Soybean production in Argentina has increased from 0.01 million to more than 14 million hectares in 30 years, making it the world's third largest producer. The rise of the soybean has been accompanied by massive increases in hunger and malnutrition in a country long accustomed to producing 10 times as much food as the population required. The consequences of growing GM soya include a massive exodus from the countryside and ecological devastation. Now soya is being imposed on Argentineans as an alternative to traditional foods. Despite all indications to the contrary, the government continues to see the export of GM soya as key to servicing the country's massive debt.

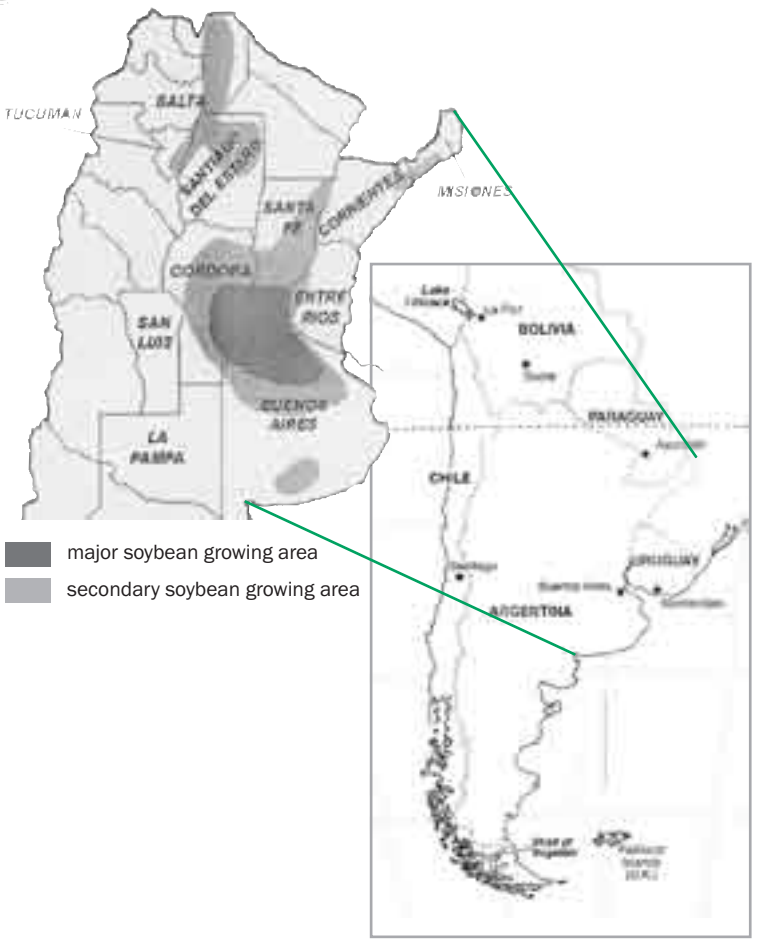
Argentina's torrid love affair with the soybean

LILIAN JOENSEN AND STELLA SEMINO

Argentina assumed the role of an exporter of raw materials, mainly agricultural products, and an importer of manufactured products during the 19th Century, as required by its colonial masters. In 1853 the country was unified and the process of internal colonisation accelerated, via initiatives like the "conquest of the desert", which involved forcibly removing indigenous peoples from land required for agriculture. The government also adopted an economic model to facilitate exports and began to contract debt. But although Argentina was exporting agricultural produce, much of it to the UK, there were many differences between the impact then and now. Then it was mainly producing food for internal consumption, there were no toxic chemicals being applied, people were able to save their seed and make their own farming decisions, and there was plenty of employment.

In 1890, the country suffered an economic collapse and the peso was devalued against the price of gold, which actually helped exports, while the entry of foreign currency ensured a rapid recovery. After 1890, UK interests in the country shifted and investment focused on the railways. Between 1880 and 1913, investment in the railways increased 30 fold and millions of railway sleepers were produced by itinerant workers from the forests of North East Argentina. Railways were not routed to facilitate the movement of Argentineans but of commodities to the ports (Buenos Aires and Rosario). Today's parallel is the construction of the "Hidrovía" waterway, the massive intergovernmental project

The major soybean growing areas in Argentina



to build canals and link rivers so as to open up the whole continent to big cargo vessels to take out products. Grain and fertilisers are predicted to make up 48% of the goods carried. US companies plan to transport 70,000 tonnes of oilseeds (including soya) daily for processing at the industrial centre ROSAFE close to the port of Rosario.

"The economy finally collapsed in 2001, and this time the peso was devalued against the dollar, which in turn helped to promote the export of GM soya."

One of the architects of Argentina's agricultural modernisation, José Martinez de Hoz, wrote a book in 1967 renewing the call for Argentina to base its economy on industrial export agriculture. The green revolution began with the importing of hybrid seed and chemical fertilisers and machinery. Most of the production was consumed internally as international prices did not favour exports. In 1984 the new democratic government sought to promote fertiliser use by exchanging fertiliser for grain. The country's debt had increased greatly under the military dictatorship of 1976-83. In spite of this the new government was able to attract loans from the World Bank, the International Monetary Fund (IMF) and the Club of Paris. Rapid returns attracted investment and financial speculation on a large scale became an important part of the economy. During this period power was concentrated increasingly in the hands of a small elite.

Between 1983 and 1989 there was hyperinflation, fuelled by speculation on the peso versus the dollar and not helped by low international prices for exports. In 1989 the fiscal system collapsed, together with incomes, while national industry continued to decline. The economic chaos, de-industrialisation, concentration of the economy in few hands, was the perfect context for ushering in the presidency of Carlos Menem (1989-2000). His proposal to turn Argentina into a first world country and reduce its debt through a savage neoliberal programme was welcomed as a possible way out. Menem's stated aims were to cut state expenditures and privatise as much as possible (even scientific research), to make public services "more efficient". He followed the World Bank, the IMF and the Inter-American Development Bank's standard prescription. This meant monetary reform, fiscal reform, reducing taxes and restrictions on imports and exports; reform (privatisation) of the public sector, including the social support system, education and pensions.

But instead of dwindling, the debt tripled, reaching $US 145,000 million in 1999, and the situation was exacerbated by capital flight on a massive scale. At the same time, national industry was decimated, unable to compete with cheap imports. Argentina once more found itself exporting raw materials and importing finished goods made from them. The economy finally collapsed in 2001, and this time the peso was devalued against the dollar, which in turn helped to promote the export of GM soya.

Opening the door to GM soybeans

Between 1991 and 2002, 569 field trials on genetically modified (GM) crops were approved in Argentina, including maize, sunflower, soya, cotton and some wheat, potatoes and alfalfa. No information was given to the public or to Congress about what was happening. The Advisory Commission on Biotechnology included biotech companies like Monsanto, Syngenta, Dow AgroSciences, and Bayer CropScience. In 1996, the government gave a licence to Monsanto to grow GM soya. At that point, international prices for soya were high. Monsanto was not able to charge royalties because they had not been granted a patent on the gene for glyphosate

resistance in Argentina, which meant that farmers were able to save their seed from season to season. Moreover glyphosate was cheap, all of which gave Argentina a distinct advantage in international sales. Since credit was hard to obtain, producers were instead given packages of seed and inputs by the distributors of seed and chemicals, which they paid for after the harvest. Grain companies also rented land to grow soya. Over the next few years, GM soya seed was smuggled and grown illegally in Brazil, Paraguay, Uruguay and Bolivia. Having succeeded in ensuring that GM soybean was cultivated throughout the region, Monsanto then demanded royalties. In Argentina, a tax is being levied on wheat and soybean seed and the proceeds shared by the companies involved.

The production of soybeans in Argentina has expanded from 9,500 hectares in the early 1970s to 5.9 million in 1996, 10.3 million in 2000-1 and 14.1 million in 2003-4, almost all of which is GM (some estimates are as high as 97%). However, even though the area under cultivation rose by 1.5 million hectares between 2002-3, at the expense of other crops and forest clearance, production fell slightly, from 34.80 million tonnes to 34.77 million tonnes, because overall productivity fell by about 10.5%. The government is unwilling to acknowledge that there is a problem because it sees the income from GM soya as the main way to service the country's massive debt.

Rural exodus and the growth of poverty

In 1992, the Argentine government declared that 200,000 producers would have to leave farming and that farming units of less than 200 hectares were uneconomic. Small farmers have found it extremely difficult to compete given the economic conditions in the country and the advent of GM soybeans has increased the pressure. Almost no labour is required for directly sown GM soybeans, small farmers cannot afford the massive machines used for the direct drilling technique that GM soybeans require (see box) and many people have sold or rented their land and left for slums in the cities. Others have been driven out with threats and violence. Land has been acquired by "sowing pools", investor groups that have replaced contractors and bring in their own employees to grow soybeans.

Food sovereignty in Argentina is seriously threatened by the export model exemplified by soybeans. The Argentine diet used to include plenty of cheap meat, dairy produce, lentils, beans and other vegetables. Mixed farming, with animals and crops, using rotation, provided good yields, but received no support from the government. In

Direct drilling

Direct drilling (along with its minor variants known as 'no-till', 'lo-till' and 'conservation tillage'), was introduced in the US to save time and money for farmers, and also to counter erosion. The land is not ploughed, but instead the farmer uses a single machine to partly incorporate the crop residue into the top few centimetres of soil, drill in the seed and press down the soil. With the machinery developed for the purpose, everything can be done in a single operation by one man. The rotting crop residues mean that slug pellets and other pesticides may be required to tackle the pests that flourish in them.

Although perhaps not originally developed to promote chemicals, direct drilling has now become widely associated with the use of herbicides, particularly glyphosate, to tackle the weeds that flourish in the system. In the case of GM crops, spraying can continue while the crop is growing, instead of only before it emerges. Using massive machines, a single producer can plant soybeans thousands of acres, yielding large returns for the big farmer. However, the small farmer cannot afford the machinery required and may be forced into quitting his land or renting it to the sowing pools. The technique of direct drilling has been adopted widely in USA, Canada, Australia, Chile, Brazil and Argentina and is now being promoted all over the world.

One of the problems with soybeans in this system is that the residue after harvest is very sparse and so the soil is left exposed to erosion and poorly nourished. Modern soybean varieties are extremely efficient at extracting nutrients from the soil, so the crop flourishes when first planted in areas where forest has been cleared, but soon exhausts the land, while its residues give very little back. Chemical fertilisers and pesticides and the huge areas cleared make it almost impossible for native vegetation to re-establish itself. Desertification soon follows.

Another problem arising from the direct drilling system is that it has resulted in a plague of *Phakopsora pachyrhizi* (Asian rust fungus), which only appeared in Argentina in 2001 and can reduce production by up to 80%. The spores survive to the next season in the vegetation left on the surface in direct drilling and are also dispersed widely by the wind. Scientific research also suggests that glyphosate makes plants more susceptible to certain diseases (eg fusarium fungus) by mechanisms which are now being investigated.

recent years, soybeans have replaced the production of food staples, which are now being imported. at much higher prices for consumers. In fifteen years Argentinean dairy farms have halved in number, from 30,000 in 1988 to 15,000 in 2003. Higher priced milk is now being imported from Uruguay.

The population of Argentina is predominantly urban, so the rural crisis remained invisible for a long time. Nobody believed there could be hunger in a country that produced so much food. But economic crashes, the reform of the public sector, the fall in wages, the destruction of national industries, the replacement of national food crops with GM soybeans for export and the rural exodus have been disastrous. The percent of the population below the poverty line was only 5% in 1970. It rose to 12% in 1980, 30% in 1998 and 51% in 2002. Malnutrition among infants is between 11% and 17% and rising.

"In February 2003, peasants found their crops destroyed by glyphosate sprayed from the air. Their chickens died, and other animals were adversely affected."

In some regions, GM soybeans are exacerbating old injustices. In the 19th century, the region of Santiago del Estero supplied the rest of the country with agricultural products. The beginning of the 20th century saw the massive extraction of timber to make more than 20 million sleepers for the new railway system. Much of the mobile labour force that carried out this work settled on the land afterwards. The law says that if people settle on a piece of land for 20 years it becomes theirs, but the process of proof is complex. The province has long been subject to almost feudal rule, with rampant deforestation and the concentration of land in the hands of the few. Many long-established peasant communities have been approached by someone who claims to own their land. If they refuse to leave, armed groups may steal their cattle, burn their crops and threaten them with violence. Once they are dislodged, the situation is generally irreversible. A peasant organisation, MOCASE, has been formed to defend people's rights, with some success. The lure of profits from GM soybeans is the latest and most intense threat to their livelihoods.

The "United Republic of Soya" - ruled by corporations, and where national boundaries become irrelevant. "Soya knows no boundaries", says Syngenta.

New pest and weed problems

Due to the technique of direct drilling, there are new problems with disease. The fungus *Phakopsora pachyrhizi* (soybean rust) has been spreading and is also showing up in Brazil and Paraguay. Weed communities are showing increasing tolerance to glyphosate. This means that producers are now having to use an extremely toxic mix of 2,4.D, metsulfuron methyl, imazetapir and atrazine in addition to glyphosate, plus paraquat and atrazine to deal with soybean volunteers.

In December 2003 Syngenta, which produces paraquat and atrazine, as well as fungicides, declared Argentina, Brazil, Paraguay, Bolivia and Uruguay the "United Republic of Soya". In Paraguay, where GM soybean planting has not been legalised, peasants who gathered to protest about the spraying of illegal soybean fields were shot at by police.

Argentina's troubles do not end with soybeans. In July 2004, Monsanto's RoundUp Ready maize (NK603) was approved for commercial cultivation in Argentina. The company presents it as the 'solution' to the problems that arise when trying to spray GM soybeans without damaging conventional (glyphosate-sensitive) maize. It also promises that planting GM maize will reduce herbicide applications and thus the cost to the producer. When the European Union, which imports some two million tonnes of maize from Argentina appeared ready to reject GM maize, Monsanto recommended that Argentina's GM maize should be put to use domestically. But in July 2004 the EU finally approved NK603 maize for import and processing, just a few days after it was approved in Argentina. At that point Monsanto's share price rose to US$ 36.

Human and environmental costs

Communities close to soybean cultivation have been seriously affected by the aerial spraying of herbicides, mostly glyphosate. One study in Loma Senes, Formosa, involved peasants with an average of 10 hectares of land who planted cotton until the price fell. They now grow mixed vegetables for their own consumption, selling any excess. Large areas of land around their holdings have been rented out for soybean production by direct drilling. In February 2003, the peasants found their crops

destroyed by glyphosate sprayed from the air. Their chickens died, and other animals, especially horses, were adversely affected. People suffered from nausea, vomiting, diarrhoea, stomach pains, skin lesions, allergies and eye irritation. They succeeded in stopping the spraying for a few months, with the help of their local organisation, MOCAFOR, but it has since been resumed. Similar cases have been reported from many parts of the country, and there are also cases involving other chemicals like 2,4.D.

High levels of deforestation for soybeans cultivation have been reported from the Yungas and Chaco regions, facilitated by good prices, high levels of investment, better roads and more powerful machinery. This has led to an increase in cases of leishmaniasis (a parasitic infection transmitted by sandflies). Treatment is relatively expensive and re-infection is common, leading to terrible scars and deformities. In Entre Rios, where an order forbidding deforestation was implemented in October 2003, almost 1.2 million hectares of forest has been removed in the last few years, due in part to a doubling in the area of soybean production (0.6-1.2 million hectares) between 1994 to 2003. Up to 30% of soybean production in the area is now carried out by sowing pools. In all these regions, the loss of biodiversity is catastrophic.

Soybean as the solution to hunger?

Over the last few years, as resistance to GM soybeans has grown outside Argentina, domestic propaganda to promote soya as the solution to problems, especially hunger, has increased. At the end of 2001, the Argentine Association of Direct Drilling Producers launched a "Soya Solidarity" campaign, through which for every tonne of soybeans exported, 1 kg was 'donated' to feed hungry people. In fact, although it was given free at first, later it was sold. At the same time, great efforts were made to promote soybeans as a safe and nutritious substitute for – and even superior to – meat, milk and eggs. Since soybean had never formed part of the Argentine diet and nobody knew how to use it, recipes were produced for making dishes using soybeans instead of meat, eggs or milk. But children did not like soybeans and many public projects gave up using it although it was cheap. The government continued to provide the information that soymilk should not be given to children under five and only to the those under two with doctors' advice. Yet it did nothing to oppose the promotion of soybeans, even though the National Forum for a Feeding and Nutrition Plan made it clear that soya is not good for bone development; that it contains little iron, and the kind of iron it does contain is difficult for the body to utilise, and that its protein needs to be complemented with protein from other sources.

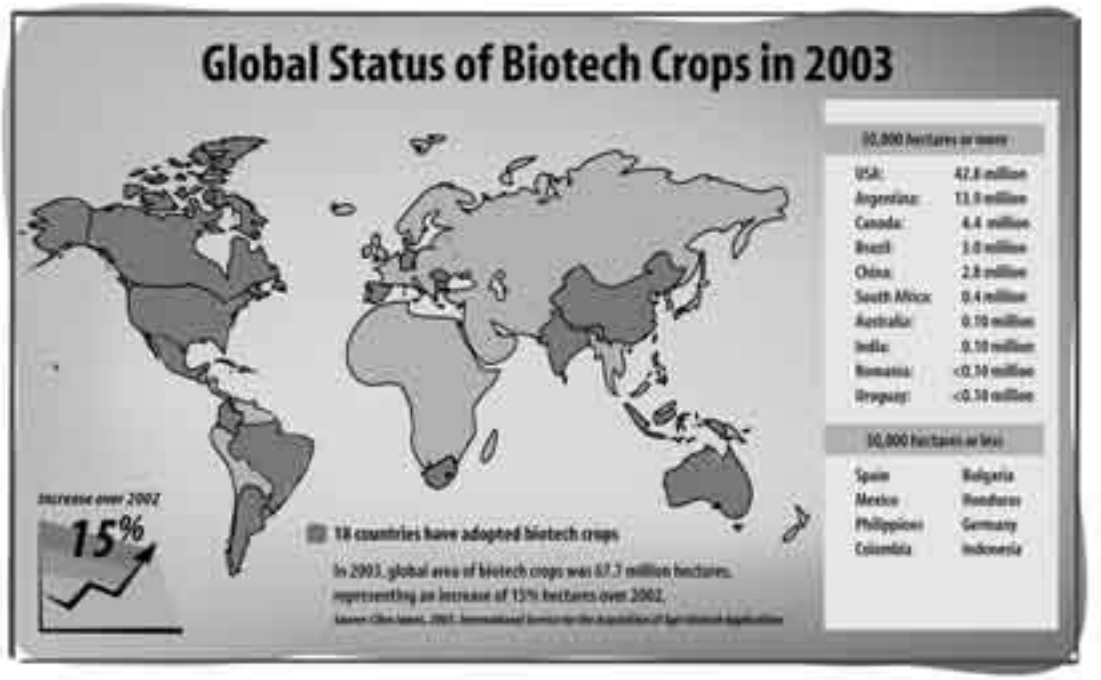
Meanwhile, the church is involved in the charitable efforts of Soya Solidarity to feed the poor with soybeans and DuPont has pledged assistance through its "Protein for Life" programme. The Food Bank Project, started in 2000, collects unsold food stocks from companies for distribution (including Kraft Argentina, Nestlé Argentina and Procter and Gamble). It has been experimenting, along with DuPont and the National Scientific and Technical Investigation Council of Argentina, with ways of mixing in other foods to improve the nutritional value and taste of soybeans. DuPont is providing food fortified with soya protein to 3,500 poor people in the Buenos Aires region.

"As resistance to GM soybeans has grown outside Argentina, domestic propaganda to promote soya as the solution to problems, especially hunger, has increased."

Facing up to stark realities

Some NGOs are exploring the possibility of sustainable soybean production. This case study demonstrates that it is simply not possible. Nor is the production of GM crops a solution to hunger. Quite the opposite: as GM soybean production has grown, hunger has skyrocketed to levels never seen before. Any idea that the use of agrochemicals would be reduced is also an illusion. Argentinean agriculture has not only become dependent on

Soya is recognised as being unsuitable for children under five, and yet it is being fiercely promoted for all children.



Thanks to its obsession with GM soybeans, Argentina ranks second in the global GM crop hall of fame

inputs, but is also using pesticides which are prohibited elsewhere. The so-called 'free market' has meant that corporations oblige Argentina to produce commodities for other countries, at the expense of its own natural resources and future generations. This is all in order to pay debts which were illegally contracted with the connivance of the international institutions that promote the opening up of countries to free trade. The catastrophe unfolding in Argentina shows that GM crops are a tool for domination through creating hunger and dependency. The Argentine case should sound the alarm for any people seeking to defend their own food security and sovereignty.

This article is the summary of a longer case study entitled *"Argentina: Case study on the impact of RoundUp Ready soya"*. The full study is available from the Gaia Foundation at gaia@gaianet.org or from 18 Well Walk, London NW3 1LD, UK, Fax: +44 171 431 0551. It was written by **Lilian Joensen** and **Stella Semino** of the Rural Reflection Group, Argentina, with Helena Paul of EcoNexus, UK. Stella (left) has a background in community development. From 1998 to 2003 she worked for the Argentinean National Congress first on community development and then on issues related to our external public debt, which was how she became concerned about how the production of GM soya was being linked to debt servicing. Lillian (right) is a molecular biologist who has been working on Chagas' disease in Argentina. Says Lillian, *"As a biologist that uses biotechnology as one of the many tools in my basic research, I believe (as most biologists do when we speak inside the lab) that the use of genetic modification in agriculture and the invasion of nature by these organisms is at least huge irresponsible and dangerous, since there is no way to control the further effects, once the GM organisms have been released"*. The authors can be contacted directly by email at stella.semino@mail.dk and lilianj16@yahoo.com.