Macro effects in Brazil
The impacts of agroenergy crops in four areas of the country
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Research Production

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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.
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 2007/08\textsuperscript{1} 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 sugar\textsuperscript{2}. Production units also generated 1,400 megawatts (MW)\textsuperscript{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 hectares\textsuperscript{4}. 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. Armindo Kichel, from the Cattle Division of Brazilian Agricultural Research Corporation (Empresa Brasileira de Pesquisa Agropecuária, EMBRAPA), 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%).

2) The National Agroenergy Plan

The PNA 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 unexplored. Alexandre Betinardi Strapasson, director of the Ministry’s Sugarcane and Agroenergy Department, said during the first CANASUL 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) considers that there are 77 million hectares available for expansion – 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 industry. According to the Mato Grosso do Sul’s government, investments of over 17.3 billion reais are expected for the state.
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 billion. 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 development.


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 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 Sul.

- 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.

In 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 arrangement that need to be monitored.

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

![Chart 3: Land price evolution for farming and grazing](Source: Ministry of Agriculture and Livestock)
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 prices\(^{18}\). Besides, cattle activities are valued and pastures are replaced by other activities, such as sugarcane and soybean plantations\(^{19}\), 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 Economics\(^{20}\))*
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.
**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 introduction.
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 Olimpia - 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 being 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 hole 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

2 CONAB, 2007, p. 11.
Case Studies
1) Grains x Sugarcane in the south of Brazilian State of Goiás

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1) Presentation

The region of southern Goiás is an area of ancient occupation, recognised as one of Brazil’s largest farming areas. According to the last Agricultural Census (2006), the total area of the southern region was 10,448,453 hectares, of which 6,058,128 (57.9%) were pastures, 2,279,806 hectares (21.8%) were plantations, and 1,861,577 (17.8%) were woods and forests.

More recently, the region stands out as a major hub to attract agroindustrial projects, such as Agroindústria Perdigão, which supplies both the domestic market and the foreign market with its manufactured products. Those projects demand large amounts of raw materials such as grains, chicken, and swine, and lead to more intensive use of land in the region. According to data provided by the Brazilian Institute of Geography and Statistics (IBGE), only in the 2007/08 harvest the region produced about 8,656,339 million tons of grains, which is 14.5% of Brazil’s total. The cattle industry had at the time 7,783,620 bovine heads, 879,735 swine, and 26,022,610 chickens.
Around 2005, the production scenario in southern Goiás started changing. The strong arrival of sugarcane and investments on constructing processing facilities, at a time when values paid for grains were below production costs, encouraged several landowners to replace traditional plantations with the sugarcane monoculture. At first, decreasing prices of land led companies to buy some of those properties, but about 70% of the sugarcane planted came from leased areas that until recently were used for grains such as corn and soybean.

Attracted by large areas with stepped topography and low declivity (which makes mechanisation of planting and harvesting easier), mild temperatures, and good rainfall, the sugarcane crop triggered fast changes in the local landscape and economy. Euphoria lasted until the economic crisis that hit the world in mid-2008. And that ‘hangover’ hit all segments of society in Southern Goiás: several leasers found themselves stuck to 10-year-plus contracts with processing companies that no longer pay; sugarcane workers coming from several parts of the country were dismissed without having their labour rights respected and increased the region’s violence and poverty statistics; local commercial establishments suffer with mounting unpaid debts; producers who thought about opening their farms to sugarcane were scared away and organised themselves so as to prevent it from spreading.

Based on such scenario of dispute between traditional grains and the new sugarcane crop over production areas, Southern Goiás was chosen for surveying macroeffects in biofuel production and the role played by civil society to prevent or mitigate such effects. The core working methodology was the systematic surveying of information on the region and conducting interviews with direct questions on how the advancement of the new agricultural frontier (sugarcane’s) has impacted on the region, both positively and negatively. The methodology was built so as to have a more faithful picture of the area, which is still seen as a new agricultural frontier to be conquered by the biofuel industry.

2) Social, economic and environmental aspects

At least two factors can be considered highly important for southern Goiás to reach the strength it now enjoys. The first one was technological mastering of the Cerrado ecosystem, which until the 1960s was considered unfit for agriculture. Scientific research made latosol, which is the type of soil that prevails in Southern Goiás, an area proper for grain crops, since they are easy to mechanise (soil prevailing in Cerrado areas; highly weathered, with small mineral reserves for plants; major depth, usually over 2 metres; high concentration of clay fraction, 15-80%; clay fraction composed mainly of aluminium silicate, aluminium, and iron oxides.

Despite their low fertility, added of fertilisers and correctives they have high potential, but more for cattle). The second factor was the creation of the Mixed Co-operative of Southern Goiás Rural Producers (Cooperativa Mista dos Produtores Rurais do Sudoeste Goiano, COMIGO) in 1975 – a successful and bold
organisation that currently includes over 4,210 members and is considered one of Brazil’s largest farmers co-operatives.

To have an idea of the magnitude the enterprise has assumed, besides fostering grain production, COMIGO carries out soybean crushing, operates a fertiliser factory, makes animal feed, among others activities. It currently receives up to 35% of the region’s soybean production and sells inputs to 30% of southern Goiás’s producers. Its crushing capacity is 3,500 tons/day of soybean to produce oil, soybean meal, and animal feed. COMIGO and its members are in charge of a 100 thousand-hectare production area, producing mainly corn and soybean. Of all production sold, about 70-100 thousand tons are exported to the European Common Market, including The Netherlands.

Large agroindustrial companies are established in southern Goiás, such as Perdigão (which merged with Sadia in 2009 and became today’s BR Foods), Cargill Agrícola, Siol and Kowalski, adding value to the agricultural production. Soybean crushing industries there can crush six thousand tons/day of soybean. Large multinational companies producing pesticides, inputs and machinery are also operating there: Pioneer, John Deere, Monsanto, Case, among others. Perdigão stands out locally.

Perdigão is one of the largest food companies in Latin America – third place in fowl slaughter and amongst the ten largest in swine slaughter in the world, as well as one of Brazil’s main milk collection companies. It is an international company with products reaching over 100 countries. In the town of Rio Verde where it is installed, its numbers are high: 7,500 direct jobs, 30,000, daily slaughter of 420 thousand fowl and 4,200 swine. Perdigão consumes about 750 thousand tons a year of corn and soybean meal to produce animal feed. Some numbers show what its arrival represented for the region: in 1999 – a year before it started operating in Rio Verde, the town had 424 thousand fowl. Likewise, swine production went from 104 thousand (1999) heads to 345 thousand in 2007 – a 231% increase.

Not only the strategic location regarding production transport, the high production of grains, proper climate and tax incentives by the state government made southern Goiás a receiver of investments. Its social indicators should also be considered. Its population in 2006 was estimated at 1,661,348 – a 12.6-person/km² density. Human Development Index (HDI) was the same of the national average of 0.807 (PNUD/2006), Gross Domestic Product was 15,404,396,527.00 reais (IBGE/2006) and per capita GDP was 14,017.87 (IBGE/2006). The meso-region of Southern Goiás includes 82 towns grouped into six micro-regions. Proportionally, and by far, it is Goiás’s richest meso-region.

Education and labour training are well-structured segments, with several universities in the area. Vocational Teaching is present at the following institutions: The Rio Verde Technology Education Centre (Centro Federal de Educação Tecnológica de Rio Verde, CEFET), with courses in Business Management, Accounting, Farming, Foods, Trade, Computers, Secretary, Zootechnics, and higher
education in Grain Production Technology; National Service for Industrial Learning (Serviço Nacional de Aprendizagem Industrial (SENAI), which offers courses in automobile mechanics and electro-electronics, computers, safety and management support; National Service for Commercial Learning (Serviço Nacional de Aprendizagem Comercial (SENAC), which trains labour for the service and trade industries with courses in management, computers, fashion and beauty, health, hotels, and communication and arts.

Topography in Southern Goiás is plain, slightly undulated with about 5% of declivity, average altitude of 748 metres, and the climate offers two well-defined seasons: a dry season (May-October) and a rainy season (November-April). Average annual temperature is 20-25°C.

The region’s climate is mesothermal humid with mild temperatures in winter and hot temperatures in summer and especially in spring. Autumn-Winter seasons see the lowest temperatures, which are between 6°C and 15°C. The lowest temperature recorded in the last 8 years was 0°C on July 18, 2000 (Low: 0°C/High: 27°C). Therefore, at that time of the year there is large temperature variation. Some days the lowest temperature can be below 10 °C and the highest one can be over 30°C.

Soil is the dark red latosol type with clay and sandy-clay textures. That type of soil is highly sought after for farming, even though it is low in nutrients, since the clay that amounts to about 80% of its composition allows longer water retention. Vegetation is made up of cerrado e residual forest. Cerrado is Brazil’s second most endangered biome and, ironically, there is no effective legal tool to monitor and reduce the high pace of deforesting in the region. Twenty-one areas for preservation were found in Southern Goiás according to a survey by the Ministry of the Environment.

3) Biofuel expansion

The ethanol market – both in Brazil and worldwide – has experienced major growth, encouraged mainly by the high increase in sales of cars with Flex engines and by the worldwide acknowledgment that the fuel is cheaper, more efficient and that it allows higher reductions in CO2 emissions, providing energy safety to face global warming challenges.

According to IBGE, in 2005, over 80% of Brazil’s sugarcane production was located basically within an important geographic area: the Paraná River Basin. Its 88 million hectares include the main areas for sugarcane expansion and new sugar and alcohol producing units in the country, mainly the basins of rivers Paranapanema (low basin region, in São Paulo/Paraná), Paraíba (Goiás and Mato Grosso do Sul), Tieté (São Paulo), Ivinhema (Mato Grosso do Sul) and Grande (Minas Gerais and São Paulo).
With the exhaustion of agricultural areas available for sugarcane plantations in the state of São Paulo, several sugar-alcohol companies started to move towards Brazil’s Midwest in search of new areas open to mechanisation. One of those destinations was Southern Goiás.

Fertile soil, with plain topography, slightly undulated, with 5% of declivity, average altitude of 748 metres, and two well-defined seasons, a dry one (May-October) and a rainy one (November-April), attracted investments of the ethanol industry to the region.

In 2005, with the investment boom in biodiesel production in Brazil, Southern Goiás was invaded by sugarcane plantations. The landscape started changing since three years ago, when the prices of grains decreased a lot and rural producers saw sugarcane as a new chance for gains. Figure 1 shows (in green) the increase in sugarcane plantation areas in Southern Goiás. In the 2005/2006 harvest, 106,411 hectares were occupied by the crop in the area; in 2008/2009, it was 149,716 hectares. That meant a 41% increase in the area planted within only three years. Comparatively, the area used for grains fell 13.9% (Box 1 – Variation in area planted – in hectares – in Southern Goiás).

Figure 1 – Area planted with sugarcane in southern Goiás (Source: Canasat)

<table>
<thead>
<tr>
<th>Temporary plantations (hectares)</th>
<th>Year</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains</td>
<td>3,121,111</td>
<td>2,838,852</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>106,411</td>
<td>127,671</td>
</tr>
</tbody>
</table>

Source: IBGE
By observing the expansion of sugarcane activity in the region on a historical series (Box 2 – Area planted with sugarcane in Southern Goiás (hectares) it is possible to see more clearly the strong arrival of sugarcane. The area planted varied +71.78% within seven years. The output went from 6,369,885 tons in 2000 to 12,398,399 in 2007 (a +94,64% variation) (Box 3 – Sugarcane output in Southern Goiás).

**Box 2 – Area planted with sugarcane in Southern Goiás (hectares)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Temporary plantations (hectares)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>2001</td>
</tr>
<tr>
<td>Southern Goiás</td>
<td>87.15</td>
<td>77.56</td>
</tr>
</tbody>
</table>

*Data: IBGE – Municipal Agricultural Production*

**Box 3 – Sugarcane output in Southern Goiás**

<table>
<thead>
<tr>
<th>Region</th>
<th>Temporary plantations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
</tr>
<tr>
<td>Southern Goiás</td>
<td>6,369,885</td>
</tr>
</tbody>
</table>

*Data: IBGE – Municipal Agricultural Production*

Only in the area there are 19 alcohol and sugar processing plants and other 33 are planned for 2015. Considering that each plant demands about 1.5 tons of sugarcane, multiplied by 33 units and adding the output in the latest IBGE data available (2007), of 12,398,399 million tons, future demand will be 61,898,399 million – an estimated 399.2% increase in case all planned investment is carried out. In a comparative analysis in terms of planted area, taking the year of 2007 as a basis, when 149,716 hectares were planted to produce 12,398,399 million tons of sugarcane, an increase in sugarcane producing area of about 750,000 hectares will be necessary.
Most investors are groups coming from the state of São Paulo, with foreign participation, seeking new areas to plant sugarcane to supply the domestic and international markets with ethanol.

The use of the region’s agriculture areas for sugarcane is not recent, since some companies are already there for over 50 years. However, from 2000 on, with the boom in worldwide demand for ethanol, many producers, especially small and medium-size owners of fertile land sold or leased their properties to produce sugarcane and alcohol, which might seriously threaten the economy of the whole region, whose production base is the grain agribusiness.

Traditional grain producers were scared by the power of sugarcane that arrived to the region and the fast-paced conversion of areas previously used for grains to the sugarcane monoculture. Under such strong pressure, rural producers associations, allied to local grain-processing companies organised themselves so that, in 2006, in the town of Rio Verde, the mayor sanctioned a law restricting the area for sugarcane to 10% of the town’s arable area (about 50 thousand residents). The law, considered unconstitutional, served to draw attention to Southern Goiás and the fast change in the agricultural uses in the near future.

The general fear was that, seduced by high prices paid by the sugar-alcohol industry, several properties could be converted and thus reduced the power of the local grain industry, which indeed started to happen.

With the decrease in the value paid in the 2005/2006 grain harvest, several landowners saw sugarcane as an alternative for guaranteed and permanent profit. Until 2008, sugarcane production seemed to be the best agricultural activity in the region, due to optimistic market outlook, especially with the increasing prices of the oil barrel. A domino effect of that optimism was seen shortly after that: thousands of workers (coming mainly from North-Eastern Brazil) arrived at the region to work in sugarcane cutting, land prices skyrocketed, infrastructure to transport production improved, pressure on urban centres increased, more money started circulating in commerce, investments in new processing plants were often announced, strengthening the movement of expansion of the sugarcane monoculture, including areas of native vegetation (causing serious environmental impacts). There was general euphoria and the desperate grain industry could do nothing to avoid the definitive conquest of southern Goiás by sugarcane.

But in late 2008, with the fall in oil prices, the crisis hit the sugar-alcohol industry, especially because of its difficulties in obtaining long-term credit. Some towns that had 60% to 70% of their arable land converted to sugarcane plantations, such as Santa Helena de Goiás, collapsed. Producers and workers have not been paid since December 2008. Sales decreased, money is no longer circulating as it used to be and some processing plants filed for judicial recuperation. Given that scenario totally opposed to the golden times of sugarcane expansion, rural producers found themselves hostages of a crop that was supposed to be their salvation. Tied to 10-year-lus contract, not able to go back to producing grains whose prices went up,
with no economic power to break the contract still in force and pay for the resumption of investments in other crops, landowners started to realise that sugarcane production has serious flaws. With streets full of unemployed migrants that could not (and did not want to) return to their hometowns, with investments planned for infrastructure cancelled, land occupied with sugarcane that cannot be harvested and with no hopes for improvement in a near future, Southern Goiás experienced the ups and downs of the crop within only three years.

4) Macro effects

The possibility of resuming investments in biofuels, recently announced by the world press, meant a yellow light in areas where biofuel-oriented crops expanded. For instance, challenges to the US import tariff can open that market to other countries, especially Brazil. The US market is huge and will further consolidate itself in the coming 15 years. The country will leap to 140 billion litres of alcohol, but today it produces 28 billion litres. Brazil produces 22 billion. The expectation of the sugar-alcohol industry is that in the bilateral re-negotiation the government might open the US market a little more, which would mean an important outlet for Brazil’s ethanol.

Considering such scenario of new optimism for the biofuel industry, investors started to become enthusiastic and opened in early 2009 three more alcohol processing plants in Southern Goiás. Investments in infrastructure to transport production were resumed and there are already waterways, railways and alcohol pipelines to be finished by 2010. New areas for expansion of sugarcane plantation are already under study.

The question is: which will be the future scenario if all investments planned come true? How do the areas that experienced and suffered with sugarcane expansion see the possibility of a new growth wave? In an attempt to answer those and other questions, an analysis will be conducted of the current situation and the future perceptions of local actors about each of the macroeffects of biomass production for biofuels.

Land prices

The expansion of sugarcane plantations and the recovery of commodity prices such as soybean made land prices increase in Southern Goiás at an average of 20% in 2008. In 2007, in that region, each hectare used to cost between 5.8 thousand and 6.5 thousand reais. In 2008, it was worth 7.2-7.5 thousand reais. Land research also shows a larger presence of foreign investors in that market. Land is sought more often by Brazilian and multinational companies linked to the farming industry, besides being a highly frequent target for investment funds.

Local actors reveal that in times of debts by landowners, processing companies try to purchase land; in times of high productivity and good grain trade,
in turn, representatives of the manufacturing industry try to lease the property by offering 50% to 70% above market values. The general expectation is that this scenario will be maintained during this new stage of sugarcane expansion.

**Food prices**

According to general perceptions, there was little variation in food prices. However, in some cities where many traditional small properties have also changed their production system from cattle – milk and meat – and grains to sugarcane, that variation was a little larger. According to interviewees, that trend might spread to the rest of the region, in case sugarcane is not planted in a sustained way.

**Land property**

There is a consensus among actors interviewed that land property is going from rural owners to processing companies, in a medium-to-long-term process. The leasing contact system (covering 7-12 years of sugarcane plantation) makes rural producers hostages of companies. Within a few decades, they will lose their land, since their descendents (children) will not return to farming. In times of crisis in the farming product market, companies usually offer to purchase land, since prices tend to go down with owners indebted.

A common advice given by the rural producers association and the sugarcane associations is that, if producers are interested in trying the sugarcane crop, they should compromise at most 30% of their property in order to avoid dependence or a possible crisis with the crop.

**Food availability**

This was not a problem in most cities because most of local rural settlers (family farming) decided not to get involved with sugarcane. That somehow ended up protecting food availability. Given that sugarcane seeks large areas, it is believed that the situation will not change.

**Relocation of food production and pastures**

According to the Goiás Association of Alcohol Industries (Sindicato das Indústrias de Fabricação de Álcool do Estado de Goiás), about 30% of the expansion of sugarcane in the state will take place in areas occupied by grain crops, and about 70% will be on pastures.

As mentioned above, in case those 33 new alcohol and sugar processing plants are established in the region, other 750 thousand hectares will be necessary to provide them with sugarcane. The increase in the number of cattle heads per hectare and the opening of new pastures in neighbouring regions indicate that the change in the land use patterns tends to be stronger as investments are resumed. Some
producers advocate diversification in order for other crops to coexist without major problems.

The grain segment is highly concerned with the possibility of investments becoming real. Therefore, its representatives have been organising, together with the association of rural producers, ways to avoid total replacement of grains with sugarcane, by providing guidance to producers interested in the new crop.

**Deforesting**

Despite deforesting denounced by several actors interviewed, there is not a more precise study on the region showing the conversion of natural areas into sugarcane plantations. Unfortunately, prosecutors have not satisfactorily met the community’s wishes, for lack of technical personnel or even political will. About sugarcane expansion, IBAMA (The Brazilian Institute of Environment and Renewable Natural Resources – the federal agency in charge of monitoring threats to the environment) is concerned mainly with new areas for the conversion of the crop, as well as pastures relocated due to occupation of old areas by sugarcane.

Traditionally, Legal Reserves and Permanent Protection Areas (such as gallery forest and hilltops) are not protected, as demanded by Brazil’s environmental law. The failure of the public system in charge of monitoring such violation only worsens the region’s environmental situation. One of IBAMA’s offices in Southern Goiás is in charge of the environmental monitoring of 30 towns and has only three employees to serve all that demand. Nevertheless, the agency aimed at surveying information, collecting satellite images and mapping the region in order to improve sugarcane and grain expansion. There are still problems with illegal production and transportation of coal from Cerrado’s native species.

**Loss of food production areas**

According to interviewees, local farming areas used to produce corn, soybean and other grains as well as cattle – all for human consumption – might be reduced in case the investments in the sugar-alcohol industry recover their strength. The change in land use patterns in this case might mean the reduction of food production areas at a general level.

**Changes in vegetation patterns**

The old cover of Goiás’ Cerrado has virtually disappeared from the region. Some palm swamps can still be seen isolated amidst pasture and plantations, but they are witnesses of a past marked by strong disorderly exploitation. As reported by some interviewees, when the agricultural frontier was expanded in the state, producers received tax incentives and often government resources to cut the existing vegetation to be replaced by pastures and agricultural crops. Today, the burden of recovering Legal Reserves and Permanent Protection Areas falls on
landowners. If they do not follow the environmental legislation, they risk receiving high fines and losing rural credit lines provided by the federal government. With the new wave of expansion of sugarcane plantations, several local actors are concerned about the disappearance of the region’s last forest areas.

**Degradation of water resources as well as air and soil quality**

According to interviewees, conversion of pasture and grain areas into sugarcane has caused strong changes in the local climate, bringing high temperatures, changing rain patterns, air moisture and reducing the quality of water resources (stream and river sources and areas where water is collected for human consumption). Those and other related environmental problems, such as soil degradation, reduction in air quality (especially during times of burnings in order to clear ground for harvest) and less control of pests in the field might become worse with the increase in areas dedicated to sugarcane plantation.

**Loss of biodiversity**

At the time of burning sugarcane areas for harvesting, interviewees reported that processing companies end up burning also gallery forest and other Permanent Preservation and Legal Reserve Areas, which, besides deforesting, causes the death of several animals that fail to escape. Interviewees agree that the sugarcane monoculture does not respect the environment and threaten seriously local and regional biodiversity. Besides, the burning of plantations for harvesting can reduce the diversity of species and soil-enriching microorganisms.

**Change in services (innovation, farming-oriented technology institutes)**

The region has several vocational and higher education centres, including fields intended to train and qualify personnel for the local market of farming products. Investments by the sugar-alcohol industry are expected to provide opportunity for new institutions that are able to train the local population so that they can be absorbed by new companies.

**Local investments**

Since most of inputs and machinery needed by sugarcane come from other regions and in amounts that are enough for each processing plant, the lack of local investments by companies is visible. Most interviewees agree that financial resources created in the region do not circulate locally, going rather to the mother-company that is often located in other states. Roads are badly kept and even unusable in some parts, which ends up increasing the price of transporting local production.
Impoverishment

Income concentration in the hands of processing companies is one of the justifications for the fear of sugarcane expansion in the region, especially by (i) rural producers, who are not paid by leasers because of the crisis and instability in the industry and thus cannot pay their own debts; (ii) rural workers, whose wages are still low for an extremely strenuous manual work; and (iii) for the local commerce, since the money of the sugar-alcohol industry does not circulate locally. Impoverishment of the population leads to other social problems such as increase in crime, people living in the streets, drug dealing, etc.

Job losses

Job losses are attributed to changes in the production system in some cities in Southern Goiás, for example, farm hands who used to work with cattle in the pastures now taken by sugarcane. They do not adjust to labour in plantations and then migrate to urban centres and other areas in search of better living conditions. Since new enterprises are basically mechanised, several rural workers who anxiously await return on what they invested might feel frustrated and see no alternative to seeking areas where their services can be hired.

People displacement

The most serious social problems in those cities with high sugarcane production are related to workers’ temporary demographic explosion – especially men coming from other states to work in sugarcane plantation and cutting. Because of their cultural profile, the population of Southern Goiás have not adapted to work at Perdigão or in sugarcane plantations. Therefore, migrants brought intense pressure on urban structures and crime and poverty rates increased a lot. Since future enterprises will be basically mechanised, workers’ displacement is expected to stop.

Power changes in rural areas

All interviewees said that there is a change in power over land in rural areas. All of them reported a concern by local people with a clear displacement of power from old ‘owners’ (farming) to ‘new’ ones (processing companies), since many of the latter are increasing their private areas as well as land leased to plant sugarcane. When commenting on the controversial municipal law that restricted sugarcane planting to 10% of Rio Verde’s arable land, one of the interviewees recalls that it was not created by the need for environmental protection, but rather ‘to guarantee soybean production, since the family of the mayor (of the time) is one of the founders of COMIGO’.
Change in women’s power

Women’s power has not undergone significant changes; since family-based farming (where they play a more important role) was not involved in sugarcane, they suffered no negative impact with the ethanol crisis. Besides, the federal government provides loans for working rural women.

Conflicts

One of the conflicts that emerged in interviews was related to the breaking of labour laws for sugarcane cutters. At the reception of the Labour Prosecutor’s office in Rio Verde, a public mural displayed several regulations with legal decisions telling companies to follow legal norms and respect workers’ rights, especially in sugarcane plantations.

An interview with members of a local NGO showed how scared and actionless the organisation is. Deprived of any part in local environmental decisions, the NGO has been publicly discredited by politicians and others with economic power, and some of its members have even received death threats to stop denouncing environmental aggressions or transgressions.

The rebellion of rural workers in Santa Helena – who have not been paid by the company since December 2008 – almost caused a serious incident. Some of them wanted to burn down leased sugarcane plantations to protest. The Labour Union of Santa Helena, Turvelândia, and Maurilândia estimates that 1,700 rural workers have not been paid. Other workers who are permanent to the company would not have their labour rights deposited with the government for 50 months. Those who want to leave the job cannot do it, since procedures of labour lawsuits stop when the company files for judicial recuperation.

In the same city, where 70% of arable land is occupied by sugarcane, rural producers are desperate because they are not able to terminate contracts. Under that model of land lease, after a few decades, owners usually lose the land to processing companies. The cost of planting about 4 hectares of sugarcane is 22-25 thousand reais. In order to change the production system where sugarcane is already planted, owners have to wait an average of five years or, in case they decide to break the contract, they will have to estimate how many annual harvests of that crop they will still produce, set the price with processing companies, compensate them and then have their land back – a complex process.

5) The role of civil society organizations

Local civil society organisations have been organising so as to anticipate and mitigate the impacts of the strong arrival of sugarcane plantations. One of the main works carried out by the Union of Rural Workers was the Collective Labour Agreement for Goiás’s Sugarcane Industry signed by companies, workers, and
justice in 2008. The Agreement established pioneering rules (rights and duties) for labour in sugarcane plantations. A highlight was Clause 17, Paragraph 4, which meant a major achievement for unions: ‘In cases of workers hired in cities of other states or regions, the employers will provide accommodation free of charge, not related to wages, observing security, health and hygiene regulations.’ Labour Prosecutors are following that union closely and receive charges of labour-related irregularities.

Rural producers’ associations have been telling local landowners to stay alert to the pros and cons of sugarcane. Cases like Santa Helena de Goiás are seen as examples of what can happen if the change in land use patterns happens too fast and without awareness. COMIGO has strong presence in producers’ associations so as to avoid more losses in grain production areas and the resulting compromising of the local production chain.

The only active environmentalist NGO in Southern Goiás is undergoing a deep restructuring process and needs help to be able to study, monitor and/or mitigate the environmental pressure exerted by sugarcane. FURMA (Rio Verde’s Environmental Foundation Frutos do Cerrado) is an environmental non-government organisation that emerged with support by Rio Verde’s Popular Movement (MOPORV).

FURMA’s history shows that in one of Brazil’s most productive regions, environmental and anti-corruption struggles face major conflicts of interest that involve segments whose power is enough to carry out political persecution for decades, to dominate the media’s editorial policies and – perhaps one of the greatest difficulties the environmental work – to hide and deny information, treating environmentalists as ‘invisible’ social actors. According to its members, public information guaranteed by law is often concealed by, for instance, State Prosecutors, who have received several formal denunciations from FURMA, but in virtually all cases they understood that there was no irregularity or environmental crime.

The organisation has no specific project to monitor the impacts of farming activities, but it sees the issue as one of its action priorities. FURMA aims at building more partnerships and strengthening the local socioenvironmental movement with support by Brazilian and foreign institutions, since the region has major problems resulting from the farming model adopted.

Based on interviews conducted with local actors, an enormous power gap was visible, where economic, political and even judicial entities that should favour public interests impact the local production system, manipulate public opinion through the media and conceal or often downplay serious environmental problems.
6) Conclusion (including chances and opportunities)

No actor interviewed is against the arrival of sugarcane, understanding that it is a new economic activity that might benefit Southern Goiás. However, the expansion of plantations should be directed specially to less developed areas or those with lower investment or funds for agriculture, with no capacity to produce two harvests a year. A common alternative that seems to emerge in interviews is a percentage balance between sugarcane and other crops, in order to lower the impact on the economic system based on the grain/meat productive complex.

There still are no effective mechanisms or agreements that guarantee expansion (in the future, in case the ethanol market improves) with minimum impact in Southern Goiás. Such debates will only happen in case there is strong pressure for more sugarcane plantations – as happened in 2006 and 2007. This opinion was also unanimous among producers, organised civil society and labour justice.

It is worth pointing out that social actors strategic for the monitoring and control of the expansion of the sugar-alcohol segment in the region are extremely weak.

The only environmentalist NGO – FURMA – undergoes a restructuring process after years with little activity. Despite being the oldest and most active local environmental organisation, it faces daily conflicts with public authorities, producers, the media and even State Environmental Prosecutors.

In this context, it is very important to have a network of partners that might contribute for local organisations to face the challenges with more power and be able to find solution for existing problems, that one way or another will influence every person.
II) Ivinhema River High Basin

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1) Introduction

The Ivinhema River high basin, traditionally a large producer of corn and soybeans - approximately 2.7% of the Brazilian grain harvest - is one of the main environmental units, geo-environmental to be more precise - where occurs an intensive process of sugarcane crop expansion for the production of sugar, electrical energy and ethanol in Brazil. This expansion is headed by large national and international corporations from the biofuel sector, agricultural commodities and those created with resources from funds raised in the stock market.

For 3 years now, there has been a debate between grain producers and other sectors of society on the use of land and the possibility of negative impacts from the production, projects and presence of large sugar-alcohol companies with high demand for land - each one of them demands between 30 and 50 thousand hectares - in the same territories that produce grain. Local contention laws were proposed in municipal city councils and the Legislative Assembly of Mato Grosso do Sul state with the objective of establishing limitations on the expansion, but were not approved at the end of the debates.

This specific scenario of production space dispute, studies and a survey done for two years in the region, made the choice of the area the most appropriate for one of the pilot analysis projects of the macro effects from production of biofuels. The information and data base came from previous study done by Ecoa that lasted for 18 months, with numerous field trips as one the main tools for gathering and verification of information. The methodology applied, in its totality, allowed us to go beyond the common generalizations about the theme and allowed us to start fresh from situations detected and analyzed in the territory, better capturing details of questions such as climate, water, vegetation, micro-basins, soils, surface relief and agricultural production in each region where there are cane crops and industrial units set up.

Location and area

The Ivinhema River basin is part of the hydro graphic region of Paraná River and its total area is 4.64 million hectares. The high part is approximately 2.57 million
hectares. Besides São Paulo, it is the largest biofuels consumer center in Brazil, 1200 kilometres. In case the production is exported the nearest ports are Paranaguá and Santos, located at a distance of 920 and 1190 kilometres respectively.

Located between the parallels 20° 51´ and 23° 14´ latitude south and 52° 21´ and 55° 57´ longitude west of Greenwich, it is entirely situated in the state of Mato Grosso do Sul, bordering Paraguay in the west. With 11 medium and small municipalities, it has a population of approximately 422 thousand people. The largest is Dourados with 182 thousand inhabitants.
2) Regional Characteristics

Surface relief and soil quality

Relief and soil, together with climate, are fundamental characteristics when sugarcane based ethanol producers choose a certain region. The first for the possibility that it offers for the mechanization and the soil for its depth, nutrients and capacity for proper water retention. In Ivinhema high basin the relief is formed by one of the landings of the plateau region on the western border of the Paraná River basin, more specifically the Maracaju and Dourados plateaus (Figure 2). A great part of these were originally occupied by forests.

![Figure 2 - Surface Relief Ivinhema basin](image)

Source: Oliveira, de H., Urchei, M. A.; FIETZ, C. R., 2000, p. 18

In figure 3 we see the distribution of the main types of soil for all of Ivinhema River basin. The Purple latosol dominates the high basin, the focus of this study, occupying an area of more than 2 million hectares. They are characterized as mineral soils that are “generally, very deep.” Its physical and topographical characteristics are adequate for the production of grains that require extensive machine usage, possessing a high potential for nutrients. A part of it is occupied by Dark-Red latosol, characterized as “normally very deep, thickness rarely less than 2 meters, of high permeability and, in general, well drained.” Here, we should point out that the high permeability is a negative factor for cane production. They have varied fertility and its texture ranges from Yellow Red Latosol (Sandy loam soil) to
very Red Argisol (Clay soil) For the most part, they tend to occupy areas of flat topography or gently undulated.

Figure 3 - Ivinhema basin soils


The Economy

The economy of the region revolves around the production of grain and cattle breeding. The first occupies 30% of the territory and the second another 35% with a total of 1.73 million cattle heads. In the 2007/08 harvest there were produced 3.92 million tons of grain. Four of its eleven municipalities are among the 30 largest producers of grain in the country and six are among the 50 major producers, according to the Brazilian Institute of Geography and Statistics (IBGE).

The Indexes of grain productivity, generally speaking, are above national average. Between the 06/07 and 07/08 harvests there was an increase of 13.36%, passing 2.86 tons per hectare to 3, indicating that the region also has potential for growth in the next years.

A factor that favours the region is the lower cost of soy production in some of its municipalities, relative to other large producers in the north of the country, as found in a research by the Brazilian Western Cattle Raising Research Company (Embrapa Oeste), for the 07/08 harvest. The average cost was 22.26 reais per sack,
or 9.1% less than the ones from the municipalities Campo Novo do Parecis, Sapezal, Sorriso and Primavera do Leste, all within Mato Grosso State, where the average value found was 24.29 reais. These four municipalities of MT are among the 20 largest grain producers in the country, according to IBGE. If the quotation is done only with the municipality of Dourados - the 16th largest producer of corn and the 17th of soybeans (2006/2007 harvest) - the difference is still larger, reaching 22.19%, as the average there was estimated to be 19.88 reais².

Large national and international groups that operate in the agricultural area have projects in the region, among them, France’s Louis Dreyfus Commodities, Bunge, Cargill, and Archer Daniels Midland (ADM). Some of these with investments in the biofuels sector.

Table 1 – Area occupied by agriculture and cattle raising activities in Ivinhema High Basin (2007/2008) (thousand hectares)

<table>
<thead>
<tr>
<th>Territory</th>
<th>Total area</th>
<th>Cane</th>
<th>Grains *</th>
<th>Cattle-Raising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivinhema high basin</td>
<td>2.573</td>
<td>184.55</td>
<td>769.03</td>
<td>920</td>
</tr>
</tbody>
</table>

*Summer harvest.


Table 2 – Production of cane, grains (2007/2008 Crop) and Bovine herd (2006) in Ivinhema Basin

<table>
<thead>
<tr>
<th>Territory</th>
<th>Cane (millions of t)</th>
<th>Grains* (millions of t)</th>
<th>Cattle (millions of heads)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivinhema high basin</td>
<td>184.55</td>
<td>3.92</td>
<td>1.73</td>
</tr>
</tbody>
</table>

*Summer harvest.

Transport and Energy Infrastructure and comparative advantages

The existing infrastructure, particularly highway transportation and electrical energy networks, is an important advantage over other agricultural regions of the country. In Ivinhema high basin there are five federal highways and various asphalted state roads, which facilitates the fast access to major urban centers – large consumers of ethanol and electrical energy and the major maritime ports of the country. This scenario will most likely be expanded with the construction of an “alcohol duct” and a railway connecting the region to the Paranaguá Port, in the Atlantic, according to several announcements made by the federal government.

One of the main clear advantages of the region is the lower freight cost of grain and other products compared to other large producers, as the following case attests. In January of 2008 the highway freight per ton of grain between Dourados, the largest municipality of the high basin in population, and Paranaguá Port (917 kilometres), in Paraná, was 81.71 reais. To transport the same quantity from Sapecal, in the sate of Mato Grosso, the second major producer of soybeans in the country, the cost for the same time period was 171.71 reais or 2.1 times larger, for a distance
of 2.2 thousand kilometres. A truck trailer with capacity for 30 tons of soybeans hired out of Sapezal to transport the load to Paranaguá would cost around 5.15 thousand reais, whereas if the contract was made in Dourados the cost would be approximately 2.45 thousand reais, paying the contractor 53% less.

3) The Biofuels in Ivinhema High Basin and the scenario for 2014/2015

The Ivinhema high basin region, as seen before, is one of the major zones of sugarcane expansion and consequently the installation of processing plants for ethanol and sugar. Although only one biodiesel production plant is installed – in the municipality of Dourados – there are plans for production of four other units until 2015, reaching a volume of 365 million litres per year, which would be the equivalent to 31% of the current Brazilian production. The biodiesel theme is treated in another constant study of this work on macro-effects.

In the case of ethanol, the forecast is that in the 2014/2015 harvest there will be 31 producing units operating (table 3), of which 7 are already in operation, 18 are in implementation and 6 find themselves in the planning phase. These 31 units in complete operation (see the distribution by territory in figure 4) will take an area of approximately 1.27 million hectares, a multiplication of 7 times the current area, taking into account that in the 07/08 harvest were planted 184.55 thousand hectares. The percentage of the territory taken by cane would rise from the current 7.18%, to almost 50%. In the 2007/2008 harvest the 184.55 thousand hectares produced 13.05 million tons of sugarcane. With the 31 plants installed by 2015, the tonnage would reach approximately 107.25 million.

<table>
<thead>
<tr>
<th>CROP</th>
<th>SITUATION</th>
<th>NUMBER OF PROCESSING PLANTS</th>
<th>CROPS (thousand hectares)</th>
<th>Milling (millions of t/year)</th>
<th>SUGAR (thousand t/year)</th>
<th>ALCOHOL (million of litres/year)</th>
<th>ENERGY GENERATION (MW)</th>
<th>INVESTIMENT (millions of reais)</th>
<th>JOBS (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007/008</td>
<td>Operation</td>
<td>7</td>
<td>184.55</td>
<td>16.65</td>
<td>796.45</td>
<td>380.75</td>
<td>70.06</td>
<td>-</td>
<td>16.91</td>
</tr>
<tr>
<td>Expansion*</td>
<td></td>
<td></td>
<td>62.39</td>
<td>6.55</td>
<td>72</td>
<td>551.18</td>
<td></td>
<td>198</td>
<td>-</td>
</tr>
<tr>
<td>Implementation</td>
<td>18</td>
<td>871.07</td>
<td>69.65</td>
<td>3,350.68</td>
<td>4,010.25</td>
<td></td>
<td>2,011.94</td>
<td>8,235.70</td>
<td>29.11</td>
</tr>
<tr>
<td>Planned</td>
<td>6</td>
<td>161.22</td>
<td>14.4</td>
<td>788</td>
<td>751.7</td>
<td>0.7</td>
<td>1,900.36</td>
<td>8.41</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>1,279.23</td>
<td>107.25</td>
<td>5,007.13</td>
<td>5,693.88</td>
<td>2,280.70</td>
<td>10,136.06</td>
<td>55.53</td>
<td></td>
</tr>
</tbody>
</table>

*Of the plants in operation three are undergoing expansion.

Source: Research Data
The economic groups present in the region

The economic groups in the biofuels sector are diversified and its organization in society reasonably complex. With the global crisis and the greater difficulty to access money that was caused by it, there came about new processes that lead to sales, rebuilding of groups and even projects put on hold. Bunge, that had strong presence in the grain sector of the high basin and was absent in the production of sugarcane, acquired Nova América S/A, belonging to Nova América group. For the next months changes are expected due to the arrangements determined by the crisis.

In table 4, there are some of the main groups, their place in society and a summary of the profile. Generally speaking the table shows that in the high basin there are present a whole array of groups, traditional groups such as Cosan and Unialco; economic groups that have arrived recently to the biofuel scene like Odebrecht, large Brazilian contracting companies; groups from the agriculture commodities area such as Louis Dreyfus, Bunge and Sojitz Corporation and groups
based on funds raised in the stock exchange such as Clean Energy (CEB) and BVA Bank.

Table 4 – Main economic groups present in Ivinhema high basin

<table>
<thead>
<tr>
<th>Group</th>
<th>Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clean Energy Brasil (CEB)</strong></td>
<td>Clean Energy Brasil Plc (CEB) is formed by a group of Brazilian and European investors. Its stocks are traded in the London Market since May, 2006. At its start up, CEB raised 200 million pounds, which were destined for sugar and ethanol processing plants in Brazil. The group has two plants being implemented in Ivinhema high basin, one in the municipality of Sidrolândia/MS and another, in partnership with Unialco, in Dourados/Ms. <a href="http://www.cleanenergybrazil.com">www.cleanenergybrazil.com</a></td>
</tr>
<tr>
<td><strong>Cosan</strong></td>
<td>Cosan is leader in the production of ethanol in Brazil and the second largest group in the world. It produced 1.57 billion litres in 2007. It entered the Brazilian market in 2004, went through a stock restructuring and in 2006 appeared in the New York stock exchange. It has port infrastructure for the export of sugar and ethanol. In partnership with the groups Crystalsev, Nova América, Cargill and Plínio Nastari created TEAS – Santos Ethanol Exporter Terminal S.A. dedicated for the ethanol export. The group has a processing plant being implemented in the municipality of Caarapó, where an estimated 510 million reais are being invested. <a href="http://www.cosan.com.br">www.cosan.com.br</a></td>
</tr>
<tr>
<td><strong>Louis Dreyfus</strong></td>
<td>The Louis Dreyfus group is controlled by Louis Dreyfus S.A., based in Paris. Its main activities include commerce and world processing of diverse agriculture and energy commodities. In the sugar/ethanol branch it controls the plants in Luciânia, Minas Gerais state, Cresciual and São Carlos, in the interior of São Paulo state. In February, 2007, it acquired four units from the Tavares de Melo group of Pernambuco, with three of them in operation in the Ivinhema high basin, one in the municipality of Maracaju and the others in Rio Brilhante. A new unit is being implemented in Sidrolândia and another is being planned for Maracaju. <a href="http://www.louisdreyfus.com">www.louisdreyfus.com</a> <a href="http://www.ldcommodities.com.br">www.ldcommodities.com.br</a></td>
</tr>
</tbody>
</table>
Odebrecht/Sojitz Corporation

ETH Bioenergia was created in July, 2007 to work in the production of sugar, ethanol and electrical energy. It is a Brazilian association between the Brazilian Odebrecht with the Japanese Sojitz Corporation, a multinational trader that works with the commercialization of commodities, which owns 33% of ETH. The company was created mainly to reach the international market of biofuels. The investment forecasted for Brazil is 5 billion reais, of which 1 billion is aimed at Ivinhema high basin. Odebrecht is one of the major conglomerates in Brazil. In the engineering and construction area, it also works in most South American countries, Central America, the US, Africa, Portugal and the Middle East.

www.eth.com.br

4) Macro effects

Relocation of food production and cattle breeding

The processing units of the region began direct competition, for the sugar cane plantation, in lands traditionally used for grains, specially soybeans and corn. Besides direct competition, there has also been found a direct dispute through the search for land “stocks” – generally pasture areas – that sometimes are converted for the culture of grains. These processes are common in the High Basin and have lower or higher intensity dictated by the profitability of each sector (cattle raising or grains). The direct competition was detected and confirmed through a series of field trips throughout most of the region, at different time periods. The photos 7 and 8 show regions in the municipality of Itaporã, with soybeans crops, that in the future will receive plants from the groups Eldorado and Unialco.
In December, 2008 IBGE, informing on the growth of cane production, concluded that in the state of Mato Grosso do Sul “it occurred, specially in areas that were occupied by soybeans and pastures in the meso-region of Dourados, with emphasis in the municipalities of Rio Brilhante, Sidrolândia and Maracaju, where new processing plants began operations and there was expansion in the crop area by the industries already installed.” All municipalities mentioned are in the Ivinhema high basin.

Figure 7 – Soybeans occupying space where Itaporã Agroenergy Plant will be installed in Itaporã – MS, a municipality in Ivinhema high basin. (25/01/2008) Source: Research Data.

Figure 8 – Area where Eldorado Plant will be installed – Itaporã Unit occupied with soybean crops. Itaporã/MS (25/01/2008) Source: Research Data.
Emblematic Comparison

The small number of sugar and alcohol production units in a region dominated by pasture fields of low productivity, as occurs in the neighbouring basin of Pardo River – which has cheaper lands and good infrastructure – shows that the main argument being used by the defenders of the Brazilian biofuel politics that the natural way to expand the cane are the grazing areas is not confirmed. (Figure 9).

In the study done by Ecoa on Ivinhema basin, one of the conclusions is this: “The large concentration of units in a grain producing territory, with lands with higher prices (high part of Ivinhema), indicates that more careful analyses and conclusions are necessary for ‘the ways of the cane.’ These analyses are particularly important for the construction of scenarios on the thesis that the preferential expansion of biofuels occurs on grazing areas, specially the degraded ones. Logically, there is no way to disagree that the way ‘degraded pasture areas,’ in case it was in fact being taken, would be beneficial for the country due to the low productivity and to the immense territory occupied by cattle raising – one of the driving forces of environmental degradation.”

Figure 9. Industries planned to be installed in Pardo and Ivinhema basin (2014/2015 harvest)

Source: FARIA, A. FRATA, A. 2008."
Conflict

The dispute for territories between sugarcane and grain triggered economic and political impingements. In a September, 2007 interview, Maurício Peralta, development manager (until 2008) of one of the major cooperatives of the country, Cooagri, which began being controlled by Archer Daniels Midland (ADM) in 2009, informed that the leasing of lands for alcohol processing plants in areas belonging to cattle raisers is on the rise, which were previously destined for the producers of grain, or at least, something of a “Reserve Stock of Land.” He also informed that this process is meaningful for municipalities such as Dourados, Maracaju and Rio Brilhante. He predicted that the greatest “impingement” will occur, more likely, in lands leased or available for lease rather than traditional properties, belonging to soybean producers. One of the reasons is the capital invested in technology and equipment, which makes the change of business difficult.

Besides this conflict, there were detected political initiatives for the contention of the expansion of sugarcane. In the Legislative Assembly of Mato Grosso do Sul the congressman Ari Rigo, from the PDT (Democratic Working Party), with its electoral base in municipalities that produce soybeans (Maracaju, Rio Brilhante and Dourados, among others) presented a proposal to limit the area of cane crop to 10% of the land used for agriculture. The representative Elias Ishy (PT – Working Party) of Dourados presented the Bill in the city council, in 2007, proposing planting cane to a maximum of 10% of the agricultural area and prohibiting burnings. Although not approved, the initiatives had great repercussion.

Infrastructural changes (roads, ports, canals)

One of the main reasons the region is a preferred choice for the expansion is the good infrastructure that exists there. An important macro effect is the expansion, with recent decision to destine the resources for the construction of an ‘alcohol duct’ all the way to Paranaguá Port, in the Atlantic, and the extension of a railway, Ferroeste, from Paraná state. All of this process strengthens the region as a priority area for ethanol and biodiesel.

Land prices

Following are two graphs showing the behaviour of the price of the soybean sack and price of land in the major grain-producing municipalities of the high basin, where there are ethanol producing units in operation and being implemented. In the period studied (2002-2008) what is seen is that the price follows approximately the one for soybeans or grain. A phenomenon detected in the field work and interviews was that in the radius of cane crops – between 30 and 50 kilometres from the industrial unit – there is pressure on the prices, to raise them. This phenomenon should be observed.
Graph 2 Shows price behaviour in the lands of high productivity in the major grain and sugarcane-producing municipalities in the high basin.
Notes


According to the Agribusiness Annual (Anuário do Agronegócio) 2007 – Globo Rural, Cooagri occupied 4th place in 2007 among the 50 largest companies in the agricultural sector of the Brazilian Mid-West, receiving for the second year in a row the Best in Agribusiness Award “Production of Soybeans”. It stood out also in Valor 1000 magazine (for Economic Value) – 1000 largest companies, being elected the Best Company for the North and Mid-West Agriculture Sector Region.
III) The Biodiesel project in Irati, Paraná

Presentation

The economy of the state of Paraná has always been closely linked to farming, especially agriculture. In this context, the state is highly important for production of raw materials for biofuels, especially those related to sugarcane for ethanol and soybean for biodiesel.

Paraná is Brazil’s second largest alcohol producer and in 2009 it will export 400 million litres according to the president of the Paraná Association of Bioenergy Producers (ALCOPAR, Associação de Produtores de Bioenergia do Estado do Paraná, Anísio Tormena, in an interview published on the COFECON (The Federal Economy Council) website on April 3, 2009. In the current harvest, the state’s processing companies will crush 31.9 million tons of sugarcane, harvested over a 500-thousand-hectare area.

ALCOPAR’s president estimates that sugarcane will inevitably occupy cattle’s territory, as a result of the Brazilian Biofuel Programme. Pastures now represent 41.90% of the 15.9 million hectares of Paraná’s arable area, while sugarcane occupies only 2.10%. ‘Even if it grows, it will not go beyond 6%’, Tormena predicted.

Sugarcane crushing increased from 3 million tons between 1979/1980 to 10.5 million tons in 1985; to 29 million tons in 2004/2005; and to 24.8 million tons between 2005 and 2006. Sugar production was 1.5 million tons in 2005/2006 and 2.1 million in 2007. The sugar-alcohol industry is now present in 130 towns in Paraná’s regions known as North, Pioneer North, and Northeast (as a comparison, the state has 399 towns).

On the other hand, although Paraná is also Brazil’s second largest soybean producer – the raw material for about 80% of the country’s biodiesel – the state has little tradition and plays a minor part in the industry among Brazilian producers. This scenario of minor expression in the context of national biodiesel production might change because of two factors. The first one is the political intention of the state government to consolidate its Bioenergy Programme, encouraging technical-scientific research for the study and improvement of crops used for biodiesel.
production, as well as political and economic actions to encourage growth of the industry in the state.

The second factor refers to the announcement of a series of biodiesel industrial plants to be installed, including the one publicised in Brazil’s and the worldwide media as the ‘world’s largest biodiesel facility.’ It belongs to the Brazilian Company for Alternative and Renewable Energies (Companhia Brasileira de Energias Alternativas e Renováveis, CBEAR), to be built in Irati, Paraná. A second enterprise is the fourth plant to be built by Petrobras Biofuels in Palmeira, Paraná. Finally, a unit of the Agrenco Group is being considered, to be located in Marialva, PR. The business group has recently been resold to BSBios from Passo Fundo, Rio Grande do Sul. The evolving picture is complemented by a set of smaller-scale processing plants under study or under construction.

But that scenario is planned for the future, and today Paraná is not very relevant in the biodiesel national and international market. After all, the state’s first industrial plant, belonging to Biolix, installed in Rolândia, started producing the fuel in May 2004, at local scale. Other two companies located in the town started their operation in 2008: Biopar and Big Frango. In 2008, according to data by ANP – Brazil’s National Petroleum Agency, Paraná produced 7.3 million litres of the fuel, or only 0.6% of the total recorded in the country in that year.

The present report, based on secondary surveys and field visits, collected and systematised information about three enterprises – Biopar, CBEAR, and Petrobras so as to provide information for a matrix of Macro effects that can result from the construction and operation of a plant planned for Irati (CBEAR), projecting a future scenario for this case. As will be seen, one of the most important Macro effects identified was that the world economic crisis strongly affected planning and the capacity of international and national investors to really establish new biofuel processing plants.

1) Socioenvironmental and economic aspect

Paraná is one of Brazil’s 27 states (Figure 1). It is located in the country’s South-eastern region and borders with São Paulo (north and east), the Atlantic Ocean (east), Santa Catarina (south), Argentina (southwest), Paraguay (west), and Mato Grosso do Sul (northwest), with an area of 199,314 km².
About half of the state’s territory was originally covered by Mixed Ombrophilous Forest – part of the Atlantic Forest Biome. Nowadays, there remains only 0.8% of primary forest of that ecosystem in Paraná. Areas of natural grassland – another endangered ecosystem – are common on the highest parts of plateaus.

According to the State’s Institute of Economic and Social Development, IPARDES (Instituto Paranaense de Desenvolvimento Econômico e Social) the mid-south area of the state includes 13 towns: Fernandes Pinheiro, Guairanga, Imbituba, Inácio Martins, Ipiranga, Iraí, Ivaí, Mallet, Prudentópolis, Rebouças, Rio Azul, São João do Triunfo, and Teixeira Soares, totalling 244,698 inhabitants, or 2.4% of the state’s population (Figure 2).
The towns included in the Mid-south follow the upward variation in HDI (Human development Index) between 1991 and 2000, which was present in Brazilian towns and cities in general. However, that movement was not enough to improve the position of those towns compared to the state’s average. Even Mallet, which records the highest index (0.761), is within that average (0.787). All towns in the region are even below Brazil’s average (0.766).

The Mid-South region included 23,781 farming businesses in 1995/1996, which accounted for 7.3% of Paraná’s total. That number of businesses was evenly distributed over the 13 towns that make up the territory, and Fernandes Pinheiro had most of them (132) and Prudentópolis, the lowest number (7,644). Besides the strong difference in the number of businesses – a clear result of differences between towns – there is also distinction between businesses regarding each town’s topography, natural fertility, and productive activities.

Family farming businesses clearly predominate in the area, with production units using only family-based labour. The second most frequent category is the employer family business, which complements its labour by hiring others. Finally and less frequently, there is the non-family business, where most labour is employed. Distribution is the same seen all over the state, but in the Mid-south
territory the family-based type is more frequent (74.8%) than the two other types, when compared to Paraná’s total (66.0%).

Corn and soybean (Figure 3) occupied most of the planted area. While soybean expanded, corn saw a reduction of about 8% in the period. Both crops lost productivity. Among the main products planted between 2003 and 2005, an increment was seen in productivity of smooth potatoes (rain season harvest), black beans (dry season harvest), manioc and soybean (late harvest).

![Soybean plantation. Ponta Grossa, PR](image)

Source: Bonilauri, 2009

Considering the figures of main livestock in the area, the highest were those of bovines (172,042 heads in 2005), followed by swine (135,740). The main silvicultural product in 2001-2005 was timber, in logs and with other purposes. Altogether, it represented over 81% of the value of silvicultural products in the area. In 2005, those forms of wood increased their relative share to 88.6%, especially because of the increase in timber logs and the decrease in firewood. Production of wood for cellulose and paper varied during the period, but with an upward trend.

Therefore, in the coming years production, of that type of wood might expand, especially because it is something to be achieved in the long and medium terms. Environmentally, 43.7% of the area are vulnerable to soil degradation due to high risk of erosion. Besides, 2.6% are improper because of excess of water. In terms of preservation, the area includes an integral conservation and preservation unit (0.07% of it) – the Fernandes Pinheiro Ecological Station – and conservation units with sustainable use (e.g.: the Escarpa Devoniana and Serra da Esperança Environmental Protection Areas) which total 7.8% of the territory.
The Mid-South of the state of Paraná is located totally within the Mixed Ombrophilous Forest ecosystem. That forest formation, also known locally as *Araucaria Forest*, is part of the Atlantic Forest biome, making up a complex and varied regional ecosystem that includes several species, some of them endemic. It is characterised by two tree strata, a higher one called *Araucaria angustifolia*, locally known as *Brazilian pine* or simply *araucaria*, which gives the forest a peculiar appearance, and a lower one, dominated by varieties such as sassafras (*Ocotea odorífera*) and imbuia (*Ocotea porosa*). It also has a bush stratum in the underwoods, where mate (*Ilex paraguariensis*) and xaxim (*Dicksonia sellowiana*) are predominant.

That phytoecological unit occurs in the Southern Plateau, mainly in the states of Paraná, Santa Catarina, and Rio Grande do Sul, and is thus defined for its lack of a dry season and its severe winter, and the coexistence of tropical (Afro-Brazilian) and temperate (Austro-Brazilian) flora. The Mixed Ombrophilous Forest occupies different topographies, lithologies, and soil, usually at latitudes higher than 23 S, at altitudes from 500 to 1,500 m above sea level and far from sea influences. Several ecosystems might also occur that are associated to that forest formation, such as steppes or grasslands. Like grasslands, mixed ombrophilous forests are endangered. Paraná’s Mid-South region is one of the few still to have significant remainders of such vegetation formation.

1.1) Characterisation of Irati, Paraná

Irati is a Brazilian town located in the state of Paraná, about 150 km from the state capital Curitiba, in the Mid-South region (Figure 4). Its population includes a mixture of distinct ethnic groups (especially Poles and Ukrainians) that attempt to keep their ancestors’ habits and traditions.

The main farming and silvicultural products are: corn (regular and late harvest), ‘water’ beans, soybean, tobacco, timber logs as well fowl for slaughter, swine and bovine. The town is crossed by the BR-277 road (figure 5), which crosses the whole state (from Foz do Iguaçu, by the Paraguayan border to the Port of Paranaguá), a vital route for exportation; and BR 153. The town is also served by Ferroeste – the West Paraná Railway. (Figure 6)
According to 2007 IBGE population census, it has 54,151 inhabitants.

2) Biodiesel in Paraná

With increases in price of the oil barrel recorded mainly in 2008, among other factors such as climate changes, in recent years there was considerable investment on biofuel production in Brazil as a viable alternative to diversify the country’s energy matrix.

Until June 2008, the state of Paraná was only a biodiesel consumer. However, it also acquired producer status within the National Biodiesel Programme after its mandatory mixture with gasoline was increased from 2% (b2) to 3% (b3) under a National Council for Energy Policies decision. The Paraná State Bioenergy Programme was also established, encouraging new enterprises and new research to obtain raw materials.

Before the world economic crisis, forecasts were that within two years the state would start exporting biodiesel. Production was driven by BIOPAR, in Rolândia, PR (Figure 7), which sells most of its output to Petrobras. Biopar’s production is based on soybean oil.
Although costly, production from soybean oil can become viable because of the mandatory mixture. Nowadays, the domestic market for the fuel is about 850 million litres a year and with the increase in the mixture, that demand should grow to 1.3 billion litres a year. Estimates are that because of that increase to 5%, after 2013 production should be 2.4 billion litres a year.

Brazil’s biodiesel production based on soybean oil will increase demand from 1.5 million to 2 million hectares, according to the programme’s national coordinator Arnaldo Campo. According to estimates by the Paraná state government, in order to serve the processing plants established in the state, about 500 thousand should be invested in production. As seen in Box 1, only two plants are operating nowadays in the state (Biopar and Big Frango).
## Processing plants in Paraná and their operational status

<table>
<thead>
<tr>
<th>Plant</th>
<th>Town</th>
<th>Status</th>
<th>Capacity (million litres/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrenco (*)</td>
<td>Marialva</td>
<td>Non-operational</td>
<td>120</td>
</tr>
<tr>
<td>Agrodiesel Mercosul</td>
<td>Santa Helena</td>
<td>Under planning</td>
<td>144</td>
</tr>
<tr>
<td>BigFrango</td>
<td>Rolândia</td>
<td>Operational</td>
<td>14.4</td>
</tr>
<tr>
<td>Biolix</td>
<td>Rolândia</td>
<td>Non-operational</td>
<td>10.08</td>
</tr>
<tr>
<td>Biopar</td>
<td>Rolândia</td>
<td>Operational</td>
<td>43.2</td>
</tr>
<tr>
<td>Biopetro</td>
<td>Ibipora</td>
<td>Under construction</td>
<td>7.2</td>
</tr>
<tr>
<td>Cbear</td>
<td>Irati</td>
<td>Under planning</td>
<td>600</td>
</tr>
<tr>
<td>Lubeco</td>
<td>Araucária</td>
<td>Non-operational</td>
<td>0.12</td>
</tr>
<tr>
<td>TDN Paraná Biodiesel</td>
<td>Ponta Grossa</td>
<td>Under planning</td>
<td>120</td>
</tr>
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*Source: BiodieselBR, 2009. (*) Sold to BSBios in March/April 2009.*

### 2.1) Rolândia, PR

Rolândia is located in Northern Paraná, within Londrina’s metropolitan area, 399 km from the state capital Curitiba. Its estimated population in 2006 was 55,271. Its main farming and silvicultural products are: soybean, sugarcane, and corn. Its manufacturing industry, in turn, focuses on food products, leather, skin and the like; furniture; and textiles. The city has the three pioneering processing plants in the state – Biolix, Biopar, and Big Frango – the first one now temporarily non-operational.

Big Frango’s plant produces biodiesel from chicken guts fat and uses it for its own consumption, in its truck fleet that transports chicken cargo, while Biopar’s now sells 700 thousand litres of biodiesel a month to Petrobras. However, the expectation of placing Paraná as a major biodiesel producer and definitely entering the route of biodiesel trade and export lies on the construction of CBEAR’s industrial plant in Irati, on the Mid-south region of the state.

### 2.2) Palmeira, PR

Palmeira is located near Ponta Grossa. Agriculture and cattle farming are the basis of its economy. With a territory of 1,552 km², its topography and soil are highly varied, as well as their fertility. However, most of its land is proper for
agriculture, with fertility ranging from good to excellent. Family-based farming prevails, developed in small areas where basic consumption products are planted. Larger areas are worked on mechanically, with prevailing soybean, corn, wheat, oat, and barley.

Petrobras has a project for its fourth biodiesel processing plant in Paraná. Investment will be 120 million reais and its capacity will be 113 million litres a year, twice as much as the initial capacity of each of the three plants already opened by the company, located in Candeias, Bahia; Quixadá, Ceará; and Montes Claros, Minas Gerais.

According to Richardson de Souza, who coordinates Paraná’s bioenergy programme at the State Department of Agriculture, Palmeira was chosen based only on technical criteria and took into account mainly aspects of infrastructure, transport logistics, family farming’s concentration and production potential, and proximity to distribution and consumer centres. According to him, initial diagnosis and technical feasibility studies have already been conducted by state government and Petrobras staff. The company is now conducting the project’s final study.

According to the interview that Mater Natura carried with Mr. Valmir Sanson, an official with Palmeira Municipal Department of Agriculture, Manufacture, and Trade, the project was advanced when in January/February 2009, they received a visit by Petrobras to communicate that the enterprise has not been approved in the company’s 2009 budget. Prospects for the 2010 budget are good.

Small farmers plant mainly tobacco, then corn, which is used for family consumption and to feed animals, then black beans. Large-scale sunflower plantations would only be viable if prices were similar to those of tobacco. For small farmers, there are more viable options such as milk, since they have the structure, technologies, and several milk-processing companies in the area.

Other alternatives are vegetables and fruits, especially grapes, since a partnership is being established with Campo Largo Wines and there are minimum grape prices in the market.

2.3) Irati, PR
The enterprising: The Brazilian Company for Alternative and Renewable Energies (CBEAR)

CBEAR was created almost two years ago, but a year earlier investment in the Brazilian market was already under study, according to the company’s executive-director Christianne Fullin, who was interviewed by the Mater Natura team on March 26, 2009. The company was created after the merger of five Brazilian and foreign partners.
Almost all resources needed for the project have already been guaranteed by the partners and also by loans granted before the emergence of the world crisis, according to Fullin. Therefore, she says, the project is guaranteed even in a scenario where credit is scarce.

All the production of that crop in the state of Paraná will have the foreign market as its destination. ‘We do not focus on the auctions of ANP – Brazil’s National Petroleum Agency’, she says. The demand has been an obstacle to the activities of several companies, according to criticism that circulates in the industry. With capacity always above the sales established at auctions, many remain off them for months.

One of the consequences of today’s economic crisis has been the vertiginous fall in oil prices, which could discourage biodiesel purchases by foreign customers, since the fuel would be losing comparative advantage. According to the Fullin, the deal with the foreign buyer has also been closed, which guarantees demand for CBEAR’s production in Paraná.

The industrial biodiesel plant, seen as the largest biodiesel producer in the world, was initially planned for Guarapuava; however, when the lot was to be bought, real estate speculation made its price increased five times, making the purchase impossible. Therefore, the enterprise was transferred to Irati. The choice for that town, says Christianne Fullin, was due to its logistic structure, its closeness to the Port of Paranaguá, and a railway already negotiated with Ferroeste. According to her, socioenvironmental concerns also led to the choice for that town, since the region lacks private investments and has low Human Development Index (HDI).

Christianne Fullin said that the enterprise will produce 50 million litres of biodiesel a month – a total of 600 million litres a year. Furthermore, according to her, it will foster the economy of 68 towns in an area of about 120 km around Irati and it should generate about 500 new jobs (100 in the manufacturing industry and 400 in storage facilities). Ten of those towns will have facilities to storage grains. Fullin says that the plant will be installed as planned in its executive project, since even the lot is already bought. Even though its implantation has been delayed for six months due the world economic crisis, the delivery of the first biodiesel lot is scheduled for 2010.

However, the region is still not prepared to supply the enterprise only with raw materials such as sunflower, canola or hanksley, which CBEAR sees as long-term priorities. In order for the company to start its production, it will have to use soybean oil in the first two years, until the other crops are developed in the area. At its maximum capacity, the enterprise would need 20% of the current soybean production in the state of Paraná (Figures 8 and 9) to produce biodiesel. Raw materials will come initially from the states of Mato Grosso do Sul and Paraná itself, as well as from Paraguay.
Initially, soybean oil to supply the processing plant will be purchased directly in the market and not from small-scale farmers, while canola and sunflower, to be included only after 2011, will be purchased directly from farmers. The company will have a network of 400 employees providing technical support to raw material production (Figures 10 and 11). According to the secretary for Industry, Trade and Mercosur Affairs Virgilio Moreira Filho, ‘canola and sunflower, since they are winter crops, will increment those farmers’ income’. It should be underscored that Paraná is completing agricultural zoning of crops used as raw materials to produce biodiesel.
The planned processing plant should have four production lines for soybean, canola, sunflower, and hansley. Investment in the industrial plant and in agriculture was initially planned for 300 million euro, but the economic crisis made prices of several products fall, and that investment was reduced to 200 million euro. The investment also predicts a research lab.

Logistic arrangement to transport production is all designed, since according to Fullin, a railway line has been requested to Ferroeste, as well as space for CBEAR in the Port of Paranaguá. However, due to limited depth of the Port of Paranaguá and the possibility of operation of a new port in Pontal do Paraná, the latter is seen as a more viable alternative, if the railway is extended to it.

3) Projection of Macro effects – CBEAR case

Since CBEAR’s enterprise in Irati is still in its executive project stage, the methodology to identify possible Macro effects resulting from a future scenario where it would be actually implemented in the town was built based on interviews conducted with distinct actors involved in biodiesel production and on two cases of major processing plants in the state of Paraná: Biopar, already built, and Petrobras’s projected plant in Palmeira.

The effects listed in the testing framework proposed for this study and the reality presented during field trips suggest that even before the processing plant is established, uncertainties about its construction have already impact on local land prices, especially those close to its likely site. In the medium term, the urban area – because of the arrival of people that will work directly at the industrial plant – is expected to experience increases in land as well as rent price rises. Likewise, if the plant creates the financial benefits predicted by both CBEAR and local authorities, productive areas will also see an increase in prices and there will probably be changes in land ownership patterns.

According to CBEAR’s Christianne Fullin, the model adopted for the production will not compromise food offer and prices due to diversification of crops to obtain raw material for biodiesel production. That statement is in agreement with information provided by Richardson de Souza, from Paraná’s State Department of Agriculture and Supply. He says that the agency’s policies do not encourage crop replacement, but rather taking advantage of windows to diversify. However, in the medium and long terms, while there is no plenty of diversified raw materials and given the establishment of all biodiesel enterprises in Paraná, offer and demand market laws might change prices, in this case, of soybean, since it is a basic raw material for the industry.
The Mid-South region has a highly negative history regarding preservation of areas, since the industry, chiefly timber, which has cultural roots, has already compromised a large part of natural areas. Therefore, the state government and organised civil society are now mobilising to preserve and/or recover those areas, especially Permanent Preservation and Legal Reservation Areas in rural estates. In this context, it is believed that there will be no suppression of forest areas to oleaginous crops for biodiesel production, because of control and joint actions by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the State Police, through its Environmental Police Division – the Green Force. Furthermore, because of low management required in future sunflower, canola, and hansley crops, as well as crop diversity, they should contribute to improving soil conditions.

A change in land use patterns expected by public authorities is the replacement of tobacco plantations with oleaginous plants, given the environmental and social impact of the former. Given the model that will be adopted by the company for producing raw materials (sunflower, canola, and hansley) with local farmers, which includes full technical support, as well as the investment in research to improve production, technology transfer becomes a major positive macroeffect. That technical support to the family-based farmer is in agreement with recent policies adopted by the state government to increase research with crops for biodiesel production – especially those produced by family-based farming. The following Macro effects are also underscored:

### 3.1) Family farming in biodiesel production, guaranteeing raw material diversity and income generation

The introduction of new alternative crops such as sunflower, canola, and hansley will strengthen the local economy, especially because sunflower and canola are winter crops, and production areas are idle in that season. Hansley is a perennial crop and, according to CBEAR’s director, it will be planted only in areas where it is not possible to mechanise traditional crops, thus preventing impacts on food production. However, according to agronomist Rodolfo Garbelini from the regional branch of Irati’s Department of Agriculture and Supply, local farmers are culturally conservative and new crops should be introduced slowly, if rural extension work proposed by CBEAR is not highly effective.

### 3.2) The tobacco crop and life quality

Tobacco has a strong presence in Mid-South Paraná, but the crop is hazardous to the population’s health and life quality.
According to data collected during a visit to the region, both farmers and local authorities believe that after arrival of the enterprise as proposed by CBEAR, tobacco might be replaced in the medium and long terms according to the company’s development and the demands it creates. Such replacement might create significant impacts on the health of farmers linked to the crop and then reduce the current costs related to their occupational health, improving their life quality.

The CBEAR director said that it is not strategically interesting to have quarrels with any segment, but rather to find options to use the full potential of the region and to create multiple alternatives for jobs and income.

3.3) Pressure on the demand for raw materials (soybean), thus increase on the product’s price

Nowadays, soybean output in Paraná is not enough to supply the market for biodiesel production without competing with food production, considering the demand that will be created by the ANP’s proposal of increasing the percentage mixture of biodiesel to diesel.

Therefore, if all enterprises now under planning or implementation are actually established, there will not be enough raw materials, especially because soybean oil is still Brazil’s core base for biodiesel production, although it is more expensive.

Estimates are that 20% of the soybean production in the state of Paraná would have to be directed only to meet CBEAR’s demands. Therefore, according to Christianne Fullin, while there is no production of other crops to supply the industry, soybean will come from Mato Grosso do Sul and Paraguay, as well as some from Paraná itself.

Therefore, it is crucial to strengthen research such as that under development by IAPAR (the Paraná Agronomy Institute) on diversification of crops in order to offer raw materials to the biodiesel market, otherwise there can be competition between the two markets, increasing soybean prices.

3.4) Investments in research on diversifying the offer of raw materials and on biodiesel production

CBEAR’s industrial plant will include a research lab to improve crops intended to supply the biodiesel industry. In an interview, the company’s executive-director reported that the lab to be established will conduct research with several crops, in order to develop techniques to increase their productivity, as well as tests to improve the quality of the biodiesel offered. That concern is related to the
demands posed by the foreign market and, according to Fullin, the product offered by CBEAR will always meet the highest standards – in this case, the German standard.

Still according to the CBEAR director, after a request by the local government and the Mid-Western State University (Universidade Estadual do Centro-Oeste), a joint experimental lab will be established with the university to develop research studies.

3.5) Tax generation, increasing municipal funds

With the advent of CBEAR’s industrial plant, Itati’s Municipal Secretary for Manufacturing and Trade José Tadeu Jenczmionki said in an interview that the administration will welcome the enterprise, especially because of its size and capacity to create income and jobs, as well as the service chain that will be mobilised and increased in order to meet its demands. Estimates are that it will increase the town’s current PIB three times.

In an interview, Sérgio Luiz Voslki, president of Irati’s Trade, Manufacturing and Farming Association, said that there is high expectation from the trading and service industries to increment investments in order to meet the demands of the market to be created.

As a comparison, data collected about Biopar in Rolândia show that, since its production is lower than CBEAR’s, the former has not created any significant economic development in town. In fact, when the Mater Natura team visited the Municipal Economic Development Department, officials had no knowledge about the processing plant.

3.6) Information and counter-information about the establishment of CBEAR’s processing plant

The news about the establishment of CBEAR’s processing plant in Irati has created high expectation in the local population as well as in the whole chain that might be mobilised with the arrival of the plant, but its media repercussion and the lack of concrete information have created generalised uncertainty as to the its actual establishment.

Conversations with trade and businesspeople from the service industry show that, due to the lack of information there are already rumours that the company will not come. Some sustain that it was all a political move by the former candidate and now town mayor; others, in turn, said that the obstacle was the lack of a site for the plant.
The climate of uncertainty or counter-information might also have been created as a result of the pressure the town has been experiencing. For instance, in an interview with Fullin, she said that the land plot has already been purchased while Irati’s municipal secretary of manufacturing and trade, José T. Jenczmionki, said that the deal has not been closed yet.

### 3.7) Impacts on infrastructures

Christianne Fullin was questioned about the negative impacts on region by the company and she said that all variables were considered and presented to municipal authorities in order to warn them against impacts to be triggered. She also said that actions are planned by the company, together with the municipal government, to give support to reduce impacts, mainly in health, education, safety and transport structure.

To transport production, as has been mentioned earlier, the company has asked Ferroeste to extend a branch into its site in order to avoid the estimated traffic of 300 trucks a day if the road modal is used, besides saving in transport costs. Such request for Ferroeste has been confirmed by the Mater Natura team in a consultation with IAP, the state’s agency for environmental licensing.

The company also predicts partnership with Ferroeste for the purchase of wagons with the technical specifications needed for biodiesel transport. According to Fullin, biodiesel transport should be done very carefully in order to keep the fuel’s characteristics according to foreign market’s specifications. Therefore, the company should purchase the wagons, which will be paid to CBEAR by Ferroeste during 15 years.

Even with the investment that will be made in transporting production by railway, Ferroeste will not be able to do the whole transport, so that the use of roads will be inevitable and will create impacts such as: profits for cargo transport companies, increasing risk of road accidents, increasing traffic, and additional investments in the maintenance of the road network, especially those that are not covered by tool systems.

### 3.8) Pressure for the construction of a new port in Pontal do Paraná

Currently, a Project is under study for the construction and operation of a new sea port in the town of Pontal do Paraná. CBEAR’s executive director explained that, because of the draft of ships that intend to use to the port of Paranaguá to transport production, that use would be impossible, while the new port would meet requirements for the traffic of ships with deeper draft. Fullin said that, even though there is an area already reserved for them that in the Port of Paranaguá, if the new port is built and there is the option of railway transport, CBEAR’s production can be sent to it.
In this context, after that demand is created, businesses’ pressures for the establishment of the aforementioned port will likely increase. The construction of the port, road, and railways leading to it are being debated by Paraná’s environmentalists, since it will generate significant impacts on the Atlantic Forest (Dense Ombrophilous Forest) and the region’s coastal ecosystems.

3.9) Introduction of exotic species and dissemination of pests in agriculture

The increase in biodiesel production will favour diversification of raw material sources, with consolidation or introduction of exotic crops in the state. From the biological or even economic viewpoint, constant monitoring of those crops is needed in order to identify damages to the state’s environment or farming resulting from pests and the dissemination of invading species. It should be said that Paraná pioneered a state legislation regarding exotic and invading species, having created a State Committee do Invading Exotic Species, where Mater Natura is one of civil society’s representatives. What most scares farmers both in sunflower and canola is a fungus called *Sclerotinia sclerotiorum*, which can remain viable in soil for up to five years and then contaminate other crops.

3.10) Transfer of technology and technical knowledge to farmers

The model to be adopted by CBEAR to provide technical support to farmers should be the core measure of transferring technology and technical knowledge to farmers. According to Fullin, the intention to provide technical support and diversify crops will broaden farmers’ technical knowledge and bring them an additional income source.

By obtaining such knowledge, farmers should minimise environmental impacts, since they will have ‘gains’ in terms of preserving soil, water resources, and natural waters. That should be reinforced by an attempt by the Social Seal entrepreneur to encouraging the search for sustainable alternatives for production.

3.11) Real estate speculation in the town where the enterprise will be established

One of the first impacts resulting from the possible establishment of a large scale enterprising such as that proposed by CBEAR is the significant increase in land prices, initially for installing the industrial plant and then, at a smaller degree, in urban areas.

As has been mentioned, regarding CBEAR’s enterprising, Fullin said that the initial proposal was that the plant was installed in Guarapuava, but the owner of the
area intended for the processing plant increased the value of the land plot five times, making the company move to Irati.

Irati’s secretary José Tadeu Jenczmionki said that investors from out of town have been prospecting areas around the plant’s future site, in order to profit from their valorisation.

3.12) Increase in investment in the construction industry

Another industry that is already responding to the news about the plant is construction. The municipal government has received several phone calls from companies seeking information about the construction works and offering their services.

3.13) Labour offer

Another demand created by the expectation of establishing the plant is the search for professionals in agricultural extension and from fuel production industry to form the company’s technical staff.

According to information from the Irati municipal government, those demands are coming directly to the government, which, in turn, is redirecting them to CBEAR. Christianne Fullin mentioned her surprise to see that she will be able to count on the local labour force to form her technical staff, given its high qualification level.

The enterprise should also induce the arrival of workers seeking job opportunities. Is it known that, because of such mobility, some families end up arriving to town and never return to their original places, often becoming unemployed and creating serious social problems.

4) Civil Society Action

The Mater Natura Institute of Environmental Studies is a non-profit civil association based in Curitiba, PR, which has worked with public policies for over 25 years, in order to contribute to preserve biological and cultural diversity towards improving life quality.

Because of work in more than ten networks and state and national councils, Mater Natura can have a wide view, interconnected with several segments of society.
The councils and networks the NGO is a member of include:

- Brazilian Network for Biofuel Sustainability (* Rede Brasileira sobre Sustentabilidade dos Biocombustíveis – RedeBio, founding member);

- Atlantic Forest NGO Network (* Rede de ONGs da Mata Atlântica – RMA, a member of its national board);

- National Network Pro-Conservation Units (* Rede Nacional Pró-Unidades de Conservação – Rede Pró-UCs, member of director’s council);

- The National Council for the Atlantic Forest Biosphere Reservation (* Conselho Nacional da Reserva da Biosfera da Mata Atlântica, CN-RBMA, representative of NGOs from Southern Brazil);

- Pact for the Restoration of the Atlantic Forest (* Pacto pela Restauração da Mata Atlântica – member of its managing council);

- State Environmental Council (* Conselho Estadual do Meio Ambiente – CEMA (Representative of Paraná’s NGOs);

- State Council for Protection of Native Fauna (* Conselho Estadual de Proteção à Fauna Nativa – CONFAUNA – Representative of Paraná’s NGOs);

- State Council for Water Resources (* Conselho Estadual de Recursos Hídricos – CERH – Representative of Paraná’s NGOs);

- State Committee for Invading Exotic Species (* Comitê Estadual das Espécies Exóticas Invasoras, representative of Paraná’s NGOs).

It should also be underscored that Mater Natura has recently approved a project with IUCN NL to monitor, disseminate information, and build public policies for Criteria and Principles of the Round Table about Sustainable Biofuels (* Mesa Redonda sobre Biocombustíveis Sustentáveis, MRBS), with stakeholders in the Paranapanema River Basin (about 350 towns in the states of São Paulo and Paraná).

Since the NGO is already working at several fronts related to public policies and monitoring environmental issues, including biofuels, co-operation will be easy with other NGOs, networks and councils that work national level as well as in Paraná’s Mid-South region, in order to follow Macro effects as well as environmental and social impacts resulting of the establishment and operation of major biodiesel industrial plants mentioned in this report. It should also be said that, since May 2002, Mater Natura conducts a project in ten towns in the Mid-South to form the
Managing Council and Management Plan for the Environmental Protection Area (APA) of Serra da Esperança.

Irati has no active environmentalist NGO, as shown by the current makeup of the Managing Council of its FLONA (National Forest), which does not include any active representation of civil society and where timber companies prevail. We list below the most active NGOs in the Mid-South and other towns around that region. However, none of them has any experience with public policies related to the biofuel industry. Therefore, since Irati is about 150 kilometres from Curitiba, Mater Natura intends to establish contact and partnerships with those NGOs for the joint monitoring of CBEAR’s enterprising.

The NGOs and councils in the region include: Conselho Gestor do Território Centro Sul do Paraná, Instituto Os Guardiões da Natureza – ING (Prudentópolis), Instituto Maytenus (active in the whole state of Paraná), Instituto Equipe de Educadores Populares (Irati), DESER – Departamento de Estudos Sócio-Econômicos Rurais (active in the whole state of Paraná), Centro de Desenvolvimento do Jovem Rural – CEDEJOR (Guamiranga), Terra de Direitos (active in the whole state of Paraná).

5) Conclusion

In case the CBEAR processing plant is established, considering information collected in town and the expectations held by the community and local authorities, and taking into account the company’s concern with the creation of mechanisms for local development by establishing new crops and technical support, it is believed that it will bring environmental, social, and economic gains, compared to the markets currently explored in the region, especially those linked to the timber and tobacco industries.

However, given the high output and short-term uncertainties regarding production of raw materials alternative to soybean, and considering market laws, the product’s price might increase and therefore, prices of soybean destined to other markets might vary, including those related to food production. Another concern related to the arrival of the enterprising is the rise in the cost of living for the population because of the low offer of products and services in town. On the other hand, in the medium and long terms, given the demand generated, the whole structure of the trade and service industries can be incremented, creating more opportunities for job and income generation.

The scenario projected indicates that, since production is based on soybean, at least in the three former years, pressure on the Mixed Ombrophilous Forest (araucaria forest) might increase in the region of the 68 towns focused on by the
company to obtain its raw material. Even though efforts to preserve the forest have been considerable, including programmes to establish the Legal Reservation and Permanente Protection Area (APP), owners will be able to expand agricultural frontiers, thus causing considerable environmental damages to that eco-region. Even considering CBEAR’s statement that raw material to produce biodiesel from soybean will be purchased from co-operatives and in the foreign market, land will go from small to large landowners, since production in small areas is not feasible. Therefore, it might trigger a major social problem in town because of the rural exodus and the creation of poverty pockets.
IV) Sugarcane Industry in Sertãozinho, São Paulo

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Presentation

The area around Ribeirão Preto, in the northeast of the state of São Paulo, is the main hub for Brazil’s ethanol industry, not only for the amount of sugarcane produced, but also in terms of generation of cutting-edge technology for the industry. Full of sugarcane plantations around it, cities such as Ribeirão Preto and Sertãozinho also have strong metal and service industries directed to implementing processing plants and establishing automation processes. Part of the production is directed to the foreign market and some local companies already have branches abroad.

The history of the development of the sugarcane industry in the Ribeirão Preto area dates back from the 1960s. In 1975, when the National Alcohol Programme, known as Proálcool, was launched as the Brazilian government’s response to the oil crises, a processing plant maker located in Sertãozinho – Zanini – became one of the project’s sustaining pillars.

The presence of the sugarcane industry, which produces technology as well as alcohol, sugar, and electricity – the latter by burning bagasse – is one of the factors placing Ribeirão Preto and other 16 cities in its region within a quadrilateral that includes 185 cities in the state. If they were a country, it would be the 27th
largest economy in the world according to survey conducted by the São Paulo state government. The study, released in 2008, has also assessed indicators on infrastructure and human development and considered that, besides the sugarcane industry, the region is benefited by being a university and medical-hospital centre.

As for its Human Development Index (HDI), Ribeirão Preto was 21st place in the national ranking in 2000 – the last data available on cities – with a 0.855 index, already above the current Brazilian index, from 2008, which is 0.807. That methodology is adopted by the United Nations (UN) and uses income, education, and life expectancy of a given population as its parameters. Areas whose indexes are over 0.800 are considered of high human development.

But those data are only a statistical average, since acquiring so much wealth has a price – starting for a social one. Half the sugarcane in the Ribeirão Preto region is still harvested manually by labourers coming from the poor outskirts of the cities and especially by migrants from Brazil’s north-eastern states such as Bahia, Piauí, and Maranhão, as well as Minas Gerais.

At the beginning of each year, thousands of buses usually arrive to the region of Ribeirão Preto with people to work on sugarcane cutting. When they get a job in cutting, they are subjected to a working regime where they earn more if they cut more. That productive logic leads many to accept extenuating working hours that led to the death of at least 22 men between 2004 and 2008 in the state of São Paulo. Workers get between R$ 500 and R$ 600 a month to cut, besides productivity gains. Their monthly pay is between R$ 700 and R$ 900– only enough for them to return to their hometowns by the end of the harvest period, until they restart the migratory cycle in the following year.

The sugarcane industry also has its environmental price. The expansion of plantations makes that monoculture the most common landscape in the Ribeirão Preto region, instead of the old cerrado vegetation – similar to African savannas – that used to occupy the territory. Besides the jeopardised biodiversity, sugarcane burned to make manual cutting easier pollutes the air with greenhouse-effect gases and therefore cancels ethanol’s energy balance advantages over gasoline.

Those Macro effects of ethanol production were investigated in a series of field trips to the Ribeirão Preto region in October 2008, under project Brazil of Biofuels, by NGO Repórter Brasil, and in the surrounding area already covered by the research projects, in April 2009. This time, the focus fell on the city of Sertãozinho, whose economy is dependent on the activities of local sugarcane and metal companies. Besides collection of statistical data, its methodological proposal includes interviews conducted with labour union leaders, residents, activists, and workers in Sertãozinho.

Besides the present time, marked by current crises in the sugar-alcohol industry, this study is interested in reflecting on future scenarios. In that case, the
Ribeirão Preto region can be seen as an indication of what can become of the new sugarcane frontiers being opened in the country: the industry might bring wealth, but a high social and environmental price is still to be paid. If one of the solutions includes complete mechanisation of plantations, as advocated by government officials and businesses, there is something to be explained: What will become of the thousands of workers that are now functional to sugarcane cutting, but who will lose their jobs in the future?

Sugarcane owners and union leaders estimate that each combine harvester replaces about 100 jobs in a sugarcane plantation, but ten workers are eventually absorbed by machine operation and maintenance. What can be done with the other 90? The answer to this question now includes programmes of worker re-qualification, so that they can perform other functions in the ethanol production chain or even change areas. However, those programmes are more like proposals for the future than a real option for just-unemployed workers.

1) Socioenvironmental and economic aspects

The city of Sertãozinho is located in the geological area of basalt outpouring in northern São Paulo, where adaptation of structured red soil to agriculture has encouraged the expansion of that activity since the 19th century. Besides the type of soil, the tropical climate contributed for the development of the region’s agriculture, with rainy summers, dry winters and good lightning all year round.

The region gained importance in Brazil’s history in the second half of the 19th century, when the arrival of the Mogiana railway integrated local owners into the so-called coffee economic cycle, which would last until the 1930s. During that period, waves of migrants arrived from Italy, Spain, Portugal, and Japan, whose cultures are still strong in local life.

The expansion of coffee plantations contributed for the destruction of the original fauna and flora, made up of species typical of Cerrado – Brazil’s second largest biome, only smaller than the Amazon. Currently, the only relevant preserved area – with 7.7 km² – in Sertãozinho is within a local biological reservation. The growth in sugarcane plantations after the second half of the 20th century contributed to the extinction of original areas, including those close to water sources.

Estimates are that about 3 million people live in the 66 cities and towns that make up the so-called meso-region of Ribeirão Preto. Per capita income in the city is 18 thousand reais, twice that of Brazil. In Sertãozinho, it reaches 14.3 thousand according to data from 2000. In that same year, Sertãozinho’s Human Development Index (HDI) reached 0.833, already above the 2008 national average of 0.807.
As a sign of economic strength, the Brazilian Institute for geography and Statistics (IBGE) released a study in 2008 with data about the region’s Gross Domestic Product (GDP) that pointed to a growth rate above that of Brazil. The study indicates that between 2003 and 2006, the regional GDP increased 16%, to R$ 52.5 billion, while Brazil’s index increased 10%.

Sertãozinho was one of the highlights in IBGE’s study. The city recorded the highest growth in the state from 2005 to 2006, increasing 29%, going from 50th to 43rd place among the state’s largest economies. That happened because its economy does not depend only on sugarcane plantations or even on its transformation into sugar, ethanol or electricity by processing plants, but rather because it also has a manufacturing and service park for the whole sugar-alcohol industry.

2) The economy of ethanol

The region of Ribeirão Preto is Brazil’s largest sugarcane hub as well as one of the largest in the world. According to IBGE’s 2007 data – the latest data released by the agency – the country produced in that year 549.7 million tons of sugarcane and the region accounted for 18.2% of that total – or 100.5 million tons.

In the list of Brazil’s largest sugarcane producer cities, seven out of the eleven first ones are located in the region, as well as the four leaders: Morro Agudo, Guaíra, Miguelópolis, and Barretos. Between 2006 and 2007, production remained stable in Morro Agudo, but it increased 96% in Guaíra, 46% in Miguelópolis, and 36% in Barretos, in areas where there used to be cattle or especially grain crops.

<table>
<thead>
<tr>
<th>Sugarcane production ranking (tons) – 2007</th>
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<tbody>
<tr>
<td>1st Brazil</td>
</tr>
<tr>
<td>2nd Morro Agudo - SP</td>
</tr>
<tr>
<td>3rd Guaíra – SP</td>
</tr>
<tr>
<td>4th Miguelópolis – SP</td>
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<tr>
<td>5th Barretos – SP</td>
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<tr>
<td>6th Paraguaçu Paulista – SP</td>
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<tr>
<td>7th Piracicaba – SP</td>
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<td>8th Batatais – SP</td>
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<tr>
<td>9th Guararapes – SP</td>
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<tr>
<td>10th Barra do Bugres – MT</td>
</tr>
<tr>
<td>11th Ituverava – SP</td>
</tr>
<tr>
<td>12th Jaboticabal – SP</td>
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Source: IBGE
In Sertãozinho, sugarcane production increased a little, from 2.4 million to 2.5 million tons, because of the lack of new areas for expansion. But, as has been said, the city’s wealth does not come only from rural areas, but rather from processing plants and metal and service industries located within its limits.

Brazil’s second largest sugar-alcohol business group is based in Sertãozinho. Today, Santelisa Vale, formed by the merger of Santa Elisa and Vale do Rosário in 2007, operates five plants in several cities, which, together, process over 18 million tons of sugarcane a year, producing 800 million litres of ethanol and 1.2 tons of sugar.

Besides, the processing companies São Francisco, Santo Antônio, Albertina and the Santa Inês Distillery also operate in the city. São Francisco stands out for producing over 80 thousand tons of sugar and 51.2 million litres of ethanol per sugarcane harvest, and Santo Antônio for a production of up to 140 thousand tons of sugar and 111.6 million litres of ethanol.

From 2003 on, Brazil’s sugar-alcohol industry experienced a real boom after the advent of ‘flex’ cars, which could run on gasoline or alcohol. Currently, over 90% of cars sold in the country are of the ‘flex’ type. With such a potential demand out there, investors started focusing on modernisation and construction of new processing plants. No wonder why ethanol production in the country jumped nearly 150% after 2003, to 14.3 billion litres in the 2007/08 harvest.

The Brazilian government decided to support the industry, seen as crucial to turn the country into an export platform for renewable fuels. President Luiz Inácio Lula da Silva began approaching the subject in his international trips, signing tens of protocols of intentions with other countries to develop the ethanol market.

For that, the government has also provided businesses with aid from the Brazilian Social and Economic Development Bank (Banco Nacional de Desenvolvimento Econômico e Social, BNDES). Since 2004, the bank has signed contracts to support the construction of 43 processing plants. In 2008, R$ 6 billion were granted to be invested in the industry – 61% over last year’s amount.

But the expansion of the sugar-alcohol industry is not always a smooth process. In 2008, the excess in ethanol offer in the Brazilian market – caused, among other reasons, by the beginning of the operation of new plants and the difficulties to export the product to countries such as the United States – brought ethanol prices down to levels that were not compensating for companies. The wholesale price of the litre had fallen from near R$ 1 in the beginning of the decade to R$ 0.80.

The result was catastrophic for some of the companies with major debts due to investments made to enlarge their facilities or to build new units. The crisis could
be seen among companies listed at the stock market, such as Cosan, the country’s largest sugar-alcohol business group. The company lost R$ 47.8 million during the fiscal year closed in 2008.

Nevertheless, since most companies are private capital corporations, bad times were only noticed indirectly, because payments to providers were late, products were not delivered and workers were earning little and late. The situation got even worse along the second half of 2008, when the international financial crisis made credit options scarce.

Not surprisingly, problems hit hard the Ribeirão Preto region. In 2009, some companies delayed the start of their sugarcane processing activities and others did not even start them, such as Sertãozinho’s Albertina, sunk in debts of 100 million reais. In that city, hundreds of jobs were terminated, causing the industry’s crisis to reduce the traditional migration of sugarcane cutters from north-eastern states and Minas Gerais, which takes place in the beginning of the year.

3) Identification of Macro effects

As has been said in this work’s introductory chapter, Macro effects of ethanol production were examined during a series of field trips to the Ribeirão region in October 2008, under NGO Repórter Brasil’s project ‘Brazil of Biofuels,’ and by returning to the area covered by the current research project in April 2009.

As its methodological proposal, besides collection of statistical data, interviews were conducted with labour union leaders, residents, activists, and workers in Sertãozinho. Only Macro effects mentioned by interviewees and basically checked with objective data are reported below.

The increase in food prices in local supermarkets was mentioned as a problem, but it was impossible to verify any relation between such increase and the growth in sugarcane areas in the region, since most of that food is historically brought from other regions in the country.

3.1) Migration

Virtually half the sugarcane in the region of Ribeirão Preto is still harvested manually, through the strenuous work carried out by cutters. Most of them have low educational level and migrate from poorer regions in the country, especially north-eastern states and Minas Gerais, in search of a job. Although many attempt to settle in the region, a considerable wave of them leaves and comes back each year: they
arrive in January and February and they leave in late November and early December.

The Migrant’s Pastoral Commission – an organisation linked to the Catholic Church working in the region – estimates that 70 thousand workers arrive every year to sugarcane plantations. It should be pointed out that they are at least 135 thousand in the state of São Paulo, according to the Sugarcane Industry Association (UNICA) and at least 330 thousand in the whole country.

But that figure is starting to decrease, not only because of the advancement of mechanised harvesting, but also because of the crisis that hit the industry in 2008. The 2008 edition of ‘Brazil of Biofuels – Sugarcane’, a report by NGO Repórter Brasil, tells the story of migrants who came from the town of Pimenteiras, state of Piauí, in the northeast of Brazil, to work in Sertãozinho.

At age 31, Francisco Vital da Costa had migrated to São Paulo for ten years to work in sugarcane cutting. The reason, he says, was the lack of opportunity in his hometown, where the HDI for 2000 was only 0.574, below the 2008 0.807 national average. With him, over 100 workers from Pimenteiras went to São Paulo in some harvests.

But they are no longer coming. In the latest field research conducted in Sertãozinho in 2009, already under this research project, only two workers from Pimenteiras could be found: Antonio Silva Montanha, 35, and Carlos Antonio de Almeida Brito, 28. Montanha now works for Santo Antonio and Brito had already bought his ticket to return to Pimenteiras.

Montanha and Brito, from Pimenteiras, PI, who work as sugarcane cutters in Sertãozinho, SP
Photo: Marcel Gomes
According to Montanha, only some 10 workers from that town were left in Sertãozinho. The reason is simple: the crisis made jobs scarcer and pay, less attractive. ‘People from Pimenteiras keep migrating because there is no work to be done there. But they are going to other regions, such as Mato Grosso, Minas Gerais and other cities in the state of São Paulo’, says the cutter. In Sertãozinho since 2002, he has worked for Albertina until 2008, when he got a job at Santo Antonio. When Albertina’s crisis started, he was four months without pay and, in order to survive, he had to spend the few savings he intended to take back to Pimenteiras. ‘I want to stay here for one or two more years and the return’, he said.

Brito, the other worker from Pimenteiras, was counting days to hop on the bus and get back to his hometown. Between working in sugarcane harvesting in Sertãozinho and be day worker in Pimenteiras’ plantations, he chose the latter, according to him, also in order to be closer to his wife, who did not want to live in Sertãozinho. He used to earn around R$ 700 a month to work in sugarcane cutting – which is more than Brazil’s minimum monthly wage of R$ 465. ‘It’s not worth it. I don’t want to be here anymore’, he sustained.

### 3.2) Conflicts

Poor working conditions in Sertãozinho’s sugar-alcohol industry caused a series of workers’ demonstrations against processing companies all over 2008. According to union leader Zaqueu Ribeiro de Aguiar, from the São Paulo State Federation of Rural Waged Workers (FERAESP), which represents sugarcane workers, in October 2008 almost 10 thousand workers in several cities of the Ribeirão Preto region went on strike at the same time demanding better working conditions and pay. Some protests were violently repressed by the police, as occurred in Sertãozinho in December 2008, during a strike that lasted nine days at Albertina. More often than not, workers that lead the strike are persecuted by the companies’ administration and fired on just cause, against Brazilian legislation that guarantees the right to labour organisation.

Protests were maximised by precarious working conditions. The fact that most sugarcane cutters in the state of São Paulo have regular working papers registered at the Ministry of Labour and Employment does not prevent violation of other legal rules. Data from the Rural State Group for Labour Inspection in São Paulo, as can be seen in the table below, point to increase in irregularities by companies in items such as pay, weekly day off, toilets for workers, provision of individual protection equipment and transportation to the plantation. Being a relevant problem in other areas of Brazil, slave labour is rare in the Ribeirão Preto region.
Wages paid for sugarcane cutting are yet another focus of dissatisfaction for workers. According to a survey by NGO Repórter Brasil, between 1999 and 2007, cutters improved their purchasing power. In 1999, an average income of R$ 509 could buy 4.5 basic item packages worth 111.91 each. In 2007, average income jumped to R$ 1,142, equivalent to 5.5 packages worth R$ 205.48.

However, such evolution ceased to occur in 2008. The value of the basic package in that year went to R$ 238.66 – a 16.1% increase, but wages increased only 7%, according to the São Paulo State Federation of Rural Waged Workers (Federação dos Empregados Rurais Assalariados do Estado de São Paulo, FERAESP). Such fall in purchasing power is one of the reasons for the conflicts that happened in 2008 and that could happen again in 2009. In Sertãozinho, discouragement remains with the current harvest, where jobs have become scarce and wages stagnated.

Data on wages are from the Ministry of Labour and Employment and do not refer only to cutters, but to all workers involved with sugarcane cutting, and data on the basic food package come from the Inter Trade Union Department of Statistics and Socio-Economic Studies (Departamento Intersindical de Estatística e Estudos Sócio-econômicos, DIEESE).
3.3) Land price increase

The expansion of sugarcane in the region of Ribeirão Preto made land prices skyrocket. According to the Institute of Agricultural Economy (Instituto de Economia Agrícola, IEA), an agency linked to São Paulo state government, one alqueire, or 24.2 km$^2$, of land proper for sugarcane reached an average of R$ 24.8 thousand. In 1999, it used to cost only R$ 3.7 thousand, which, updated according to the period’s inflation, would be worth today about R$ 7.1 thousand. That means that in real terms, the price of land in the region of Ribeirão Preto has increased 250% over nine years.

Such huge increase makes land a privilege for large owners and investors, who are often processing companies themselves. Besides, it hampers land reform policies to settle former cutters that have lost their jobs because of harvest mechanisation. Such policies are suggested, for instance, by the National Confederation of Agriculture Workers (Confederação Nacional dos Trabalhadores na Agricultura, CONTAG). However, increasing land prices are one of the reasons pointed out by the Brazilian government to carry out land reform only in areas remote from consumer centres, creating difficulties for the survival of new settlements.

3.4) Destruction of vegetation

Amongst Brazil’s biomes, the one most threatened by sugarcane expansion is Cerrado, which is similar to African savannas. A study released in 2008 by NGO Instituto Sociedade, População e Natureza (ISPN) showed that 142 thousand hectares of Cerrado considered as priorities to be conservation units were turned into sugarcane plantations in the 2006/2007 harvest.

The NGO compared the Ministry of the Environment’s Map of Priority Areas, released in 2007, with satellite data organised by project Canasat, which monitors Brazil’s sugarcane plantations and led by the National Institute for Space Research (Instituto Nacional de Pesquisa Espacial, INPE).

Data indicate that the state of São Paulo was first place in deforesting biodiversity areas, with 86 thousand hectares transformed into plantations, followed by Minas Gerais with 25 thousand, Goiás 13 thousand, Mato Grosso12 thousand, and Mato Grosso do Sul 6 thousand. At least two areas threatened by sugarcane are within the Ribeirão Preto region, and one of them surrounds the Biological Reservation located in Sertãozinho.
3.5) Contamination by pesticides

The advancement of sugarcane plantations over native forests increases the use of pesticides in rural areas that surround cities. To make things worse, given risks for human intoxication, the region of Ribeirão Preto led the national ranking for use of illegal pesticides in the first quarter of 2009. Data from the National Association of the Industry of Agricultural Defence Products (Sindicato Nacional da Indústria de Produtos para Defesa Agrícola, SINDAG) show that 4.5 tons of illegal pesticides were confiscated in the region – 64% of the country’s total.

The explanation is that Ribeirão Preto would be used as the base for distribution of banned products for Midwestern states such as Mato Grosso and Goiás. Pesticides, smuggled from Paraguay and Bolivia, would go primarily to corn and soybean production, which are planted in the Ribeirão Preto, alternated with sugarcane.

In order to fight counterfeiters and to monitor the use of pesticides, the Brazilian government maintains a programme to collect containers. When buying a product, farmers are already oriented as to where they should return containers. Although it has been praised, the programme is not able to prevent thousands of people from being contaminated by those products every year. According to the latest data released by the National System for Toxic-Pharmacological Information (Sistema Nacional de Informações Tóxico-farmacológicas, SINITOX) on 2006, 7,740 people were contaminated in Brazil, of which 1,999 were in the state of São Paulo and 124 in the Ribeirão Preto area.

4) Action by Civil Society

Sugarcane cutters from Sertãozinho have at least two major references in terms of civil society organisation: the São Paulo State Federation of Rural Waged Workers (FERAESP), with an office in town, and the Migrant’s pastoral Commission, whose headquarters are located in Guariba, a town in the same region.

FERAESP is a federation of affiliated rural labour unions, as provided for in Brazilian legal framework regarding unions. In Sertãozinho, besides carrying out collective bargaining with sugarcane processing companies, its leaders conduct meetings to raise workers’ awareness and to demonstrate in front of companies’ facilities. According to union leader Zaqueu Ribeiro de Aguiar, that process is slow and hampered by turnover of workers, who are mostly migrants.

He stresses that 2008 was an atypical year, since poor working conditions helped to mobilise cutters, which lost the fear of being fired and took part in demonstrations. Last year, unions linked to FERAESP were able to mobilise 10 thousand workers in a strike for better wages and working conditions in plantations.
In Sertãozinho, the strike in the Albertina processing plant, for instance, was successful. After nine days, cutters achieved the right to receive food-tickets and a small increase in their wages.

Nationally, FERAESP has been taking part in a dialogue table called by the federal government to discuss improvements in work conditions, together with business segments. In a meeting held in Brasília in February 2009, the Federation advocated at the dialogue table the end of labour outsourcing and the use of standard work contracts among companies.

Another reference for sugarcane cutters in the region of Ribeirão Preto is the Migrant’s Pastoral Commission. Linked to the Catholic Church, it plays a role similar to that of the Land Pastoral Commission (CPT) in the Amazon, by working to organise workers and raise their awareness about the rights.

The Commission is known for warning about the precarious situation of cutters’ work, especially migrants, and following lawsuits related to those that died at work under a suspicion of excess efforts. According to Inês Facioli, one of the Commission’s coordinators, at least 22 men died for that reason between 2004 and 2008 in the state of São Paulo.

5) Conclusion

Wealth and development brought by the sugarcane industry might surprise travellers arriving at the region of Ribeirão Preto. But a trip into the city’s outskirts is enough to find out the less noble side of the activity. Workers who are subjected to intensive working regimes in exchange for money that is not enough to guarantee their life quality.

According to economist Francisco José Alves, from São Carlos Federal University, a worker that cuts up to 12 tons of sugarcane a day cannot keep doing it for more than 10 harvests, given the effort needed during one of them. According to Alves’ estimates, that worker will walk 8.8 thousand metres, hit the machete 133.3 thousand times and carry the 12 tons of sugarcane to its truck each day.

In spite of mechanisation advancements, manual sugarcane cutting will continue in the next years, given the difficulty to mechanise in some areas. In the area of Ribeirão Preto itself, with one of the highest technology levels in the country, half the harvest still depends on cutters. For those men and women, who face intensive working hours in exchange for low payment, whether or not Brazil will become an even stronger power in ethanol production makes little difference. What they really want is at least part of that wealth that some insist on concentrating.
This research work reports only on those Macro effects caused by increase in ethanol production mentioned by interviewees and minimally verified against objective data. They are the migratory process, workers conflicts’ with processing companies, land price increases, destruction of cerrado vegetation, and contamination by pesticides, including banned products.