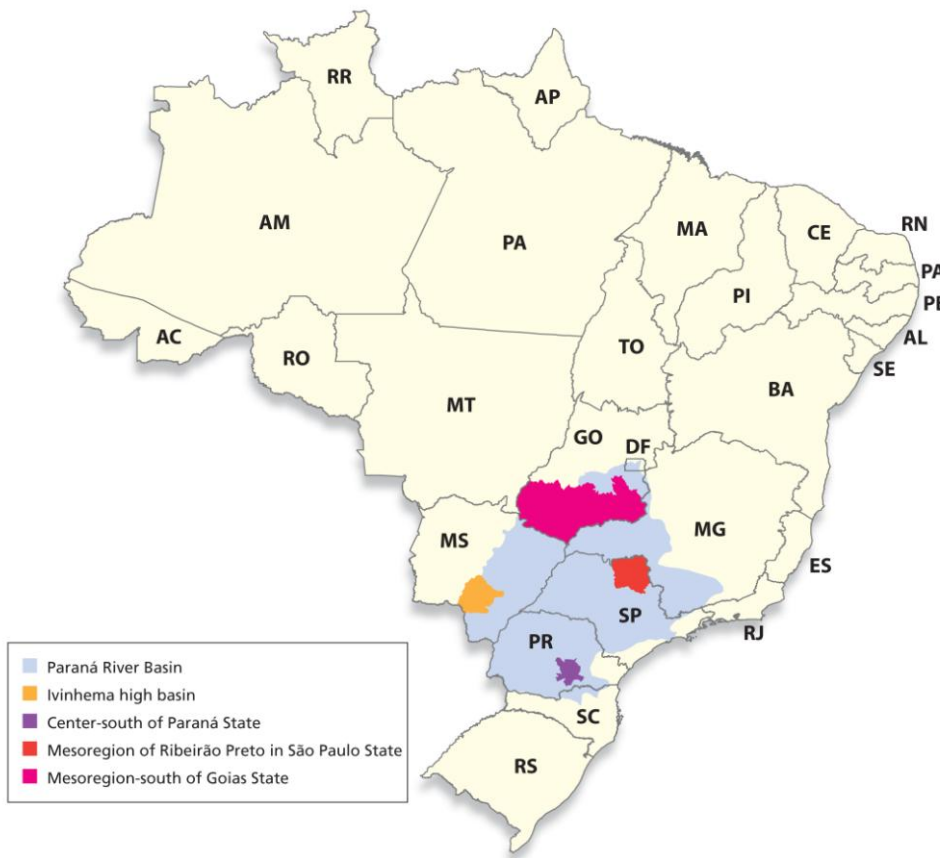
It should be pointed out that in both periods oil prices were high; currently, the core selling point are environmental gains over fossil fuels. Another element contributing to the expansion is the current development of 'flex' vehicles technology, which run on gasoline, alcohol or any mixture of both.

Over 80% of sugarcane production in Brazil is located within the 88 million hectares of the Paraná River region (*Figure 1*) – about 10% of Brazil's territory – where ethanol-related crops are now expanding.

For those reasons, the two case studies on ethanol were conducted in that region, in areas where expansion is strong: the so-called Southern Goiás meso-region and the High Ivinhema River Basin. The former study focused on the meso-region as indicated by the Brazilian Institute for Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE) and the latter focused on an environmental unit (river basin).

For biodiesel, the case study focused on a processing plant planned for the state of Paraná, for the following main reasons: its unprecedented size; its high consumption of oleaginous crops; and the fact that it is totally oriented towards exports. Since it is still in its project stage, the study will also help civil society carry out careful monitoring. The fourth study was conducted by Repórter Brasil and focuses on social aspects in the area of Ribeirão Preto.

Figure 1: areas of case studies and the boundaries of the Paraná River Basin



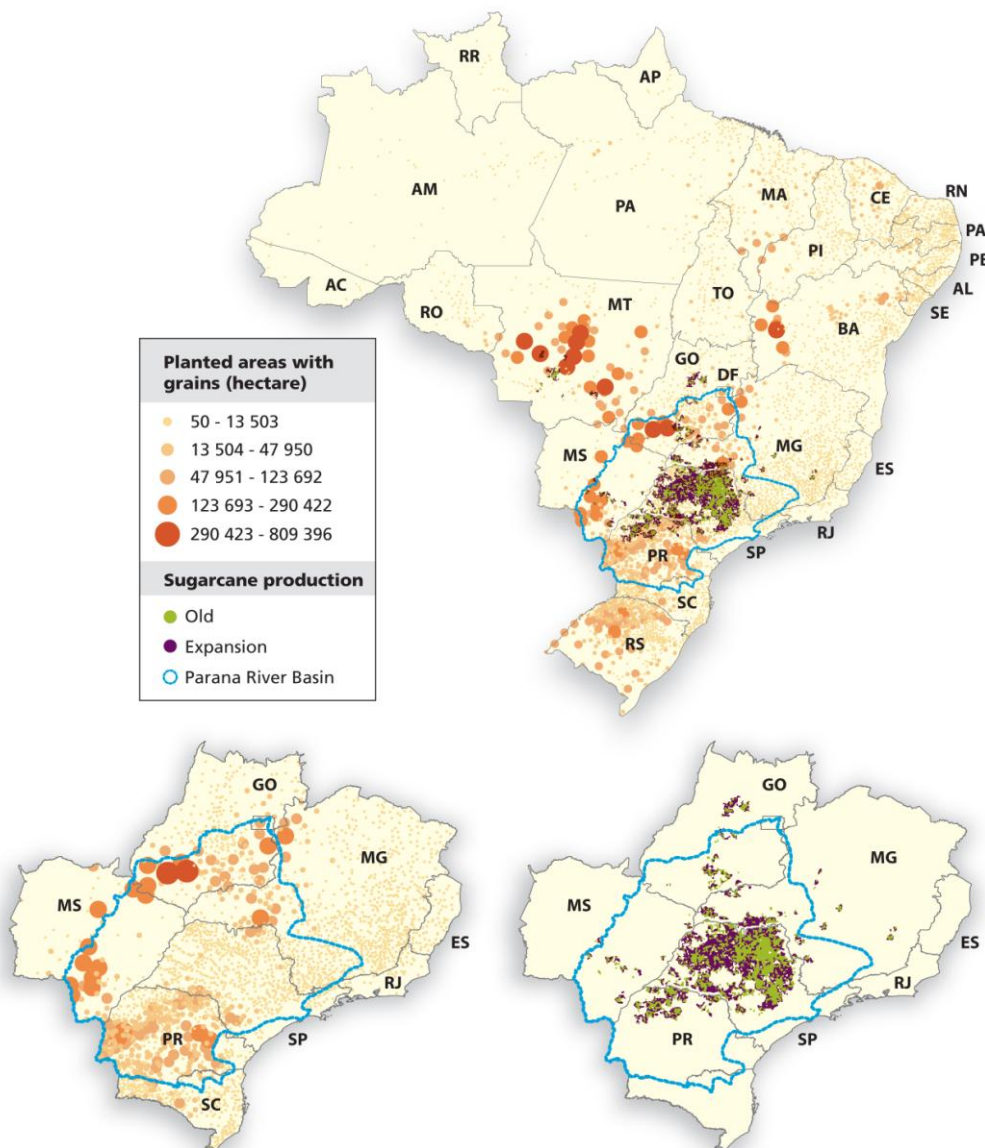
1.1) Brazil and its sugarcane, grains, and cattle industries

Brazil has a total area of 851 million hectares, of which 15.9 million are underwater. Of the remaining 835.1 hectares, about 6.96 million, or 0.8%, were planted with sugarcane in the 2007/08¹ harvest period. In 2006/07 period, processing of the 475 million tons harvested produced 17.5 billion litres of alcohol and 30.2 million tons of sugar². Production units also generated 1,400 megawatts (MW)³ of electricity.

The 2007/2008 grain harvest's output was 144 million tons – a result of distinct crops in an area of some 47 million hectares⁴. Soybean covers 21.3 million hectares (45.3%); corn takes up 14.7 million hectares (31.2%), and the remaining 11 million are taken by other crops, such as rice, beans, and wheat – amounting to 23.4 % of Brazil's total grain area.

The cattle sector takes up about 20% of the territory or 172.3 million hectares with 169.9 million cattle heads. The country's average of 0.98 cattle heads per hectare is considered very low and therefore, a subject of heated debate, always presented as an indicator of inefficiency of the industry: it takes a large area for an extremely low economic performance. Armino Kichel, from the Cattle Division of Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária, EMBRAPA)⁵, reports that 80% of the country's pastures have some level of degradation and 60% are totally degraded. The researcher also says that average meat production per animal/year is 40-45 kilograms when it could reach 90 kilograms with proper management.

Figure 2: Grain and sugarcane production areas in the Paraná River Basin
(Source: IBGE and Canasat, 2008)



The GDP (Gross Domestic Product – the monetary measure for performance of the three industries: farming, manufacturing, and services) in Brazil in 2006 was 2.4 trillion reais, of which 149.79 billion (6.11%) were generated by farming (agriculture and cattle). Out of that total, agriculture generated 84.97 billion (57%) and cattle, 64.82 billion (43%)⁶.

2) The National Agroenergy Plan

The PNA⁷ was formulated by the Ministry of Agriculture, Livestock and Supply (MAPA) and by the state agency EMBRAPA Technological Information in order to increase the proportion of biofuels in the energy matrix, ‘in a planned and sustainable way’. The plan guarantees that the country has a large stock of available land, and that expansion can be based on four comparative advantages for production:

- The possibility of large-scale irrigated crops, since it has one fourth of the planet’s surface and underground freshwater;
- The possibility of multiple crops each year according to ‘production windows’, such as the systems of harvest and late harvest already adopted for grains;
- Brazil’s extension and geographical location – with most of its territory in tropical and subtropical areas with strong sunlight (source of bioenergy), as well as high climate diversity and ‘exuberant biodiversity’, which would allow several options associated to energy-oriented agriculture’;
- The possibility of Brazil ‘incorporating new areas to energy-oriented agriculture without competing with food-oriented agriculture and with environmental impacts limited to socially accepted ones. Therefore, Cerrado expansion areas, cattle-agriculture integration, degraded pastures, reforesting areas and those currently left out – such as the North-Eastern Semi-Arid Region – total about 200 million hectares’.

In sum, the PNA as a whole resorts to current ideas about the potential for biofuels in Brazil, based mostly on environmental conditions (biodiversity, water, topography, soils, and climate) and on the land availability balance. Such accounting-based balance goes from some tens to hundreds of millions of hectares, depending on the author’s approach.

Current efforts intend to show that there is no serious problem for the expansion of sugarcane for ethanol and biodiesel-oriented crops. According to the PNA, it is possible not to face future negative effects such as: competition for land with grain production and other food products; occupation of family-based

agriculture areas and the direct advancement over Pantanal and the Amazon or even forced transfer of agricultural activities to those regions.

2.1) Biodiesel

Since it was launched in 2004, the National Programme for Production and Use of Biodiesel (PNPB) aimed at ‘implementing production and use of biofuels while focusing on social inclusion and regional development, through income and job generation’.

The PNPB’ core guidelines are:

- To establish a sustainable programme while promoting social inclusion;
- To guarantee competitive prices, quality and supply;
- To produce biodiesel from distinct oleaginous sources and in several regions.

Law 11097 of January 13, 2005 mandates a minimum percentage of biodiesel to be added to diesel sold to consumers anywhere in Brazil.

The biodiesel mixture into mineral diesel is known by the letter B, added of its biodiesel percentage. For instance, if a mixture includes 5% of biodiesel, it is called B5, B20 has 20% of biodiesel, and so on. Until June 2009, B3 (3%) was used, so that after July 1st B4 came into force. The federal government has already signalled that it can advance the adoption of B5 (5% of biodiesel) to 2010.

Between 2005 and 2007, Brazil produced about 840 million litres of biodiesel. With the planned increase in the mixture of biodiesel to mineral diesel, going from 2% to 5%, the demand will reach 2.4 billion litres per year after 2013.

2.2) Ethanol from sugarcane

The programme known as Proálcool was created by the Brazilian government in 1975 (Decree 76593) in order to reduce the country’s dependence on foreign oil in a time of major increase in its price in the international market. The programme initially raised the percentage of anhydrous alcohol from sugarcane added to gasoline.

Later, at its second stage (Decree 80762/79), it promoted the use of hydrous alcohol in vehicles with engines developed specifically for that fuel. The industry’s economic considerations were also accounted for in the formulation of the programme. However, environmental and social concerns did not play a significant

role at the time. With decrease in oil prices and increase in sugar prices in the second half of 1980, supply collapsed and the programme was discredited.

The Brazilian government decided to keep the mixture of ethanol into gasoline, and increased it in 1994 (Law 8723/93) to a 22-26% proportion, in order to reduce the release of greenhouse effect gases. After 2003, the arrival of the flex-fuel engine – which runs on gasoline and/or alcohol – to the country's automobile market made the domestic ethanol demand skyrocket.

About 90% of the 2.97 million cars sold in Brazil in 2007 were already bi-fuel, which corresponds to consumption of 16.7 billion litres of ethanol. A total of 3.5 billion litres of ethanol were exported in that year. In February 2008, consumption of ethanol in Brazil surpassed that of gasoline. For 2013, 15 million cars are estimated to be running on that biofuel. The 2007/2008 output reached 26.68 billion litres and estimates for 2008/2009 are of 28.59 billion litres.

3) Arable land in Brazil and biofuel expansion

One of the justifications by businesses, government, and even the scientific community for the possibilities of biofuel expansion in Brazil is the availability of arable land. Some understand that it would be even necessary in order to promote rural development.

Figures displayed show millions of hectares, usually followed by terms like 'high productivity'. The Ministry of Agriculture website, for instance, informs that Brazil has 388 million hectares of fertile, highly productive arable land, of which 90 million remain unexplored⁸. Alexandre Betinardi Strapasson, director of the Ministry's Sugarcane and Agroenergy Department, said during the first CANASUL⁹ meeting held in May 2007 in Campo Grande, Mato Grosso do Sul, that there are 91 million hectares of 'unexplored, available areas for agriculture', adding other information such as that the cattle industry occupies 220 million hectares.

In the business segment, the Sugarcane Industry Association (União da Indústria da Cana-de-Açúcar, UNICA)¹⁰ considers that there are 77 million hectares available for expansion¹¹ – 14 less than Strapasson's figures and 13 below MAPA's – which would be within the 340 million of arable hectares.

The figures of expansion

An example of that situation is that in the state of Mato Grosso – Brazil's largest soybean producer – governor Blairo Maggi announced that in 2008 about 6 billion reais would be invested in the industry¹². According to the Mato Grosso do Sul's government, investments of over 17.3 billion reais are expected for the state¹³.

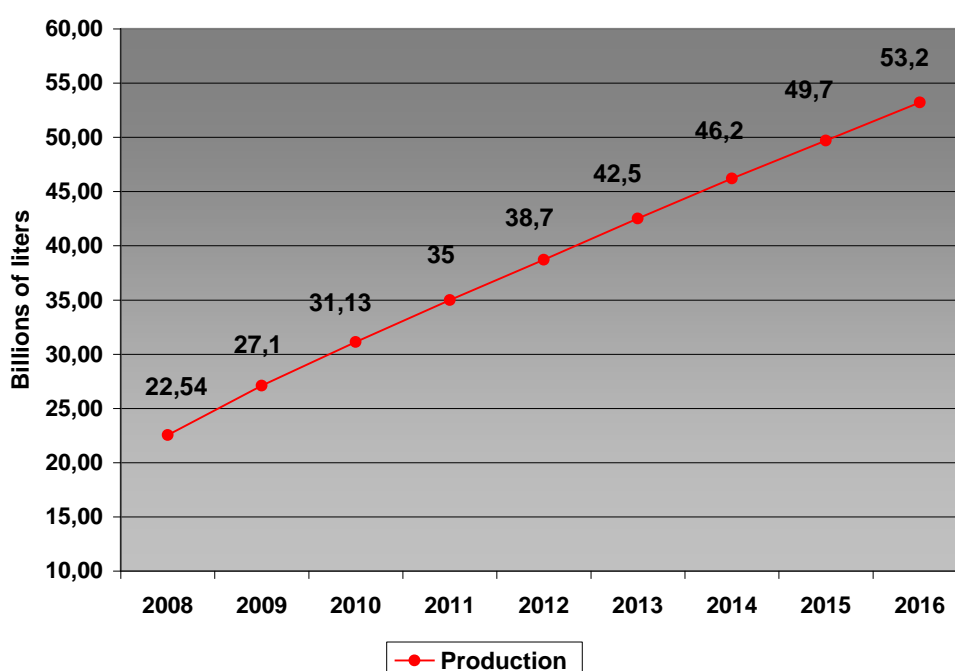
Studies conducted say that, despite continuing deforesting in the Cerrado biome, this sugarcane-driven cycle is not characterised precisely by opening frontiers; it rather seeks areas where the crop already showed high sugar levels, so that it is possible to reach large consuming markets and exporting ports with low cost.

More recently, the larger impulse comes from the sugarcane area, which has been confirmed by the fact that investments between 2005 and 2008 totalled 20 billion dollars and are estimated to reach 33 billion until 2012, according to data released by UNICA. That figure can be considerably higher if we take into account that the study predicted 10 billion dollars in investments only for the southern Goiás meso-region and for the High Ivinhema River Basin.

By June 30, 2007, state-owned bank Banco do Brasil had provided 49.6 billion reais in loans for agriculture and cattle, of which the sugar-alcohol industry received 3.4 billion¹⁴. The Brazilian Development Bank (Banco Nacional de Desenvolvimento Econômico e Social, BNDES) announced that in the next three months it will provide loans of about 19.7 billion reais, with 15.38 billion for sugar and alcohol production; 2.33 billion for co-generation of energy (1.4 thousand MW); 1.88 for sugarcane plantations; and 143 million for research and development¹⁵.

The Energy Research Corporation (Empresa de Pesquisa Energética, EPE)¹⁶ estimates that ethanol production will reach 53.2 billion litres in 2017. Chart 1 illustrates prediction for consumption of alcohol fuel – both hydrous and anhydrous – in Brazil between 2008 and 2017.

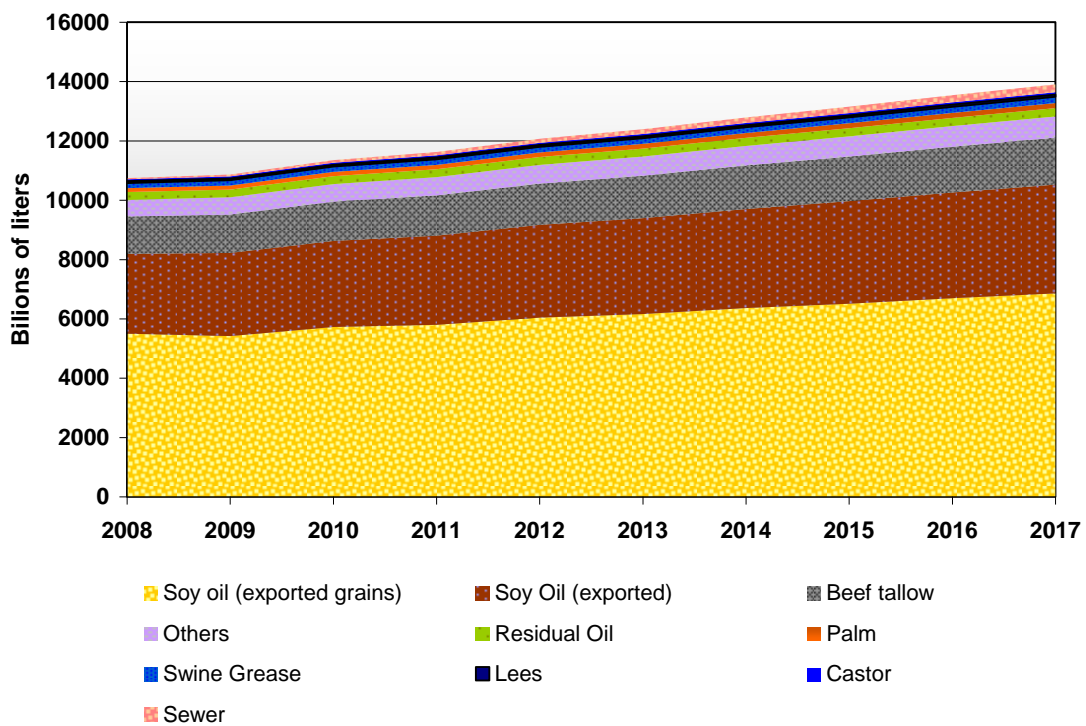
Chart 1: Estimation of ethanol consumption in Brazil 2008-2016 (Source: EPE, 2008)



For the biodiesel market, demand is projected at 2.4 billion litres per year in 2013, as mentioned above. In order to present the potential of the biodiesel offer in Brazil to meet that demand, EPE assessed the behaviour of the physical availability of fat inputs and installed processing capacity of the facilities. Chart 2 shows the total amount of biodiesel that can be offered by using each input.

Soybean represents, on average, 73% of the availability of inputs considered in the ten-year period (2008-2017), equivalent to the sum of projections for exported oil (about de 25%) and soybean exported as grain (48%).

Chart 2: Potential offer of biodiesel in Brazil 2008-2017 (Source: EPE, 2008)



4) Macro effects

4.1) A new cycle in rural Brazil

The main and more visible macro-effect of biofuel production in Brazil is the beginning of a new economic cycle of re-occupation/re-organisation in rural areas, based on the traditional model of large sugarcane processing units to make ethanol, sugar, and energy.

Each of the units demands between 30 and 50 thousand hectares of plain land, good-quality deep soils, and regions with proper climate – the same conditions necessary for grains.

Another important factor for installing production units is proximity to sea ports and consuming hubs, which is clear from the fact that precisely the country's most developed region is the largest sugarcane consumer. Investment in each unit can reach R\$ 150 million.

4.2) The global crisis and macro effects

Until the emergence of the global economic crisis, the clear scenario was that of consolidation of the process towards the new cycle mentioned above, with large investments by the financial market. The most evident effects then were the following:

- Occupation of high quality land with characteristics favourable to grain production in order to install sugarcane processing units to produce ethanol, sugar, and electricity.
- Emergence of some conflicts between grain and sugarcane segments over land. The former seek to stop unrestrained expansion over territories previously controlled by grain plantations, afraid of being pressured into leaving the best areas or paying high prices to lease land.
- Sugarcane has taken over beef cattle land, usually that with low occupation by animals, low profitability, and which degrade soil conditions because of trampling. The area for that activity at the High Ivinhema River Basin is 920 thousand hectares and in Southern Goiás, 2.27 million hectares. This process, in cases where land is not part of the area reserved to plant grains, can be considered a positive macro-effect that leads to recovery, since sugarcane demands well-prepared soils. However, there is a possibility of transferring cattle activities to the Amazon and other sensitive regions. An example to be considered is that of Samir Jubran, a breeder of 150 cattle heads who sold 30 thousand live cattle in 2005: one of his farms in São Paulo, with 9,367 hectares of which 8.8 thousand are pastures, and 11 thousand cattle heads: he informed that he would lease the farm for sugarcane

plantations and the animals would be transferred to farms in the Amazon and Mato Grosso do Sul¹⁷.

- Redesign of local and regional policies in areas of expansion. Each producing unit, according to the volume of investments, is an instrument for direct influence on the election of mayors, city councillors, state representatives and governors. As an industry, they gain strong influence over public policies, particularly in the area of tax incentives and infrastructure.

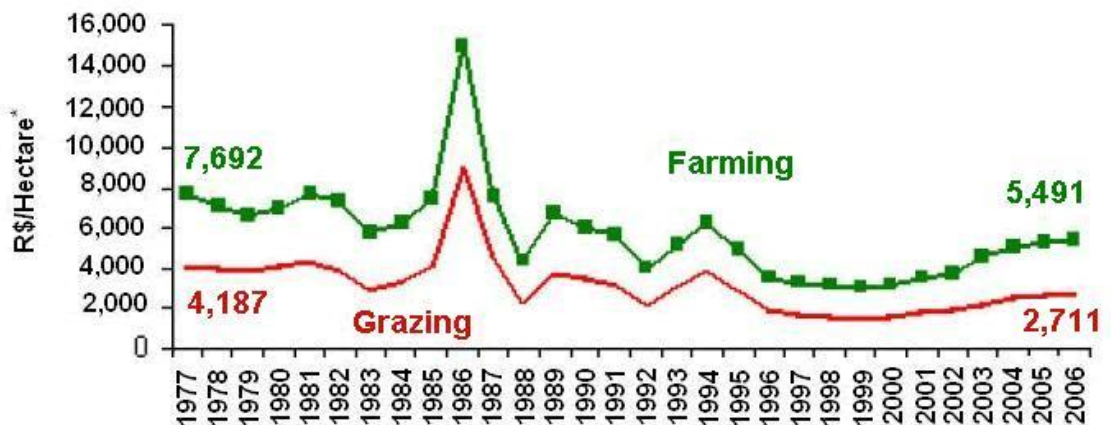
4.3) Biofuels and Land Prices

The final makeup of land prices for agricultural activities in Brazil is determined by several factors, including geographical location – proximity to major consumer centres is crucial –; environmental aspects as well as soil quality, topography, water availability and climate; infrastructure; variation in prices of agricultural commodities and public policies to support agriculture.

It has recently become necessary to examine the impact (or its absence) of biofuel production on land prices, since it should result in increase in food production costs. One of the aims of this work is to start such analysis, considering that this is a major macro-effect also for its potential global consequences.

Based on the set of charts presented here and on other surveys, including field interviews, we present some elements for debate. It is important to consider that it is still not possible to have a clear reading on the subject, since it should be considered that such expansion is relatively recent and that, at the peak of investments, with foreign capitals entering the industry, the world economic crisis created new arrangements that need to be monitored.

*Chart 3: Land price evolution for farming and grazing
(Source: Ministry of Agriculture and Livestock)*



*Values deflated according to the IGP-DI index for December 2007

Background

Chart 3 presents a study conducted by the Ministry of Agriculture and Livestock (MAPA) about prices of land for plantations and pastures between 1977 and 2006, where it can be seen that the last decrease took place in 2000, according to the average –for both pastures and agricultural land.

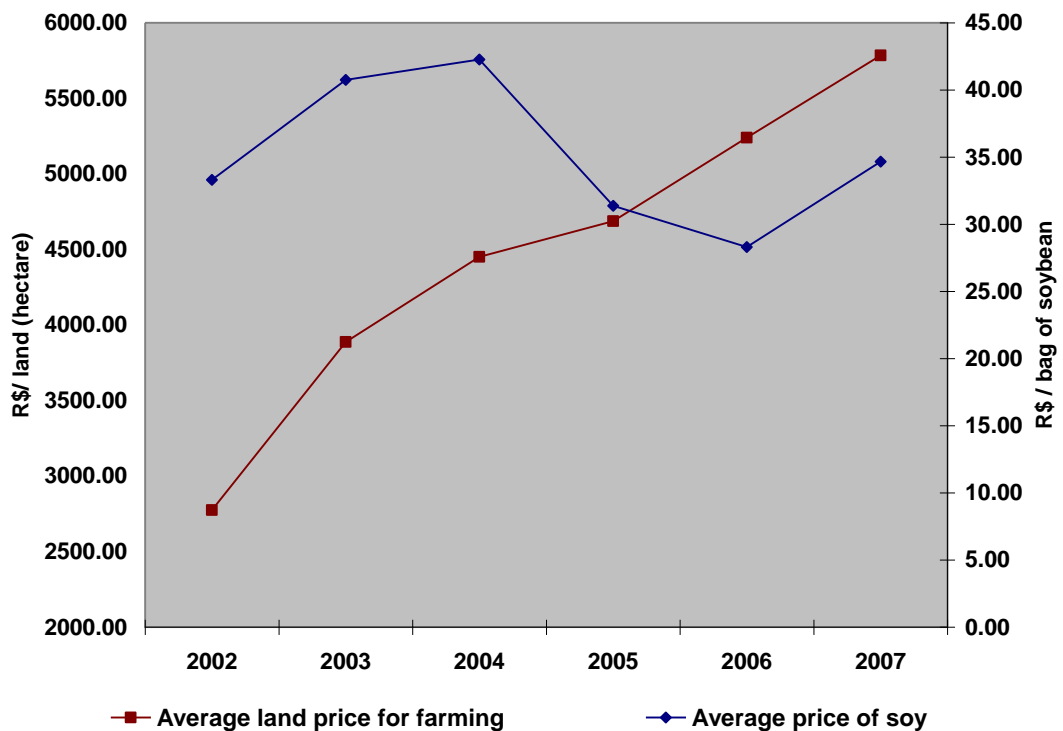
From 2000 to 2006 there is gradual recovery. According to José Garcia Gasques, MAPA’s coordinator for strategic planning, the behaviour of land prices reflects the growth in worldwide demand for biofuels, which ‘...affected agricultural markets and put product prices at levels above those of previous years.

The expansion of sugarcane, soybean, and corn plantations pressured land prices¹⁸. Besides, cattle activities are valued and pastures are replaced by other activities, such as sugarcane and soybean plantations¹⁹, contributing to increase pasture prices.

Soybean versus land prices

The following chart shows the average price of the hectare of land for plantation and the sack of sugarcane between 2002 and 2007. The first variable shows a permanently upward behaviour, while soybean showed major variations in the period.

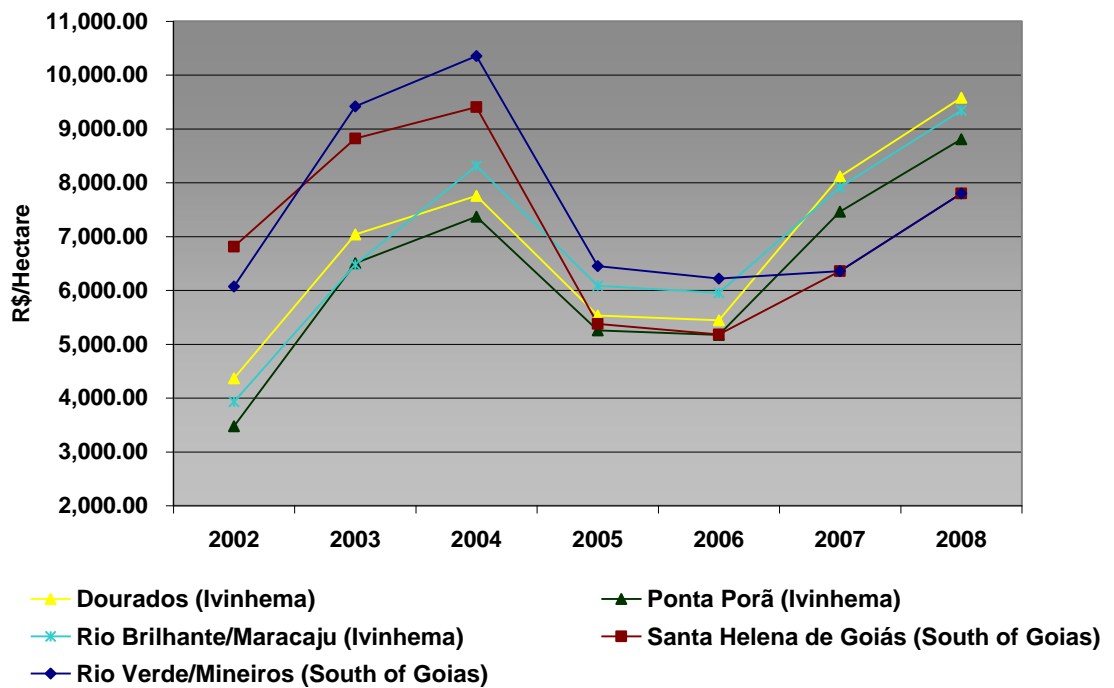
*Chart 4: Average price of land (hectare) for agriculture and bag of soybean in Brazil
(Source: FNP Institute and Advanced Studies in Applied Economics²⁰)*



The following chart shows the variables land price and sack of soybean in the main towns within grain producer regions studied (High Ivinhema River Basin and Southern Goiás). The same behaviour is seen in the two regions and it is also possible to see the influence of the price of the sack of soybean on land prices.

That is confirmed by Jaqueline Bierharls, a land market analyst working with FNP, a private institute that conducts research about the agriculture and cattle segment in Brazil, according to which grain producer regions traditionally index land prices to soybean sacks.

Chart 5: Average land price in major soybean-producing counties of the Ivinhema Upper Basin and mesoregion-south of Goiás State (Source: FNP Institute)



A distinct behaviour is seen in the area of Ribeirão Preto, Brazil's largest sugarcane producer, as shown in Chart 6. As expected, land prices are linked to those of the ton of sugarcane.

Chart 6: Average land price for farming in Ribeirão Preto
(Source: Institute of Agricultural Economy – IEA²¹)

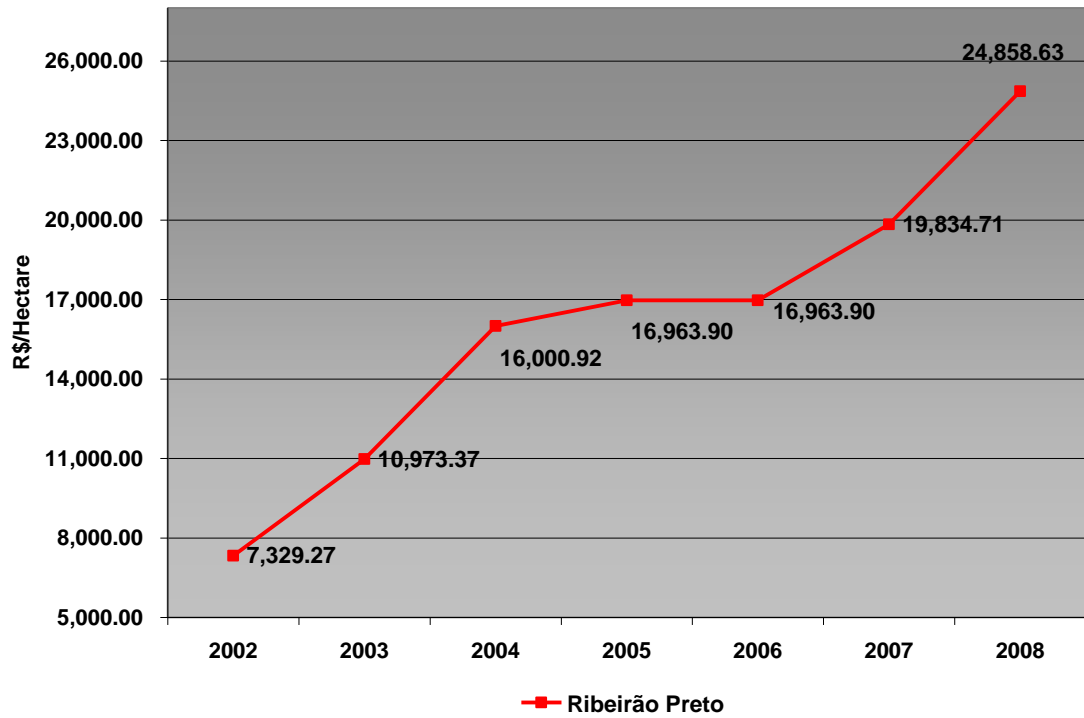
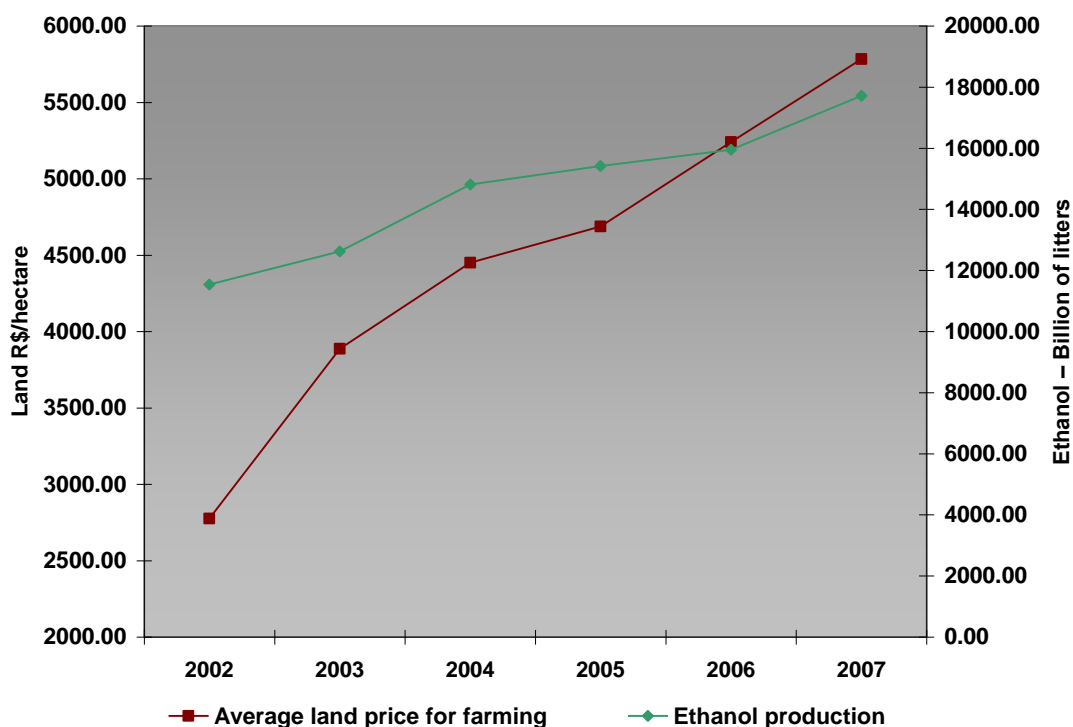


Chart 7 shows the behaviour of land prices and the increase in ethanol production. Data available do not allow pointing out a direct relationship, but the issue should be monitored.

*Chart 7: Average land price for farming and for ethanol production
(Source: Ministry of Agriculture and Getúlio Vargas Foundation²²)*



Conflicts and prices

During field visits and interviews conducted in grain producer regions, an increase was seen in land located near industrial units, since sugarcane should be planted within 50 kilometres in order for the enterprise to be economically viable.

The crisis and the prices

According to information provided by FNP, so far it has not been possible to detect whether or not the economic crisis contributed to contain land prices, since between 2008 and 2009 there was an increase in the average price of the hectare. The main motives for that behaviour include ‘the return of international investors and valorisation of commodities’ – a situation that is not completely clear as mentioned in the introduction²³.

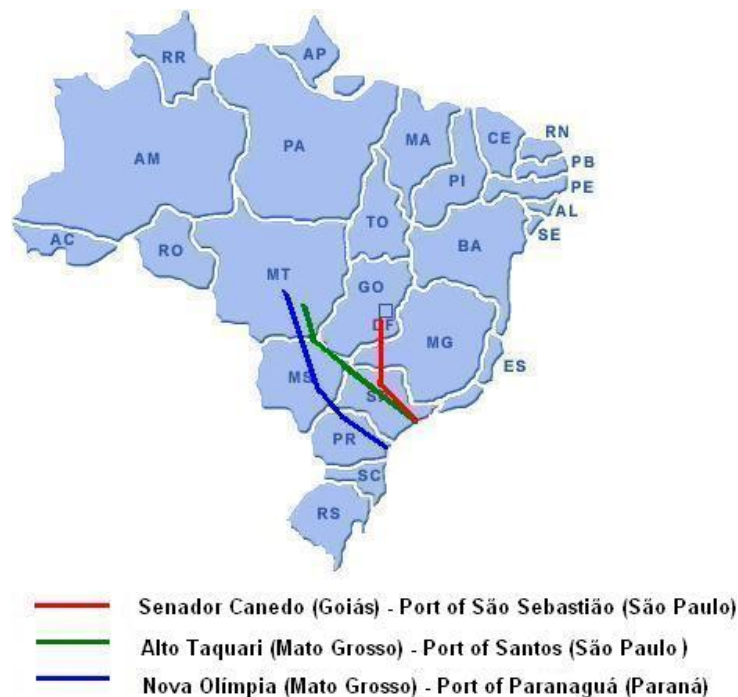
4.4) The expansion of the infrastructure

New investments in infrastructure are predicted for the drainage of ethanol. The main ones come from the Growth Acceleration Plan (PAC), created by the Federal Government in 2008, where transport and energy projects have been planned.

Two pipe lines are part of this plan, which would drain ethanol and biodiesel, the first, with 1150 kilometres of extension, with the capacity to transport up to 6 billion litres, making the connection from the municipality of Senador Canedo – Goiás to the port of São Sebastião - São Paulo. (Figure xx). The second will connect the municipality of Nova Olímpia - Mato Grosso, to the Port of Paranaguá – Paraná, totaling xx kilometers. The total value invested will be 4.1 billion reais.

Besides these projects, Brenco – Brazilian Renewable Energy Company created CentroSul – a Pipe Line Transporter with the objective of implementing a pipe line to drain ethanol, of approximately 1.120 kilometres, starting from Alto Taquari – Mato Grosso all the way to the Port of Santos - São Paulo. Its export capacity is 4.25 million m³/year. The project was estimated at 1 billion dollars and should began operations in 2011.

Figure 3: Projected Pipe Lines for the drainage of ethanol and biodiesel in Brasil



4.5) Changes in investments after the crisis

The world economic crisis and the decrease in capital flows for markets in general and specially in bioenergy has slowed the pace of expansion processes and even suspension of investments in the biomass energy sector. Those processes and the very behaviour of the biofuel market and its associated commodities – mainly grains, sugar – should be followed step by step as one of the methodologies to identify environmental, social, and economic macro-effects.

Shortly before the beginning of the crisis or in its early stages, newspaper O Estado de São Paulo²⁴, in its article ‘From financial markets to processing plants’ (Do mercado financeiro para as usinas), stated that the industry’s new investors are ‘used to the speculative world of the financial market and are willing to take high risks to pocket large fortunes. In the last two years, they have thrown billions of dollars into the Country, bought tens of processing units and started a series of projects for ethanol production.’²⁵

In recent months, indications are that such trend has been restricted and societal arrangements were established. Some groups cancelled their investments and other filed requests for judicial recuperation, such as the Naoum Group, owner of the Santa Helena processing plant in Goiás and the Infinity Bio-Energy Group, which owns five units in Brazil, including one in the Ribeirão Preto region and another one in High Ivinhema River Basin.

The former case of new arrangements – to be followed in order to see whether or not there is a trend – includes the arrival of groups linked to the food industry such as the giant Bunge, which has recently bought 60% of a production unit in the High Ivinhema River Basin, more precisely Monte Verde Agroenergética, in Ponta Porã.

5) Conclusion and the role that civil society organizations

Expansion in biofuel feedstock production in arable lands has already brought rapid change in land use and production activities, and is expected to cause dramatic socio-environmental impacts over the coming decades. Nowadays, Civil Society Organizations (CSO) has been playing an important role when it comes to participation process in discussion of environmental and social issues.

Especially regarding biofuels production, CSO are at the frontline dealing with all kinds of difficulties while trying mostly to assure better labor conditions, respect to the environment and natural resources and provide secure ground information about the real effects on biofuels production to orientate other studies and public policies building. The actual government politic of total support to biofuels production had made the way a bit harder.

The most common and constantly presence noticed on the study case areas were of civil society organizations related to providing support for workers' rights in biofuels production. For example, in Ribeirão Preto Region on São Paulo State, the cane cutters have at least two big references on the fight for their rights on proper labor conditions: the Rural Workers Federation of São Paulo State (FERAESP) and Pastoral do Imigrante (a religious organization associated to the Catholic Church).

The FERAESP is a federation of rural unions that takes leadership on collective labor negotiations with the ethanol plants, while working on personnel awareness and workers' protest in the companies' front gate. The Pastoral do Imigrante has an important role on working in the organization and awareness of the workers' rights. This organization is also well known for publicize alerts on the precarious work situation of cane cutters, especially immigrants, and following judicial processes concerning those workers who died on the cane crop, suspected of excessive load of work.

The respect to environment and natural resources is always a delicate issue in every land use change process. On biofuels crop production this concern is amplify when the basic environmental law is not respected and starts to affect human health. In the mesoregion-south of Goiás, many stakeholders relate that during the period of sugar cane harvest, besides the heavy smoke and hot waves that brings health problems to the surrounding communities, the crop burning goes beyond the farm limit destroying preservation and riparian areas.

A lot of dead animals are found on those areas and there is no control or monitoring by the authorities. According to the local NGO FURMA the current way on sugar cane production had diminish the water quality and availability in some places, due to change on small rivers course and contamination by agrochemicals and stillage used on the plague control and fertilization.

It was informed that in a small village with less than a 1000 inhabitants called Ouruana, the water contamination by agrochemicals had already lead 4 people to commit suicide, only in the first three months of 2009. Water tests were not made to prove this theory, because the land owners do not allowed the entrance of a technical group.

While trying to fight for labor conditions, environment and human rights, some organizations are working on research to feed discussions with secure information about the real impacts on biofuels production. A good example comes from the Ivinhema Upper Basin where the NGO IMAD (Environment and Development Institute), in articulation with the Swedish University on Agricultural Science, prepared in 2007 a discussion paper to present the socio-environmental impacts on ethanol production to the European public. This study was useful to demonstrate the real impact for those who used to think ethanol as a "clean" renewable fuel.

The four organizations involved with the realization of this report are members of the Brazilian Civil Society Organizations Group that works for the Biofuels Sustainability (RedeBio), together with others 11 institutions known national and internationally such as Friend of Earth – Brazilian Amazon, Vitae Civillis, Conservation International, Imaflora and Both Ends, to name a few.

RedeBio joined organizations that share the vision that the actual progressive expansion of agroenergy production and commercialization requires more information, transparency and capacity building to civil society. This is valid for the whole chain, not just production, but to industry, distribution logistic and infrastructure, financing and consumption all over the world.

It is well known that to properly assess the transformations and develop effective intervention strategies regarding the macroeffects on biofuels production, stakeholders need to be better equipped to obtain access to and effectively use key information.

The recent disturbing growth in biofuels indicates the need to obtain access and share knowledge in technical spheres that go beyond prior capacities, including the characteristics of feedstocks, net energy requirements and respective greenhouse gas contributions, and their probable effects on natural resources, labor use and other socioeconomic factors, among others.

During this study many civil society organizations were identified and a common situation could be met to all of them: even though the need to monitor and mitigate the impacts on biofuels production is recognized and urgent, those CSO do not have enough strength to deal with it by themselves and need constructive and immediate assistance in order to avoid a worst future.

6) Notes

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