

One of the most destructive developments in agriculture over the past two decades has been the boom in soya production in the southern cone of Latin America. The corporations that led that boom are now moving aggressively into sugar cane, focusing on large tracts of land in southern countries where sugar can be produced cheaply. If these developments are not resisted, the impacts are likely to be severe: local food production will be overrun, workers and communities will face displacement and exposure to increased levels of pesticides, and foreign agribusiness will tighten its grip on sugar production. We look at the intersection between the development of genetically modified (GM) sugar cane and transformations in the global sugar industry.

Corporate candyland

The looming GM sugar cane invasion

GRAIN

Within a span of only 10 years, nearly the entire Argentine pampas and huge swathes of forest and farm land in Brazil, Bolivia, Uruguay and Paraguay have been converted into green deserts of soya monoculture.¹ Latin America's soya boom was, and continues to be, a bonanza for agribusiness. It provided the handful of global grain giants who dominate the international oilseed trade and commercial feed market with a cheap and abundant site of production for the expansion and consolidation of their global operations. These same companies, such as Cargill, ADM and Bunge, have also made billions in selling the required chemical fertilisers, while other big foreign companies, such as AGCO and John Deere, have cashed in on sales of tractors. Monsanto and Syngenta have raked in record profits selling their genetically modified seeds and chemical pesticides.

The soya invasion was based on a model of production revolving around the use of seeds genetically modified to withstand huge doses of chemical herbicides. Monsanto provided both the seeds and the herbicides while a new generation of agricultural companies, run mainly by businessmen in the cities, leased or took over large areas of land and handled the farming. Wherever this model has been deployed small farmers have been driven out and local communities have been devastated by the rural exodus and chemical contamination.

As for the big agribusiness TNCs, the experience with soya in the southern cone has shown how to profit from the expansion of industrial agriculture into developing countries. It has opened the door

¹ Walter Pengue and Miguel Altieri, "GM soya bean: Latin America's new colonizer", *Seedling*, January 2006. <http://www.grain.org/seedling/?id=421>



Box 1: The current status of genetically modified sugar

Experimentation has been under way with GM sugar beets and sugar cane for more than a decade. While sugar cane has a complex genetic make-up that makes genetic modification difficult, work with GM sugar beet is simpler and has advanced much further. In 2008, the first commercial GM sugar beets, a variety genetically modified by Monsanto and the German seed breeder KWS for resistance to glyphosate (i.e. Roundup Ready), were introduced in the US, and later in Canada. Already, all the major sugar beet seed companies in North America are selling Roundup Ready sugar beet varieties, and some industry insiders predict that nearly 100 per cent of the US crop will be Roundup Ready in 2009, unless the campaigns against GM sugar beets can reverse things (see Box 4). In the EU, by far the biggest market for sugar beet seed, GM sugar beets have not been approved for commercial introduction, even though the Roundup Ready beets have been approved for use as food and feed.

As for GM sugar cane, Monsanto expects to have a Roundup Ready/Bt variety on the market by 2015, and there are other big biotech companies with sugar cane in their sights.¹

¹ Two other GM sugar cane programmes of note are: CTC Brazil's work with GM sugar cane varieties with high sucrose content; and a joint venture between the Max Planck Institute in Germany, the Vasantdada Sugar Institute in Maharashtra, India and an association of sugar cane growers in Chacra, Argentina experimenting with varieties modified through chloroplast transformation.

to a new era of conquest. Sugar, a crop with a long history of environmental and cultural destruction and sheer human exploitation, might well be next in line for a soya-style boom, especially with new genetically modified sugar crops already in the fields (see Box 1).

Redrawing the global sugar map

Sugars can be derived from a wide variety of crops, but today most of the world's sugar supply comes from sugar cane. It accounts for over 70 per cent of global sugar production and is planted on around 15 million hectares (ha) in more than 100 countries of the tropics and sub-tropics. The second most import source of sugar is sugar beet, which is grown mainly in the northern hemisphere on 10 million ha in at least 50 countries. But the map of the global production of these crops is in flux, with much of their cultivation shifting and expanding on to new lands.

Three developments in particular have altered the geographical production of sugar. The first has been the emergence of Brazil as the world's largest sugar producer and by far the world's largest sugar exporter. Around three-quarters of the expansion of sugar cane production in the past decade has occurred in Brazil, where the sugar cane area has grown by an average of 300,000 ha per year between 2000 and 2007 – a rate equivalent to the expansion of soya cultivation in the country.² In 2008, the sugar cane area rose by a remarkable 14 per cent. A sizeable proportion of Brazil's sugar cane production goes into its local ethanol industry, but much still flows on to the world market (see Figure 3). Today, more than half of global raw sugar exports come from Brazil – up from only 7 per cent in the early 1990s.

Despite the rise of such a huge low-cost producer, the old structure of global production remained largely intact until recently because of long-standing protection schemes for domestic production in the EU and the US, and preferential trading agreements between Europe and those of its former colonies still heavily dependent on sugar exports. However, a second development to hit the sugar industry – the EU sugar reform – has blown this old structure apart.

When Australia, Brazil and Thailand challenged the EU's domestic subsidies and protection of its

Table 1: Approvals for Monsanto and KWS' H7-1 Roundup Ready sugar beet

Status	Country
Cultivation/food	USA, Canada, Japan
Food	Colombia, EU, Australia, Mexico, New Zealand, Philippines, South Korea, Russia, Singapore

sugar industry at the WTO, the EU decided to use this case as an opportunity unilaterally to undo its long-standing Sugar Protocol with its former colonies and to make significant changes to its domestic regimes. Quotas still remain to protect EU producers, but these have been reduced and weakened, such that production within the EU will increasingly be concentrated in just a few major sugar producing regions, with the EU no longer dumping subsidised sugar on the global market. The EU market has also been opened up to quota-free, duty-free imports from least developed countries (LDCs) and countries that have signed up to the Economic Partnership Agreements. This means that the former colonies will no longer be

² Günther Fischer, Edmar Teixeira, Eva Tothne Hiznyik and Harrij van Velthuisen, "Land use dynamics and sugarcane production", in Peter Zuurbier and Jos van de Vooren (eds), *Sugarcane ethanol: Contributions to climate change mitigation and the environment*, Wageningen Academic Publishers, The Netherlands, 2008.



Table 2: Some biotech firms investing in sugar cane

Company	Sugar cane projects
Dow Agrosciences (USA)	December 2008 – signed a two-year research collaboration with Australia’s Cooperative Research Centre for Sugar Industry Innovation through Biotechnology.
Syngenta (Switzerland)	Experimenting with Bt sugar cane in Brazil and with the Vasantdada Sugar Institute in India. Established the Syngenta Centre for Sugarcane Biofuel Development on the campus of the Queensland University of Technology in Australia in 2007 and is working with John Deere on a sugar cane planting technology that will “allow sugar cane growers to replant their fields more frequently.”
Dupont (USA)	Sugar cane is a feedstock for its joint venture global biobutanol programme with British Petroleum and Associated British Foods (British Sugar). They are looking at different countries for investment in sugar cane production, notably China and India. British Petroleum has recently made major investments in the Brazilian sugar industry and in a joint venture with Verenium for the production of “energy cane”, which can be grown on areas not suitable for sugar cane.
Amyris (USA)	Biotechnology company in a joint venture with Crystalsev, one of Brazil’s largest sugar/ethanol companies, and Votorantim, a Brazilian forestry and technology conglomerate, for the development of biodiesel from sugar cane.

able to sell at EU-protected prices, making exports to the EU market uneconomical for all but the lowest-cost producers among them.³

As the EU’s sugar reforms come into full effect in 2009, the EU is expected to switch suddenly from being a net exporter, dumping millions of tonnes of subsidised sugar on the global market, to a net importer. This is already generating a move to relocate sugar production away from countries such as Fiji, Île de la Réunion and much of the Caribbean, where the costs of production and transportation are high, to countries such as Sudan, Ethiopia, and Mozambique, where the costs of production are low and where there is favourable access to the EU, in terms of both trade agreements and transport. Moreover, outside the EU, large sugar refiners, hungry for sources of cheap sugar to replace the EU exports, are now looking around for alternative supply routes.

The third key development changing the map of global sugar production is the monumental rise of agrofuels. Sugar cane is seen as one of the most cost-effective raw materials for the production of ethanol, if not the most cost-effective. The global market for ethanol is growing fast, as a number of major markets for transport fuels have or are about to put in place mandates that require certain percentages of ethanol to be mixed with petroleum. Before the financial crisis of 2008 and the collapse in oil prices, the sugar industry was awash with investment for new ethanol plants. Lately this investment has slowed, with many projects being delayed or shut down. Still, the government mandates are enough to keep a sizeable amount of money flowing into ethanol production, and there are many large-scale ethanol projects, complete with sugar plantations, coming on stream around the world, pushing sugar production into new areas. Investments are also being made in technologies that could open up new markets for sugar-cane-based agrofuels.⁴ In short,

the growing agrofuels market has greatly boosted demand for sugar, which, in turn, has expanded global sugar production (see Figures 1 and 2).

High times for agribusiness

Big agribusiness is driving these changes to global sugar production and pocketing the proceeds. The major European sugar corporations have used the EU sugar reforms, for instance, to consolidate their control over quota production in the EU and to move into overseas production in lower-cost areas with preferential access to the EU.⁵

But the big players from the South in the sugar industry, which have traditionally focused on national production, are starting to expand overseas as well. For example, Thailand’s largest sugar company, Mitr Phol, is setting up operations in Laos to produce for export to the EU through a joint venture with Tate & Lyle, while Colombia’s Manuelita sugar company has expanded into Peru and Brazil. Sudan and Ethiopia have become particularly important targets for investment from southern investors, something their governments are embracing. The government of Sudan says

Table 3: Top seven global sugar producers

Company	Country	Sugar production (mt/year)
Sudzucker	Germany	4.24
Associated British Foods	UK	3.85
Copersucar	Brazil	3.56
Cosan	Brazil	3.15
Eurosugar	France/ Germany	3
Tereos	France	2.8
Mitr Phol	Thailand	2.7

* Does not include ethanol

3 For an excellent history and analysis of the EU sugar reforms, see Ben Richardson, “Restructuring the EU-ACP sugar regime: Out of the strong there came forth sweetness”, *Review of International Political Economy*, 28 January 2009. <http://tinyurl.com/at9oax>

4 For a more detailed analysis, see ETC Group, “Com-modifying Nature’s Last Straw? Extreme Genetic Engineering and the Post-Petroleum Sugar Economy”, October 2008. <http://tinyurl.com/cayhzo>

5 The Everything But Arms initiative, which came into force in March 2001, opens the EU to duty-free, quota-free imports from all LDCs, with a transitional arrangement in place for sugar until July 2009.



that it wants to expand sugar cane production in the country from the less than 200,000 hectares currently under production to 1.7 million hectares.⁶

There are new players getting into the sugar industry too, mainly for ethanol. The giants of the grain trade, who until recently were not much involved in sugar cane or sugar beet production, are now moving aggressively into the industry. Cargill, which already controls 15 per cent of the global sugar trade, has recently made major investments in sugar cane production in Brazil and Mexico, and has launched new joint venture refineries and/or ethanol operations in Syria, India and El Salvador. Even ADM, the king of US corn ethanol, launched its first major investment into Brazilian sugar cane in 2008, with a joint venture that involves two sugar/ethanol plants and large-scale plantations. The same goes for the energy and natural resource companies based in the North and the South – both big established players, such as BP, and smaller venture capitalists from the mining sector.

The basic picture, then, is of a major expansion in global sugar production, concentrated both geographically and in the hands of a smaller number of corporations that operate vertically integrated global chains of production and distribution.

Brazil's sugar boom

The trends in global sugar production bear down most heavily on Brazil. There, the sugar industry is increasingly concentrated in the hands of a few families, known in Brazil as the sugar barons, and a few foreign companies, typically acting in partnership with each other. With foreign investment flooding into Brazilian sugar – US\$9 billion in ethanol alone in 2006 – the sugar barons have been consolidating their holdings and restructuring their companies in order to capture these inflows. Some have even put their family businesses on to the Brazilian stock exchange. What often happens is that foreign investors buy up controlling interests or minority stakes, leaving the sugar barons to oversee the agricultural operations – although foreign investors are starting to take a more dominant role in both (see Box 2). Foreign-owned mills processed 12 per cent of Brazil's sugar cane during 2007–8, up from less than 1 per cent at the beginning of the decade. If the mills with foreign minority-ownership are included, this figure jumps to 23 per cent.⁷ Today it is possible to discern just a few conglomerates – transnational networks of TNCs and sugar families – that control much of the industry. The

Table 4: Major European sugar corporations investing in overseas sugar production and supply

Company	Countries
Associated British Foods (UK)	China, Malawi, Mali, Mozambique, Swaziland, South Africa, Tanzania, Zambia
Tereos (France)	Mozambique, Brazil
Sudzucker (Germany)	Mauritius
JL Vilgrain (France)	Cameroon, Chad, Republic of the Congo
Tate & Lyle (UK)	Egypt, Laos, Zimbabwe
AlcoGroup (Belgium)	Brazil, Mauritius

main three are built around Cosan, Crystalsev and Copersucar, which, according to Maurílio Biagi Filho, the head of Crystalsev, own nearly a third of Brazil's mills.⁸

With Brazil's sugar boom, production has shifted from the north-east of the country to the centre-south, where the terrain is more suitable to mechanised production. Millions of hectares of the *cerrado*, a region of Brazil comparable to the Amazon for the richness of its biodiversity, have been cleared for new sugar cane production.⁹ The mills in this region now account for about 90 per cent of Brazil's sugar output, with roughly 60 per cent of this converted into ethanol.¹⁰ The area has become the power base of the industry and, with heavy support from President Lula's government, the region's politically connected sugar barons and their foreign partners have been easily able to push through their agendas for expansion – converting vast areas of agricultural and forests lands to sugar cane production in the process. And while the global financial crisis has slowed things down, the World Bank's International Finance Corporation, the Brazilian development bank (BNDES), and the Inter-American Development Bank have stepped in with funds to keep the expansion and consolidation on track.¹¹ Several private investment funds with hundreds of millions of dollars have also recently been established to buy land in Brazil for conversion to sugar cane production, including the Radar Propriedades fund managed by Cosan, the Calyx fund managed by Louis Dreyfus and the BrasilAgro fund managed by Cresud, a company owned by Argentine soya baron Eduardo Elsztein. Not surprisingly, land conflicts are on the rise where sugar cane is expanding, as is the violence inflicted on those who dare to resist.¹²

The model of production pursued by the sugar conglomerates in Brazil is large-scale and vertically

6 "Sudan announces ambitious plan for sugar production", *Sudan Tribune*, 7 March 2008. <http://tinyurl.com/apfern>

7 União dos Produtores de Bioenergia (UDOP), "Capital estrangeiro responde por 12% da cana moída no Brasil", 4 February 2009. <http://tinyurl.com/aalniv>

8 "Açúcar e álcool são os paradoxos da crise", *Gazeta Mercantil*, 17 November 2008. <http://tinyurl.com/cntqny>

9 Maria Luisa Mendonça, "Impacts of Expansion of Sugarcane Monocropping for Ethanol Production", Rede Social de Justiça e Direitos Humanos and Comissão Pastoral da Terra, October 2008, available online from the Transnational Institute (TNI). <http://tinyurl.com/dbrvu2>

10 Ben Richardson, "An Exclusive Engine of Growth: The Development Model of Brazilian Sugarcane", *Ethical Sugar*, 17 January 2009. <http://tinyurl.com/aooogg>

11 In 2008, BNDES released nearly US\$2.5 billion to the sugar/ethanol industry, (Centro de Monitoramento de Agrocombustíveis–Repórter Brasil, "O Brasil dos Agrocombustíveis: Os Impactos das Lavouras sobre a Terra, o Meio e a Sociedade, Volume 3 – Cana-de-açúcar", 2009. <http://tinyurl.com/bca4ev>) See also Inter-American Development Bank, "IDB backs \$150 million Regional Financing Facility for Sugar and Bioenergy", 16 January 2009. <http://tinyurl.com/aatudm>

12 See for instance, the following report from the state of Mato Grosso do Sul, into which sugar cane production has recently expanded: Mieceslau Kudlavicz and Juliana Grasiéli Mota Bueno, "A expansão canavieira em Mato Grosso do Sul," *Comissão Pastoral da Terra*, 26 August 2008. <http://tinyurl.com/cxnq6f>



Box 2: Today's sugar companies in Brazil: Guarani and CNAA

Açúcar Guarani

Açúcar Guarani is the Brazilian subsidiary of the French transnational sugar corporation Tereos. The company maintains tight control over its sugar supply. A third of its supply comes from its own plantations, where it has increased the level of mechanised harvesting from 32 per cent in 2004 to 80 per cent in 2008. The rest is contracted to outside suppliers who must use Guarani's sugar cane varieties and who must adhere to Guarani's systems for such things as soil preparation, planting, harvesting and disease management. Guarani is one of a few sugar companies in Brazil to have signed up to a sustainable-ethanol supply contract with Swedish ethanol producer Sekab, which requires complete mechanisation of production.¹

The Companhia Nacional de Açúcar e Álcool (CNAA)

In 2007, Goldman Sachs bought 19 per cent of Brazil's second largest sugar mill, Santa Elisa, part of the Crystalsev Conglomerate. At around the same time, Santa Elisa and Goldman Sachs launched a US\$300m joint venture with the international trading company Global Foods Holding, and US private equity firm the Carlyle Group. The joint venture, called CNAA, was to set up four large sugar mills and ethanol facilities, making it one of Brazil's top three sugar/ethanol producers. Company representatives say that it will focus on expanding into the "newer" cane-growing areas of the centre-south, with Crystalsev handling domestic distribution and Global Foods Holding organising international trade. The CNAA joint venture has benefited from a recent US\$270m loan injection from the Inter-American Development Bank and more than US\$200m in financing from the Brazilian development bank (BNDES). Two of the mills are already in operation and a third is being built. In early 2009, Carlyle raised its stake in the company to become the majority owner, while Santa Elisa was taken out of the management structure. The company is now run by a completely foreign-controlled fund that brings together the Carlyle Group, Goldman Sachs, Global Foods Holding, and Discovery Capital.

1 Sekab, "Requirements for Sustainable Ethanol". <http://tinyurl.com/dd6qvp>

13 Ben Richardson, "An Exclusive Engine of Growth: The Development Model of Brazilian Sugarcane", *Ethical Sugar*, 17 January 2009. <http://tinyurl.com/aoooog>

14 Sílvia Noronha, Lúcia Ortiz and Sergio Schlesinger, "Agribusiness and Biofuels: An Explosive Mixture," *Friends of the Earth, Brazil*, 2006.

15 Centro de Monitoramento de Agrocombustíveis - Repórter Brasil, "O Brasil dos Agrocombustíveis: Os Impactos das Lavouras sobre a Terra, o Meio e a Sociedade, Volume 3 - Cana-de-açúcar", 2009. <http://tinyurl.com/bca4ev>

16 CPT, "Em ano recorde em operações, mais de 4,6 mil trabalhadores são libertados", 19 January 2009. <http://tinyurl.com/dalpyc>

17 Friedrich Berschauer, "The long-term growth trends for the Brazilian agro business remain firmly intact", *Bayer CropScience*, 20 April 2007. <http://tinyurl.com/bd77dv>

18 Company reports from 2005 show that the Brazilian tractor market is controlled by AGCO/Valtra (65%), New Holland (18%) and John Deere (7.5%).

integrated. Three-quarters of the sugar cane land in the country is either owned or leased by the mills, and Brazil's 60,000 independent growers, with farms of less than 150 hectares, account for just 27 per cent of national production.¹³ Labour conditions on the sugar plantations are notoriously brutal, and as the sugar companies have grown in power they have been able to extract more and more from their workers, who are generally paid by the amount of cane they cut. The average tonnage of cane cut per day in the São Paulo region has doubled from 5–6 tonnes in the 1980s to 10–12 tonnes today – which translates into an estimated 12,000 strikes of a machete per day.¹⁴ Since 2000, sugar cane cutters in this region have increased their productivity by 11.9 per cent, but the amount they are paid for the cane has increased only 9.8 per cent over the same period.¹⁵ Every year some workers die from exhaustion, and forced labour remains widespread in the industry. The Comissão Pastoral da Terra reports that 2,164 workers were freed from forced labour on Brazil's sugar plantations in 2008.¹⁶

The model of production is also increasingly industrial – relying on the machines, new cultivars, and chemical inputs supplied by agribusiness. The boom in sugar cane is a major reason why Brazil's pesticide market increased fourfold between 1992 and 2006 to be worth over US\$5 billion in 2007.¹⁷ It is generating a huge new growth market for the

foreign-owned companies that control Brazil's tractor market too.¹⁸ For the sugar companies, mechanisation reduces the need for manual labour, freeing them in part from the demands of workers and the increasing international criticism of working conditions on Brazilian sugar plantations. It is also a way to avoid the common practice of burning fields before manual harvests, which weighs heavily on the argument for the environmental merits of Brazilian ethanol. In fact, the "sustainability" criteria drawn up by EU ethanol importers and their Brazilian suppliers requires mechanisation and, in this direction, the Brazilian government introduced a Protocol in 2007 to eliminate the burning of fields on 20 per cent of sugar cane lands by 2010, and 100 per cent by 2020.

In short, then, the sugar expansion in Brazil is characterised by a high level of corporate control, rapid and massive land conversion and an industrial model of production, based on labour exploitation and the supply of modern machinery and inputs by agribusiness.¹⁹ Brazil may be the epicentre of the global boom in sugar cane production, but a number of other countries are also being sucked in, following the same agribusiness model. Indeed, Brazil has now become the leading proponent of sugar-cane-based ethanol on the international scene, supplying Brazilian finance, investment and technology to countries around the globe to engage in its production.



**Table 5: Syngenta's tropical sugar beet projects**

Partner	Country	Details
Maquiltec S.A., Campos Chilenos (EDF&Man)	Colombia	US\$250 million ethanol project put on hold in January 2009 for financial reasons. Expected to require 8,000 ha of sugar beet production. ¹
MIDROC	Ethiopia	US\$300 million project in Amhara state involving 30,000 ha plantation and contract-grower scheme.
Vasantdada Sugar Institute (VSI), Harneshwar Agro Products	India	With the Samarth Cooperative Sugar Mill, VSI grew sugar beet for food use on some 48.5 ha of land and processed at a pilot plant at Ambad, near Jalna, Maharashtra. With Harneshwar Agro Products, it contracted sugar beet production with the company's 12,000 farmer shareholders and built a bio-ethanol production plant to process the beets, also in Maharashtra.
Unknown	Sudan	Sugar beet is grown on around 70,000 ha in Sudan and is being expanded through the establishment of a sugar beet factory in the Gezira Scheme by investors from the United Arab Emirates. Syngenta has conducted field trials of its sugar beet in the country.

1 "Campos Chilenos paraliza proyecto de etanol en Colombia por US\$270 millones por falta de financiamiento," 29 January 2009. <http://tinyurl.com/bbfvdy>

Monsanto makes its move into Brazilian sugar and beyond

A key part of the story of the expansion of Brazilian sugar production was the development of varieties suited to the centre-south region and to ethanol production. Most of these varieties were developed by the Centro de Tecnologia Canavieira (CTC), a semi-private institution that was controlled by Copersucar but is now owned by a collection of the country's top sugar mills. CTC used to charge non-members royalties, but now denies any access to its varieties to those outside its structure, who account for over half the country's sugar production.²⁰

A new player, however, recently emerged on the scene, which is eating into CTC's dominant position. CanaVialis, the world's largest private-sector sugar cane breeding company, was set up in 2003 by several former public breeders with financing from the Brazilian conglomerate Votorantim, along with a sister company, Allelyx, devoted to sugar cane biotechnology. Similar to the CTC, CanaVialis works for the major sugar companies, who contract it to develop varieties specifically for them. CanaVialis recently signed a US\$25 million deal with Cosan to set up 10 research stations and develop sugar cane varieties. It has also developed sugar cane varieties for Odebrecht's sugar cane plantation in Angola. CanaVialis says that its varieties now cover at least 15 per cent of Brazil's sugar cane area. In Brazil, then, sugar cane breeding has become a potentially profitable business, something which has yet to happen elsewhere.

The development was not lost on the world's largest seed company, Monsanto. In 2007, it began a partnership with CanaVialis and Allelyx to develop varieties of sugar cane genetically modified for resistance to glyphosate (Roundup Ready).

Then, at the end of 2008, it decided to buy out both companies for US\$280 million, suddenly catapulting Monsanto into the position of the world's largest sugar cane breeding company.

Monsanto is clear that its intention is to use CanaVialis' network of corporate clients and its germplasm collection as the basis for a widespread introduction of GM sugar cane. Sugar cane, unlike soya, is perennial, and farmers typically replant only every five years or so – and then they use cuttings, not seeds. So Monsanto plans to sell its varieties according to the CanaVialis model – working through contracts and partnerships with the major mills, who will use the varieties on their own plantations and through contract production with their suppliers. The same model could then easily be applied outside of Brazil. CanaVialis has already been doing varietal development in Angola and California, and Brazil's centre-south sugar cane varieties are cultivated elsewhere in the world, including in Sudan by Kenana Sugar, the world's largest integrated sugar company.

Part of Monsanto's road to GM sugar cane is already being paved by Roundup Ready sugar beets. These were introduced in the US and Canada in 2008 and Monsanto has regulatory approval to export them to major markets such as the EU and Japan. Similar regulatory approvals could be given for Roundup Ready sugar cane since, in both cases, the refined product is said to be free of transgenic material. This, at least, is what the proponents of GM sugar argue. In Australia, where both Dow and Syngenta are collaborating with leading public research institutes on GM sugar cane, the sugar industry has already formed a lobby group to facilitate the introduction of GM sugar cane – the Sugarcane Gene Technology Group, which is modelled on the GM sugar beet lobby group in the US.²¹

19 For a more comprehensive report on Brazilian sugarcane production, see Maria Luisa Mendonça, "Impacts of Expansion of Sugarcane Monocropping for Ethanol Production", Rede Social de Justiça e Direitos Humanos e Comissão Pastoral da Terra, October 2008, available online from the Transnational Institute (TNI). <http://tinyurl.com/dbrvu2>

20 Janaina Simões, "Center of Sugarcane Technology indicates the path and sets the pace for technological innovation in the sugar and alcohol sector," State University of Campinas, UNICAMP Innovation, 5 June 2006. <http://tinyurl.com/bpg8xm>

21 See Queensland Cane Growers Organisation Ltd, 2008 Annual Report. <http://tinyurl.com/bw9z57> and A. Wynne, B. Milford and E. Wall, "Advancing sugarcane: leading and managing change," Second ISSCT management workshop, Australia, May 2008. <http://tinyurl.com/dj3v79>

Box 3: GM sugar beets heading south?

Sugar beets are crops not just of the EU and North America. They are grown extensively in China, Russia, Eastern Europe, Egypt, Sudan, Turkey and Argentina. Moreover, Syngenta is developing a tropical sugar beet to be used mainly for ethanol. The beet can be grown where there is insufficient water for sugar cane – opening up new areas for sugar production. Syngenta projects a near-term expansion of tropical sugar beet production of 1–3 million hectares globally, and has been conducting field trials in a number of countries, including China, Australia, Thailand, Vietnam, Kenya, South Africa, Ethiopia, Sudan, Brazil, Colombia, Peru, Mexico and the US.¹ At this point, Syngenta's tropical beets are not called GMOs, but the company is heavily involved in work on GM sugar beet, and its subsidiary Hillebrand is a leading supplier of Roundup Ready sugar beets.

1 Syngenta press release, "Syngenta's tropical sugar beet receives World Business and Development Award", 25 September 2008. <http://tinyurl.com/awxnq>

Deserts of GM sugar cane

As with all other GM crops introduced on the market so far, the looming first round of GM sugar cane will be modified for resistance to Monsanto's glyphosate herbicide, Roundup. Just as with GM soya, the appeal of these GM sugar cane crops is that they simplify things for large-scale, industrial production. GM soya took off in Latin America because it made farming easy for agribusiness investors, concerned only with raking quick profits off large areas of fertile land. It will be exactly the same for GM sugar cane. The Roundup Ready trait makes controlling weeds a simple affair of dousing the fields every once in a while with glyphosate.

It is a system tailor-made for big sugar multinationals, which are expanding their vertical control over global sugar production and distribution. It is perfectly adapted to their strategies for increased mechanised production, in Brazil and elsewhere, and will facilitate the

conversion of more agricultural land to corporate sugar cane production that will be used mainly for ethanol. Independent, small-scale producers will be completely excluded from this system, and vast areas of land that are or could be occupied by small farmers and used for local food production will be transformed into green deserts of GM sugar cane.²² To put this in perspective, the Brazilian government claims to have identified an additional 44 million hectares for sugar cane production – around six times the current sugar cane area (which already accounts for one third of global production).²³

The environmental and health impacts of a GM sugar cane boom will also be severe. While Roundup Ready sugarcane might simplify herbicide applications, the experience of Roundup Ready soya in Latin America shows how it fosters an abusive use of pesticides.²⁴ Because the crops are genetically modified to tolerate high levels of glyphosate, fields are drenched with the stuff, often sprayed by planes, with complete disregard for

Table 6: Examples of land/water conflicts over sugar cane expansion

Country	Conflict
Mali	Illovo (ABF) is constructing an ethanol plant and sugar cane mill on 14,000 ha of land in the Office du Niger. The project is opposed by the national coordination of farmers' organisations (CNOP).
Ethiopia	Expansion of sugar cane production into the Awash Basin of Ethiopia has generated land conflict with the Afar pastoralists, whose ways of life are directly threatened by the new sugar cane projects.
Mozambique	Farmers are protesting against an ethanol project spearheaded by mining company Camec, because it will deprive them of water.
Sudan	Protesters from the village of El Wag in White Nile state blocked a highway in July 2008 demanding compensation for the construction of the new White Nile Sugar project. A clash with police left 3 villagers dead and 8 wounded.
Brazil	In 2007, the Landless Workers Movement (MST) invaded Cargill's Cevasa ethanol mill in São Paulo and, a month later, 6,000 hectares of land, also in São Paulo, where they torched 30 tonnes of unplanted sugar cane.

Sources: The Afar Human Rights Organisation, "Ethiopian Govt endangers Afar pastoralists ecosystem," 4 July 2007. <http://tinyurl.com/dxa3ny>
 Juba Post, 25 October 2008. <http://tinyurl.com/cgoxn7>
 Ethical-Sugar, "An Exclusive Engine of Growth: The Development Model of Brazilian Sugarcane," January 2009. <http://tinyurl.com/aooggg>

22 UITA, "Brasil: la Caña de Azúcar avanza también sobre la pradera", 14 May 2008. <http://tinyurl.com/arjv5m>

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Box 4: Campaigns against GM sugar in North America

In January 2008, Earthjustice and the Center for Food Safety filed a federal lawsuit on behalf of the Organic Seed Alliance, Sierra Club, and High Mowing Organic Seeds, challenging the US Department of Agriculture's (USDA) decision to deregulate Roundup Ready sugar beets. The lawsuit seeks to reverse the approval of genetically engineered sugar beets and to force the USDA to conduct an Environmental Impact Assessment, as required by law.

The groups say they are opposed to Roundup Ready sugar beets because: they will increase the use of toxic herbicides; they will contaminate conventional and organic seeds (including relatives of sugar beets, like Swiss chard and table beets); they will jeopardise markets for other farmers; and they have not been proven safe for consumption. Apart from the legal action, these groups have been involved with a wider coalition of groups seeking to put pressure on food companies not to accept GM sugar for their products. They have launched a petition and letter-writing campaign, and have established a registry of companies that pledge not to use GM sugar.¹

Groups are mobilising to oppose GM sugar beets in Canada as well. On Valentine's day, the Canadian Biotechnology Action Network led an action in which 1500 letters were sent by email and post to the president of Lantic, Canada's only remaining sugar company, urging it to stay GM-Free. Also, in 2008, local groups successfully thwarted the establishment of a sugar beet ethanol plant on Prince Edward Island that would have grown Monsanto's Roundup Ready sugar beets as feedstock.²

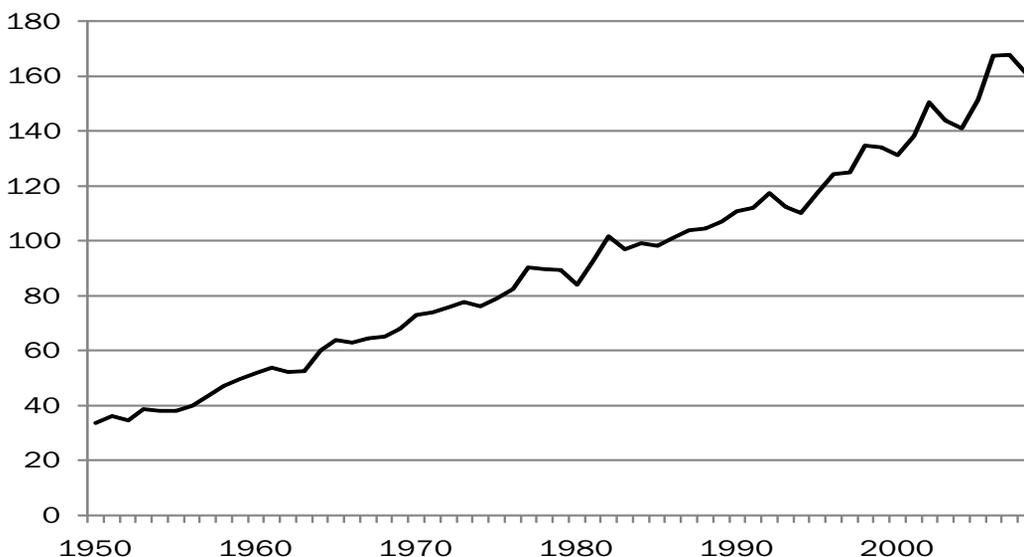
- 1 Center for Food Safety, "Tainted Sugar", Food Safety Fact Sheet, June 2008. <http://tinyurl.com/526b8c>
Non-GM sugar beet registry available at <http://tinyurl.com/dy7xkb>
- 2 See the CBAN website. <http://tinyurl.com/cfg3ly>

the impact on surrounding communities. During the approval process for its Roundup Ready sugar beet in the US, Monsanto successfully lobbied the US Environmental Protection Agency to increase by 5,000 per cent the glyphosate residues allowed on sugar beet roots.²⁵ Roundup (glyphosate) is a toxic herbicide that presents serious risks to human health, even at low levels.²⁶

Moreover, Roundup Ready is likely to encourage the use of multiple herbicides. With sugar cane, the common practice of no-till farming under

mechanised production often relies on glyphosate to destroy the remaining ratoon (stubble) when it is time for replanting. Since this practice will not be possible when the ratoon has tolerance to glyphosate, no-till with Roundup Ready sugar cane is likely to require additional herbicides. The growing presence of glyphosate-tolerant weeds and Roundup Ready volunteers (maize and soya), especially in Latin America, will also force industrial operations growing Roundup Ready sugar cane to use additional herbicides. To deal with such problems with its soya, Monsanto says

Figure 1. World Sugar Production, 1950–2008
(million tonnes)



Source: F.O. Licht's *International Sugar and Sweetener Report*, various years

25 Center for Food Safety, "Tainted Sugar", Food Safety Fact Sheet, June 2008. <http://tinyurl.com/526b8c>

26 N. Benachour and G-E. Séralini, "Glyphosate formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells", *Chem. Res. Toxicol.*, 22 (1), 2009, pp. 97–105; Dr Mae-Wan Ho and Brett Cherry, "Death by Multiple Poisoning, Glyphosate and Roundup," ISIS Press Release, 11 February 2009. <http://tinyurl.com/b9phij>





Photo courtesy of Jorge Chullén

Cane cutters handling glyphosate with inadequate socks instead of protective gloves.

it will soon be introducing a Roundup Ready soya that is also resistant to the herbicide dicamba – so that both herbicides can be sprayed to ensure that any glyphosate-tolerant weeds are destroyed.²⁷

Farm workers are often the worst affected by such pesticide practices. Jorge Chullén of the International Union of Food Workers says that the problem of pesticides for workers in sugar cane plantations has intensified in recent years, particularly because there is an increasing tendency for the mills to outsource the application of pesticides, among other field operations, to contractors, thus evading their responsibilities to their workers. He describes the working conditions with these outsourcing operations as “horrible” and says that the practice is further deteriorating safety standards for workers. GM sugarcane could thus be a double blow to workers – increasing their exposure to pesticides and contributing to a process of mechanisation that wipes out jobs in the sector.²⁸

The other side of sugar

Sugar cane production has become so industrialised and so integrated into the corporate food system that other forms of production and use are often not recognised. But local communities sustain entirely different – and important – cultures based on sugar cane. When not refined and chemically treated, sugar cane is actually a highly nutritious crop, rich in vitamins and minerals. It provides an important food source that flows into a vast small-scale food economy – from the jaggery (*gur*) makers in India to the street vendors selling cane juice in almost any tropical country in the world.

In Colombia, communities have a long-standing tradition of organising what they call “trapiches comunitarios”, where they process the juice from their local sugar cane into a concentrated product called *panela*. As in other parts of Latin America, local farmers in Colombia maintain their own sugar cane varieties, adapted to their lands and to the making of *panela*. Several of these traditional varieties have been documented by the Instituto Mayor Campesino (IMCA). Erminsu Iván David Pabón-Mincho, a programme coordinator with IMCA, says that the *trapiches comunitarios* and the local sugar cane varieties that they utilise are critical to the livelihoods and well-being of rural communities in Colombia. But he says that the recent drive to expand sugar production in the country, especially for ethanol, threatens to take away the already limited lands that these communities have for the production of their own sugar cane. Moreover, he sees government regulations of the sugar industry as designed to penalise local *panela* production and to concentrate the sugar industry in the hands of big companies.

Communities such as these are directly in the path of GM sugar cane. They are the ones most at risk of losing their land from GM sugar cane expansion, of losing their jobs from the mechanisation of sugar production, of having their communities polluted by herbicides, and of having their traditional sugar cane crops contaminated by GMOs. Moreover, they are most at risk of any adverse health consequences from GM sugar, since they consume sugar cane in its pure form and depend on it as a source of nutrition, not just as a sweetener. So far, in the approval of GM sugar beets, authorities have considered the impact on diet of only the refined form, where the transgenic material is supposedly no longer present.²⁹

Taking a stand against GM sugar cane, and GM sugar in general, is thus important for many reasons. It is part of a larger opposition to the expansion of corporate sugar over agricultural land that should instead be used by farmers for local food production. It is also a rejection of the industrialisation and dehumanisation of a food crop that has significant cultural and economic meaning for many communities, especially with the current rise of sugar-cane-based ethanol. Workers, farmers and other food producers throughout the tropics and sub-tropics depend on sugar cane as a food source and for their livelihoods. Today they are suffering badly as agribusiness and governments collude to redesign the world map of sugar production. The introduction of GM sugar cane will only worsen and intensify their problems. 

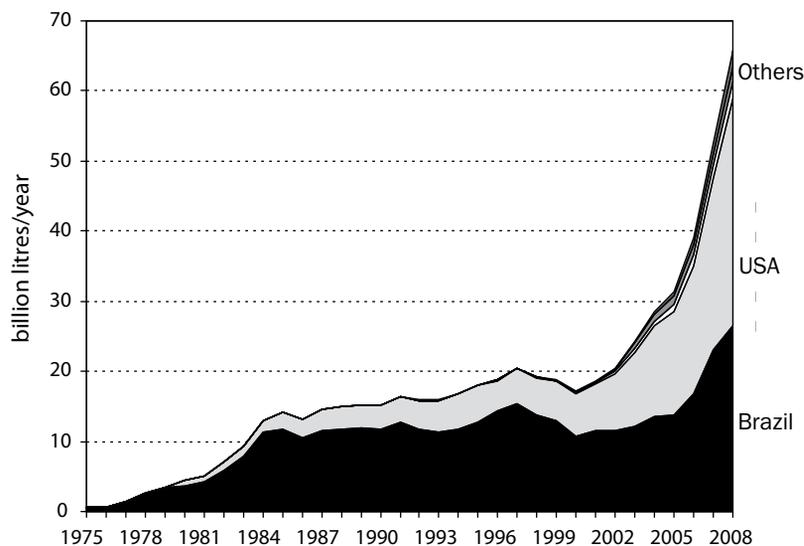
27 See GRAIN, “Twelve years of GM soya in Argentina”, Seedling, January 2009. grain.org/seedling/?id=578

28 The Brazilian sugar industry estimates that mechanisation will lead to the net loss of 114,000 jobs between 2010 and 2021 in São Paulo state (Ethical-Sugar, “An Exclusive Engine of Growth: The Development Model of Brazilian Sugar-cane,” January 2009 <http://tinyurl.com/aooogg>) Mechanisation does not necessarily provide workers with safer working conditions. A study in Brazil concluded that the pattern of illness among harvester operators is similar to that of manual sugar cane cutters (R.A. Scopinho, F. Eid, C.E. Vian, P.R. Silva, “New technologies and workers’ health: mechanization of sugar cane harvesting,” *Caderno Saúde Pública*, 15 (1), January–March 1999, pp. 147–61).

29 See, for example, Health Canada’s approval of H7-1 Roundup Ready sugar beets. <http://tinyurl.com/aszd94>

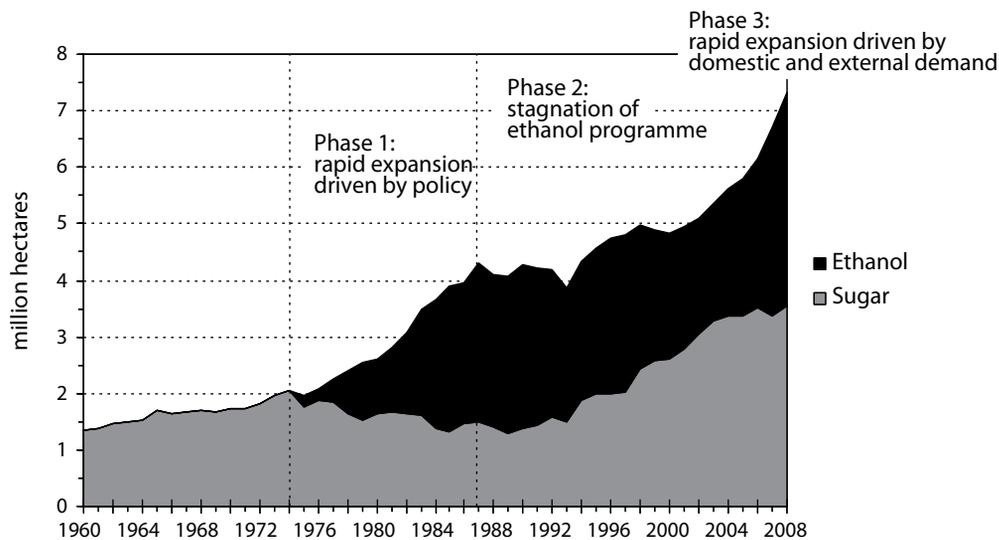


Figure 2: World production of fuel ethanol (bn litres/year)



Source: F.O. Licht's *International Sugar and Sweetener Report*, 2007 and 2008

Figure 3: Land in Brazil under sugar cane cultivation



Source: Peter Zuurbier and Jos van de Vooren (eds), *Sugarcane ethanol: Contributions to climate change mitigation and the environment*, Wageningen Academic Publishers, The Netherlands, 2008

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