



Smoke Screen:

The Hidden Story Behind
Biofuel Production

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Smoke Screen: The Hidden Story Behind Biofuel Production

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Introduction

The recent expansion of sugarcane monoculture for fuel purposes, and its implications for the future, has led to an intense debate about its social and environmental impact. Two fundamental aspects of the debate will be discussed here.

The territorial expansion of sugarcane at the expense of food production is the first impact. The debate revolves around the threat to food sovereignty and security, especially in the context of what was called the global food crisis in 2007, with rising prices of basic agricultural commodities traded at an international level. It wasn't only the increase in the use of sugarcane for automotive fuel, but primarily the use of corn in the United States that caused most of the concern.

Climate change is the second aspect of the debate. On the one hand, governments and businesses use the argument that by avoiding the use of fossil fuel, biofuels reduce carbon dioxide emissions and contributes to the reduction of total emissions of greenhouse gases. They argue also that sugarcane isn't planted in the Amazon, which means that it doesn't contribute to deforestation. On the other hand, many institutions, both scientific and civilian, point to the various sources of emissions created by the process of producing ethanol, such as the burning of cane leaves after harvest and the use of pesticides, both of which contribute to global warming. They also point to the displacement of other agricultural activity created by the arrival of sugarcane, which resulted in the expansion to new areas in important environmental regions, until then preserved, such as the Amazon and the Cerrado. The result is a battle of numbers, one side presenting their own version, and the other side, the opposite.

With this report, ActionAid intends to elucidate the debate through an analysis of biofuel production and a more integrated view of agricultural activities in Brazil as a whole. In addition to the numbers, we provide information from two 2009 field studies in states where sugarcane production is expanding quickly, Goiás and Mato Grosso. We also present a 2008 case study from São Paulo, the wealthiest state in Brazil, where land is the most expensive and where most of country's sugarcane is currently planted.

An Old Problem

Monoculture sugarcane farming in Brazil began in 1550 by the Portuguese, with the intention of exporting sugar to Europe, as well as for consumption by the recently colonized local population. The primary purpose was for the production of sugar, which had a high commercial value in Europe, which at the time was supplied in small quantities by Sicily, the Madeira Islands, Cape Verde, and by the countries of the Far East. The volume produced was small; bought and sold in grams by the establishments at the time.¹ In the meantime, production was growing. One of the first social impacts of sugarcane was this competition of the monoculture system of farming with other food crops. In the eighteenth century an attempt to obligate the sugarcane plantation owners to plant other types of crops used

¹ Caio Prado Jr., 1976.

for food did not work; the large landowners were part of a much wealthier class and could easily pay for the food they needed, which came from increasingly longer distances. The food supply problem led to chronic malnutrition among urban populations.

To meet sugar demands, cane historically grew at ratios similar to population growth rates around the world. The ratio changed in 1970 when it began to be used for energy.

The use of ethanol is not as new as it might seem at first glance. In the US, the Model T, the first car produced by Ford, was able to run on corn-based ethanol, in 1866. In Brazil, ethanol has been used as automotive fuel since the 1930s, but it was the first big international oil crisis in the 1970s that led the government to create the National Alcohol Program (Proálcool) to encourage the production of vehicles that were able to run exclusively on hydrated ethanol. Consequently, since 1978 Brazil has had cars that run on alcohol. In 1986, the height of the program, 76% of the car fleet was equipped with engines that could run on sugarcane-based alcohol.²

Alternating between cycles of highs and lows since then, sugarcane has arrived in the twenty-first century as the crop that occupies the third largest area in Brazil, after soybeans and corn. The country is currently not only the largest producer and exporter of sugar, but sugarcane-based ethanol as well.



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Harvesting machines cut 3,500 tons of sugar cane per day

2 Schlesinger, 2008.

The Production and Commercialization of Sugarcane and its By-products

Sugarcane is the source of nearly 70% of the sugar produced in the world. Brazil is the world's largest producer. In recent years, the country's production is equal to about one-third of the total worldwide harvest.

Sugarcane is produced in almost every Brazilian state and uses approximately 10% of the farmland in the country, which makes it the third most important crop, after soybeans and corn. Production has expanded rapidly in recent years. For the 2009-2010 harvest, 7.4 million hectares were planted, which is 5.7% higher to the previous year according to Conab³, and 604 million tons were harvested.

Sugarcane: Area Planted, and Production by Region and State

	Area (mil ha)			Production (mil ton.)		
	harvest 09/10	harvest 10/11	variation (%)	harvest 09/10	harvest 10/11	variation (%)
Brazil	7,409.68	8,091.5	9.2	604,513.6	664,333.42	9.9
North	17.2	29.9	73.8	991.6	2,671.7	169.4
Roraima	1.8	2.1	18.91	111.3	189.0	69.9
Amazonas	3.8	3.8	-	211.8	281.9	33.1
Pará	10.9	9.9	(9.17)	623.4	650.9	4.4
Tocantins	0.7	14.1	1.960	45.1	1549.1	3.333.5
Northeast	1,082.6	1,128.9	4.3	60,677.2	65,452.0	7.9
Maranhão	39.4	45.7	16.0	2,209.4	2,682.0	21.4
Piauí	13.6	13.2	(3.0)	1,014.0	923.3	(8.9)
Ceará	2.3	2.3	-	154..4	134.1	(13.2)
R. Grande do Norte	67.0	66.3	(1.3)	3,472.5	3,557.3	2.4
Paraíba	115.5	118.4	2.5	6,320.0	6,478.1	2.5
Pernambuco	321.4	324.3	4.0	17,805.6	18,802.1	5.6
Alagoas	448.0	464.6	3.7	24,504.5	27,176.2	10.9
Sergipe	37.9	39.8	5.0	2,249.7	2,280.5	1.4
Bahia	37.4	44.5	19.0	2,947.1	3,418.4	16.0
Central-west	940.3	1,160.1	23.4	77,435.9	98,132.3	26.7
Mato Grosso	203.0	219.2	8.0	14,045.6	15,553.7	10.7
Mato Grosso do Sul	265.4	339.7	28.0	23,297.8	30,161.2	29.5
Goiás	471.9	601.2	27.4	40,092.5	52,417.4	30.7
Southwest	4,832.6	5,163.5	6.8	419,857.7	447,445.1	6.8
Minas Gerais	588.8	647.7	10.0	49,923.4	56,211.3	12.6
Espírito Santo	68.0	72.1	5.9	4,009.6	3,525.6	(12.1)
Rio de Janeiro	45.8	46.3	1.0	3,260.0	3,147.7	(3.4)
São Paulo	4,129.9	4,397.5	6.48	362,664.7	384,560.5	6.0
South	537.0	609.0	13.4	45,551.3	50,632.3	11.2
Paraná	536.0	607.9	13.4	45,502.8	50,583.6	11.2
Rio Grande do Sul	1.0	1.0	-	48.5	48.7	0.5

Source: Conab, 2010.

3 See Conab, 2010.

In the last two decades, Brazilian sugarcane production grew at two and half times the growth rates of previous decades, driven primarily by rising rates of domestic ethanol consumption mainly for use as a mixture for conventional car engines and, above all, by the development of flex-fuel engines, which can run on any proportion of gasoline or alcohol mix. More than half the fleet of cars on the road today in Brazil, 2010, are equipped with flex engines, and by 2017 that figure is expected to increase to 90%.⁴

The estimate for the 2010-2011 harvest, according to Conab, is more than eight million hectares planted, an increase of 9.2%. Production is forecast at 664 million tons, a 10% increase over the previous year. Of this total, approximately 90% will be come from the South-Central region (South, Southeast, and Central-West), and the remaining 10% will come from the North and Northeast regions.

The state of São Paulo accounts for most of this production, about 55% of the 2010-2011 harvest, followed by Minas Gerais, with 8%. In this most recent harvest, São Paulo is responsible for the largest area of expansion; of the 681 thousand hectares planted, 267 thousand are in São Paulo.⁵

Sugar

The largest producers of sugar in the world, Brazil, India, China, Thailand, and the United States, in that order, account for approximately 60 % of global production. For the 2010-2011 harvest, the USDA is estimating worldwide production to be at 158 million tons and global exports to be around 54 million tons.⁶

World Sugar Production – in thousands of tons

country/harvest*	2006/2007	2007/2008	2008/2009
Brazil	31,450	31,600	31,850
China	11,497	14,636	12,337
India	30,780	28,630	15,960
Mexico	5,633	5,852	5,260
Thailand	6,720	7,820	7,200
United States	3,119	3,113	3,010
Others	38,851	39,271	38,146
Total	128,050	130,922	113,763

* The USDA measures crop years between the months of October through September of the following year. So the figures for Brazil will be slightly different than the figures released by CONAB.

Source: USDA (www. fas. usda.gov/psdonline), accessed, 9/21/10.

Brazil: Sugar Production – in thousands of tons.

Region/Harvest	2007/08	2008/09	2009/10
Central-south	26,201	27,074	28,747
North-northeast	4,826	4,546	4,328
Brazil	31,027	31,620	33,075

Source: Conab

4 "The Economist analyzes Brazilian ethanol," O Globo, September 4, 2010.

5 Conab, 2005

6 USDA, 2010

World sugar trade is close to 50 million tons, the equivalent of a third of global production. The international market is strictly controlled and protected in various countries by subsidies and import barriers, particularly in the US and Europe, the latter of which has been facing pressure from exporting countries to reduce restrictions on sugar imports.

In 2003, the World Trade Organization, at the request of Australia, established an arbitration panel against the European Union. These countries argued that the EU exceeded internationally agreed-upon limits for sugar subsidies, as well as general commerce regulations. The panel decided in favor of the plaintiffs. In June 2005, the EU announced plans to reduce prices paid to sugar producers by approximately 40% over a period of two years, and to reduce production by more than one-third by 2012.

As a result, European exports could fall by five million tons per year, or nearly 10% of the world's total production. The expectation in the Brazilian sugar industry is that with the end of European subsidies, Brazil could gain 50% of the newly open markets.⁷

Regardless of this fact, the USDA expects Brazil's participation in the world production and export of sugar to increase to approximately 25% of the global sugar trade.⁸

Brazilian Sugar Exports

Year	Millions of tons	US\$ Millions	Average price (US\$/ton)
2005	18,147	3,918.79	215.95
2006	18,870	6,166.00	326.76
2007	19,344	5,100.44	263.67
2008	19,472	5,482.97	290.69
2009	24,294	8,377.54	344.84

Source: MDIC

Brazilian Sugar Exports by Destination Country — 2009

	Millions of tons	Percentages (%)
India	4,367	18.0
Russia	2,707	11.1
United Arab Emirates	1,813	7.5
Bangladesh	1,285	5.3
Nigeria	1,236	5.1
Saudi Arabia	1,017	4.2
Algeria	989	4.1
Canada	877	3.6
Morocco	854	3.5
Malaysia	777	3.2
Others	8,372	34.4
Total	24,294	100

Source: MDIC.

⁷ See Guarani, 2007

⁸ USDA, 2010.

Ethanol

Domestic ethanol sales totaled approximately 22.8 billion gallons in 2009, a 16.5% increase over 2008. The rapid growth has been driven mainly by hydrated ethanol (used in flex-fuel engines), the consumption of which was 23.9% higher in 2009 than 2008.

Brazil: Ethanol Production – millions of liters

Region/Harvest	2007/08	2008/09	2009/10
South-Central	20,333	24,327	23,737
North-Northeast	2,1938	2,356	2,026
Brazil	22,526	26,683	25,763

Source: Conab

In 2009, Brazil exported 3.3 billions of liters of ethanol, for US\$1.34 billion in revenue. The main buyers were the European Union, the Caribbean Basin Initiative (CBI), India, and South Korea.

Brazilian Ethanol Exports

Year	Billions of liters	US\$ Millions	Average price (US\$/ton)
2005	2,592	766	295.31
2006	3,428	1,600	468.20
2007	3,541	1,470	415.14
2008	5,119	2,390	466.94
2009	3,309	1,340	404.57

Source: MDIC

Part of this volume is exported directly, and part of it goes through the Caribbean, under an agreement with the CBI that allows 7% of US demand to pass through the Caribbean without paying the US\$0.54 per gallon surcharge that is charged to countries outside the agreement. Even paying a 2.5% surcharge rate, plus \$0.54 per gallon (equivalent to 3.785 liters), Brazilian ethanol is still less expensive when it reaches the US market than the US\$1.90 for local US-produced ethanol, which is made from corn and is highly subsidized.

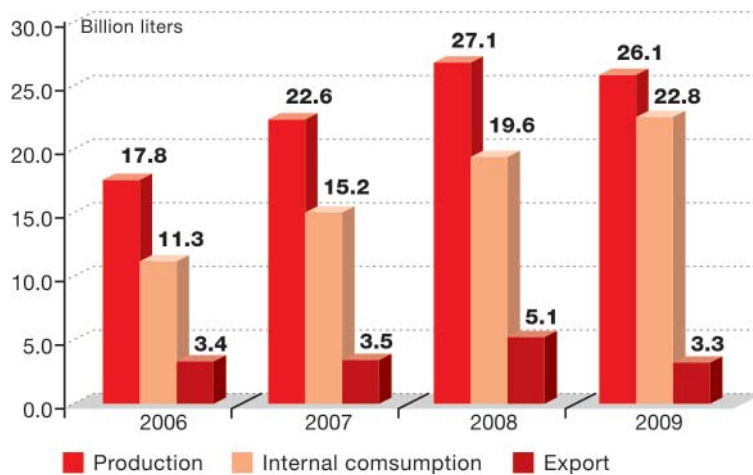
Brazilian Ethanol Exports by Destination Country – 2009

	Millions of tons	Percentage (%)
European Union	876	26,5
CBI*	777	23,5
India	371	11,2
South Korea	317	9,6
Japan	283	8,6
United State	270	8,2
Nigeria	117	3,5
Mexico	74	2,2
Switzerland	59	1,8
Philippines	32	1,0
Others	133	3,9
Total	3.309	100

* Caribbean Basin Initiative

Source: MDIC.

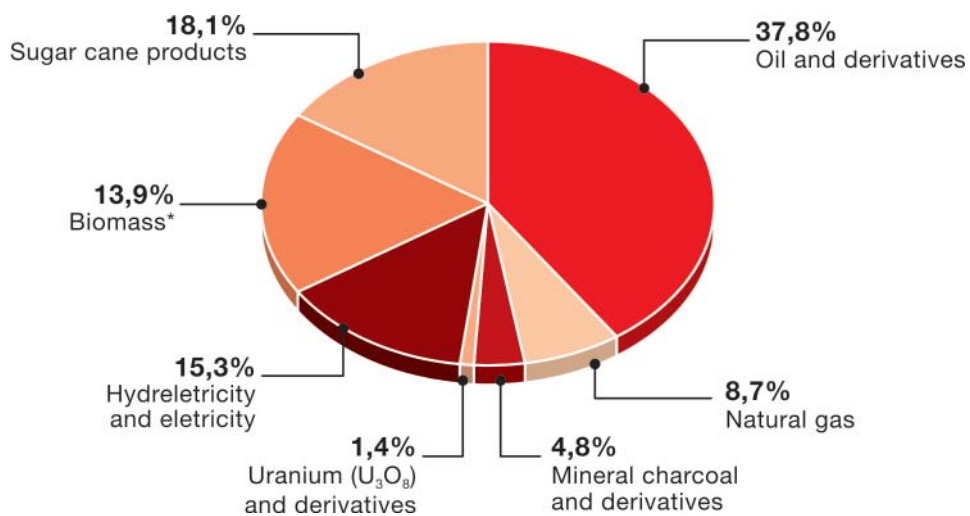
Brazil: Production, Internal Consumption, and Exportation of Ethanol



Source : Secex, ANP, MAPA, in BNDES (2010).

In the chart below, note that sugarcane derivatives are a significant part of the energy mix in Brazil. Of the 18.1%, which is the approximate percentage of sugarcane products used for energy in 2009, 15% were used for ethanol and 3% for generating electricity for use by the mills, through leftover sugarcane detritus and leaves.

Domestic Energy Supply – 2009



Source: BEN (2009)

* Including wood, charcoal, and other renewable

The Production Chain

Businesses

The sugar-based alcohol industry has always been primarily in the hands of national business. Foreign capital, however, isn't necessarily new. In the early part of the twentieth century the French company, Grupo Sucrerie, opened its first large sugar plantations in the state of São Paulo.

In the 1970s, during the Proálcool phase, companies backed by British capital participated actively as cane suppliers to the main businesses at the time, including Guarani, Santa Elisa, and Generalco.

Closed to the direct intervention in the production and commercialization of sugar and ethanol by the government until the end of the 1990s, the French again were the first to invest. In 2000, Cosan, which merged with Shell in January 2010 in the largest merger in the sector's history, established a partnership with the French group, Union SDA. Later, SDA merged with other French cooperatives that had acquired Beghin Say, which in turn acquired Açúcar Guarini in 2001. The joining of these cooperatives in 2002 led to the creation of Tereos, which had started as the main controller of Guarini.⁹

In 2002, the French firm, Louis Dreyfus, acquired the Cresciumal plant in Leme (São Paulo), the beginning of what is now the second largest group active in the Brazilian cane industry in terms of milling: LDC-SEV or Louis Dreyfus commodities – Santelisa Vale.

Today, particularly after the last decade, the number of acquisitions, mergers, and internationalizations of businesses in the sector is increasing. The entire industry now is in the hands of approximately 150 companies. In 2004, according to *Valor Econômico*, foreign businesses made up 5% of the total.¹⁰

For the 2005-2006 crop, the five top-ranking sugarcane mills were nationally-owned businesses: Copersucar, Cosan, Crystalsev, San Martin, and the Carlos Lyra Group. In 2010, four of the five largest sugar-based alcohol groups in Brazil – Cosan, Louis Dreyfus, Bunge, e Guarini – are at least 50% foreign-controlled.¹¹



Sugar cane being grinded in the mill of the Carlos Lyra Group, in Alagoas state, Northeastern Brazil

9 Jank, M. A. "Globalização e o Setor Sucreenergético Brasileiro." [Globalization and the Sugar-based Brazilian Energy Sector] *Revista Produtor Rural*, March, 2010.

10 Scaramuzzo, Mônica. "Estrangeiros avançam nos canaviais." [Foreigners Sugarcane Presence Increases.] *Valor Econômico*, 30/6/09.

11 Foreigner companies already control most of the Brazilian sugar-based alcohol industry. <http://www.brasilagro.com.br/index.php?noticias/detalhes/12/27603>, accessed on 8/27/10

Foreign participation in the sugar and ethanol sector has tripled in just three years. In the 2007-2008, only 7% of the mills had the participation of external capital, either controlling or minority status. For the 2010-2011 crop, this percentage rose to 22%, according to projections made by Unica [Sugarcane Industry Group – *União da Indústria de Cana-de-açúcar*]. According to Dextron, companies from various countries participate in the Brazilian sugarcane-based alcohol industry including China (Noble), Spain (Abengoa), United States (ADM, Bunge), France (Louis Dreyfus, Tereos), Netherlands (Shell), England (British Petroleum, Clean Energy Brazil) and Japan (Mitsubishi, Sojitz).¹²

The study also points out that the tendency is to increase participation of foreign capital among the major industry groups, as new companies begin to expand their local operations, including ADM, BP, and the Noble Group.

On the national side, in April 2010, Petrobras, whose interest in renewable energy led to the creation of Petrobras Biofuels, announced that it holds a 45.7% shareholder interest in Açúcar Guarini, the fourth largest sugarcane plant in the country.¹³

The Producers

Brazilian sugar plants, on average, operate with 80% of their sugarcane grown on their own land, on leased lands, or from businesses associated with the company in one way or another. The remaining 20% is supplied by 60,000 independent producers, most of whom have less than two plots of land, which is the smallest divided parcel of land in the rural area, the least amount of land required to sustain a family, and varies from region to region.¹⁴

Brazil has nearly 370 sugar and ethanol business in the state of São Paulo, a concentration of 62% of the mills in the country. In addition to producing most of the cane that is processed, the business generally seek to convert the entire planting region in the area around the plants to sugarcane, for logistic reasons. For the 2007-2008 crop, the average distance between the land and the mills was 23.2 kilometers, and in the South-central region, 86.6% were in a radius of 40 kilometers.

The Producer/Plant-Owner Relationship

The main issue between the plant owners and the suppliers revolves around sugarcane price. One of the problems suppliers have is based on the uncertainty of the sugar and ethanol mix produced by the plants. Because it influences the price they need to pay producers for their cane and varies depending on market conditions, the plants tend to declare a particular production mix that benefits them, and allows them to report a lower actual production figure along with the best market price (for either sugar or ethanol), which reduces the amount paid to the supplier.

The Organization of Cane Planters of the South-Central Region of Brazil (Orplana) is the main organization of independent cane growers, and combines thirty associations in the states of São Paulo, Mato Grosso, Minas Gerais, and Goiás, representing 13,700 planters. The total sugarcane crop in 2009-2010 was 139.2 million tons. In the state of São Paulo alone, 124 million tons were harvested.¹⁵

12 Olivon, Beatriz. Foreign participation in sugar and alcohol tripled in three years. <http://portalexame.abril.com.br/negocios/noticias/participacao-estrangeiros-acucar-alcool-triplica-tres-anos-561944.html>, accessed on 8/27/10.

13 Petrobras. Fato Relevante. "Parceria entre Petrobras e Tereos no Setor Sucroenergético". [Partnership between Petrobras and Tereos in the Sugar-base Energy Sector.] 4/30/10.

14 BNDES, 2008.

15 <http://www.orplana.com.br/empresa.html>, accessed 9/15/10.

Investors and Financing

The main sources of funding for renewable energy sector are the BNDES and the resources from loans provided by both private and public banks. In the case of sugarcane, the purpose of the loans, whether for sugar or ethanol, doesn't make a difference. Both sugar and ethanol producers are perceived by lenders as being the same and use part of their harvest, as well as the mill equipment, for either sugar or ethanol, depending on demand and financial return.

Most of the credit in the sugar-based alcohol sector comes from the Central Bank (BC), which is operated by both public and private banks, as well as from credit unions, the goals of which are to fund sugarcane planting in areas that are already planted and to fund existing facilities rather than expansion. The sums of money used to finance marketing are also significant, as the table below shows.

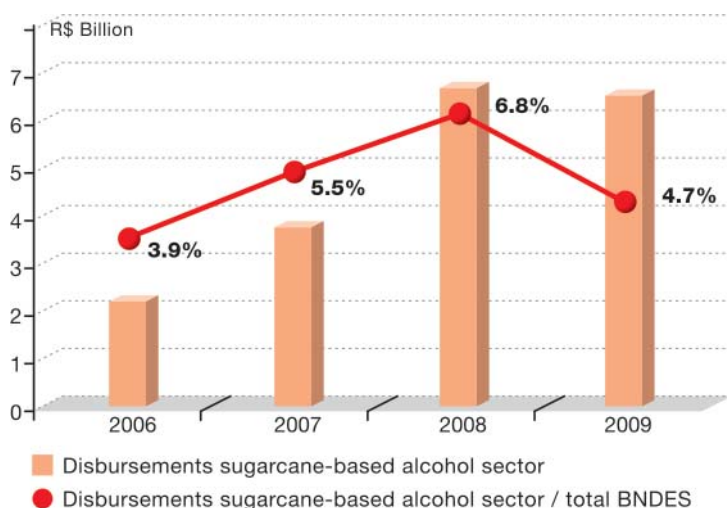
Financing in the Sugar-based Alcohol Sector Controlled by the Central Bank – 2009

Purpose	R\$ millions
Cost	2,550
Investment	364
Marketing	1,010
Total	3,924

Source: Calculations based on figures from the Central Bank of Brazil (2010).

BNDES funds are already being used primarily to fund mills, and the annual financing figures are significantly higher than the financing with funds from the Central Bank. In recent years, the annual figure is in the area of R\$6.5 billion, see chart below. The reduction of investing by the private sector provided by the BNDES (from 6.8% in 2008, to 4.7% in 2009) can be explained by the large amount of extra funds provided to other sectors in an attempt to overcome the international financial crisis that started in mid-2007.

Evolution of BNDES Disbursements to the Sugarcane-based Alcohol Sector



Source: BNDES, 2010

In 2010, BNDES is expecting outlays of R\$6 billion, based on projects already approved and in contract.

The investment portfolio of BNDES provides approximately R\$6 billion for the Fund for Workers Support (FAT), which includes assistance to international groups such as Louis Dreyfus (LDC-BIO) and George Soros (Adecoagro), both of whom have new plants in Mato Grosso do Sul.

Outlook

Sugar and ethanol are seen by the Office of Strategic Management at the Ministry of Agriculture, Livestock, and Food Supply (MAPA) as the products with the highest possibility for growth in Brazilian agribusiness in the next ten years, driven by both domestic consumption and exports of sugar and ethanol.

An example of prospects for sugarcane production growth can be found in the expansion of crops estimated by the Ministry of Agriculture. Between 2010 and 2020, estimates of total area planted for all crops will grow from 60 million hectares in 2010 to 69.7 million hectares in 2020, an increase of 9.7 million hectares, which is an area larger than the southern Brazilian state of Santa Catarina. This expansion of planted areas will focus on two main products: soybeans (over 4.7 million hectares) and sugarcane (more than 4.3 million). Corn will have an expansion of approximately one million hectares, and other crops such as coffee, rice, oranges and others will remain virtually unchanged or lose ground.¹⁶



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Expansion of the area planted with sugar cane in Brazil

16 MAPA, 2010

Brazilian production of sugarcane by 2019-2020 should reach 893 tons, 56% higher than the 2008-2009 harvest of 571 million tons. Estimates for the Brazilian production of sugar suggest an average annual growth rate of 3.5% in the years between 2009-2010 and 2019-2020. These rates should result in the production of 46.7 million tons in 2019-2020, an increase of 15.7 million tons in comparison to 2008-2009. Projected exportation and consumption rates for the same period are 3.8% and 1.9%, respectively, per year. For export, the projection for 2019-2020 is 32.2 million tons.

Projections for the production of ethanol reflect strong growth due, particularly, to domestic consumption. The estimate for 2019-2020 is 63 billion gallons, more than double the 28 billion liters produced in 2009-2009. Unica's projections for 2020-2021 are 65.3 billion liters, including consumption of 49.6 billion liters and exports of 15.7 billion liter. Domestic consumption in 2020 is estimated to be 47.8 billion liters and exports will be 15.1 billion liters.

The state of São Paulo, according to projections, is expected to expand production 50.3% in the coming years, from 400 million tons in 2008-2009 to 602 million tons. Area planted with sugarcane is expected to increase 46%, from 4.7 million hectares in 2008-2009 to 6.8 million in 2019-2020. Sugarcane is also expanding into states that haven't traditionally been involved in the industry, including Paraná, Mato Grosso, Mato Grosso do Sul, Minas Gerais and Goiás.

The South-Central¹⁷ geo-economic region of Brazil accounts for about 90% of the country's sugarcane production. The Central-West and the South are currently expanding faster, while the Southeast is the region that produces the most.

It is interesting to note how soy has been replaced by sugarcane in the state of Goiás. With new plants coming into operation, the sugar-based ethanol industry is growing at rates much higher than in other parts of the country. In the last few years, nearly 20 plants have started operation, which should increase production by 54% in 2009-2010, compared with 2008-2009.

To illustrate the distressing tendency of the expansion of sugarcane monoculture farming, three studies may shed light the debate: two case studies that were done in Goiás and Mato Grosso, two states with rapid expansion, as we mentioned above, and a case study from São Paulo, which because of its economic importance to the country, shouldn't be left out.

17 The South-Central geo-economic region covers the Brazilian states of the South and Southeast (with the exception of Northern Minas Gerais), as well as Mato Grosso do Sul, the south of Tocantins, Mato Grosso, and the Federal District. It comprises approximately 220 million hectares (nearly 25 % of the territory of Brazil).

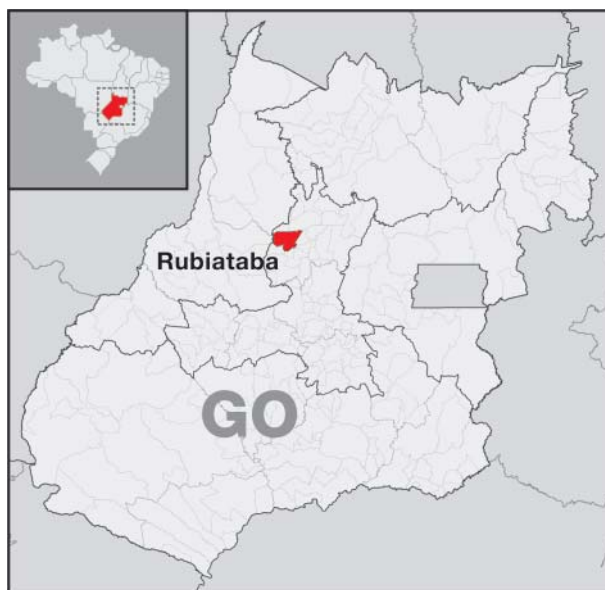
Case Studies

Rubiata – Goiás

The municipality of Rubiata is located in the São Patrício Valley, in the central part of the state of Goiás, in an area of 756 square kilometers. Approximately 2,200 of its 18,000 inhabitants live in rural areas. The valley was developed with the help of the National Agriculture Colony [*Colônia Agrícola Nacional*] in 1941, when it brought settlers to the region from several Brazilian states, and from other countries.¹⁸

Many of the agricultural families who currently live in the region arrived during this period, producing food such as rice, beans, and corn. In the 1950s, most of the food that fed the workers who built the city of Brasília, Brazil's new capital, came from the São Patrick valley.

Because of this, the municipalities in the valley have a high proportion of agricultural families compared with the rest of the state. Although the 22 municipalities make up only 3.86% of the total population of the state, its 8,800 agricultural families are 11% of the total agricultural families in Goiás.¹⁹



The Cooper-Rubi Ethanol Plant

The municipality of Rubiataba has about 45 small furniture manufacturers, as well as a few small businesses that make clothing. The main industry, however, is Cooper-Rubi, founded in 1983 as a cooperative with 70 members, with the objective of producing ethanol from the sugarcane they grew on their land, and taking advantage of tax incentives offered by the government in its Proálcool program of 1975.

Cooper-Rubi now belongs to Japungu Agroindustrial of Paraíba, in association with 28 co-operatives. The business processes approximately one million tons of sugarcane annually, on nearly 17 million hectares in Rubiataba and the neighboring municipalities. Most of the land is situated on flat area. Current ethanol production is close to 10 million liters, 50 % of which goes to the state of Goiás and the rest to other Brazilian states.²⁰

18 State University of Goiás, "Socioeconomic report of UEG Ceres," UEG, www.seminario.ueg.br/download/estudo_ceres.pdf. Accessed on 6/20/09.

19 Seplan. "Socioeconomic profile of municipalities in Goiás." www.sieg.go.gov.br, accessed 6/30/09.

20 Figures provided by Adão Moreira da Silva, administrative finance manager at Cooper-Rubi, during an interview on June 23, 2009.



Cooper-Rubi mill in Rubiataba, Goiás state, Mid-Western Brazil

The company created a business specifically to manage agricultural activities, Agro-Rubi, while Cooper-Rubi itself is responsible for the primary activities of the plant. During harvest period, between April and October, the plant operates 24 hours a day, employing nearly 1,700 workers. In 2007, using BNDES loans, they bought harvesting machinery. They also benefitted from fiscal incentives from Fomentar, a Goiás state government program that, according to Adão Moreira da Silva, administrative finance manager of the company, ensures a reduction of 55% of the ICMS tax, which resulted in a surplus used for further investment and job creation.

The business currently owns only 900 hectares of land. The rest of the harvest comes from the 16,100 hectares that are leased to 181 farmers, referred to as “partners” by the company. At an average of 89.44 hectares per property, this means that the majority of the property owners are family farmers.²¹

The Tenants’ Situation

Contracts can be signed for one, two, or three sugarcane cycles. Each cycle lasts between five and six years, which means four to five harvests plus the cultivation that precedes each. At the beginning of the contract, an advanced payment can be agreed upon, which can be for one or more years. The remaining payments covering the span of the contract period can be agreed upon based on the preferences of the “partner,” who can opt for monthly or yearly payments. Prices vary with the price of sugarcane, which is established by Consecana.²² In June 2009, the value was R\$33 per ton. The average production per hectare is fixed at 11.3 tons of sugarcane per harvest.

Despite the apparent benefits, installments of advance payments in one or two years, at the beginning of the contract, can be a veritable trap for tenant farmers who, with this kind of agreement, no longer receive payments in the long term. In this way, it becomes difficult to resume farming when the contract is finished, if they want. According to a company representative, when asked about the number of tenants who return to their land at the end of contracts, it is unusual. “Very few farmers return to their land. To date, few contracts have

21 Family farmers are those who own property that have a maximum size of four fiscal “modules.” The size of a module varies in each region. In Goiás, a module is 30 hectares, which means that family farmers have no more than 120 hectares.

22 Consecana is the Council of Sugar, Ethanol, and Sugarcane Producers [Conselho dos Produtores de Açúcar, Etanol e Cana-de-açúcar] of the state of São Paulo, who created the system of payments to sugarcane producers.



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Tenants loose space for growing food and raising cattle

been closed. People generally renew.”²³ (Adão Moreira da Silva, administrative finance manager at Cooper-Rubi, during an interview on June 23, 2009.)

Another concern is that, on average, a majority of these farmers migrate to the cities, and the improvements they made to their land are removed. Corrals, gardens, orchards, fences are all eliminated to plant sugarcane. If a previous agreement is made, houses are even demolished. These farmers, who in the past grew their own food and sold the surplus, now have to buy all the food they need, which combined with their precarious financial situations, means a reduction in food security. Also, they lose their relationship to the land, which makes it that much less probable that they will return at the end of the contract.

“Production was pretty good. I’d harvest 20 sacks of beans, about 400 sacks of corn on the cob, and other products also. The storage house was full of food. These days we don’t have a storage house. I used to bring the little truck to the city almost filled with rice, with 20-30 sacks of beans, and 200-300 sacks of corn. Most people these days have to buy the corn they want to eat. People rented almost everything to them, because they made that kind of irresistible offer.” (Francisco da Costa Marinho, small Rubiataba farmer, June 21, 2010)

The following table shows the production of rice, beans, corn, and sugarcane in Rubiataba in recent years. While the total grain production in the municipality was 21 million tons in 1980, this figure has been reduced to merely 4,2 million tons in 2008, around 20% of the 1980 production. During this same period, sugarcane production was multiplied for almost 5 thousand times, going from 117 tons to 560 million tons.

Production of Sugarcane, Rice, Beans, and Corn in Rubiataba

	1980		2000		2008	
	Production (t)	Area (ha)	Production (t)	Area (ha)	Production (t)	Area (ha)
Sugarcane	117	7	157,500	2,100	560.000	7.000
Rice	5,337	3,936	3,600	2,000	306	180
Beans	1,110	3,432	200	290	-	-
Corn	14,586	4,202	9,600	3,000	3.960	800
Total 3 grains	21,033	11,570	13,400	5,290	4.266	980

Source: Municipal Agricultural Research [Pesquisa Agrícola Municipal], IBGE

23 Adão Moreira da Silva, administrative finance manager at Cooper-Rubi, during an interview on June 23, 2009.

The state of Goiás also has the third largest cattle herd in the country. The herd in the state is growing continuously. Between 1980 and 2008, it grew from 16.5 million to 20.5 million heads in the state of Goiás. During the same period, which corresponds to the strong expansion of sugarcane in Rubiataba, the herd in the municipality of Rubiataba fell by 75 thousand to 67.8 thousand cattle (see table below). This indicates that the production of sugarcane is taking up areas that were used in the past for grazing, and has pushed cattle to other areas.

In both cases, grain production and cattle, there are similarities with what has been happening in the state of São Paulo, discussed below.

Cattle Herds in Goiás and Rubiataba

	1980	2000	2008
Goiás	16,453,598	18,399,222	20,466,360
Rubiataba – GO	75,036	70,000	67,800

Source: Municipal Livestock Survey, [*Pesquisa Pecuária Municipal*], SIDRA database, IBGE.

The Situation of the Remaining Farmers

The remaining 592 family farmers in Rubiataba, for the most part, have their livelihoods secured by their dairy cattle. In addition, they plant rice, beans, and manioc for their subsistence. They also have gardens where they grow bananas, mangos, and other fruit, and raise chickens and pigs. To supplement their animal feed, they plant grasses and sugarcane.

The credit the government provides for these activities are much lower than those provided by ethanol production. While the 515 family farmers in Rubiataba received financing of R\$3.5 million for the 2007-2008 harvest from the National Program of Family Agriculture and Support (Pronaf),²⁴ Cooper-Rubi provided R\$179 million in financing, in addition previous payments from BNDES.

Family farmers who remain on their land are directly affected by environmental issues caused by the production of sugarcane. The most serious of the issues, according to reports, are the consequences of the intensive use of pesticides, before and during the first planting. The problems were worse when the company applied the pesticides with airplanes, which they no longer do.

Despite the use of equipment for individual protection, ActionAid learned from a family farmer and former employee of Cooper-Rubi that approximately 18 tanks (carried on one's back) of 20 liters are applied each day prior to cutting the sugarcane. He told how the pesticides frequently fell on the protective equipment and how difficult it was to wear the protective masks in the hot weather. Before lunch, it was possible to wash only his hands, and after an hour of rest, the work proceeded:

"At the time I was earning R\$18 per hectare, plus four reais bonus from the firm that sells the poison to the plant. There were about 18 to 19 pumps per days. About 10 pumps fit into each hectare. So it was pretty much of a rush, the supervisor kept you running. You'd start at 7:00 in the morning, spraying the poison. At around 11:00, stop for lunch, smelling terribly. Around noon, you'd start again. You'd be stinking in the bus on the way to the plant, take a cold shower, still smelling bad, all white from the poison, and then went back to town." (Adilson Alves Pimenta, small farmer and ex-Cooper-Rubi worker, April 22, 2009)

24 "Rural Credit Application, Plano Safra, 2007-2008," [Aplicação de Crédito Rural – Plano Safra 2007/2008] Pronaf, 2008.

Among the pesticides used, the company representative mentioned the herbicide, Velpar, which contains two active ingredients, diuron and hexazinona. The NGO, Pesticides Action Network (PAN), defines both ingredients as toxic (“bad actors”). Diuron is considered carcinogenic, it contaminates groundwater, and is detrimental to human reproduction. Hexazinona is considered extremely toxic and pollutes the groundwater as well.²⁵

Local farmers also complain about the air pollution caused by the burning of the sugarcane leaves before the harvest. All the farmers interviewed say they need to protect their houses to prevent ash from getting inside. Another issue is the dust kicked up by the huge trucks, especially during dry periods, which creates problems for people's health and living conditions in general. Air pollution that occurs as a result ethanol production at the plants is also mentioned:

*“The house was filled with ash, black and gray, on top of the bed, all over the place. The powder from the chimney of the plant and cane boiler throws the ash into the air and it falls onto houses. So it isn't just when the fields are burned. There's a powder that comes from the plant also. It's a terrible dust, really polluting. (Francisco da Costa Marinho, small Rubiataba farmer, June 21, 2009)”*²⁶

Another negative impact mentioned is the way people get isolated. When neighbors rent their land to plant sugarcane, they leave the land and move into town. The quality of life for family farmers includes a healthy social environment, which means neighbors and community life.

The isolation caused by the advance of monoculture sugarcane farming was also experienced in other parts of the country, including Santarém in the state of Pará. There, it was soybeans that expanded as the expense of local farms. The family farmers emphasize the loss of community values they experienced with this change:

*“In the past there was a community, we'd go to the church, chat, joke around with the neighbors, but later it was just us who stayed. We have teenage children now and we live out in the sticks where there's never anyone around, and transportation is also very difficult. (Marina Pimentel, who sold her land in Belterra, and now lives in the municipality of Santarém, PA).”*²⁷



Smoke from sugar cane burn reaches houses and roads, causing pollution and the risk of accidents

25 www.pesticidesinfo.org.

26 Schlesinger e Noronha, 2006.

27 Schlesinger and Noronha, 2006. (Ver original)

The Food Security Question

According to Adilson Alves Pimenta, family farmer, it is possible to live well raising cattle for milk production. In addition to the milk, vegetable gardens, orchards, and other crops, as well as small livestock and the sale of what is left over, provides food security for the family.

“The mill owners persuade people, in a certain way, because if people don’t have their head in the right place, they’ll lose their land. They tell them they’ll earn between \$1,000 and \$1,200 reais, which is better than “killing” yourself working. People think only about the money; they forget that they won’t have the chicken they used to raise, or the small garden of lettuce and tomatoes they didn’t have to buy at the supermarket. They forget that they still have to pay for water, energy, and rent. They only think about the \$1200 reais per month they’ll get.” (Adilson Alves Pimenta, small farmer in Rubiataba, June 22, 2009).

To continue with this traditional way of life, it is clear that support through public policy is necessary. In the municipality, there is a milk producer’s cooperative that brings together 300 farmers, 95% of which are family farmers, who produce a total of 1.6 million liters per month. The cooperative director stressed the importance of family production and the problems the people who rent their land have:

“People who produce milk are out on their land. They plant their gardens, they have an orchard, they have chickens, and a pig in the sty. Their food is excellent. People who decide to do monoculture farming leave their land and go out to the periphery. At the periphery, what are they going to do? Nothing. It will be terrible out there. Surviving on that income isn’t a great thing. We can’t compare it to only producing milk. We have to take into account the production of the land, where we get our good food, our sustenance. (Pedro Barbosa de Oliveira, President of the Agricultural Cooperative of Rubiataba, June 22, 2009)”

In the meantime, public policy is necessary to reverse the current tendency of market concentration we see in the milk production sector. Demands for higher rates of production, productivity, and quality have reached small producers. Technical regulations have also contributed to this. Today’s market requires investment in sophisticated technology by producers.

According to the IBGE, the number of businesses producing milk in Brazil dropped from 1.81 million in 1996 to 1.35 million in 2006. The family farm production of milk still accounts for 58% of the milk in the country in 2006.²⁸ These numbers include specialized producers as well as those who produce milk only to feed their own family. In 2005, Embrapa estimated that:

- only 2.3% of the farms (approximately 30,000) produce 44% of the total milk in the country.
- more than one million farmers (approximately 90% of the total) account for less than 20% of the total milk produced. Or 80% of the milk produced in Brazil comes from 11% of the producers.²⁹

Businesses and cooperatives, especially the smaller ones, also face difficulties. The IBGE survey shows that 113 dairy businesses went from being active to being inactive during the year 2008, all of which were small producers. Slightly more than 2000 processing businesses remained active during the period analyzed.³⁰

28 IBGE, 2009.

29 Carneiro and Stock, 2007.

30 Informativo Semanal AGL. [Weekly Report], Associação Gaúcha de Laticínios [Gaúcho Association of Milk Producers], 04/09/09.

Context

Cooper-Rubi is gradually mechanizing the sugarcane harvest. According to a company representative, the number of workers in the harvest will soon be reduced from 800 to 300. This radical reduction will happen in all the producing states, and even more quickly in flat regions, where it is easier for machines to do the cutting. This and other issues regarding the work conditions of the cane workers are discussed below in a São Paulo study case.

“There is nothing better for sugarcane and for sugar plantations than manual cutting. Nothing is wasted, there are no problems with compacting the soil. But there is the problem of tired workers, and the sugarcane burning. With those issues, mechanization is an imperative. (Adão Moreira da Silva, administrative finance manager at Cooper-Rubi, June 23, 2009)



Mechanization take sugar cane cutters off the job, worsening their situation

Family farmers are concerned with this apparently irreversible process and emphasize the idea of land reform as an alternative:

“It is very complicated. The government has to create other options. And one of those options is land reform. Rural workers need to be able to work for themselves, with an infrastructure and the ability to maintain themselves in the fields. If everything gets mechanized there will be chaos. Hunger will afflict people in a way that will be frightening.” (Carlos Arriel, Rubiataba farmer, June 22, 2009).

Mirassol d'Oeste – Mato Grosso

Mirassol d'Oeste is located in the southeast of Mato Grosso and has a population of 25,605. Of these, 1335 are farmers and 268 are settlers.

When the region was originally settled in the 1960s, agricultural activities focused on subsistence production on small farms.³¹ The primary crops were beans, corn, manioc, and small livestock like pigs and chicken.³²

In the 1980s, these small properties where subsistence farming was practiced began losing ground to large established beef and dairy farms. The cultivation of sugarcane



³¹ Soares, Souza, and Pierangeli, 2009.

³² Heinst, 2003

started at around the beginning of the decade in Mirassol d'Oeste and in neighboring municipalities. At the end of this period, with the help of federal tax incentives through the Proálcool program, in parallel with the cutting of subsidies for basic food production, sugarcane cultivation gained momentum. The Agricultural Cooperative of Cane Producers of Rio Branco (Cooperb), also known as Grupo Novo Milênio, was founded in 1986.

At the end of the 1990s, following the decline of Proálcool, the Cooperb was shut down. In 2003, when flex-fuel engines started to go on sale, the process of reactivation of the Mirassol d'Oeste plant began. From there, sugarcane cultivation, along with livestock, became the primary agricultural activity in municipality and in the region.³³

Today, there are two Cooperb plants in operation. The first was established in Lambari d'Oeste and the second is in Mirassol d'Oeste. Cooperb occupies 18,000 hectares of land, and it continues to expand.³⁴

Sugarcane occupies areas where there were previously established family farms, who started working in sugarcane along with immigrants from the Northeast region of Brazil.

"Many who sold their land live in these units and work with sugarcane, in the plant. A large part of the cutters are from the Northeast. They are from Alagoas and Pernambuco. The company buys all the land, and they bring in the tractors and demolish everything. Our community here is 220 families, some with larger properties, some smaller. Years ago, it was a lot more, 300 families. Today there are far fewer. People started to leave and the plant started buying land, weakening the hands of the poorest people. (Luiz Italiano, small producer, Lambari D'Oeste, August 19, 2009).

The following table shows the expansion of sugarcane in the cities where the plants established themselves, and shows the evolution of the production of rice, beans, and corn from 1996 to 2008. In the same way that it happened in Rubiataba, Goiás, the tendency toward the growth of sugarcane in place of the other three foods occurred in Lambari d'Oeste and Mirassol d'Oeste. Exception is the maize in Mirassol d'Oeste, which planted area increased 28% between 2000 and 2008. But this is not comparable to the growth of the planted area with sugar cane: 150%, in the same period.

Production of Sugarcane, Rice, Beans, and Corn in Lambari d'Oeste

	1990*		2000		2008	
	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)
Sugarcane	-	-	343.200	4.800	942.799	11.350
Rice	-	-	720	400	300	100
Beans	-	-	24	80	32	45
Corn	-	-	1.320	600	1.224	360
Total 3 grains	-	-	2.064	1.080	1.556	505

* The municipality of Lambari d'Oeste was established in 1991.

33 Soares, Souza, and Pierangeli, 2009

34 COOPERB, "Quem somos." [Who We Are] www.cooperb.com.br. Accessed on August 27, 2009.

Production of Sugarcane, Rice, Beans, and Corn in Mirassol d'Oeste

	1990		2000		2008	
	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)	Prod. (t)	Area (ha)
Sugarcane	133.042	2.181	-	-	498.894	5.477
Rice	2.400	1.500	1.998	1.110	3.000	1.000
Beans	1.320	2.200	486	1.100	360	600
Corn	5.000	2.500	5.850	1.950	9.060	3.200
Total 3 grains	8.720	6.200	8.334	4.150	12.420	4.800

Source: Pesquisa Agrícola Municipal, IBGE.

Cattle in Mato Grosso, Lambari D'Oeste and Mirassol d'Oeste

	1990	2000	2008
Mato Grosso	9.041.258	18.924.532	26.018.216
Lambari D'Oeste – MT*	-	96.000	113.456
Mirassol d'Oeste – MT	67.480	99.496	132.416

* The municipality of Lambari d'Oeste was established in 1991.

Source: Pesquisa Pecuária Municipal, banco de dados SIDRA, IBGE.

The Struggle of the MST in Mirassol d'Oeste

During the 1970s and 1980s in the southeast region of Mato Grosso, there were violent conflicts between family farmers and large land owners. In 1996, the first large farms were occupied by the Landless Rural Workers Movement, known as the MST [*Movimento Sem Terra*], with 2000 families involved. After a march of 280 kilometers to Cuiabá, the state capital, and 60 days of camping in front of the INCRA [*Instituto Nacional de Colonização e Reforma Agrária*/National Institute of Colonization and Agrarian Reform], the first settlement was established, called Margarida Alves, in Mirassol d'Oeste. In 1997, 145 families each received a 25-hectare lot of land, totaling 3,600 hectares. In 2002, another settlement was established in the municipality, Rosalina Nunes, with 331 families and a total of 10,600 hectares.

For these families, milk production is their main means of support. It is transported to a central cooler because the small farmers don't have their own refrigeration equipment. Some of the families produce food for their own subsistence, including rice, beans, and manioc.

The settlers faced a series of issues. The lack of technical assistance from INCRA, for example, was one of the problems that might help them develop projects that would require access to government resources designated for family farming. Associations were created for this purpose, four of them at the Margarida Alves settlement, but they were not successful due to a lack of technical and financial aid officers. In addition, the land itself was depleted from over-grazing and wasn't suitable for the cultivation of basic traditional food.

People interviewed at Margarida Alves talk about how the official at the Public Prosecutor's office of Mato Grosso prevented them from getting financial support from PRONAF, based on the irregular situation of the land with regard to environmental legislation. According to the farmers, the economic-ecological zoning of the state of Mato Grosso says that the property in this region needs to preserve 80% of the land with its original vegetation, and only 20% can be used for productive activities. The reality is most of these lands have already been cleared. The farmers are opposed to this restriction, arguing that they are not responsible for the deforestation; that they received the land that way because of cattle

raising, which was prevalent in the region before they arrived. In addition, they have been waiting for three years for the necessary financial resources to fix-up their homes, which is also an issue.

Despite these problems, there is good news. The Rosalina Nunes settlement is growing food, in activities that involve 65 families, for use at the municipal schools of Curvelândia as well as for the 750 families in the region, who lack food security. The supply is provided through the federal government's Program of Food Acquisition [*Programa de Aquisição de Alimentos/PAA*], which ensures a minimum price for the products and provides delivery as well. At the settlement, there is a community garden, with plots divided among the families.

In addition, a local women's group is trying to have equipment installed that industrializes the process of making farina from manioc root. With the support of the city, machines for the production of brown sugar and molasses are also being installed. There are also plans to breed chickens. The group, called the *Grupo das Margaridas*, two years ago introduced a plan to harvest and process the *babaçu* fruit. Another women's group at the settlement is making underwear and straw mats.

When the MST started their struggle, sugarcane was already being cultivated in the region. There was a time, before the settlement of Rosalina Alves, when families planted beans and the whole crop was lost because of the sugarcane pesticide spraying from the airplanes in adjacent areas. The chemical that was sprayed, according to the settlers, was called "maturador," or "ripeners," which is used to accelerate the ripening process of the sugarcane.

At the Margarida Alves settlement, sugarcane planting makes other forms of agricultural production difficult:

"Before planting sugarcane on the other side of the creek, I planted rice, and I planted and harvested beans, and corn. After they started planting sugarcane on the other side of the creek, about 200 meters from my own property, the crop duster would pass and dump pesticides on the sugarcane, and it would fall on my property. After that, I couldn't plant anymore. I planted rice, and it came out beautifully, it grew, but it didn't produce rice. I used to think it was the sun's fault, but it did rain! The plants just didn't produce. We went five years like that, and we just couldn't produce anything like we used to. So I gave up planting. Even the vegetable garden we used to plant on the side of the house wouldn't grow, which was about 1000 meters from the sugarcane." (Roberto Barbosa Mussato, small farmer in the village of Margarida Alves, August 19, 2009).

Another problem is the pressure that the expansion of sugarcane cultivation creates for the settlers and their own land. In both settlements, there were attempts by the cooperative to rent their lands for this purpose:

"We had to go to INCRA to say that it was unacceptable. Because if my neighbor rents his lot to plant sugarcane, that means the others will surely rent their land, and I'll be squeezed out. Here they use way too much poison in their sugarcane production. There is a type of poison that they spray from above on their property and it is terrible. (José Paes Florian, small producer in the Margarida Alves settlement, August 19, 2009).

In the cases of Rubiataba and Mirassol d'Oeste, data and interviews provide an idea of the situation of family farmers in the country. The expansion of monoculture sugarcane cultivation is a socioeconomic and environmental threat: the removal of small producers from the land, unemployment, the issue of food security, the health of the workers who work on the harvest, the depletion of the soil, and pollution, among other issues.

The Case of São Paulo

The state of São Paulo, the largest consumer center and exporter in the country, also has the highest population in Brazil, with more than 40 million inhabitants. In addition to being the largest Brazilian industrial center, it historically accounts for a significant portion of production and export of various agricultural products. Although it occupies an area less than 3% of Brazil (24.8 million hectares), the state accounts for approximately one-third of the country's GDP, and 11% of its agricultural production.³⁵

São Paulo ranks first in the production of sugarcane, oranges (80% of Brazilian production), and peanuts. A significant portion of its rural area is occupied by artificial forests of pine and eucalyptus trees, as well as corn. The current area occupied by agriculture and livestock is more than three-quarters of its territory: 19 million hectares.

Total Area of Major Crops in São Paulo

Cultura	Area (ha)		Variation (%)
	1995/96	2007/08	
Sugarcane*	2.886.312	5.497.139	+90,5
Eucalyptus	679.639	862.505	+26,9
Corn	1.235.906	667.685	-46,0
Oranges	865.801	741.316	-14,4
Soy	714.206	396.427	-44,5
Coffee	229.089	214.790	-6,2
Pine	136.052	151.860	+11,6
Beans	162.208	104.154	-35,8

* Figures from the São Paulo census are higher than figures supplied by IBGE and Conab due to different methodologies. The main difference is the São Paulo census estimates total cultivated area, including sugarcane for industrial use and for animal feed, as well as new areas that still are not producing.

Source: Pino, 2009.

In 2009, sugarcane represented 42% of the gross value of agricultural and forestry-based production.³⁶

Value and Percentage of Production of Major Agricultural Products in São Paulo state – 2009

Produtos Selecionados	Value (R\$ 1.000)*	(%)
Sugarcane	18,193	41.98
Meat	4,708	10.86
Eucalyptus wood	3,095	7.14
Chicken	2,352	5.43
Oranges for industry	1,925	4.44
Corn	1,309	3.02
Eggs	1,185	2.73
Milk, grade C	1,024	2.36
Coffee products	924	2.13
Soy	877	2.02
TOTAL	43,340	100

* Calculated using average prices in the current months, January and December.

Source: Secretaria de Agricultura e Abastecimento/Instituto de Economia Agrícola (Secretary of Agriculture and Food Supply/ Institute of Agricultural Economy) – IEA-SP.

35 Agropecuária. Investimentos.sp.gov.br., May 2008.

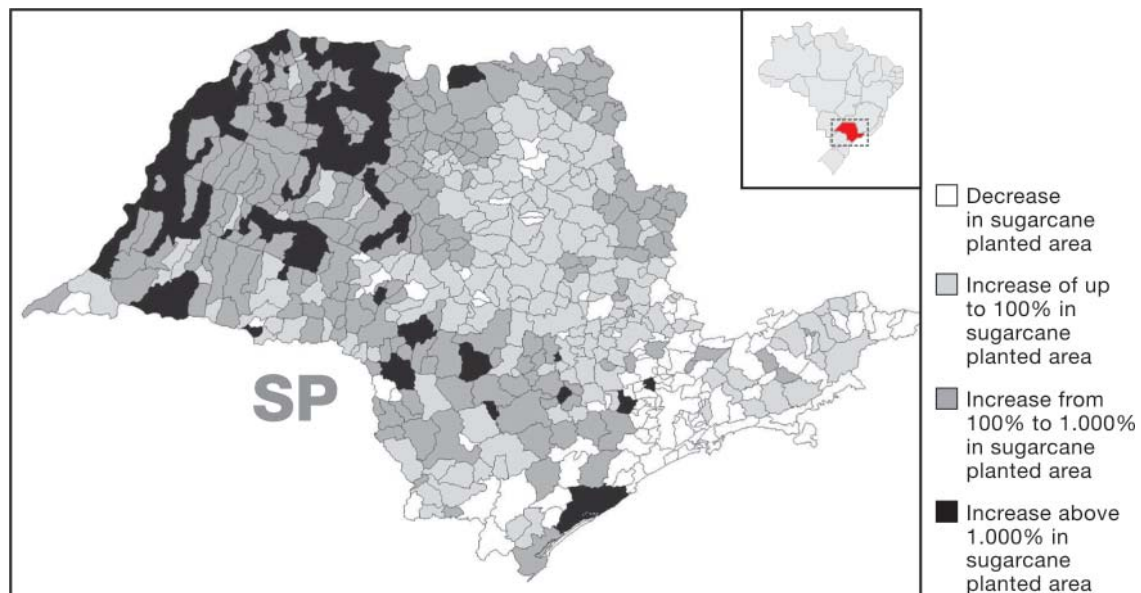
36 Tsunehiro et. al., 2010

Sugarcane in São Paulo

Preliminary analysis of the agricultural census conducted by the state of São Paulo regarding the 2007-2008 harvest indicates that in comparison to the last census, 1995-1996, the area occupied by seasonal crops grew by 46% (from 4.6 to 6.7 million hectares), due primarily to the expansion of sugarcane cultivation. The study also shows that sugarcane occupies slightly more than one-quarter of the state of São Paulo. While the number of sugarcane producers increased 42% in the period, the area increased by 90.5%,³⁷ which indicates that the expansion of sugarcane has resulted in the concentration of land ownership.

A study done by Olivette and others (2009), also based on the last two agricultural censuses done by the state government in São Paulo, shows that of the total municipalities in São Paulo, 17% reduced the amount of acreage cultivated, 30% increased cultivated area by 100%, 36% increased from between 100% and 1000%, and 16% by more than 1000%.

Geographic Distribution of Municipalities by Class of Increase in Rate of Sugarcane Cultivated Areas, 1995-96 and 2007-08



Source: Olivette et. al., 2009.

A study done in June 2008 by Sergio Schlesinger in a few São Paulo municipalities, with support from Food and Water Watch, gathered information and interviews with people and institutions directly involved, and often affected by the process of expansion. The region of the state where the study was done is the vicinity of Ribeirão Preto, known as the “California of Brazil,” because of the dynamism of its agriculture industry. The area concentrates several diverse municipalities where sugarcane is predominant, occupying as much as 90% of the total area, as in the case with São Joaquim da Barra. (See table.) According to the *Folha de São Paulo*, based on the study by the National Water Agency [Agência Nacional de Águas], there were four municipalities in the region with more than 80% of their land occupied by sugarcane.³⁸

³⁷ Pino, 2009.

³⁸ Marcelo Toledo. “Cana ocupa metade da área de 35 cidades.” [“Cane occupies half of the area in 35 cities.”] *Folha de São Paulo*, June, 26, 2008.

Thirty-five municipalities in the Ribeirão Preto region had at least 50% of their total area occupied by sugarcane plantations in the 2007-2008 harvest. Throughout the region, 42% of the area is currently occupied. Sugarcane production in the greater Ribeirão Preto region increased 10.6% in comparison to the previous year.

Planted Area in the Ribeirão Preto Region

City	Total area (km²)	Area with cane (km²)	Percentage
São Joaquim da Barra	324	294	91
Dumont	102	91	90
Guariba	264	226	86
Dobrada	154	125	81
Morro Agudo	1,372	1,089	79
Ribeirão Preto	642	324	50
Araraquara	1,011	444	44
Barretos	1,570	527	34

Source: ANA (Folha de São Paulo, June 26, 2008).

It's Difficult to be a Neighbor of Sugarcane

For nearly a year and a half, together with six other families, Raimunda produces a wide variety of food, corn, various types of fruit, manioc, onions, celery, lettuce, arugula, eggplant, and other products that Brazilians traditionally eat. Their lands are part of a settlement of 170 families who had no land at all, at the Fazenda Bela Vista in the municipality of Araraquara in the state of São Paulo. Of these, currently only 20 to 30 have not been leased to the Zanin Plant, located near the settlement, established nearly twenty years ago. The leasing is illegal and has been the cause for action on the part of INCRA, with the help of the Federation of Rural Workers and Rural Employees of the State of São Paulo (Feraesp), because the land belongs to the union.

For INCRA, the relationship of the settlers to Zanin is leasing. The person who leases his or her land has no control over production, and in practice, merely hands over their land to the sugarcane mills. According the agency, the purpose of the land reform settlements, under the Land Act, is to strengthen family farms and to produce food. Sugarcane, characterized as monoculture, would not meet that goal and would make the farmers dependent on the mills.

Smallholder surrounded by sugar cane production



The problem also occurs in other settlements of the sugar-growing region such as Araçatuba, Ribeirão Preto, Barretos, and Andradina. In a few of them, settlements were promoted by the state government, whose criteria were different than those adopted by INCRA. In Rosana, Pontal do Paranapanema, 170 settlers maintain a partnership for planting and supply of cane to the Alcídia mill, with the approval of the Land Institute of the State of São Paulo (Itesp), which manages 168 settlements with 10,100 families.³⁹

Those who do decide not to lease their lands, in addition to ongoing pressure and regular threats, face a series of problems due to crop contamination by pesticides that is frequently applied by aircraft, the way it was done in Mirassol d'Oeste, which is common in many places we visited.

"Last year my corn withered, along with the corn of three other people. Everyone says it was because of the product they used to ripen the sugarcane. We know it, but we can't prove it." (Raimunda Silva Lobo, farmer at the Fazenda Bela Vista settlement in Araraquara, São Paulo, June 28, 2008).

Adiel, another settler we visited who resisted the pressure to lease his land told us:

"You plant other things, and when they start spreading their poison, sometimes even using an airplane, it becomes impossible. I've lost crops of beans, and a lot of other people also lost beans because of it. The planes even pass over the river." (Adiel Augusto Gonçalves, farmer, settler at Fazenda Bela Vista, Araraquara, São Paulo, June 28, 2008).

At the time of the burning of the sugarcane leaves, life becomes hell, even inside the house during the nights when they're working. The same problems reported in Serrana, where sugarcane cultivation practically invaded the city. Adiel describes the debt of the families who leased their land to the mills and the risk of food shortages in the region.

"The first years we received a little change. Now there are a lot of people who owe money to the plant and are going to have to rent again to pay their debt. Soon, there won't be any more food. And there won't be any money to buy it with. They planted so much sugarcane the price is now falling. And I think sugarcane is going to bring misery to the country." (Adiel Augusto Gonçalves, farmer, settler at Fazenda Bela Vista in Araraquara, São Paulo, June 28, 2008).

Government Support of Local Food Production

The few settlers at the Fazenda Bela Vista who continue to produce food are among the family farmers encouraged by direct food purchase by municipal and federal governments from family farmers. Sinézio de Silva Junior, Coordinator of Agribusiness and Food Security of Economic Development in the municipality of Araraquara, tells us that the programs of food acquisition for consumption by local administrative agencies, as well as for school meals, have encouraged local producers that selling directly allows them to get better prices than when they sell to intermediaries.

Through these programs, which include direct counseling for small producers, nearly one-thousand productive farms in the region and in neighboring municipalities, it has been possible to gradually increase the market of these farmers, with prices that are better for the local government as well. The city is currently hoping to expand the volume of purchases, which according to the Federal Government Food Acquisition Program, is limited to R\$3,500 annually.

39 José Maria Tomazela. "Incra quer proibir cana em assentamentos de São Paulo". ["INCRA wants to prohibit cane at the settlements in São Paulo."] O Estado de São Paulo, January 27, 2008.

The Expansion of Sugarcane over Cattle

In the region of Araçatuba, also known as the “national cattle capital,” even the president of the farmers union switched from raising cattle to growing sugarcane, which he called a “salvation” for the cattle ranchers.

Maurício Lima Verde, president of the Rural Worker’s Union of Bauru and vice-president of the Agricultural Federation of the state of São Paulo, explained that the farmers of the state have opted to lease their lands to the mills or plant sugarcane directly because the profits are up to three times higher. Another factor is the stability offered by the leasing contracts, through which the mills agree to purchase the entire production of the land for the lifetime of the plant, which is five or six years.⁴⁰

According to Paulo Cavasin, agricultural engineer at the Regional Agricultural Development Office in Araraquara,

“Where there used to be cows, now there is a sea of sugarcane, and this will happen with other crops as well. The state lost a large part of its dairy production to sugarcane. Ranchers left São Paulo and went to other states, such as Goiás and Paraná. The consumers were the ones who lost in the end.”

In São Carlos where, according to Hélio das Neves, of Feraesp, there used to be large producers, today there are only a few. In Dourado, in the 1960s, more than 60 thousand liters of milk a day were once produced. Since sugarcane arrived, the number has declined to 12 thousand liters a day, and currently if one thousand liters produced per day it would be a lot.

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Expansion of the sugar cane plantations in Goiás state, Mid-Western Brazil

All the major milk farms, which produced about 10 thousand liters per day have, without exception, switched to sugarcane. The switch was advantageous to the sugarcane-based alcohol industry because it took a large area of pasture land, flat and logistically well-positions. No one can make 10 thousand liters of milk a day from a hole in the wall. “The pastures were the best pieces of land on the ranches.”⁴¹

Beef export data from the state of São Paulo also confirms this thesis. In 2005, São Paulo accounted for 61% of the beef exported. This figure fell to 41% by 2009, according to Secex, an agency of the Ministry of Commerce, Industry and Development.⁴²

The Conditions of Sugarcane Workers

Zaqueu Teixeira and José Carlos Barbosa, directors at Feraesp in Serran, a municipality next to Ribeirão Preto, are ex-sugarcane cutters. They say that the degrading work, comparable to slave labor, is being practiced by the sugarcane business interested in implementing mechanization in full swing, which might resolve the issues for sugarcane, but the problem of unemployment in the area will only get worse.

40 Cana e desânimo puxam preço do bezerro em SP. [Cane and a lack of enthusiasm influence the price of cattle in São Paulo.] Pecuária.com.br, May 24, 2007.

41 Fernanda Manécolo. “Área de plantação de cana duplicou nos últimos sete anos”. [“Sugarcane area doubled in the last seven years.”] Tribuna Imprensa de Araraquara, 0716/07.

42 <http://www.desenvolvimento.gov.br/sitio/interna/index.php?area=5>, accessed on September 15, 2010.

But in the meantime, the exploitation of workers continues.

"Just this week, here in Serrana, people were lured down from Maranhão. There's a contractor here in São Paulo who lets people loose in the city. When the people arrived, they were left in abandoned buildings, without the slightest accoutrements for living. Even so, workers prefer to submit themselves to these precarious conditions because of a lack of alternatives. The only solution is land reform, but workers don't have that awareness." (Zaqueu Teixeira, Director at Feraesp in Serrana, SP, 26/8/08).

Mechanization also reduces the area available for the cultivation of other crops, as sugarcane has been responsible for unemployment in the rural regions. José Marangoni Camargo, of the Institute of the Economy at Unicamp, demonstrates in a recent study that between 1970 and 2000 approximately 700,000 agricultural jobs were lost in São Paulo, around 40% of the jobs that existed during that time, and the process hasn't stopped. After 1990, according to the author, the situation grew worse.



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After long hours journey, sugar cane cutters wait in the road for the bus to be fixed

The sugarcane-based alcohol sector experienced many changes during this period. In the last 15 years, the level of mechanization, above all during harvest, increased significantly. One harvesting machine does the work of 100 workers. "It's important to mention that currently sugarcane is planted on half the area of the state. Any change in the production process, in other words, will have a major impact on agriculture as a whole."⁴³

Not only sugarcane, but the agricultural model based on monoculture and cattle ranching have produced frightening numbers, even for people who are aware of Brazilian social reality. In March, 2007, the

prison population in Ribeirão Preto totaled 3,813 people, according to data from the state Secretary of Penitentiary Administration (SAP). The figure is significantly higher than the entire rural population of approximately 2,000 inhabitants. "There hasn't been only an increase in the number of *favelas*, but also an increase in agro-villages for agro-business," said Edivar Lavratti, regional director of the MST of Ribeirão Preto.

According to Lavratti, these agro-villages are places of abject misery in satellite cities around Ribeirão Preto. There, people depend directly on sugarcane cutting, and live with unemployment due to mechanization and the seasonal nature of the work. This leads to idleness among a considerable number of men and women, which is the cause of serious alcoholism problems as well.⁴⁴

43 Manuel Alves Filho. "Mecanização ceifa 700 mil empregos na agricultura nos últimos 30 anos em SP". ["Mechanization leads to the loss of 700 thousand jobs in the last 30 years in São Paulo"], *Jornal da Unicamp*, September 10 -16, 2007.

44 Eduardo Sales de Lima. "Presos superam população rural em Ribeirão." ["Prison numbers exceed population in rural Ribeirão Preto."], *Agência Brasil de Fato*, 01/04/07.

Social and environment impact

Sugarcane workers

The IBGE Agricultural Census of 2006, published in September 2009, reports that approximately 670,000 people are employed in the cultivation of sugarcane.⁴⁵

As we saw in the case of the state of São Paulo, the mechanization of cane cutting has caused the unemployment of hundreds of thousands of workers. In the 2006-2007 harvest, only 18.6 % of the sugarcane in Brazil was mechanized. In the following year, this percentage rose to 28%. In 2008-2009, the figure rose to 37%, and in the following year, to 45.3%. In 2010, mechanized farming has reached more than half of all the sugarcane planted in the country. In São Paulo, the largest producing state in Brazil, 60% of the current crop was harvested by machine.⁴⁶

Mechanization was a response by the sector to pressure from seasonal salaried workers and from society in general against the practice of burning sugarcane for the manual harvest. In regions where the harvest is manual, the new sugarcane cycle, which is characterized by high productivity, requires workers to harvest 15 tons a day. In the 1980s, workers were required to cut approximately six tons a day on average, and more recently 12 tons.

According to Maria Aparecida de Moraes Silva, of the State University of São Paulo (UNESP), this extra effort shortens the work cycle, which has resulted in a situation where workers' standards of living are inferior to what they were before the abolition of slavery. Fifteen years of work in the 1980-1990s is done in 12 years in 2000. According to historian, Jacob Gorender, the cycle of a viable working life for slaves was 10-12 years until 1850, before the prohibition of slave trafficking.⁴⁷

The violation of labor laws and collective bargain agreements characterize work in the sector. A study on working conditions at the plants in Paraíba, mentioned by DIEESE (2007), concluded that workers suffer enormous losses due to the following practices: daily wage and minimum salary reduction; the raising of fees through classification of irregular cane; errors or fraud in the way the cane harvest is measured; and commutation or non-payment based on agreements such as paid rest, vacations, or the customary extra-month bonus at the end of the year.



Sugar cane worker cuts from 6 to 10 tons of sugar cane per day

45 IBGE, 2009

46 Zulmira Furbino. Com os dias contados.[Counting the days] Estado de Minas. Caderno Agropecuário, 04/30/10.

47 Mauro Zafalon. "Cortadores de cana têm vida útil de escravo em SP". ["Cane cutters have viable working lives of slaves in São Paulo."] Folha de São Paulo, 04/29/07.

The loss to workers during the harvest in Paraíba is estimated at R\$1.92 million in unpaid minimum wages. For every day of work, workers lose two in pay. In terms of salary alone, it is estimated that losses reach 60% of workers' salaries. Errors and fraud diminish the pay by 21%. The study shows a series of union responses to improve the situation: increase control of workers over their production and simplify the calculations; create enforcement agents; establish inspection campaigns; submit complaints and put pressure on official agencies."⁴⁸

The Rising Price of Land

The fever to produce ethanol from sugar is seen as the main reason for the sharp rise in land prices that occurred mostly in 2007 in various regions of the country. The newspaper, *O Globo*⁴⁹ says that from July 2006 to June 2007 the average price of land in Brazil rose 11.64%. The regions that had the sharpest increases were precisely those where the expansion of sugarcane occurred with the highest intensity: the Southeast (17%), Central-West (12.2%), and the South (11.64%).

According to *Agriannual*, a publication from the FNP Institute, the land with the greatest potential to increase in value is on the new agricultural frontier and has the potential for agro-energy and reforestation. The annual publication also mentions interest from foreign investors, focusing specifically on the agricultural frontier areas of the North and Northeast. "In addition to being a factor in production, Brazilian land has become an object of speculation. Many businesses are establishing themselves in the country with the purpose of acquiring land and transforming it into producing property, and then selling it at a higher price."⁵⁰ The publication *Anualpec* (2009), from the same consulting firm, shows how the Central-West had the highest price increase in the long term (48.5% in 36 months), as the table below shows, followed by the South, with a 47.5% increase.



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The increasing value of flat land proper to mechanization is displacing smallholders and taking the job of sugar cane cutters

48 DIEESE, 2007

49 Aguinaldo Novo. "Produção de etanol faz preço da terra ter valorização histórica no Brasil". ["Ethanol production leads to historically high land prices in Brazil."] *O Globo*, 06/0707.

50 *Agriannual*, 2009.

Price Increase by Region – in percentages

Region	Increase of value in 36 months*		
	Average	Higher	Lower
Central-West	48,5	815	(59)
Northeast	44,3	392	(51)
North	39,5	1.501	(56)
Southeast	36,3	346	(27)
South	47,8	227	(39)
Brazil	42,6	1.501	(59)

* Period between March/April of 2006 to January/February, 2009.

Source: AgraFNP, Anualpec (2009).

Among the areas used for sugarcane cultivation, there are regions in Pernambuco where prices rose approximately 67% in twelve months. Also, there were new non-traditional areas of expansion such as Poconé (MT) with 36%, and Paranavai (PR) with 18%.

Local and regional impact on food production

The steep rise in land prices in Brazil, particularly in key areas of sugarcane expansion, has already caused the displacement of large agricultural and livestock businesses, as well as small family farmers.

According to Benedito Rosa, “it can impact the production of a 250 hectare area in Triângulo Mineiro, southern Maranhão, the southeast of Piauí, the north of Tocantins, and the northeast of Pará.”⁵¹ Goiás can grow from 300 thousand to 800 thousand hectares of sugarcane, according to Rosa. “Today, cane corresponds to 160% of the area of corn in Goiás. In São Paulo, the difference reaches 300%. In the interior of São Paulo a hectare of land that cost R\$4.7 thousand in 2001 is worth R\$10.2 thousand.”

In Araraquara, the interior of São Paulo, grain and livestock are being replaced by sugarcane, causing land prices to rise 70% during this period. The expansion of the area planted with sugarcane, and the consequent rise in the price of land, puts pressure on other crops and grazing land. According to the Agricultural Economics Institute of São Paulo (IEA-SP), this growth was 54%, between 2002 and 2008 only.⁵² Preferred regions are the Triângulo Mineiro in the south of Goiás and the east part of Mato Grosso do Sul. Other areas of expansion include Paraná, Tocantins, Maranhão, Pará, and Bahia.



Sugar cane harvest grow towards food production

51 “Ipea vê exagero no apetite por etanol e recomenda foco no mercado doméstico”. [“Ipea sees an excessive appetite for ethanol and recommends focusing on the domestic market.”] Valor Econômico, 06/08/07.

52 “Área agrícola ocupada pela cana-de-açúcar no estado de São Paulo cresceu 54% desde 2002 e expansão ainda continua.” [“Area occupied by sugarcane in the state of São Paulo grew by 54% since 2002, and it hasn’t stopped.”] Folha de São Paulo, 06/01/08.

The space that sugarcane occupies in the Araraquã region doubled between 2001 and 2007, reaching approximately 480 thousand hectares of new areas of production, according to a preliminary survey the Araraquã Agricultural Office of Regional Development (EDR), and the Secretary of Agriculture of the State of São Paulo.

Many crops common in the region, oranges, coffee, as well as cattle ranching, have given up space to sugarcane. Some consequences of this rapid and continuing growth have already been felt on the retail level, as in the case of milk, which rose 50% in the middle of 2007 alone. The consumer already had been paying higher prices for other basic food items such as rice, beans, and corn. "The higher price of milk occurred because there was less land for the cattle to graze on."⁵³

Case studies in Rubiataba and Mirassol d'Oeste also show a significant reduction in the production of rice, beans, and corn. In addition, the production of milk by family farmers is also threatened by the expansion of sugarcane in the regions analyzed. One can assume that in the regions studied, as in the state of São Paulo, the prices to consumers for these items have suffered sharp rises due to transportation costs.

The increase in sugarcane planting in São Paulo is also causing an increase in the concentration of production in the hands of large suppliers and mills, eliminating small producers. According to a study by Pedro Ramos, professor and researcher at the State University of Campinas, (Unicamp), only 25 % of the sugarcane ground by the mills is supplied by independent suppliers. The other 75% is supplied by the mills themselves.⁵⁴

Among the independent producers, the smaller outfits have lost market share. In the 1995-1996 season, 27.6% of the suppliers produced up to four tons of sugarcane. In the 2005-2006 season, this figure dropped to 18%. Vendors who produced more than 10 thousand tons had their share increase from 53.2% to 64.9% during the same period. The increase of mechanization is expected to further accelerate this process of concentration.

With the announcements of new plant investments around the country (nearly 90 new projects), the cane planters are leaving their homes to follow the expansion of the plants, according to Manoel Ortolan, president of the Organization of Sugarcane Producers in South- Central Brazil (Orplana).⁵⁵ "There is a movement of planters to the western region of São Paulo and the Central-West region, still disorderly."

Orplan does not have a map of the movement, but they said that many of the São Paulo suppliers are buying land, particularly pasture land. "The number of cane growers is increasing. Many small grain farmers are interested in planting sugarcane," said Ortolan. The regions near the plants being built have been increasing in value. In a radius of 30 kilometers around the plants, the price of land is as much as four times higher than before the plant arrivals.

According to Orplana, the most common practice of partnership between the landowners and the plants is the lease, which also contributes to the rising property prices. When leasing one's land, the owner of the land does not pay for any of the planting costs and is

53 Fernanda Manécolo. "Área de plantação de cana duplicou nos últimos sete anos". ["Area planted with sugar can has doubled in the last seven years."] *Tribuna Imprensa de Araraquã*, 16/7/07.

54 Mauro Zafalon. *Pressionado a produzir mais, trabalhador atua cerca de 12 anos, como na época da escravidão*. ["Pressured to produce more, workers produce for 12 years the way they did during the time of slavery."] *Folha de São Paulo*, 05/01/07.

55 "Fornecedores de cana se preparam para expansão do setor." ["Cane suppliers prepare for expansion."] *JornalCana*, October 2006. www.jornalcana.com.br.

paid according to what was agreed upon in the contract (or per production per hectare or the total harvest). In Goiás, there are cases where a hectare is leased for up to R\$30,000. In Matos Grosso and Mato Grosso do Sul, the prices vary from R\$10,000 to R\$15,000.

The sharp rise in the price of land and the practice of leasing for the expansion of sugarcane planting has created profound effects on the mode of agricultural production, the creation of rural jobs, migrations, food supply, and the availability of land available for agrarian reform.

As shown in the case study of Rubiataba, when farmers choose to lease their land, it can be a decision that is difficult to reverse. When advance payments are received, it is difficult for the farmer at the end of the contract to return to his or her property. In addition, the removal of orchards, gardens, and even their own houses, make the possibility of return that much more remote, which means that lease contracts are systematically renewed.

Environmental impact

Among the primary environmental impacts of the cultivation of sugarcane with regard to land use are the following:⁵⁶

- Soil compaction due to the use of heavy machinery during planting, maintenance, and during harvest;
- Silting of bodies of water due to soil erosion in farming areas;
- Reduction of biodiversity caused by the deforestation and the implementation of monoculture sugarcane farming.

Monoculture, very common in the cultivation of sugarcane, contributes to the onset of erosion, causing the progressive loss of soil nutrition, and possibly causing the rapid and total sterilization of soil, and in some cases even desertification. In addition to being one of the most important factors in the reduction soil productivity, it also has the effect of carrying away soil particles along with the pesticides, organic material and chemical nutrients, causing silting and polluting rivers, lakes and springs. This silting, in addition to causing environment damage, may also have consequences for the supply of hydro-electricity and for the public water supply, among other problems.⁵⁷



Degradation of soils in areas of sugar cane plantation

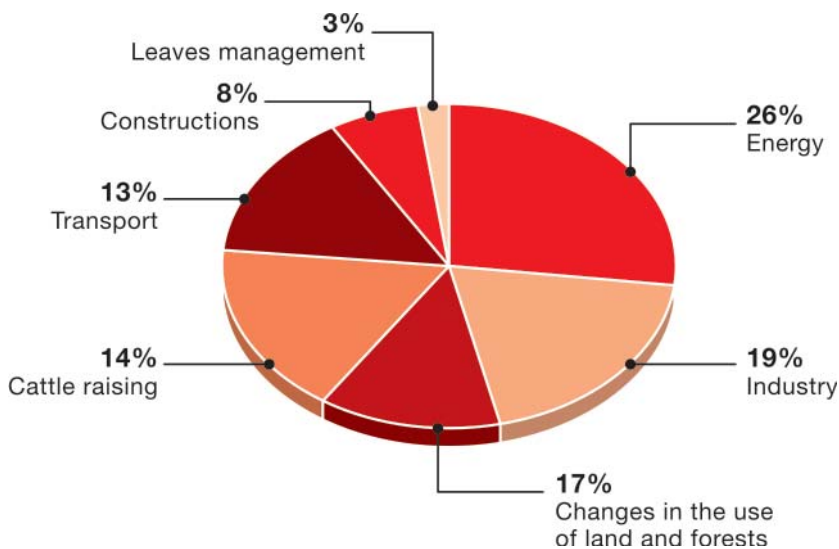
⁵⁶ Szmrecsányi, 2008.

⁵⁷ Zoratto, 2006.

Sugarcane and global warming

Worldwide, the production of energy and industrial activities are primarily responsible for the emission gases that cause the greenhouse effect, with 26% and 19%, respectively, using 2004 as a reference point, as the illustration below shows.

Participation of the Different Sectors in Worldwide Greenhouse Gases, 2004 – in CO₂-eq⁵⁸



Source: IPCC, em Bartholomeu, 2009.

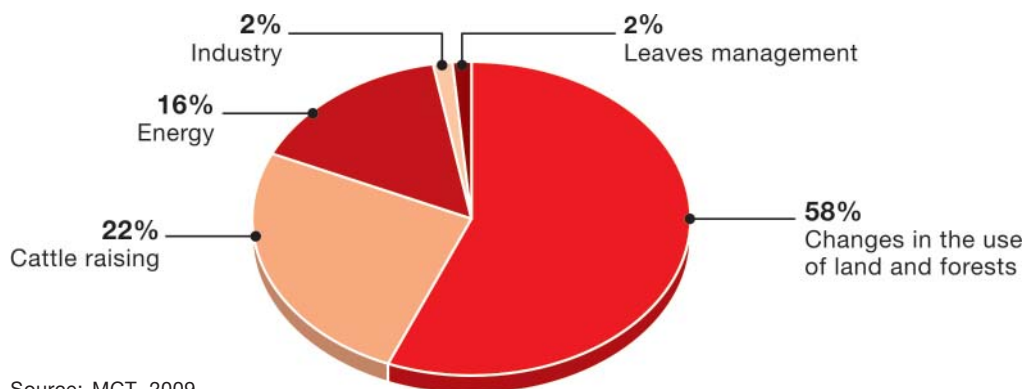
While the burning of fossil fuel is primarily responsible for the high concentration of greenhouse gases, according to the Intergovernmental Panel on Climate Change (IPCC), agriculture accounts for 13.5% of the annual global emissions of carbon dioxide equivalents. This figure takes into account the direct emissions of the sector, formed primarily by methane (CH₄), which comes from intestinal gas, cattle waste, and rice floods, as well as from nitrous oxide (N₂O), emitted through the use of fertilizers and the burning of biomass.

In Brazil, which is now the third largest exporter of agricultural products in the world, and at the same time contains about 40% of the earth's remaining forests, the numbers are very different than in the rest of the world. The primary cause of emissions in Brazil are referred to as "changes in land and forestry activities." Emissions from the production of energy and industrial activity represent only 16% and 2% respectively.

Deforestation and forest fires represent the largest share of total national greenhouse gases, making Brazil the fourth largest emitter of greenhouse gases in the world. According to the Ministry of Science and Technology (MCT, 2009), 58% of these emissions come from vegetation changes, particularly the deforestation of the Amazon region and the Cerrado, and 22% from farming and cattle activities themselves.

⁵⁸ CO₂-eq is the standard unit that measures the capacity greenhouse gases have to contribute to global warming in the amount of converted CO₂.

The Greenhouse Gas Emissions of Different Sectors in Brasil, in CO₂-eq



Source: MCT, 2009.

Changes in the use of soil and forests

Due to its size and location, cattle and soy have been most responsible, during the most recent decades, for deforestation and for the burning that has occurred in the Cerrado and in the Amazon.

In the case of sugarcane, the emissions come from annual burning, which is a common practice in the industry. The practice, in addition to being part of the manual cutting process to make it easier to cut the cane, is used where the harvest is mechanized as well.

Many articles⁵⁹ claim that the CO₂ produced in the burning would be absorbed completely by the cane through the process of photosynthesis, which isn't necessarily untrue. Other authors⁶⁰ warn, however, that many business people, technicians, and industry representatives defend the burning with inadequate information, creating a dangerous public opinion that confuses CO₂ with other gases. For this reason, it has become common to say that sugarcane absorbs the gases produced by the burning, which is not true.

The role of fertilizer in emissions needs to be studied carefully so that it is possible to understand the environmental balance of the sugarcane crop, according to Heiter Cantarella, researcher at the Institute of Agronomy (IAC) in Campinas. According to him, the nitrogen contained in fertilizers used in sugarcane farming plays a significant role in greenhouse gas emissions.⁶¹

In his study, Soares and his colleagues estimate that including the sugarcane burning, the total emission from planting to harvest is 2,722 tons of CO₂-eq per hectare. Since the average productivity is approximately 82 tons per hectare, for every ton produced there are emissions that correspond to 33 tons per kilo of sugarcane produced.

Attempts to measure, mathematically, indirect changes in land-use caused by the expansion of sugarcane are still very imprecise. In the case of cattle, for example, there is not enough information beyond counting the number of displaced heads. If this displacement was

59 See, for example, the article by Prof. Clímaco César "Impedir o avanço da cana pode ser a maior burrada ambiental das ONGs e ambientalistas do Brasil e já admitida até pelo WWF." ["Limiting the advance of sugar cane may be an environmental mistake of NGO environmentalists and has already been admitted by the WWF"] which can be found at <http://www.mfrural.com.br/informativo.asp?cod=7589>, accessed on September 22, 2010.

60 Szmrecsányi, 2008.

61 Fábio de Castro. Pesquisador defende a necessidade de compreender o papel dos fertilizantes nas emissões de gases de efeito estufa. ["Researcher defends the need to understand the role of fertilizers in greenhouse gas emissions."] Agência FAPESP, 08/14/09.



Grenhouse emissions are aggravated by the burn of sugar cane

transferred from São Paulo to the Amazon, the area occupied by the cattle by head would be much larger because the standard in the Amazon for cattle grazing is much more expansive than in São Paulo.

There are more serious issues raised by this shift, especially in the Amazon. Studies conducted in the region show that the expansion of one activity opens up possibilities for others, such as logging and soy cultivation, for example, which lead to the building of clandestine roads and create new fronts of expansion, which multiply like a snowball in ways that result in untold devastation.

While not quantifiable in terms of emission, the expansion of sugarcane is responsible in part for the growth of cattle grazing in the Amazon, due to the growth of sugarcane in other regions, especially in São Paulo, and the Southeast region of Brazil.

Marcelo de Carvalho Dias, owner of Cia. do Sal, an animal nutrition company, and cattle rancher in Barretos, confirms this trend. To him, the adoption of a system of production that keeps cattle confined would be the only way to avoid the destruction of the Amazon region. He explains that with the increase in the cost of land in São Paulo,

*"...cattle will go north, and the pressure will increase to open pasture there. Cattle ranchers tend to lease their land here in São Paulo, take the money, and raise cattle up in the Amazon. There are regions in the Amazon that are as good as Riberão Preto; red soil, plenty of rain, extended areas, and these areas will open up. If nothing is done, it will be impossible."*⁶²

Pesticides

Sugarcane culture is the third largest consumer of pesticides in the Brazil, accounting for 8.2% of sales in 2009, exceeded by soy (47.1%) and corn (11.4%).⁶³

Studying the potential impact of agricultural activities on the groundwater in the metropolitan region of Campinas in São Paulo, which is made up of 18 municipalities, Luiz, Neves, and Dynia, (2004) found that sugarcane culture alone accounted for 36.5% of the fertilizer NPK (nitrogen, phosphorus, and potassium) in the region. This was reinforced by the fact that the municipality with the highest consumption of NPK (13.1%) is Santa Barbara do Oeste, which had 94% of its cultivated areas planted with sugarcane.

62 Interview with Sergio Schlesinger, June 2008.

63 Andef, 2010.

With regard to pesticides, while sugarcane cultivation uses less per hectare than the top five crops in the region, it is third in total amount used, and presents the greatest risk to contamination of groundwater due to the leaching of the toxins, particularly tebuthiuron, which is considered high risk and is used exclusively in sugarcane cultivation. Other high-risk chemicals that have the potential to leach are diuron, ametrina, and clomazone. Various other studies demonstrate the risk to groundwater associated with this type of land use, particularly severe in monoculture cane farming, due to the intensive use of herbicides, among other factors.

Beginning in the 1980s with the advent of Proálcool, sugarcane expansion increased considerably the scale and the intensity of a serious environment problem, the excessive and indiscriminate use of fresh vinasse, *in natura*, as fertilizer in a process called fertigation.⁶⁴ This practice, already well known and used, brings the risk of water pollution to both surface water (streams and springs), as well as underground water (aquifers and groundwater), in addition to the risk of the progressive salinization of the soil.

Vinasse is a residue of ethanol production after the distillation and fermentation of the sugarcane. It is one of the main by-products and potential pollutants. Every liter of ethanol produced in a distillery generates between ten and fifteen liters of vinasse.⁶⁵ However, because of its nutritional richness, vinasse has become an important source of fertilizer, and is rich in organic material and other nutrients such as potassium, calcium, and sulfur. When vinasse infiltrates underground water, it transfers to the water table high concentrations of ammonia, magnesium, aluminum, iron, manganese, chlorine, and organic matter, and makes the water undrinkable.⁶⁶

In addition to vinasse, the sugar-based alcohol industry is characterized by the production of another liquid residue: filter cake, which is made up of a mixture of mulch and ground sludge from the sugar clarification process. From each ton of crushed sugarcane, thirty to forty kilos of filter cake is produced. It is an organic compound rich in calcium, nitrogen, and potassium. Studies show an increase in the concentration of heavy metal levels in soil that receives treatment containing the filter cake, as well as a risk of groundwater contamination, due to the fact that these metals are not absorbed by the plant itself.



Vinasse being spilled in the field: 14 liters of leaves for each liter of ethanol produced



Each truck throws until 20 tons of filter cake directly in the soil

64 Szmercsányi, 1994.

65 Câmara, 1993.

66 Hassuda, 1999.

A zoning proposal for sugarcane

In September 2009, the Ministry of Agriculture set up a program called Agro-ecological Zoning for sugarcane. The program's goal, above all, is to certify ethanol as a product that doesn't result in deforestation.

The zoning shows that the country has approximately 64.7 million hectares of suitable expansion for sugarcane cultivation, and of this land, 19.3 million hectares are considered to have the potential to be highly productive, 41.2 million to have medium productivity, and 4.3 to be low productivity. The areas suitable for expansion that are cultivated as grazing land, equaled nearly 37.2 hectares in 2002.

The area studied includes the national territory that isn't a part of the Amazon, Patanal, and Upper Paraguay River Basin. Also not included in the studied areas were the states of Acre, Amazonas, Rondonia, Roraima, Pará, and Amapá, because of their proximity to the Amazon region. Parts of the states of Mato Grosso, Tocantins, and Goiás were also excluded because they are part of Amazon, Patanal, or Upper Paraguay Basin environmental regions.



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Sugar cane planting disrespects the minimal limits established, invading the margins of the roads

The cultivation of sugarcane, however, is not the only agricultural activity in the country that is in the process of territorial expansion. Cattle ranching occupies the largest territory in Brazil, approximately 200 million hectares. Soy is the largest crop, covering approximately 24 million hectares. In just the last two years, from the 2008-2009 harvest to the 2010-2011 harvest the area of soy cultivation grew by two million hectares.

As already demonstrated in this study, the expansion of sugarcane, as well as other agricultural activities, creates a mix of production issues that result in increasing deforestation and cause a series of social problems that, in fact, are harmful to food production and to the people who work in these activities.

According to the *Reporter Brasil*⁶⁷ even if the bill is approved without alterations and is successfully implemented with effective monitoring and enforcement, there is still no guarantee that the Amazon, the Patanal, and Upper Paraguay Basin will be safe from the negative impact of agribusiness. This is because the expansion of sugarcane, even in designated areas, will displace other agricultural activities and livestock activities to the areas that the zoning will allow. Also, there are not substantial guarantees that the more sensitive environmental regions will be protected from deforestation and contamination by pesticides, such as the Cerrado, which is an area of great biodiversity, but has little protection.

According to the ZAE, the Cerrado is considered the area most suited for the expansion of sugarcane. From an environmental point of view, identifying potential of diverse regions for sugarcane, the ZAE did not consider the Priority Areas Map for Biodiversity Conservation from the Ministry of the Environment, which allows officially considered strategic locations for environmental conservation to be a target for the sugarcane. In addition, the bill does not establish restrictions for existing plants, nor for new mills that have obtained environmental permits for these areas of exception.

As seen in the case studies presented here, the location of sugarcane planting is directly related to the location of the mills. The surroundings of a mill, independent of the type of previous activity, tend to convert to sugarcane fields. As the production of grain in recent harvests has maintained an accelerating rhythm, so has sugarcane. The displacement of large crops is a phenomenon that has already occurred, occupying areas of family farms and causing consequences in more sensitive environmental regions.

67 Sakamoto, 2009.

Conclusions and Recommendations

The recent expansion of monoculture sugarcane for the production of ethanol biofuel and the implications of its growth prospects in Brazil has led to a need for monitoring the extent of this growth and its impact, particularly with regard to food production, access to land, and to natural resources in the country. From this point of view, the report sought to analyze the ethanol chain of production in the context of two crucial debates:

- Does biofuel genuinely constitute a sustainable alternative to fossil fuel, keeping in mind the realities of climate change and the need to reduce CO2 emissions?
- To what extent do biofuels compete with food production, endangering food security and sovereignty of the poorest segments of the population?

It is possible to conclude that the expansion of sugarcane cultivation has led to a series of problems, including both social and environmental risks:

- **Threats to food security** as a result of crop displacement from areas that were traditionally cultivated by family farmers and are now being used for sugarcane cultivation. This creates direct problems for the farmers who lose access to their livelihoods through the lease of their own land, and increasing land prices. Indirectly, consumers also suffer because land used to grow food is farther and farther away, and transportation costs limit access to fresh food.
- **The increasing price of land**, particularly the land around the sugar and ethanol mills, displaces family farmers due to the sale or leasing of land to the mills. After they give up the land, farmers and their families tend to move to urban centers. In the cities, they generally find that the money they've received for their land isn't enough to sustain their lives, that their farming skills don't help with their job search in an urban setting, and they have food costs that they didn't have in the past because they produced their own food.
- **Work relationships.** Relationships on the sugar plantations are characterized, historically, by degrading conditions in the fields where the sugarcane is cut, and a long history of a struggle for workers' rights. The recent modernization of the industry, the intention of which was to avoid burning the cane as well as to end the degrading exploitation, has resulted in a new problem: mechanization of the cutting process leads to increasing unemployment rates among sugarcane cutters.
- **Water and air pollution, and the social isolation of local communities.** Families that decide to stay on their land have to confront problems such as water and air pollution, which makes production of their own crops difficult and creates a series of health threats. Social isolation and the loss of community life among the rural populations are other issues these farmers mentioned.
- **Biodiversity loss.** The spread of the ethanol production model based on monoculture sugarcane cultivation has been a fundamental contributor to the loss of biodiversity, and deforestation.

- **There are no emission-reduction guarantees.** In the case of sugarcane, most emissions come from the annual burning of the sugarcane fields, which is a regular part of the cultivation process. Burning the left-over sugarcane foliage systematically destroys and degrades entire systems, both inside and outside the sugarcane plantations, not to mention the severe air pollution it creates, which has a harmful effect on not only adjacent rural areas, but on neighboring urban areas as well. Also, the excessive use of pesticides in sugarcane production also contributes to pollute underground water resources, and is another source of carbon dioxide in the atmosphere, which is an additional reason for the lack of environmental sustainability of this production chain.

A simple substitution of petroleum derivatives fuels for biofuels without considering environmental issues and social needs is not the solution to the problems caused by the mass use of fossil fuel. Energy sovereignty in Brazil should be based on a model of production and consumption of sustainable energy, that pursues the lowest impact over the environment, including biofuels as one of the possibilities since it is compatible with food production, social use of the land and ecological criteria to environment preservation.

Recommendations

- Ensure that biofuel expansion doesn't compete in important strategic ways with family farm food production, keeping in mind the need to guarantee food security on local, regional, and national levels, with a focus on maintaining stocks and food price stability.
- Ensure that by 2015 the standards of production of sugarcane for biofuel are consistent with concept of clean and sustainable energy, including the following: the suspension of the practice of burning the sugarcane fields after the harvest; the prohibition of dumping waste such as vinasse and other residues that contaminate the water table; a genuine reduction of greenhouse gases with the substitution of the type of fuel used in the transportation of sugarcane and of ethanol; and the creation of alternatives to spraying pesticides on sugarcane crops.
- Revise the sugarcane agro-ecological zoning project in a way that inhibits the expansion of sugarcane farming at the expense of food production; preserve all important ecological areas; create mechanisms that measure the indirect impact of the expansion of sugarcane farming, such as the rise in the price of land and the displacement of communities.
- Promote, as a joint effort between the public sector and private business sector, a sugarcane workers/cutters job-training program for work in other productive activities and professions, and the strengthening of policies to provide incentives to family farmers, such as access to land, credit, and technical assistance.

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