

THE SUGARCANE INDUSTRY AND THE GLOBAL ECONOMIC CRISIS



PHOTO: CARMELO FIORASO

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A close-up photograph of a man wearing a blue cap and a blue jacket, looking towards the right. He is in a sugarcane field, with the stalks of the cane visible in the background. The lighting is bright, suggesting a sunny day.

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Recent trends in the Sugarcane Industry

This article presents information on the latest trends in ethanol production in Brazil and their relation to the global economic crisis. We highlight the role of financial capital, its linkage to the territorial expansion of agribusiness and the impacts of this expansion on labour relations and disputes over the land of indigenous peoples and peasant farmers.

In rural Brazil, we have observed that the expansion of monocropping for the production of agrofuels, namely sugarcane ethanol,

continues. Ethanol made from sugarcane is said to be Brazil's main source of agro-energy, considering the volume produced, the total area used for sugarcane production and the amount invested in the expansion of the sugar-energy industrial park.

Data from the National Supply Company (Companhia Nacional de Abastecimento or CONAB in Portuguese) allow us to observe recent trends in the amount of sugarcane processed in order to produce sugar and ethanol:

Table 1

Production of the Sugar-Energy Sector - Brazil				
Harvest-Year	Production area (ha)	Sugarcane produced (tons)	Sugar produced (tons)	Ethanol produced (one thousand liters)
2004/05	5 625 300	415 694 500	26 621 221	15 416 668
2005/06	5 840 300	431 413 400	26 713 539	16 997 433
2006/07	6 163 200	474 800 400	30 223 600	17 471 138
2007/08	6 963 600	495 723 279	31 279 800	22 526 824
2008/09	7 057 800	571 434 300	31 049 206	27 512 962
2009/10	7 409 600	604 513 600	34 636 900	25 866 061
2010/11	8 056 000	623 905 100	38 675 500	27 699 554
2011/12	8 368 400	571 471 000	36 882 600	22 857 589

Source: CONAB – Companhia Nacional de Abastecimento.
The data has been taken from CONAB's harvest monitoring documents (always from the third recording of each harvest year). Org. XAVIER, C. V.



Described as a process to open *new* frontiers, the expansion of sugarcane production has been concentrated, in terms of production volume, in the Centre-South region, principally in the States of Minas Gerais, Goiás and Mato Grosso do Sul, Paraná and São Paulo¹.

Current estimates indicate that sugarcane monocropping occupies an area of approximately 8.4 million hectares in Brazil. Of this total, 86.1% of cultivated land is concentrated in the Centre-South region. The State of São Paulo is the largest producer, with 52.2% of its total area (the equivalent of 4.37 million hectares) dedicated to sugarcane production, followed by Minas Gerais with 8.87% (742 650 hectares), Goiás with 8.1% (678 420 hectares), Paraná with 7.3% (611 440 hectares), Mato Grosso do Sul with 5.70% (480 860 hectares), Alagoas with 5.45% (463 650 hectares) and Pernambuco with 3.89% (326 110 hectares)².

We observed rapid growth in the sector's production levels, mainly between the 2004-05 and 2010-11 harvest years. During this period, there was a 50.08% increase in the amount of sugarcane processed. Also in this period, the production of sugar and ethanol increased 45.2% and 79.6% respectively. However, there was a

change in this trend during the 2011-12 harvest: while the volume of production began to decline, the territorial expansion of sugarcane monocropping continued.

The global financial crisis brought significant changes to the sugarcane industry in terms of the patterns of expansion that had been traced over previous years. Taking advantage of the increase in the value of the Brazilian Real (R\$), many sugarcane plants took out cheap loans in US dollars and used the funds to speculate in foreign exchange derivatives. When the dollar's value rose again in relation to the Real, many factories went bankrupt and the sector accumulated more than R\$4 billion in losses. Companies stopped investing in, for example, the renewal of sugarcane plantations, crop handling and fertilization, which are needed to maintain high production levels. This is why in January 2012, the Brazilian government released R\$4 billion in funds to be used specifically for plantation renewal. In addition to the decline in productivity levels, we have observed the monopolistic internationalisation of the sector, an increase in the need for subsidized credit, the expropriation of small producers' and indigenous peoples' land and the substitution of food crops with sugarcane.

¹ While these are the main regions of sugarcane production, it is also important to note the recent advance of monocropping in the Northern part of the country. Even though the area used to produce sugarcane represents a small portion of the total area in terms of percentages (close to 0.41%), the North is currently the region with the highest growth rate: the amount of land occupied by this monoculture increased nearly 77.2% between the 2010/11 and 2011/12 harvests. This jump is namely due to the establishment of a new processing unit in the State of Tocantins.

² CONAB - Companhia Nacional de Abastecimento. Acompanhamento de safra brasileira: cana-de-açúcar, terceiro levantamento, dezembro/2011 - Companhia Nacional de Abastecimento. Brasília, Conab 2011.

The role of the State



PHOTO: MARIA LUISA MENDONÇA

BNDES gave credit to corporations that cultivated sugarcane on Indigenous land

The recent expansion of the sugarcane industry in Brazil was made viable mainly through funding from the National Bank for Economic and Social Development (BNDES). In 2010 alone, the BNDES provided R\$7.4 billion to the sector. During the eight years of the Lula administration, ethanol plant owners received a total of R\$28.2 billion in loans³. These disbursements represent a much more intense growth in in-

vestments than in any other economic sector in the country.

With the current crisis in the sector and productivity in decline, the Dilma government recently announced that it could increase the mix of ethanol in gasoline from 20% to 25% to boost demand in the domestic market⁴.

State support for agribusiness comes in the form of frequent rollovers of billions of

³ *Na Era Lula, usineiros receberam mais de R\$ 28 bi do BNDES.* Disponível em: <http://www.ihu.unisinos.br/noticias/40982-na-era-lula-usineiros-receberam-mais-de-r-28-bi-do-bndes>.

⁴ *Folha de São Paulo, Governo propõe zerar tributos do etanol.* 10/7/2012.



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Reals in debt, fiscal incentives, loans with subsidized interest rates, measures to ensure market security, as well as the negotiation of international trade agreements and the provision of incentives for agrofuels production, as had been done in the past. This policy gained in importance in 2004, when soybean prices fell sharply on the international market and large producers were rescued by the National Biofuels Program. A similar thing occurred with the sugarcane plants: the injection of new public funds in ethanol production “resuscitated” many plants that had been stagnant

or bankrupt since the Institute of Sugar and Alcohol’s closure in 1990.

These measures have been justified by the idea that agrofuels are a “clean and renewable” source of energy and the possibility of a significant increase in the global demand for ethanol. According to the companies’ estimates, in order for predictions on expansion to become reality over the next ten years, investments of approximately R\$43.8 billion are required. Of this amount, R\$24.5 billion is needed for land acquisition and R\$19.2 billion to establish plantations and build operational infrastructure⁵.

⁵ MOREIRA, C. *Limite de venda de terras a estrangeiro barrou entrada de US\$ 15 bi no País*. Agência Estado. São Paulo, 18/4/2011. Disponível em: <<http://economia.estadao.com.br/noticias/neg%C3%B3cios,limite-de-venda-de-terras-a-estrangeiro-barrou-entrada-de-us-15-bi-no-pais,63309,0.htm>>. Acesso em: 1º/6/2012.

The role of financial capital and multinational corporations in the sugarcane agribusiness

PHOTO: MARIA LUISA MENDONÇA



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The current scenario reinforces the tendency of corporations to seek to raise funds on financial markets, in addition to obtaining ongoing State support, in order to guarantee the expansion of their sugarcane production. The Cosan Group, which is currently the largest company in the sector and whose shares have been traded on the Bovespa stock market since the mid-2000s, serves as an example of this. The influx of foreign capital, mainly from investment funds, led to an exponential increase in Cosan's assets, which it used to set up subsidiary firms, such as Cosan Açúcar e Álcool, Rumo Logística, Cosan Combustíveis e Lubrificantes (CCL) and Radar Propriedades Agrícolas.

In addition to attracting investors from the financial system, the sugar-energy sector also engaged in a series of mergers with oil and

commodity trading corporations. The entrance of the Royal Dutch Shell oil company in the sector, through its establishment of a joint venture with the Cosan Group, is part of this process. This association resulted in the creation of the Raizen Corporation, which has quickly become one of the five largest economic groups in the country, with an estimated market value of US\$20 billion. The corporation is responsible for producing 2.2 billion litres of ethanol and 4 million tons of sugar annually. Since its creation, one of its stated goals is to increase its ethanol production to 5 billion litres by 2014. To reach this goal, it is seeking to increase its control over "new" sugarcane producing regions, such as the north-western part of the State of Sao Paulo and the States of Goias and Mato Grosso do Sul⁶.

⁶ RAIZEN, 2011. Available at: <<http://www.raizen.com.br/pdfs/apresentacao.pdf>>.

British Petroleum (BP) is another oil company that has established itself in the sugarcane industry. In 2008, through its agrofuels affiliate, BP Biofuels, the corporation acquired 50% of Tropical BioEnergy, a joint venture between LDC Bioenergia and the Maeda Group. The plant operated by Tropical BioEnergy is located in the Edeia municipality in the south of Goias. The unit is not currently operating at full capacity, but it is able to produce up to 435 million litres of ethanol per harvest (BRITO, 2011).

Petrobras is also one of the main corporations operating in the sugar-energy sector. Through the Nova Fronteira Bioenergia firm, which is the result of a merger between Grupo Sao Martinho and Petrobras Biofuels (PBio), the company plans to invest around R\$520.7 million to enlarge the Boa Vista plant located in Quirinopolis, Goias. The goal is to create the largest sugarcane ethanol plant in the world by increasing the unit's processing capacity from the 3 million tons it currently processes to 8 million by the 2014-15 harvest year. During the most recent harvest period, the plant was operating at idle capacity, processing only around 2.4 million tons, which is 600 thousand tons below its current capacity level.

One of the agribusiness trading companies active in the sugar-energy sector is Cargill. In 2006, Cargill acquired 64% of the Companhia Energética do Vale do Sapucaí (Cevasa). In mid 2011, the corporation announced its joint venture with the Usina São João, for two plants in Goias: one already in operation and the other, in the final stages of being built. ADM (Archer Daniels Midland) has also established its presence in southern Goias and Minas Gerais, namely by establishing joint ventures with existing plants. This strategy was also adopted by the Sojitz Corporation, which acquired 33% of ETH in 2007, together with the Odebrecht Group.

Bunge also established its participation in the sugarcane industry by acquiring existing companies. First, in 2007, it acquired Usina Santa Juliana, located in Minas Gerais. Then, in 2008, it set up a company to commercialise sugar with the Tate & Lile group, thereby becoming one of the biggest exporters of the commodity in the country. Over the next few years, the corporation continued to pursue its acquisition strategy and by 2011, it controlled eight plants already in operation and one in the process of being finalized. This structure has the

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PHOTO: MARIA LUISA MENDONÇA



Ethanol plant in Mato Grosso do Sul pollutes water sources



Entrance of the town of Caarapó where Raízen (Cosan-Shell) cultivated sugarcane on Indigenous land

capacity to grind 20 million tons of sugarcane per harvest.

Investment funds have also become involved in the sector both by fully acquiring plants and by establishing associations or mergers. The creation of Infinity Bio-energy is one example of this kind of full acquisition; it was set up by the Kidd & Company, Stark and Och Zitt Management Funds from the U.S. and the Merrill Lynch bank. In 2006 and 2007, the company finalised a deal to purchase eight plants and announced the construction of five more. The total cost of these acquisitions amounted to approximately R\$1 billion. This venture is linked to US\$1.5 billion obtained in May 2006 on the London-based AIM stock market, which is meant to provide resources for companies in the early stages of development⁷.

With regards to the strategy of forming associations and partnerships, one case that draws our attention is CEB (Clean Energy Brazil), which raised R\$400 million on the London stock exchange in 2006. In 2007, the company acquired 49% of Usaciga Açúcar, Álcool e Energia Elétrica

located in the State of Parana. In 2009, it formed a joint venture with Unialco S.A., acquiring 33% of shares in two plants in Mato Grosso do Sul.

The main strategy adopted by foreign corporations that have succeeded in entering the sugarcane industry is to strengthen their presence in regions identified as *new* areas of production. It has been noted that corporations such as Raízen (Shell – Cosan), Nova Fronteira (Petrobras – Sao Martinho), BP Biofuels (Tropical BioEnergy and CNAA), Cargill, Bunge, ADM, ETH (Sojitz Corporation and Odebrecht), Infinity Bio-energy, among others, have concentrated their investments in these regions.⁸

The growing participation of transnational corporations in the sector is causing an increase in the concentration of capital. Their presence is apparently related to their search for investments that they believe are “healthy”, due to a supposed ‘stability’ in Brazil’s land market. The move towards greater capital concentration is, however, the result of the global economic crisis itself, as we will see shortly.

⁷ STEFANO, F. O comprador de usinas. Revista Exame, 19 de outubro de 2007.

⁸ Information on commodity trading firms and investment funds were obtained from the following reference: PINTO, M. J. A. Investimentos diretos estrangeiros no setor sucroenergético. 2011. Dissertação de Mestrado – Faculdade de Administração, Economia e Contabilidade de Ribeirão Preto, Universidade de São Paulo, Ribeirão Preto, 2011.

The expansion of agribusiness as determined by the world economic crisis

PHOTO: MARIA LUISA MENDONÇA



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To develop a critical analysis of the sugarcane sector's expansionary process, it is essential to situate the current economic crisis in its historical context. The current moment has been marked by the way financial capital creates the illusion that money has the ability to move about autonomously. In its "autonomous" form, money is negotiated on the financial markets as a merchandise whose price is determined by interest rates. The term "financial industry" arose as a by-product of this "miraculous" system, in which money is believed to have the ability to generate more money, without going through the productive process. The financial markets offer a wide variety of "services" to generate more money for their clients.

The sugarcane industry reaffirms that in order to ensure its expansion, it has a constant

need to attract more and more resources from the financial system, always with the goal of covering its previous loans. In other words, it aims to guarantee its expansion by accumulating increasingly high volumes of debt. Therefore, the source of this expansion can be defined as fictitious capital – that is, when companies take out new credit to pay off their bad loans.

In this context, then, what we see is a growing dependency of real capital on credit. The extremely high initial costs of establishing competitive production processes demand that sugarcane corporations take out increasingly high amounts of subsidies. As a result, the sugarcane industry expands territorially by using enormous amounts of credit for mergers, construction and modernization

of processing units, plantations or to obtain control over land by purchasing it or signing partnership or leasing contracts.

It is clear that financial market actors' involvement in the sector is motivated by their quest for returns on their investments. Even though this capital originated in this process of fictionalised reproduction – in which the volume of capital that has been accumulated is generated by the illusion that money can reproduce itself on its own, free from its abstract substance, labour – the huge amounts of loan money to be incorporated into the expansion of sugarcane production lead investors to believe that the numbers will effectively rise. Furthermore, the incorpora-

tion of these investments into broadening the assets of the major corporations in the sector ends up forging a seemingly healthy reproduction process. Thus, investors are counting on promises of capital gains, when there is, in fact, a crisis scenario. This is made evident by the constant need for credit in order to sustain the productive process.

In this context of fictitious reproduction of capital, the companies' assets and profits are inflated and detached from real values. The apparent "health" of many corporations, then, masks the hidden portion of their debt. This strategy characterises the transition from industrial capitalism to the current period in which speculative capital prevails.

The history of ethanol production in Brazil as the genesis of the financialization of capital

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The Pro-Alcohol program (1975-1990) represented one of the Brazilian State's main policies for the industrialisation of rural areas, as it provided subsidized credit to the sugar-energy sector. This industrialisation process is related to the country's foreign debt and the defaults⁹ of private capital in the sector. The accumulation of foreign debt in the late 1980s led to the "collapse" of the Institute of Sugar and Alcohol (Instituto do Açúcar e do Alcool or IAA), the bankruptcies of various sugarcane plants and the decrease in the production of ethanol-based fuel and vehicles run on ethanol. Other consequences of the debt crisis in the 1980s were hyperinflation and the Brazilian State's moratorium in 1986.

The modernisation process in Brazil, promoted by the military dictatorship, was

rooted in foreign debt. Starting in the 1950s, during the Juscelino Kubitschek administration (1956-1960), there was an increase in the flow of international financing to the country. The Brazilian State's recourse to foreign loans responded to idle international capital's need to appreciate. In 1973, with the so-called "First Oil Crisis", various periphery countries saw their foreign deficits skyrocket, which moved their governments to seek alternatives in order to pay their debt and maintain their global liquidity.

In Brazil, the government coordinated its attempts to replace the energy matrix with the automobile industry, which led to the creation of vehicles run on ethanol. The government set up subsidies for the production, purchasing and consumption of ethanol. The Pro-Alcohol

⁹ TRIBUNAL DE CONTAS DA UNIÃO (TCU). *Proálcool: Relatório de Auditoria Operacional*. Brasília: TCU, 1990.



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program promoted the industrialisation of agriculture by introducing the mechanisation of sugarcane harvesting and seeding, which reduced the need for labour. Thus, the entire production chain received subsidized credit. The industrialisation of agriculture in general, and not only the sugar-energy sector, got its greatest boost from the military dictatorship's economic policies in the 1970s.

It is interesting to examine Ricci's¹⁰ description of the changes occurring throughout the Pro-Alcohol program's lifespan:

"The first activities to be mechanised on sugarcane plantations were soil preparation and seeding. For both, the impacts of mechanisation were the reduction in the time it takes to carry out the activity and the decline in the use of workers. Sugarcane harvesting is made up of three independent phases: cutting, carrying and transporting the cane to the plant. The mechanisation of sugarcane

harvesting has been very slow, reaching the transportation of sugarcane first... [...]. Then, the work to carry sugarcane was mechanised. Up until the 1950s, the workers cut and bundled sugarcane, and tied the load with the leaves [...]. The men carried the cut and bundled sugarcane on their backs to the little trucks or carts pulled by animals [...]. In the next stage, at the end of the 1960s, manual carriers were replaced by trucks, on which sugarcane was piled and carried to truck trailers [...]"

The industrialisation of agriculture in Brazil was driven by industrial and financial capital that was seeking to generate profits through the appropriation of land income. In order to maintain productivity at levels compatible with the international market, Brazilian agribusiness took on enormous debt, which eventually generated the sector's economic crisis in the 1980s. The production of sugar and ethanol,

¹⁰ RICCI, Ruda et al. *Mercado de trabalho do setor sucroalcooleiro no Brasil*. Brasília, Ipea, 1994; pg. 104-107.

for both exportation and domestic consumption, assumed the role of “rolling over” Brazil’s external debt. In the late 1980s, after a period of modernisation, companies were unable to repay their debts. As for the State, it had to eliminate its policy of subsidising the industry, which caused a series of plants to go bankrupt¹¹.

The 1990s were marked by stagnation. People stopped buying cars run on ethanol and the price of sugar remained low due to fluctuations in the international commodities market and slow growth rates in urban areas. The sector only started receiving a significant amount of incentives again in 2004.

The “new” expansion of the sugar-energy sector and the conversion of the Brazilian State’s external debt into internal debt

According to data from CONAB (see Table 1 above), between 2004 and 2009, the sugar-energy sector expanded strongly in absolute terms, something that had only happened during the Pro-Alcohol program. From the 2004-2005 harvest to that of 2008-2009, the total area planted in sugarcane grew from 5 625 300 hectares to 7 057 800 hectares. Also during that time, sugarcane production increased from 415 694 500 tons to 571 434 300 tons; sugar production from 26 621 221 tons to 31 049 206 tons; and that of ethanol from 15 416 668 litres to 27 521 962 litres. However, this rate of expansion lasted only five years, between the 2004-2005 and 2008-2009 harvests, when the crisis’ impacts begin to affect the sector. From 2010 on, only the size of the cultivated area continued to grow, whereas productivity dropped significantly. This process is related to the international economic crisis, which led to a fall in commodity prices, the valorisation of the dollar and the lack of liquidity in the financial market, which plays a key role in the sector’s expansion.

The most recent period of growth in ethanol production in Brazil began when new opportunities to access financial capital were created. During the 1990s, core countries that were previously creditors of Third World debt developed securitisation mechanisms, which created new possibilities for financing. New speculative financial products, known as “derivatives”, were created. These possibilities expanded the financial sector’s capacity to create money and its leverage. This generated huge amounts of international liquidity, as well as an exponential increase in debts, yet this time in the form of countries’ internal debts.

a) The securitisation of debt

The securitisation process allowed investors to purchase bonds tied to countries’ debts, which can be paid in different ways, like, for instance, through real estate, car or university loans. Brazil renegotiated its external debt with U.S. banks in 1994, during the Itamar Franco government, through an agreement called the

¹¹ TRIBUNAL DE CONTAS DA UNIÃO (TCU). *Proálcool: Relatório de Auditoria Operacional*. Brasília: TCU, 1990.



PHOTO: MARIA LUISA MENDONÇA

“Brady Plan”: “The agreement also resulted in the “securitisation” of credits against Brazil – that is, in their transformation into bonds or bonuses that are more easily negotiated on secondary markets¹².”

Securitisation makes it possible for creditor banks to remove outstanding debts from the assets recorded on their balance sheets. This mechanism is essential for guaranteeing the circulation of financial capital, as it increases lending capacities. It also stimulates consumption of the State and among the general population, which generates apparent economic growth. Such a procedure expanded the banks’ lending capacities far beyond previous legal limits, as creditors holding securitised bonds are no longer included in the financial reports of the banks selling the securitisation packages.

In Brazil, the Brady Plan was assessed in the following way:

“Some advocates of the Brady Plan and its implementation in the Brazilian case (...) claim that the fundamental advantage of this type of agreement resides in something less tangible, which is a gain in “credibility” that would result in, among other things, the broadening of the debtor country’s access to international financial markets¹³.”

The financial market is characterised by the predominance of “idle” capital seeking possible returns. The Pro-Alcohol program made the rolling over of Brazil’s external debt possible during the 1980s. The Brady Plan allowed Brazil to broaden the rolling over of its external debt and to transform it into “internal” debt, which was no longer calculated in dollars, but rather as National Treasury bonds whose value was

established in Reals (Brazilian currency). The Brazilian State’s capacity to rollover its debts is related to the availability of funds it can use to stimulate the economy. As such, the National Bank for Economic and Social Development (BNDES) plays a central role in encouraging new loans.

Economist Jose Roberto Afonso explains how the mechanisms used to rollover Brazil’s internal debt worked between 2003 and 2010:

“By paying the highest interest rate in the world, the country attracts an increasing amount of foreign capital, accumulates more and more foreign reserves, and raises the Real’s value higher and higher. The earnings and confidence of foreign and national investors increase. The current arrangement combines a rapid increase of credit from public sources – the state -controlled banks’ slice is worth 19.8% of GDP, while the National Treasury is a creditor of 14.5% of the GDP of these public banks. In practice, the Treasury became the largest bank in the country. However, contrary to a regular bank, it is not subject to prudential regulation. To put itself in this position, it increased between August 2008 and June 2011 the amount of extraordinary credit it conceded to official banks (basically the BNDES) by 6.5 points of GDP, while gross debt increased 5.8 points in the same period, jumping to 65.3% of GDP. Just like any other bank, there is a limit to the Treasury’s ability to continue going deeper into debt in order to continue handing out loans. [...] For this system to work, the government accumulates, directly or indirectly, an increasing amount of debt. And for what? Mainly to give more credit to public banks, which use 95% or more of these funds to give loans to the private sector”¹⁴.

¹² JÚNIOR, Paulo Nogueira Batista; & Rangel, Armênio de Souza. “O Brasil no Plano Brady”. Available at: <http://revistas.fee.tche.br/index.php/indicadores/article/viewFile/872/1151>; consulted on July 5, 2012; p. 46.

¹³ Idem, p. 45.

¹⁴ AFONSO, José Roberto. *Tesouro se Transformou no maior banco do país*. “O Estado de São Paulo”, Caderno Econômico, 29 de agosto de 2011. Available at: <http://m.estadao.com.br/noticias/impresso,tesouro-se-transformou-no-maior-banco-do-pais,765399.htm>; consulted on July 5, 2012.

The burst of the bubble on the Nasdaq technology index in 2001 made investors search for new options. At that time, internal debt bonds of periphery countries looked like a good deal. With the United States keeping its interest rates so low, investors have been attracted to Brazil's internal debt bonds, where interest rates are much higher. This mechanism, known as *carry trade*, encourages private agents to take out loans in dollars and use the funds to buy State bonds of countries that pay higher interest rates. This mechanism was used not only in Brazil, but also in other Latin American countries and the BRICS, a group of countries made up of Brazil, Russia, India, China and South Africa.

In Brazil, many sugar and ethanol plants acquired credit on foreign markets, in dollars, in order to take advantage of the low interest rates in effect on the U.S. financial market¹⁵. With ample liquidity, or a good borrowing capacity, the Brazilian government began to offer, via subsidized credit, generous loans to the private sector, namely the agribusiness industry. The offering of incentives for sugarcane, sugar and ethanol production, which began in 2003, was part of this process.

Brazil's public debt (both internal and external) neared the three trillion-real mark in 2011. In 1994, the internal debt was close to zero. Today, it represents the greatest portion of the country's debt, as the external debt is only approximately R\$350 billion. The

public debt amounts to 75% of the national GDP, which was near R\$4 trillion in 2011. Brazil spends more than R\$700 billion – that is, more than 45% of the Federal government's budget (R\$1.571 trillion in 2011) – a year on servicing its debt.

“Brazil's internal debt, which amounted to R\$892.4 billion when Lula assumed office in 2003, reached R\$1.4 trillion in 2009 and, according to the limits established by the government itself, it could reach R\$1.73 trillion at the end of 2010, almost double the amount. A growth of 94% in eight years of government”, explains the economist Waldir Serafim¹⁶. While the debt doubled in size during the Lula government, the GDP grew approximately 32%, which allows us to highlight the interrelation between them, as well as the need to rollover the national debt in order to keep the country solvent. The difference between the interest rate the State pays on government bonds (called the Selic Rate, or Taxa Selic in Portuguese) and the amount it charges as interest on loans to the private sector (including agribusiness) represents yet another way the government provides subsidised credit through public banks such as the BNDES, which is the main basis for the expansion of the sugar-energy sector.

Various studies confirm the existence of subsidized credit for the sector. The economist Pedro Ramos¹⁷ affirms that the obligation to add ethanol to gasoline can be

¹⁵ “Perdas com derivativos nas usinas atingem até R\$ 4 bilhões”. *Jornal Valor Econômico*, 9 de outubro de 2009. Available at: [http://www.jornalcana.com.br/noticia/Jornal-Cana/31304+Perdas-com-derivativos-nas-usinas-atingem-ate-R\\$-4-bi](http://www.jornalcana.com.br/noticia/Jornal-Cana/31304+Perdas-com-derivativos-nas-usinas-atingem-ate-R$-4-bi); consulted on July 1, 2012.

¹⁶ SERAFIN, Waldir. *Dívida Interna: perigo à vista*. “SóNotícias”, February 11, 2010. Available at: <http://www.sonoticias.com.br/opiniao/2/100677/divida-interna-perigo-a-vista>; site consulted on July 5, 2012.

¹⁷ RAMOS, Pedro. *Financiamentos subsidiados e dívidas de usineiros no Brasil: uma história secular e ... atual*. Available at: http://www.google.com.br/search?q=Financiamentos+subsidiados+e+d%C3%ADvidas+de+usineiros+no+Brasil&rls=com.microsoft:pt-br&ie=UTF-8&oe=UTF-8&startIndex=&startPage=1&redir_esc=&ei=bkr3T-e2HOKQ6wHA3YzsBg, 2011; consulted on June 6, 2012.

considered a subsidy. The geographer Antonio Thomaz Jr.¹⁸ shines light on the successive pardoning of the sugarcane industry's debts as proof of the "benefits" it enjoys. In August 2008, the government decreed that the Long Term Interest Rate (6.25% per year) would substitute the Selic rate (13% per year at the time) in the renegotiation of the agricultural sector's R\$75 billion debt, which dates back to the 1980s and 1990s. This amount is close to the R\$65 billion allocated to the 2008-2009 Agriculture Plan (Plano Agrícola) for investments in the agribusiness industry, with fixed rates of 6.75% per year, which represented an increase of 12% from the previous year.

The BNDES' investments in the sugar-energy sector during the Lula government are massive when compared to other sectors. The total amount was R\$28.2 billion. In 2010 alone, R\$7.4 billion was disbursed to finance a range of activities, from the planting of sugarcane (R\$953 million) to the production of sugar and alcohol (R\$5.6 billion) and the co-generation of energy (R\$665 million). The amount of these loans is greater than those provided to other sectors of the economy that year, such as the paper, cellulose and extractive industries together (R\$3.1 billion), the mechanical industry (R\$5.3 billion), the metalworking industry (R\$4.9 billion) and the clothing and textiles industry (R\$2.1 billion). In 2008, due to the financial crisis, even the working capital of companies in financial difficulty was financed. These are exorbitant

amounts when compared to what the sector received in subsidized credit (with negative real interest rates) during the entire Pro-Alcohol program: more than 7 billion dollars between 1975 and 1990¹⁹.

b) The derivatives market

"With the end of the Bretton Woods agreements and the increased volatility of interest and exchange rates, financial derivatives were created and propagated, initially with the goal of covering risks. However, the use of these mechanisms did not end up being restricted to this purpose, as they became the preferred instrument for speculation, due to the possibility of high capital gains. (...) a derivative is a financial contract whose value is derived from the value of an underlying asset, commodity price, index, rate or event. (...) One characteristic that is particular to the ensemble of derivatives is that one negotiates now what the value of an asset will be in the future."²⁰

This quote makes it clear that derivatives are related to what is known as the "futures markets". Agricultural commodities are negotiated on this market and their physical sale on the "export markets". Indexes, currencies, interest rates and commodity prices are negotiated on future markets, but their actual delivery is not.

Derivatives markets arose during the 1970s and 1980s in a midst of strong fluctuations in interest rates and, as a result, exchange rates. International traders began to buy and sell currencies and commodities

¹⁸ THOMAZ JR., Antonio. *Por trás dos canaviais: os nós da cana*. São Paulo, Annablume/Fapesp, 2002.

¹⁹ XAVIER, C. V.; PITTA, F. T.; MENDONÇA, L. M. *Monopólio da produção de etanol no Brasil: a fusão Cosan-Shell. Rede Social de Justiça e Direitos Humanos*. São Paulo, 2011. Available in Portuguese at: <http://www.social.org.br/revistacosanshel.pdf>. And in n English: http://www.social.org.br/ethanol_monopoly_brazil.pdf.

²⁰ Fahri, Maryse. *Operações com derivativos financeiros das corporações de economias emergentes no ciclo recente*. Trabalho apresentado no II encontro internacional da Associação Keynesiana Brasileira, setembro de 2009. Available at: <http://www.ppe.ufrgs.br/akb/encontros/2009/02.pdf>; consulted on July 5, 2012; p. 2.

in advance, which guaranteed them a favourable price, regardless of whether there were any abrupt changes in the markets or not. At the same time, these variations enabled investments in the derivatives markets to generate large capital gains. This is a fundamental point.

Speculation on both agricultural commodity prices and currencies cause strong impacts on and oscillations in prices, which reflect movement on the futures markets. Nowadays, the prices of certain kinds of merchandise or goods may be the simple expression of speculators' future bets, as they raise or lower prices according to what they foresee as the best option for their financial gain. What is more, these variations affect exchange and interest rates, as they stimulate investments in these derivatives markets. This, in turn, contributes even further to price volatility.

Capital gains earned by betting on financial markets began to integrate the profits of companies that used to invest only in the production of goods. The so-called "hedge" operations are speculative in nature, as the futures exchange is the speculative market *par excellence*. This kind of financial structure has gained even greater importance today, as it allows its participants to enhance their wins and losses. There is an interconnection between "productive" companies and speculative capital, as many play both roles. For example, various commodity-trading firms take on debt in apparently favourable conditions and apply the resources in commodity speculation, so as to "close" their books with the earnings they obtain from negotiating future prices.

Another speculative activity in which a growing number of companies engage in order to enhance their assets is entering in the stock market. Various plants in Brazil, such as Cosan, Açúcar Guarani, Usina Costa Pinto and Usina São Martinho, used the Initial Public Offer (IPO) mechanism to enter the stock exchange. The stock market began to expand in the 1970s and allowed financial capital to seek gains based on the flow of money, which generates more money, without participating in the productive process or the exploitation of labour.

Companies opt for this kind of procedure with the intention of increasing their capital and other assets, such as machinery, land, subsidiaries, etc. As a result, share prices end up being a fundamental part of companies' market value and a parameter for obtaining credit. The sugar-energy sector used loans in U.S. dollars from private banks during its recent expansion. Access to credit and new financial instruments augmented the sector's capacity to borrow and invest, opening the way for the technological transformation that widened the gap between investments in fixed capital and the workforce that was to be exploited. This move made companies even more incapable of generating profit through the exploitation of labour.

The main consequence of this process was the mechanisation of sugarcane harvesting. In the State of Sao Paulo, the country's biggest producer, 75% of sugarcane is harvested mechanically. In other states where sugarcane monocropping is expanding, like Mato Grosso do Sul and Goias, 50% has been mechanised²¹. As a result, the number of cases of over-

²¹ To see this data, consult: BACCARIN, José Giacomo. "Boletim – Ocupação formal no setor sucroalcooleiro em São Paulo". Jaboticabal, UNESP, 2009-2011, números 1-21. Disponível em <fcav.unesp.br/baccarin>. Consulted on 10/08/2011.

exploitation of workers, including tractor and combine drivers, is on the rise.

The sector's crisis is cyclical, like a spiral that spins deeper and deeper. A company's capacity to acquire new debt in order to continue investing increasingly high amounts is directly tied to its size – that is, the value of its assets. The need to buy land and machines, combined with the tendency to speculate on fi-

ancial markets to obtain higher-than-average profits, are defining the sector's expansion. As they modernise the production process, they replace workers with machines, which makes accumulation even more difficult. This, in turn, contributes to further indebtedness, expansion and financial speculation, which are determining factors in the over-exploitation of labour.

The impacts of the 2008 crisis in the sugar-energy sector



PHOTO: CARMELO FIORASO



As seen above, the production of sugar and ethanol depends on regular debt rollovers and financing. The 2008 global economic crisis was characterised by defaults on real estate loans, principally in the United States, which limited companies' ability to obtain credit. For many economists, this process meant the end of financial market liquidity.

Brazil's sugarcane industry was hit hard by the crisis. The sector had gone through several crises in its history, all with different characteristics. In the second half of the 1980s, the Pro-Alcohol program went under. According to the report of the Federal Auditor General²², which investigated the sugarcane plants' debts, it was the end of subsidised credit from the government that led many companies into bankruptcies and mergers. Subsidies had to be cut due to the State's inability to rollover the external debt. Initially, in the 1980s, this incapacity was compensated by a policy of hyperinflation. Later, in 1986, the government

declared a moratorium and it became more difficult to access credit.

The sugarcane industry's most recent growth cycle lasted from 2003 up to the 2008 financial crisis. During this period, companies relied mainly on loans from the BNDES, but also heavily on private credit in U.S. dollars. The sector also used financial mechanisms, like exchange rate derivatives, to generate profit. The 2008-2009 crisis combined the impossibility of accessing resources for debt rollovers with losses from investments in exchange rate derivatives. Many plants went under, which intensified the process of acquisitions by and mergers with transnational corporations.

The crisis was reflected in the fall of sugarcane production in the 2011-2012 harvest year. With the decline in ethanol production, in 2011, Brazil had to import corn ethanol from the United States. This was important symbolically, since Brazil presents on the international scene the idea that it would become the "Saudi Arabia

²² TRIBUNAL DE CONTAS DA UNIÃO (TCU). *Proálcool: Relatório de Auditoria Operacional*. Brasília: TCU, 1990.

of ethanol”. The main argument ethanol plants used to justify the decline in productivity was their inability to invest in plantation renewal, fertilization and chemicals. One way of compensating the reduction in investments was through the territorial expansion of sugarcane monocropping. Despite the crisis, the BNDES continued to finance plants and, in early 2012, it made R\$ 4 billion available to them through a line of subsidised credit to be used specifically for plantation renewal²³.

The subsidised credit provided by the BNDES was not, however, enough to sustain productivity levels, which became evident with the global financial crisis. Taking out loans in U.S. dollars and speculating with exchange rate derivatives had become common practice for companies in the sector. The economic context established prior to the crisis provided these companies with speculative gains, at a time when idle international capital was looking for ways to appreciate on the financial market. Furthermore, the United States’ low interest rates encouraged *carry trade* – that is, generating gains by earning dollars and applying them in investments that take advantage of Brazil’s high interest rates. This caused the dollar to depreciate vis-à-vis the Real, which stimulated investments in exchange rate derivatives, as investors bet on the value of Brazil’s currency remaining high.

The gains earned from exchange rate derivatives increased the flow of dollars to Brazil, which contributed to the strengthening of the Real vis-à-vis the U.S. dollar and generating more earnings with these derivatives. Specula-

²³ “BNDES Prorenewa apoia com R\$ 4 bi renovação e implantação de canaviais”. BNDES, 11 de janeiro de 2012. Available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2012/energia/20120111_prorenewa.html; consulted on July 12, 2012..



PHOTO: DOUGLAS MANSUR

tion in commodities allowed the agribusiness industry to experience strong sales on the international market, including sugar.

Between the 2004-2005 and 2008-2009 harvest years, the sugar-energy sector experienced growth in absolute terms, which meant companies had gone even deeper into debt. Despite the lack of transparency in the level of indebtedness in the sector, bankruptcies and mergers involving many sugarcane plants revealed that their debts had reached unmanageable proportions²⁴. Various companies had taken advantage of the low interest rates to take on debt in dollars and applied this money in exchange rate derivatives. Thus, they made money when the dollar devaluated in relation to the Real. Having obtained these gains, the companies invested in their productive processes, paid the interest on their debts and were able to take on new credit.

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With the crisis in 2008, these factories suffered major financial losses. Due to the insecurity generated on the global market by defaults on sub-prime mortgages, many foreign investors withdrew their speculative capital from the economies of periphery countries and bought U.S. treasury bonds, which were considered more secure. This move led the dollar to appreciate abruptly vis-à-vis the Real, generating sudden fluctuations in the exchange rate. The companies' debts in dollars jumped significantly and those who had invested funds in exchange rate derivatives incurred enormous losses. In the case of the sugarcane agro-industry corporations, this loss exceeded

R\$4 billion²⁵. The following quote describes this process:

"The deepening of the international financial crisis in the second half of 2008 (...) exposed productive companies' leveraged positions, by intensifying the volatility of asset prices. The crisis (...) caused the dollar to appreciate in relation to other currencies. However, this valorisation was much more accentuated in emerging economies. Directly affected by another sudden halt in foreign capital flows, these economies' asset prices and exchange rates became important targets for companies seeking secure investments. In this context, the enormous financial losses incurred by major emerging economies companies through their holdings on the foreign exchange derivatives markets were revealed. They had conducted operations involving large sums in these markets, betting on the belief that their national currency would not depreciate against the dollar. This decision was apparently made in the first half of 2008, a time when the dollar devalued greatly in relation to all other currencies, which contributed to a strong increase in commodity prices. However, the deepening of the crisis caused commodity prices to fall significantly and generated a new tendency for the dollar to appreciate internationally. It was then that the companies' losses brought on by their speculative bets surfaced"²⁶.

In Brazil, several plants went bankrupt, which intensified the process of mergers and acquisitions already in place. Both existing plants that had incorporated other units to boost their production, like Santelisa Vale and

²⁴ For more information, see: "Perdas com derivativos nas usinas atingem até R\$ 4 bilhões". *Jornal Valor Econômico*, 9 de outubro de 2009. Available at: [http://www.jornalcana.com.br/noticia/Jornal-Cana/31304+Perdas-com-derivativos-nas-usinas-atingem-ate-R\\$-4-bi](http://www.jornalcana.com.br/noticia/Jornal-Cana/31304+Perdas-com-derivativos-nas-usinas-atingem-ate-R$-4-bi); consulted on July 1, 2012..

²⁵ *Idem, ibidem*.

²⁶ Fahri, Maryse. *Operações com derivativos financeiros das corporações de economias emergentes no ciclo recente*. Trabalho apresentado no II encontro internacional da Associação Keynesiana Brasileira, setembro de 2009. Available at <http://www.pppe.ufrgs.br/akb/encontros/2009/02.pdf>; consulted on July 5, 2012; p. 6.



Moema, and new plants, like those known as the “greenfields projects”, declared bankruptcy.

The case of the Nova America group, owner of the União brand, is quite significant. The company was not able to shoulder its debts and was bought by the Cosan group in 2009. Shortly after, Cosan negotiated its merger with Shell, the Anglo-Dutch corporation, to form the Raizen Corporation. The Nova America de Caarapó unit, in Mato Grosso do Sul, was incorporated into the Cosan Group and is now part of the process to expand sugarcane plantations into the Centre-West region of Brazil.

Nova America was denounced for planting sugarcane on indigenous land officially recognized by the Federal government²⁷, with funding from the BNDES, as reported in an article published on March 23rd, 2011:

“According to the Federal Public Prosecutor’s Ministry, Cosan/Shell leased the Santa Claudina estate, which runs onto the land of the Guyraroca indigenous people, in Caarapo. The area has already been the object of the National Indian Foundation’s (FUNAI) identification and demarcation studies. The company also exploited gravel from the Taquara indigenous people’s land, without the community’s authorisation, which it used for the roads the plant’s trucks circulate on”²⁸.

In spite of these denouncements, bankruptcies and defaults, the BNDES continues to fund the sugarcane industry. The companies argue there is not enough credit available and pressure the State to provide more subsidies, as they are incapable of reproducing without their link to the financial system.

²⁷ For more details on the process to officially recognise indigenous lands and on the homologation by large landowners in Mato Grosso do Sul, see : Homero, M. & Guimarães, V. “Multicultural, mas esquizofrênico; a mão que afaga é a mesma que apedreja: o Estado e o estímulo ao desenvolvimento e seus impactos sobre as terras indígenas em Mato Grosso do Sul”. Em: *As Violências contra os povos indígenas em Mato Grosso do Sul, e as resistências do Bem-viver por uma terra sem males*. Relatório do Conselho Indigenista Missionário (CIMI), MS, 2011.

²⁸ “BNDES financia usinas que usam cana de área indígena”. Available at: <http://uniaocampocidadeefloresta.wordpress.com/2011/03/23/bndes-financia-usinas-que-usam-cana-de-areas-indigenas>; consulted on July 8, 2012.

Land ownership and the crisis of the sugarcane agribusiness



PHOTO: DOUGLAS MANSUR

To maintain its expansion, sugarcane agribusiness requires enormous amounts of credit and state subsidies in order to cover costs ranging from the implantation of processing units to plantation development and the implementation of projects to restructure the sector. However, as discussed above, this process has caused the sector's debt to grow exponentially, which, in turn, encourages its territorial expansion through constant incorporation of *new* areas for monocropping.

In other words, this expansionary tendency – historically seen as being intrinsic to the sugarcane industry – has gained speed in the midst of growing debt accumulation and appears as

a supposed solution for the sector's earning crisis. However, it is this expansionary context that has brought on the crisis. Agribusiness seeks to expand with the goal of remunerating capital that has been invested, although in recent years, this capital has been increasingly immobilised in the form of mechanisation and supplies, which tends to reduce profits and results in companies' de-capitalisation. It is in this scenario that the sugarcane industry enters into a spiral of crisis-expansion.

The ramifications of this process were made evident by the recent slowdown in the production growth, as can be observed in the table below:

Table 2**Sugar-energy Sector - Brazil: Comparison of Area, Productivity and Total Sugarcane Produced**

Harvest-Year	Production area (ha)	Productivity (Kg/ha)	Sugarcane produced (tons)
2004/05	5 625 300	73 897	415 694 500
2005/06	5 840 300	73 868	431 413 400
2006/07	6 163 200	77 038	474 800 400
2007/08	6 963 600	78 969	495 723 279
2008/09	7 057 800	80 965	571 434 300
2009/10	7 409 600	81 585	604 513 600
2010/11	8 056 000	77 446	623 905 100
2011/12	8 368 400	68 289	571 471 000

Source: CONAB – Companhia Nacional de Abastecimento.
Data from CONAB's harvest monitoring documents (this data are always taken from the third recording of each harvest-year). Org. XAVIER, C. V

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Companies from the sugarcane sector blame the decline in productivity on factors from the current conjuncture, mainly those linked to climatic conditions, such as the excess of rain in the 2009-10 harvest or the prolonged drought in 2010-11. While it is true that these environmental factors influence yields, this explanation alone is insufficient. The economic context that directly influences this process must be analysed in order to understand the expansion-crisis cycle²⁹.

In this context, gaining control over land – by purchasing, leasing or setting up partnerships – becomes increasingly fundamental for

the corporations. They use this strategy in an attempt to raise the value of their assets by speculating on the perspectives of the land values increasing.

The case of Radar Propriedades Agrícolas, a subsidiary of the Cosan Group whose role is to intermediate property deals, provides an example of this process. It was created in 2008 with Cosan S.A. owning approximately 18.9% of its share capital and the remaining 81.1% in the hands of other investors (such as the U.S.-based Teachers Insurance and Annuity Association of America – TIAA pension fund). While Cosan initially contributed only US\$35 million to this

²⁹ The National Supply Company (CONAB) lists the following factors that contribute to the recent decline in productivity: “the failure to renew plantations at the right moment, the decrease in the quantity of products applied due to the decapitalisation of smaller producers and the mechanization of harvesting, which makes it necessary to renew sugarcane plantations more often. It is worth highlighting that the productivity of sugarcane plantations is lower after the second or third cut. Today, it is easy to find fields where production has gone on uninterrupted for over ten years; here, productivity levels are only 30% of those of sugarcane that has been cut twice” (CONAB, 2011, p. 10). CONAB - Companhia Nacional de Abastecimento. Acompanhamento de safra brasileira: cana-de-açúcar, terceiro levantamento, dezembro/2011 - Companhia Nacional de Abastecimento. Brasília, Conab 2011.



venture and other investors provided US\$150 million, it retained administrative control over the firm, as it holds the majority of votes in the Board of Directors³⁰.

According to the corporation, “the objective is to buy property that has strong potential to increase in value and lease it to large rural producers. After its value has risen significantly, the property is put up for sale. The initial focus is on land geared towards the production of sugarcane, soybean, corn and cotton. In the first years of its operation, the company has already invested US\$ 400 million. Today, it manages nearly 106 000 hectares of land”³¹.

Other corporations in the sector employ the same strategy in order to draw financial investors into the land acquisition process,

as was the case of Infinity Bio-Energy, Açúcar Guarani S/A, Adecoagro S/A, among others³². With the emergence of the earnings crisis, these companies are seeking to attract new volumes of loan money, which will also be invested in businesses involved in land ownership, as part of a process to inflate the value of their assets.

However, if the goal of obtaining large areas of land is to raise the value of various companies’ assets, this mechanism proves to be, in reality, yet another symptom of the crisis in the productive process, as the sugar-energy sector’s growing indebtedness extends to the entire production chain, affecting producers, suppliers and outsourcing firms, as well as land owners, partners and lease-holders.

³⁰ COSAN. Comunicado ao mercado. Available at: http://www.acionista.com.br/home/cosan/280808_constituicao_subsiidiaria.pdf.

³¹ RADAR, 2012. Available at: http://cosan.com.br/cosan2009/web/conteudo_pti.asp?idioma=0&conta=45&tipo=35726.

³² For more details on land purchasing deals, see: HERNANDES, T. Estudo sobre processos, causas e efeitos da concentração e estrangeirização das terras no Brasil – estrutura de mercado. Projeto de Cooperação Técnica “Apoio às políticas e à participação social no desenvolvimento rural sustentável” (PCT IICA/MDA – NEAD), Brasília, NEAD, 2009.

The over-exploitation of labour in the harvesting of sugarcane



PHOTO: CARMELO FIORASO

During the 1950s and 1960s, agriculture in Brazil was mainly based on the exploitation of the work of settlers, inhabitants, dwellers and squatters. Few of them received a salary, as they worked for landowners in exchange for access to land. With the industrialisation of agriculture, however, the majority of these workers were expelled from the farms and began to be hired back as salaried employees³³. The industrialisation of agriculture led to the mechanisation of various stages of sugarcane production. The sugarcane labourer, known as 'bóia-fria' in Brazil and who was a predominate figure on sugarcane plantations, was overexploited due to the high level of unemployment in rural areas. Having no other option for survival, these workers were forced to subject themselves to degrading working conditions.

With the most recent expansion of the sugarcane agro-industry in the 20th century, the conditions of sugarcane workers have

not improved, despite investments and the "modernisation" of the sector. This is precisely where the contradiction in the modernisation process lies: in the work of sugarcane labourers. The mechanisation of the harvest is now predominant in the sector and has promoted the dismissal of workers, whose numbers have decreased in absolute terms. Unemployment intensified pressure on workers who began to compete for access to jobs.

On average, one combine replaces 120 manual workers³⁵. According to the Formal Employment in the Sugar-Alcohol Sector in Sao Paulo newsletter³⁶, "it can be calculated that the average number of people employed (...) fell 11 186 between 2007 and 2008; 9 788 between 2008 and 2009; 3 658 between 2009 and 2010 and 14 468 between 2010 and 2011. The major decline in the latest period is striking and is probably associated to technological changes that have been taking place³⁷.

³³ PITTA, Fábio T. *Modernização retardatária e agroindústria sucroalcooleira paulista: o Proálcool como reprodução fictícia do capital em crise*. 2011. Dissertação de Mestrado (Mestrado em Geografia Humana) – Departamento de Geografia, Faculdade de Filosofia Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 2011. See especially chapter 2 of the thesis: "O fetiche da história, o espaço como abstração, o fetiche da mercadoria".

³⁴ For a description of work in the sugarcane harvesting process, please see our report: XAVIER, C. V.; PITTA, F. T.; MENDONÇA, L. M. *Monopólio da produção de etanol no Brasil: a fusão Cosan-Shell*. Rede Social de Justiça e Direitos Humanos. São Paulo, 2011.

³⁵ RAMOS, Pedro. "O trabalho na lavoura canavieira paulista: evolução recente, situação atual e perspectivas". *Emprego e trabalho na Agricultura Brasileira*. Coordenadores Antonio Márcio Buainain e Claudio S. Dedecca, Série Desenvolvimento Rural Sustentável, v. 9, p. 304-325. Brasília, IICA, 2008.

³⁶ BACCARIN, José Giacomo. Boletim – Ocupação formal no setor sucroalcooleiro em São Paulo. Jaboticabal, UNESP, 2009-2011, números 1-21. Available at <fcav.unesp.br/baccarin>. Consulted on: 10/08/2011.

³⁷ Idem, p. 2 e 3.

Sao Paulo – evolution of seasonal workers' salary, pay rate, physical and monetary performance in sugarcane cutting and minimum wage – 1969 – 2005 (monetary values expressed in the July 1994-value of the R\$)

Year	Average daily wage of a seasonal worker (1)	Payment in R\$/ton of cane harvested (2)	Average yield in tons cut/day (3)	Daily wage (2) x (3)	Daily minimum wage in Sao Paulo (4)
1969	3,86 (March only)	2,73	2,99	8,16	4,94
1970	4,36	2,02	3,05	6,16	4,92
1972	5,11 (March only)	2,50	3,00	7,50	4,98
1973	5,90	2,51	3,30	8,28	5,02
1977	7,59	2,57	3,77	9,69	5,33
1980	6,60	2,29	3,97	9,09	6,03
1982	6,23	2,17	4,50	9,77	5,68
1985	5,72	1,92	5,00	9,60	5,51
1988	3,70	1,25	5,00	6,25	3,86
1990	3,95	0,96	6,10	5,86	2,30
1992	3,12	0,84	6,30	5,29	3,11
1994	5,67 (November only)	0,83	7,00	5,81	2,22 (= in US\$)
1996	6,36	1,05	7,00	7,35	2,52
1998	6,27	1,06	7,00	7,42	2,63
2000	5,40	0,88	8,00	7,04	2,47
2002	5,13	0,88	8,00	7,04	2,67
2004	4,54 (c. v.: R\$ 15.42)	0,86 (c.v.:R\$ 2.93)	8,00	6,88	2,48 (c.v.:R\$ 8.44)
2005	4,83 (c. V.: R\$ 17.47)	0,86 (c.v.:R\$ 3.11)	8,00	6,88	2,64 (c.v.:R\$ 9.56)

Source: IEA, Informações Estatísticas e Anuários Estatísticos, several years. (c. v. = current value); organization of data by Pedro Ramos.³⁸ (1) Average of both sets of data (April and November), with the exceptions as indicated. (2) As minimum wage and other monetary values, corrected based on FGV's General Price Index – Internal Availability (IGP-DI da Conjuntura Econômica/FGV).

The impact on workers can be noted both in the decrease in the average wage and the staggering increase in the amount of sugarcane they cut. Both stem from the need to try to maintain jobs at a time when the number of positions is being reduced.

Average of both sets of data (April and November), with the exceptions as indicated. (2)

As minimum wage and other monetary values, corrected based on FGV's General Price Index – Internal Availability (IGP-DI da Conjuntura Econômica/FGV).

Even though the data available is not very recent, it is possible to demonstrate that there is a tendency for the price paid per ton of sugarcane cut to decrease while, at the same

³⁸ RAMOS, Pedro. *O Uso de mão-de-obra na lavoura canavieira: da legislação (agrária) do Estado Novo ao trabalho super-explorado na atualidade*. Anais II Seminário de História do Açúcar: Trabalho População e Cotidiano. Itu, SP, 11-15 novembro de 2007. São Paulo, Editora do Museu Paulista da USP, 2007.

time, the average number of tons cut daily increases. The reduction in the price in Reals/ton is often in accordance with the agreements between plants and trade unions, which shows that the pressure of this tendency is growing. It is currently estimated that a worker cuts an average of 12 tons of sugarcane per day, but reports from workers indicate that this number could be higher.

With regards to labour negotiations, the plants seek to comply with the terms of collective agreements related to working conditions, as required by the Public Ministry. For example, they provide individual protection equipment (IPE) and avoid delays in the payment of wages. However, over-exploitation occurs on a structural level, as the system of paying according to productivity leads workers to intensify their efforts. Due to the growing mechanisation of the sector, only the most productive workers are able to keep their jobs. The economist Pedro Ramos, from UNICAMP, explains that:

“It has clearly become explicit that workers on sugarcane plantations have to intensify their efforts to increase their productivity, yet they have not succeeded in preventing current real daily wages from being lower than those received in the second half of the 1970s and the early 1980s. It is these efforts that ensure that a cutter’s daily pay remains higher than both the daily minimum wage and the average wage of temporary workers used by plantations in Sao Paulo. As reported by the media, this effort may be the main cause of recent deaths in sugarcane plantations in Sao Paulo. Although few employers (plant owners, suppliers and especially intermediaries) are willing to confirm this, there is no hiring of workers who do not reach a certain minimum daily yield and there are researchers who state that the real cutting average is currently situated at around 15 tons”³⁹.





According to denunciations of the Migrant Pastoral Service in Guariba⁴⁰, “birola” – which is when a person experiences generalized cramps throughout the body and then dies – brought on by overexertion on the job has caused at least 21 deaths in sugarcane plantations in Sao Paulo between the 2004 and 2007 harvests. The deaths occurred precisely during the process of modernising the sector, with

the support of government subsidies. Thus, even when the plants appear to be respecting labour agreements, over-exploitation does, in fact, persist.

Mechanisation has also led to the over-exploitation of machinery drivers and other workers employed in the industrial process. It is estimated that one combine substitutes 120 manual cutters, and between 6 and 10 people

³⁹ RAMOS, Pedro. *O Uso de mão-de-obra na lavoura canieira: da legislação (agrária) do Estado Novo ao trabalho super-explorado na atualidade*. Anais II Seminário de História do Açúcar: Trabalho População e Cotidiano. Itu, SP, 11-15 novembro de 2007. São Paulo, Editora do Museu Paulista da USP, 2007, p. 16.

⁴⁰ To accompany denunciations of over-exploitation of workers and cases of deaths on sugarcane plantations, see the Guariba Migrant Pastoral Service’s website: <www.pastoraldomigrante.org.br>.

are employed in the mechanised cutting of cane. Competition to get these jobs is intense and the working conditions are degrading. A recent example was the over-exploitation of combine drivers in land leased by Raizen (Cosan-Shell). In this case, the Public Labour Ministry observed problems with outsourcing, low wages, failure to comply with safety norms and excessively long workdays, as recorded in the inspectors' report:

“The investigation found that Raizen had committed fraud, with the clear objective of reducing the costs of the production process. At least 10 workers hired by the Marca de Ibaté outsourcing firm had had an employment relationship with Raizen. Their contract was terminated with the corporation, which was Cosan at that time, on July 28th, 2011 and they were rehired by the outsourcing firm the following day, on July 29th, 2011 to carry out the same tasks. The comparison of pay slips allowed [the inspectors] to confirm that outsourcing increases precariousness, as the salaries of the workers registered with the outsourcing firm correspond, in average, to 63% of the salary paid by Raizen. Due to outsourcing, workers who had previously worked [for Raizen] stopped receiving life insurance and production bonuses, which were given to the plant's machine operators. Furthermore, outsourced workers were submitted to precarious working conditions and had lower salaries. (...) The strongest evidence of increased precariousness due to outsourcing is reflected in the tractor drivers' working conditions. The report affirms that they do not have access to washrooms, a place to have meals, shelter from bad wea-

ther (like sun and rain), drinking/fresh water and first aid supplies, which are essential in case of accidents. The inspectors also identified excessively long working days for outsourced workers. There are reports of workers that go for more than ten days without a break. The legislation obliges companies to provide at least 24 consecutive hours of rest per week”⁴¹.

Another case of the violation of the rights of workers employed in mechanised sugarcane harvesting was found on the Santa Laura estate in Goiás. There, the existence of slave labour was discovered, as the follow report highlights:

“For the first time in the history of Brazil, workers who were subjected to a regime analogous to slavery in the mechanised harvesting process have been liberated. In total, 39 workers were rescued. They operated sugarcane-cutting machines on an estate in the city of Goiatuba, Goiás. Their work schedule alternated 24-hour workdays (27, when one includes the 3 hours of travel to and from plantations) with a break of 21 consecutive hours. At least two accidents caused by fatigue at the wheel were registered. The accidents involved two drivers that had been operating machines for more than 20 hours straight. No delays in the payment of wages were recorded, but extra hours and weekly breaks were not paid. The rescue operation took place on the Santa Laura estate, which belonged to the Associação dos Fornecedores de Cana da Usina Bom Sucesso. The estate owner will have to pay the workers a total of nearly R\$1 million in severance pay, which does not include social security benefits”.⁴²

⁴¹ “Raizen (antiga Cosan) é Processada pelo MPT”. *Jornal de Araraquara* – SP, 21 de abril de 2012. Available at: <http://www.brasilagro.com.br/index.php?noticias/detalhes/3/43091>; consulted on July 6, 2012.

⁴² “Primeiro resgate de trabalhadores escravizados em colheita mecanizada ocorre no país”. *Rádio Agência NP*, 22 de dezembro de 2011. Available at: <http://www.radioagencianp.com.br/10474-primeiro-resgate-de-trabalhadores-escravizados-em-colheita-mecanizada-ocorre-no-pais>; consulted on July 9, 2012.

These reports demonstrate that slave labour and degrading working conditions persist, even with the mechanisation of the harvesting process. In regions where mechanisation is more predominant, working conditions are worse, as cutters need to reach increasingly high productivity targets in order to keep their jobs. The companies use mechanisation as blackmail to prevent workers from demanding better salaries and working conditions. As workers are paid according to what they produce, they are forced to cut more and more to try to reach a target that continues to grow with mechanisation.

What is more, cutters have no control or means to monitor the process by which the number of metres cut is converted into tons. This facilitates the appropriation of the unpaid work by the plants and “gatos” or “cats”, as the intermediaries who recruit workers are known. Thus, workers continue to have to face outsourcing, the lowering of their wages and robbery at the time when the sugarcane they have cut is weighed. Therefore, it is not the “backwardness” of the sector that leads to the failure to respect labour rights, but rather the modernisation process imposed by the crisis of this model of production.

Impacts of the expansion of agribusiness in Mato Grosso do Sul



PHOTO: MARIA LUISA MENDONÇA

Indigenous community in Dourados, Mato Grosso do Sul state

The State of Mato Grosso do Sul (MS) is known for its biodiversity and abundant water sources, as it is located in a region that is home to the Pantanal and part of the Guarani Aquifer. However, it is also renowned for its history in the violent colonisation of indigenous people. Agribusiness corporations are currently expanding their economic power in the region, which now looks like a big ranch with its immense sugarcane, soybean and, more recently genetically-modified corn plantations, not to mention extensive livestock raising. This agricultural model combines extensive monocropping with the intensification of the use of machines and chemicals, and is based on the monopoly of a handful of national and foreign corporations. Therefore, the concentration of land ownership goes together with the monopolisation of food production and trade.

This land ownership structure began to be established between 1915 and 1928 with the confinement of the Guarani, Terena and Kadiweu people to so-called “reserves”. The reserves fulfil the purpose of exploiting indigenous labour, as the areas are too small to meet their subsistence needs. In the Dourados Reserve, for example, 12 000 people live on 3 500 hectares of land. In such a situation, the indigenous population is forced to subject itself to the worst of working conditions.

As they are forced to live in these conditions, the indigenous people of Mato Grosso do Sul are subject to violence, racism and total negligence on behalf of the State. The Indigenous Missionary Council’s (CIMI)⁴³ report on the genocide against these people presents shocking figures. From 2003 to 2010, 250 indigenous people were assassinated in MS,

more than the 202 indigenous people killed in the rest of the country. Data on suicide are also alarming: 176 cases were registered between 2003 and 2010, which represents 83% of all suicides among indigenous people in Brazil. Over the last eight years, more than 4 000 indigenous children suffered malnutrition in MS. Furthermore, in the past five years, it was reported that 1 787 people from the indigenous communities in the State died from lack of access to adequate medical attention. From 2003 to 2005, more than 70 conflicts arising from land ownership disputes between indigenous people and landowners were recorded. Currently, three indigenous leaders and four entire communities are suffering death threats and are under the protection of the SDH/PR’s Protection of Human Rights Defenders Program.

The spread of agribusiness in the region is making this situation worse. Incentives from the National Bank for Economic and Social Development (BNDES) for the sugar-energy sector include support for sugarcane plantations established on indigenous land claimed by the Guarani-Kaiowa people and officially recognized by the Federal government itself, which is prohibited. The Raizen corporation, created by the merger between Cosan and Shell, recently signed a Term for Change in Conduct agreement with the Public Prosecutor’s Ministry, for having used sugarcane planted by the Nova America estate on indigenous land in Caarapo, south of Dourados. The territorial expansion of monocropping occurs mainly in areas with access to infrastructure and in regions with vast water basins, like the Cerrado.

Currently, plants in Mato Grosso do Sul are only employing indigenous labourers. With

⁴³ Rangel, Vera. “As Violências em números, gráficos e mapa”. Em: *As Violências contra os povos indígenas em Mato Grosso do Sul, e as resistências do Bem-viver por uma terra sem males*. Relatório do Conselho Indigenista Missionário (CIMI), MS, 2011.



PHOTO: CARMELO FIORASO

the advances in mechanisation, it is estimated that manual cutting has declined 40%. Of the 10 000 indigenous workers employed in the harvesting of sugarcane until 2006, there is now only approximately 6 000. Denunciations of irregularities in hiring practices, housing and food arrangements, safety and transportation of migrant workers coming from the North East of Brazil has led the plants to opt for using local indigenous labour.

Workers are recruited by so-called “head-hunters” or “chiefs” who assume the role of the “cats” or intermediaries, play a leadership role in the villages and receive a percentage of the cutters’ salaries. Headhunters also have the task of demanding higher production levels from workers, as, with the growing unemployment, only the most productive workers keep their jobs.

Indigenous workers in Mato Grosso do Sul have recently affiliated to the Central Única dos Trabalhadores (CUT) trade union central. One of the indigenous union leaders, Evanildo da Silva, explains that the union’s struggle combines the objective of “[providing] stronger protection [and ending] workers’ submission to and dependency on the private sector and the State, in order to preserve the indigenous identity”. The union defends the immediate demarcation of their land and compliance with Convention 169 of the International Labour Organisation (ILO) on the protection of the rights of traditional indigenous and rural Afro-Brazilian communities.

Evanildo points out that work on sugarcane plantations generates illnesses and physical exhaustion: “Workers knock themselves out cutting sugarcane and suffer from the impacts of the use of chemicals on their health and the environment, which are long-term”. He remembers that indigenous people have historically been exploited and given the hardest work. They even built the state’s infrastructure, such

as the railroads. “It is common to find indigenous youth working on the estates with fake documents. When I was 17, I worked cutting sugarcane and I can still feel the effects of that today. We were housed in plastic tents. I didn’t have a contract and we had to pay for all of the equipment and food”, he states.

The union leader explains that prejudices against indigenous peoples vary according to what is convenient at the time, switching between the colonial image of the “lazy Indian” and the idea currently permeating corporate discourse that they are the most “apt” for heavy labour. One employee from the Agrisul/CBAA plant in Sidrolandia, who did not want to identify herself, explained that the company currently hires “100% indigenous labourers because they aren’t ambitious”. Since 2009, with the expansion of mechanisation, the demand for greater productivity from workers has caused frequent accidents resulting in cuts, fractures and dislocated limbs. Unemployment increases job insecurity and leads workers to accept temporary three-month contracts that free companies from the obligation of providing severance pay when harvest is over.

In the Dourados region, where the number of conflicts over land is the highest in the state, the indigenous people who have reoccupied their traditional land and are demanding its demarcation also have to subject themselves to working at the plants. As their villages are surrounded by monocultures that use a large quantity of chemicals, food production is hindered by soil contamination and the high number of plagues proliferating in the environmental imbalance caused by neighbouring plantations. This enables companies to guarantee that a workforce is available for the plantations, even when they offer degrading working conditions.



Reginaldo, who now works at the local health clinic, tells about how the companies discount the costs of clothing, food, water and equipment like boots and thermoses from workers' pay. Many under-aged youth falsify their pieces of identity and start working when they are adolescents. Occupational diseases such as back, shoulder, arms and hand problems are common, as are lung diseases and tuberculosis caused by exposure to pollution in the plantations and the unsanitary conditions of lodging at the factories.

Other indigenous people from the village tell similar stories. João⁴⁴ says that he started cutting sugarcane when he was 16. He left the village to stay at the lodge and only had a day off once every 45 days. The workday went from 5:30 am to 4:30 pm and workers were paid 10 cents per metre cut. With all of the deductions for transportation, food, medicine and equipment, the average monthly salary did not reach R\$400 and workers had no right to pension, unemployment insurance or health care. Delays in the payment of wages are common and generally, workers are only paid when they go on strike. In the regions where burning sugarcane has been prohibited, cutting "raw" cane exposes workers to contact with snakes, scorpions and other insects.

The vulnerability of indigenous people, who are subject to discrimination and repression, makes it easier for companies to circumvent problems linked to the registering of workers and the verification of working conditions. In the municipality of Dourados alone, 1 400 complaints against plants concerning labour rights were filed with the Public Prosecutor's Ministry. Public attorneys have recently filed suits demanding that the com-

panies pay workers for the time it takes them to get to and from the plantations. Despite their legal obligation to do so, the companies do not pay for these hours, which in one of these cases alone amounted to R\$350 million. Some plants went so far as to propose "funeral support" in exchange for this right. Another type of irregularity that is common is deforestation, which the corporations hide by burying the trees to avoid fines.

To get around problems with debt and to avoid defaults, many plants adopt another legal name and registration number by merging with large economic groups. Agrisul/CBAA, for example, declared bankruptcy and was able to resume its activities through a special process that allowed it to legally recuperate the company. This status authorises the companies to rollover debts and avoid paying the fines they receive for failing to comply with labour or environmental rights. Delays in paying employees are frequent, as are the strikes cutters organise to force corporations to pay their salaries. The plants' strategy serves, in practice, as a way of curtailing workers' freedom, given the absence of other forms of subsistence. Monopoly over the best quality land also prevents the development of other modes of production.

In areas of peasant farm production, the lack of basic infrastructure, such as housing, water, transportation, energy, credit and technical support, often creates dependency on and submission to work on sugarcane plantations. The non-indigenous rural population is generally hired to operate the mechanical cutters, tractors and combines. These machine-operators generally have long and gruelling workdays. The lack of appropriate support

⁴⁴ The names of the interviewees have been changed in order to preserve their integrity and safety.



Indigenous children receive food at school in Mato Grosso do Sul state

PHOTO: MARIA LUISA MENDONÇA

and, consequently, the difficulties in making a living with an alternative agricultural model leads these farmers to lease their land for planting sugarcane for corporations, which often leaves them in debt.

Mauro lives in one of the oldest agrarian reform settlements of the region and had always been able to sustain his production. In 2007, plant representatives convince him to grow sugarcane for them, promising that he would get a good financial return on the deal. He sold part of his cattle to invest in planting sugarcane and to cover all the costs of supplies and harvesting. But the plant never paid Mauro, and he was left with a loss of R\$56 000, not to mention the work he had to do to recuperate the quality of the soil on his land. He still faces serious problems due to the fires from neighbouring sugarcane plantations, which often reach environmental protection areas.

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In one of the newer agrarian reform settlements, Pedro reports that he leased land for sugarcane production in the past, but he did not receive payment either. “We only suffered losses. We spent money on the crop, fuel and labour and we didn’t receive anything in return. We ended up with R\$14 000 in debt and since the plants do not sign contracts, they are able to avoid going to court”. He also says that he used to produce manioc, beans, corn and wheat, but due to the lack of incentives he had to lease his land. Faced with no other options, Pedro also worked as a tractor driver at the plant: “They don’t pay for lunch hours and we have to eat inside the tractor while driving. They don’t accept it when the machines are stopped and we can’t go to the bathroom. We only get a day off every seven days and the contract lasts six months, during harvest. It’s like slavery”.

Peasants also look for work as machinists in the sugarcane grinding process. Joilson reports

that it is common for him to be paid late, and it has been two months since he last received his salary. “We go to the plant out of necessity, because the working conditions there are terrible. Salaries are low. We aren’t paid extra for night shifts or unsanitary conditions. They don’t pay employment insurance and now, we are without pay. That’s why we went on strike and paralysed the plant”. Another problem is the lack of safety equipment. For example, the brakes on many tractors do not work and accidents are frequent.

The agrarian reform settlers’ need to look for work comes from the lack of infrastructure required to make a living on the land. After eight years of organizing land occupations to demand agrarian reform, the area was expropriated in 2005, yet the farmers still do not have access to credit for production. Romilson plants manioc, corn, okra, pumpkin, fruit and vegetables and produces milk and eggs, yet it is difficult for him to maintain production above sustenance levels, as the biggest portion of money from sales goes to the middlemen. To reverse this situation, peasants need to receive support for production, such as credit, guaranteed market access and prices, and access to infrastructure, transportation, water and energy.

However, Brazil’s agriculture policy in support for agribusiness promotes the continuing grabbing of natural resources. Indigenous and peasant communities are surrounded by monocropping that continues to expand, causing deforestation, intoxication from farm chemicals, land and water contamination. This production model does not prioritize food production, thereby generating extreme situations of repression, hunger and poverty. One can see, then, that the “product” of agribusiness is not sugarcane, soybean, sugar or ethanol, but rather an enormous financial, social and environmental debt.



PHOTO: MARIA LUISA MENDONÇA

Conclusion

As we have noted in this study, the Brazilian economy's apparent "growth" has been determined by the global economic crisis, at a time when financial capital is predominant. The Brazilian government's efforts to turn ethanol into a commodity, so it can be negotiated on the futures markets, could deepen the impact of land speculation in Brazil, in a way that is similar to the crisis generated by the bubble on the United States and European real estate markets. We have observed this trend in Brazil's land market, which is accompanied by speculation on agriculture and raw material commodities. The recent deindustrialisation of the Brazilian economy combines the speculative movement of idle capital on the financial market with the tendency of this capital to "take refuge" in strategic resources like land, water, oil and mines.

Our study shows the tendency of large corporations to acquire land through leasing in order to expand monocropping, which is resulting in the replacement of food production with sugarcane and the expansion of the agricultural frontier into protected areas. This process is linked to a certain type of flow of financial capital, which generates speculative bubbles and causes sharp increases in land and food prices. The discourse in favour of the "modernisation" of ethanol production serves to mask the rise in labour exploitation.

The so-called "competitiveness" of Brazilian ethanol on foreign markets is based on the exploitation of labour, as the plants attempt to compensate their high level of debt and defaults. The model that has been historically adopted in the sector, based on the remuneration of sugarcane cutters ac-

ording to their yields and not the number of hours worked, has generated degrading working conditions, which are structural. In other words, the over-exploitation of workers is not a specific or isolated incident; it is systematic. To improve their public image, mainly to ensure their access to foreign markets, corporations are seeking to further the mechanisation process.

The sugar-energy industry justifies the territorial expansion of monocropping by alluding to the possibility of growth in the global demand for ethanol. But with the international economic crisis, predictions on this demand have changed. Another argument for the expansion is the potential increase in the domestic consumption of ethanol, which has been boosted by the automobile industry's use of *flex fuel* technology. These arguments, however, have several limitations, as they ignore the structural crisis in the sector.

The search for competitiveness on the world market has led the sugarcane industry, and other agribusiness corporations in Brazil, to continue assuming an increasingly high amount of debt in order to maintain productivity at an acceptable level. As in the past, the recent expansion process depended on State subsidies. The provision of this support can be interpreted as a continuation of the policies from the 1970's Pro-Alcohol period, which is contradictory to the common idea that agribusiness is continuously improving its "efficiency". The transformation of the current agricultural model is thus necessary in order to overcome the simultaneous crises in the economic, social and environmental spheres.