

Argentina:

A Case Study on the Impact of Genetically Engineered Soya

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March 2005

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www.gaiafoundation.org

www.econexus.info

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Preface

The whole world was witness to the social explosion in Argentina, caused by the fall of Fernando de La Rúa's government in December 2001. As the days passed, it became increasingly obvious that the arbitrary definition of Argentina, according to the World Bank, as a country with a *per capita* income corresponding to that of a first world country, had become completely absurd.

We entered 2002 with the sensation of having experienced a devastating earthquake. Many people suffered anguish because they could not understand what had happened. Others realised that the only way to survive in the general climate of despair was to unite in common struggle. Argentine people tried to understand what had brought the country to such a collapse, but as most of the population is urban, that was difficult. The Piqueteros (unemployed and hungry people who set up roadblocks to draw attention to their plight), the occupied factories, the local assemblies, the food gardens, the cardboard collectors, all were movements that sought to alleviate the catastrophe without understanding its origin. The government tried to respond with assistance plans which did not meet people's needs.

Hunger seemed to advance like a new epidemic. Papers and magazines showed pictures of malnourished children reminding us of countries in Africa afflicted with wars and desolation. Everyone spoke of how incomprehensible it was that hunger struck so hard. How could this happen in a country that produced enough food for at least 8 times its population?

No-one understood how the price of food could rise every day, when the myth told every Argentinean that the one thing we produced more than enough of was food. From childhood, they had told us that our soils were so rich that when our ancestors arrived, they only had to scatter seed for it to grow without further work. The great fertile plains and the diversity of climates and landscapes had made us one of the richest countries in the world for the production of meat, cereals, oilseeds, garden produce, fruit and vegetables. As a result of endlessly repeating the refrain without actually looking at the reality, we ended up believing that our destiny as a producer of a diversity of healthy foods could never change. What was happening in Argentina was simply the product of a passing crisis, due to the fall of the banking system and the loss of our national industry. It would resolve itself when the banks returned our stolen money and the factories began to function again. Those who produce food and raw materials can deal with any other problem.

True enough, perhaps. But what very few of us realised was that Argentina had ceased to be a producer of food for its own population and had become a producer of animal feed commodities for other countries. Production and distribution had fallen into the hands of the transnational companies, just as had previously happened with gas, petrol, mining, water, electricity, the ports, transport, communications, pensions, health and education.

Some groups, including the Rural Reflection Group (GRR), have been developing a campaign to awaken public and institutional interest in the tragedy that Argentina is experiencing with transgenic monocultures, especially Roundup Ready soya. This monoculture now occupies more than 14 million hectares in the Pampas which is one of the most fertile regions of the planet, similar to the Ukraine or the US Corn Belt.

In this report, we attempt to describe the devastating impacts of the agro-export model, the expansion of a crop which is alien to our food culture, simply to satisfy the demands of the global commodity market. The extent of this social, ecological, economic and health disaster, which began in 1996 with the introduction of RR soya in Argentina, makes it difficult to address all aspects of a catastrophe that has gone totally out of control.

With soya as the central pillar of our economy, it is not easy to warn about the many negative consequences of its production, without arousing strong reactions. To speak of the fragility of food security and food sovereignty, the silent killing of people who ingest the chemicals which are sprayed over transgenic crops without respect for life, the loss of thousands of trees to deforestation, animals dying from water contaminated with poisons used on fields without farmers – all this is received as badly in some quarters as mentioning the concentration camps, the disappearances and the uncontrollable rise of external debt during the last dictatorship. At that time, the economic classes complicit in the dictatorship kept the reality invisible to those sections of the population that were not directly involved in the atrocities. Nevertheless, the struggle undertaken by some peasant, indigenous, social and environmental groups and a very few politicians, journalists, scientists and activists is now helping to make broad sectors of Argentine public opinion aware of the magnitude of the disaster.

In the same way it has been very difficult to alert people to the health risks for the poor who, because they are hungry and lack information, are obliged to eat what they are offered in many of the feeding projects: vegetable protein from GM soya, otherwise used as animal feed in the countries which buy it. The sectors which benefit from soya have a vested interest in compelling people to use it. They do everything they can, not just to advertise soya, but to try and prevent people from finding out about the risks associated with consuming soya, especially GM soya, as a food staple. The Argentine government does not want to listen to these warnings. On the contrary, our politicians take political action that compromises Argentines still further. Thus the Argentine state is participating in the case before the World Trade Organisation with the USA and Canada, to compel Europe to allow the entry of GM seeds and GM foods.

We believe that although it may be difficult to get the message across within our own country, this report is an opportunity to tell the story to the wider world. In it we will elaborate on some of the rural history of Argentina, the green revolution, the relationship between debt and the production of soya, the impact of chemicals, deforestation and the struggles of local groups that are suffering the effects of GM soya.

We hope that this study will encourage the many peasant and citizen organisations, the journalists and honest politicians who do not want to resign themselves to transgenic crops and the transnationals behind them. We hope that our case will help to expose the pseudo-scientific argument for GM in the 3rd World and contribute to the arguments of all those who reject GM as a solution to hunger in poor countries. Argentina was the first developing country to follow the model and the failure has been complete. The country has entered a vicious circle from which it will be hard to escape.

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Introduction

This case study sounds a warning for any government tempted to seek a solution for their problems, particularly the servicing of national debt, through the production of GE commodity crops for export. It explains why Argentina began to grow RR soya (genetically engineered to tolerate the herbicide glyphosate and known as Roundup Ready or RR), why its cultivation has spread so rapidly to cover more than 14 million hectares in 2003-4 and why the aim is to expand it still further. The study looks at the role that Argentina adopted in the nineteenth century as an exporter of raw materials and target of foreign investment. It also investigates other factors that have influenced the situation. These include a dictatorship that killed, imprisoned, and exiled thousands of people, the accumulation of debt, economic collapse, financial speculation and capital flight. In the hope of dealing with these problems, the population initially accepted the structural adjustment programme imposed by the Menem government according to instructions from international financial institutions such as the World Bank (WB) and the International Monetary Fund (IMF). However, instead of being reduced, the country's debt tripled during this period. Meanwhile, as a consequence of de-industrialisation, devaluation of the peso, and increased costs for basic necessities, the proportion of people living below the poverty line has now risen above 50%. Basic foodstuffs such as milk have to be supplemented with imports at greater cost because soya has displaced dairy farming and the production of other food staples such as lentils.

RR soya was introduced in 1996 without any consultation with either the public or the Argentine Congress. Promoted by the biotech companies and their allies, it has spread extremely rapidly throughout the country. Argentina has also become the source of GE seed smuggled across its borders into neighbouring countries where its cultivation has not yet been legalised. The construction of a massive waterway to facilitate exports from the countries of southern South America (Argentina, Brazil, Uruguay, Paraguay and Bolivia) is intimately linked with the designation of the region as an exporter of GE soya. The social and environmental impacts of this project will be immense.

The immediate consequences of growing RR soya in Argentina, visible after only 8 years, include a massive exodus from the countryside as small farmers find they can no longer make a living or are driven off their land by interests that often use threats and violence to achieve their aims. People are leaving the land in large numbers for towns in the rural areas or the outskirts of the large cities. Here there is no work and many are forced to live by collecting rubbish or selling cheap imported goods on the streets.

The use of agrochemicals (especially glyphosate) and chemical fertilisers has greatly increased and the aerial spraying of herbicides has led to ecological contamination and health problems. Deforestation is accelerating and biodiversity is being seriously affected. Soil quality and water resources are being damaged by intensive agriculture. Hunger and malnutrition have appeared in a country long accustomed to producing 8 to 10 times as much food as its population required. Herbicide tolerant weeds and new diseases have emerged in response to the establishment of soya monocultures. These require the application of more agrochemicals and threaten production levels. *Phakopsora Pachyrhyzi* or "Asian rust", which can cause yield losses of up to 80%, has already spread throughout the whole of the region where RR soya is being grown in the 3 years since it first appeared.

Now RR soya is being imposed on Argentina's poor as a substitute for meat, milk, eggs, lentils and other traditional products. Such initiatives are often presented as charitable projects and backed by those profiting from soya production.

However, the government sees the export of RR soya as a key factor in servicing the country's enormous debt. When the international price of soya is high, tax revenues are good. But depending on the international price for a single commodity is not a secure basis for economic health. Argentina is a warning that GE crops are not a solution, to debt, hunger or poverty; in fact they are a threat to food sovereignty and food security and a tool for inducing dependence. Furthermore, the production of GE crops for export is not sustainable in the long term, yet once people have left the land, once the soil has been contaminated and impoverished, once the forests have gone, it is extremely difficult to reverse the situation.

The case of Argentina shows that following the neo-liberal recipe for development has been a disaster. It has seriously undermined Argentina's food sovereignty and greatly increased its dependency and poverty among its population. Above all, it reveals how GE biotechnology and external debt can undermine and destabilise both political sovereignty and food sovereignty in a country with a large agricultural sector.

The imposition of GE crops proceeds apace in the third world. New types of GE crop are being promised, such as crops with improved nutritional qualities, crops that are drought and salt resistant, and crops that express vaccines and other pharmaceuticals. However, these promises have yet to be fulfilled, may never materialise, and need to be treated with caution. The experience of Argentina has been that GE crops take agriculture further down the road of intensification and mechanisation, reducing diversity, promoting monocultures, and destroying forests. Even if some large farmers are benefiting, many small farmers have been driven off

the land, further disrupting an already fragile rural fabric. Now the country is trapped by a massive debt and, in order to pay the service charges, it depends on the money it can earn from a commodity that is at the mercy of unstable international commodity markets.

Brief historical background and context for the introduction of soya monocultures

We begin with an overview of the development of agriculture in Argentina, especially in the Pampas region, from before the colony was established until the formation of the national state in 1853. During this period, the country gradually defined its role as that of a producer of raw materials for export to Europe.

The Argentine Republic occupies a vast area of 2,780,400 km² with important regional differences regarding geography, climate and ethnic groups. From the end of the nineteenth century, the country became an exporter of agricultural products, mainly meat and cereals produced in the Pampas region. Other regions are also noted for different products: in the east, wine has been produced for more than a century; in the north west, sugar cane and *maté*; in the north east the *quebracho* (a tree similar in properties to the oak) and cotton; in the south, sheep and fruit.

Before the arrival of the Spaniards, the Pampas was a sparsely populated desert region, where there had previously been no agriculture. Small groups of semi-nomadic indigenous hunters of *guanacos*, rheas (relatives of the ostrich) and small deer lived there. Archaeological remains indicate a sophisticated level of agriculture in the North East, with the remains of terraces and irrigation channels in the province of Jujuy. Pumpkin seeds and varieties of maize and quinoa (a high protein grain) have been found that date from the early Christian era. In the moist flatlands of the north, where rural communities are currently being affected by glyphosate and other chemicals applied to transgenic soya, the indigenous people also cultivated these types of crops, along with sweet potato, manioc, beans and cotton.

When the Spaniards arrived, those who settled in the province of Santa Fé introduced wheat, barley and possibly planted vegetable gardens. Records show that the fertility of the soil around Buenos Aires meant that a farm of 472 hectares could yield 472 tonnes of wheat, 341 of barley and 28.8 tonnes of maize. However, the colonists encountered fierce resistance from the region's indigenous populations. By 1780 they still only controlled an area up to 150 km from the port of Buenos Aires.

In the North, the colonists exploited the indigenous peoples. They introduced cotton to Tucumán and Santiago del Estero. In Cordoba, where peasants are now fighting the imposition of GE crops, the colonists produced wine, cereal and cotton. In Buenos Aires, agriculture was confined to small areas clustered around the trading centre of the cities. Yet agriculture did not flourish fully in the Pampas region. This can be explained by the importance given to the industries that produced leather and salted meat; the damage caused by livestock due to a lack of fences; the threat posed by indigenous groups; the taxes that local authorities imposed on cereals; and the scarcity of labour for harvest time.

After the signing of the new constitution in 1853, Argentina became a nation and began to set up the current institutional arrangements, which included 23 federal provinces, executive power, legislative power and provincial and national parliaments. From that point on, Argentina became an exporter of primary products and an importer of manufactured goods. Britain, as one of the major industrial centres and the dominant global power of the nineteenth century, saw the role of peripheral regions such as Argentina as exporters of food and raw materials to the industrial centre of its empire.

After 1853, in a campaign euphemistically dubbed "the conquest of the desert", the Argentine government set about massacring those indigenous populations who resisted European colonisation in the south and northwest Pampas, thereby completely changing the ethnic composition of the region. This was done in the name of "development" and buoyed by the desire to produce for the foreign markets of the industrial north. International capital invested in these newly opened-up territories, which soon began producing food and raw materials for export. The development of Argentina's transportation infrastructure put further pressure on the Pampas region and its isolated communities. By 1874, livestock accounted for 94.51% of Argentina's exports with other kinds of agricultural production reaching just 0.29% of the country's total exports. However, this soon began to change.

Incentives for agricultural production throughout Argentina's history

After the political developments of the 1850s, the construction of the railways, dominated by British capital, fuelled the agricultural trade. But the railways served to increase social isolation in rural areas. Instead of linking farming communities with each other, the railway grid only served to link the farms with Argentina's ports. Farmers soon became more isolated, especially in the Pampas. At this time, when farms averaged 30 hectares in size, people would have to walk or ride on horseback a good distance to reach their neighbours. As farming plots increased to an average size of 200 hectares, contact between

local institutions and farms became even more difficult.

In the latter half of the nineteenth century Argentina relied on a development model similar to the one used today and based on exporting primary products. Large-scale grain production was seen as a solution to national economic crises. Then Argentina's main export commodities included wheat, maize and flax, while today GE soya has taken over. However, the consequences at that time were very different for a number of reasons:

- Pesticides were not used and producers could keep their seed and replant without paying royalties.
- Plenty of labour was also needed in agriculture and related industries.
- Production was also consumed internally, as part of the traditional food culture.
- Land tenancy was also diverse. In the past, producers understood local realities and practiced agriculture according to traditional knowledge accumulated over generations. The introduction of industrial agriculture changed this trend and the companies now involved ask few questions about the environmental and social impact of GE crops.

Historical parallels in moments of crisis

In 1890 Argentina collapsed economically, mainly as a consequence to the massive debt the country had contracted. This was due to a variety of factors. France and Britain saw Argentina as a prime target for their manufactures and made commercial agreements with Argentina that favoured their interests. Argentina became indebted, could not pay and suffered a British blockade which strangled its trade for a time. Successive governments made unsuccessful attempts to address the debt problem, thereby worsening the situation. Argentina was also involved in a number of wars including a 10 year civil war starting in 1854, during which debt servicing was suspended. After 1870, wishing to convert itself into a modern and progressive nation, the wealthy sought to consume expensive imports and the government spent large sums on infrastructure (railways and ports) for imports and exports.¹ The consequences were very similar to the crisis of 2001. In 2001 Argentina collapsed economically because of the debt contracted since the military dictatorship and later during the administrations of Menem and de la Rúa. In 1890 the Argentinean peso was devalued against gold to almost half its value. In 2002 as a consequence of the economic crisis the peso was devalued against the dollar to one third of its value.

On both occasions, devaluation was a blessing for exports, because the entry of foreign exchange seemed to help the country to recover quickly from its collapse. In 2003 the economy grew by 7.7%. Even so, unemployment continued to be as high as it

had been at the height of the crisis.² It is probable that the apparent growth was actually a result of the rise in exports, because traditional industrial activity continues in a state of collapse and the industry that has grown out of soya scarcely needs any labour. By contrast, at the beginning of the 20th Century the food industry benefited from diversified agricultural production, which, together with industries around its derivatives, created sources of work.³

Routes for exporting raw materials: from railway to waterway

In 1890, British investment in Argentina declined, but built up again in the early twentieth century in the railway construction industry. British investment in this sector rose from £7.6 million at the end of 1880 to £215 million at the end of 1913, a thirty-fold increase.

The Paraná-Paraguay waterway project is the modern-day equivalent to the extension of the railways in the nineteenth and early twentieth centuries, and is based around the same principle of providing rapid and cheap access for primary commodities to the ports for export. This new project shows that policy-makers have already determined South America's economic role to be providers of soya beans for the international market.

Estimates suggest that the shipping of agricultural commodities and fertilisers will account for 59.1% of all goods transported on the waterway.⁴ The Paraná-Paraguay waterway will incorporate 3,442 kilometres of navigable canal routes, giving access to an area 700,000 km² encompassing the states of Mato Grosso and Mato Grosso do Sul in Brazil; Santa Cruz in Bolivia; the whole of Paraguay; the region of Colonia in Uruguay; and eight Argentine provinces, including Córdoba.

Both the United Nations Development Programme (UNDP) and the Inter American Development Bank (IADB) financed the feasibility studies for the Paraná-Paraguay waterway. Current investment is being supplied not by private capital but by public money from the governments involved in the project. This money is being invested in work to improve the waterway's navigability, which involves dredging riverbeds, changing the course of adjoining rivers, and correcting and stabilising navigation channels to allow freight ships to operate non-stop all year round. The waterway is designed to give access to huge freight ships, which must conform to minimum criteria of 10 feet in draught, 350 metres in length, and 60 metres in width. Ships with a draught of 35 feet will be able to reach the port of San Martín (Santa Fé) and those with a draught of 22 feet will be able to reach the port of Santa Fé itself. The development of the waterway has recently been paralysed for political and economic reasons, thus putting the project on hold for the time being. The holding company for North-American water transport companies, American Commercial Lines, plans to

transport 70,000 tonnes per day of oil seeds to the industrial oil complex ROSAFE near Rosario on this network.

The environmental impact of the waterway is incalculable. Local environment groups say that changing the courses of rivers to increase their width and depth so that ships can continue to move even in the dry seasons will greatly disturb the ecological balance of the region. The area is rich in wildlife: 170 species of fish, 30 types of amphibians, 1,100 butterfly varieties and 650 bird species have been identified. Jaguar, marsh deer, ant bear, armadillo, giant otter, and capybara also dwell in the region.

The NGO network Rios Vivos is critical of the project, saying: "the official studies are very limited. They ignore important cumulative, direct and indirect impacts, and over-estimate the benefits of the project".

There are clear similarities between the aims of the railway and the waterway projects:

- Both base economic production on agricultural exports, replacing the extensive production of the railway era with intensive production now.
- Devaluation further encourages the export model.
- Infrastructural investment is solely designed to get products to the ports of exit.

In November 2004, President Hu of China made a two-week visit to Latin America. He has said that China plans to invest US\$100 billion (£55 billion) in the continent over the next decade. Nearly US\$20 billion of this will be invested in Argentina and a major target will be developing Argentine railways. This will facilitate exports to China, which currently imports 30% of Argentina's soya production, and is scheduled to increase its demand rapidly. Of particular interest is the Belgrano Cargo railway, which has been put out to tender for development. It crosses 14 Argentine provinces and connects to Bolivia and Chile. The transnational company Cargill has also been mentioned as a possible investor in this railway, which would provide access to the Pacific for Chinese exports. China also plans to invest US\$7 billion (£4 billion) in Brazilian infrastructure to facilitate trade.⁵

The neo-liberal model has also re-imposed the old vicious "boom and bust" cycle, forcing Argentina to export primary commodities in an attempt to repay its debt. One man in particular was responsible for promoting the expansion of the debt from 1976 onwards, the finance minister of the last Argentine dictatorship: José Martínez de Hoz. In 1967 he criticised the Peronist government of 1945 to 1955 for removing incentives for agricultural exports, and for promoting the internal consumption of food products. He believed that the export of raw materials, particularly agricultural, would enable the country to purchase new technology for the exploitation of primary products, thus balancing Argentina's economy.

In his publication '*Agriculture and cattle ranching in Argentina between 1930-60*' he wrote that key factors in achieving a more efficient production (e.g. of commodities) include: using fertilisers for intensive farming; expanding irrigation; using mechanical and chemical methods of weed control; fighting disease in animals and crops; and better management of the land. He ends prophetically: "this cannot be achieved in a day. Nevertheless it is urgent to commit ourselves to it fully. At the same time it is essential to ensure stability and continuity. ... Only thus will Argentina recover her production and export capacity in cattle and agricultural products, which in turn will enable her to achieve harmonious economic development and progress, along with a stable and secure financial climate." Martínez de Hoz laid the foundations for the establishment, 37 years later, of a soya republic.

In the 1970s production methods changed with the introduction of hybrid seeds (such as wheat developed from Mexican germplasm) and nitrogen fertilisers. Phosphate trials began at the same time in the south of Buenos Aires and by the end of the 1970s the use of hybrid seeds with mechanical harvesting was widespread. However, as Martínez de Hoz noted, the majority of Argentina's agricultural output was destined for internal consumption.

In 1984 the new democratic government noted that the use of fertiliser was still low. They developed a plan to exchange fertilisers for some of the grain produced, which increased fertiliser use in 1984 and 1985. International prices did not favour exports until the mid-1980s.

Debt and soya

Now that the production of soya has been established as a means through which to escape Argentina's economic crisis, it is difficult to openly admit that it has also brought disaster and mortgaged the country's future. Shortly after the 2001 crisis, a member of the national congress reported that he had expressed concern in a parliamentary meeting over the negative impacts already apparent from the massive increase in soya cultivation. Afterwards a colleague came up and asked him to keep quiet, because soya would pay Argentina's debt. The economic dependence caused by the soya monoculture increases constantly. Soya plays the same role in Argentina as bananas in Ecuador, oil in Venezuela, and coffee in Nicaragua.

Towards soya dependence

Argentina today finds itself in a profound economic crisis, which is not due to natural catastrophes, war, or a global economic crisis. Two major causes are the national debt and the neo-liberal reforms carried out under the administration of Menem in the 1990s. The military junta, which ruled from 1976 to 1983, began the massive acquisition of debt that was not aimed to benefit the public but its own members. The

junta systematically assassinated almost thirty thousand people, many of whom were young adults who might well have opposed the new economic model. Yet, at the same time, the military junta received loans from multilateral organisations such as the World Bank and the International Monetary Fund, with the help of the Club of Paris. These loans provided to the military junta by the international financial institutions were declared illegal by Argentina's Federal Justice Department in 2000.

Between 1976 and 1982, the enormous influx of credit was fuelled by a climate of financial speculation. Massive short-term returns meant that capital entered and left rapidly. This made it possible for a very small economic group to take control of economic policy and led to the application of neo-liberalism in the 1990s. De-industrialisation and the concentration of production in the hands of a few led to economic stagnation and, as industrial activity fell, the number of factories and factory jobs declined rapidly. Between 1974 and 1994, census figures show that 30% of Argentina's industrial units were lost (some 35,000). There are no census figures yet available for 1994 to 2004, but evidence suggests that Argentina's national industry continues to decline.

The first years of democratic government (1983 to 1989)

The first years of democratic government began with hyperinflation caused by speculation on the US dollar against the Argentine peso and unfavourable international conditions, including, between 1986 and 1987, a decrease in the price for key export grains. In 1987 the state was already unable to control the decline in incomes; the level of subsidies to the financial system; the growth in funds transferred outside the country; and the servicing of the debt. These factors contributed to the collapse of the fiscal system in 1989. The economic chaos that ensued, with de-industrialisation and concentration of the economy in a few hands, was the perfect context for the structural changes brought about under the presidency of Carlos Menem.

The presidency of Carlos Menem (1989 to 1999)

In 1989 Argentines, weary of the threat of economic meltdown, chose to hear the siren songs of Carlos Menem's administration, which propagated the idea that Argentina needed to take its rightful place as a "first world" nation. In the hope of achieving this goal, Menem privatised the state enterprises he deemed to be uneconomical and inefficient. He also claimed that the state pensions system could no longer guarantee economic security for the nation in the long-term. As a result, Argentina's pensions system was transferred to the hands of private enterprise. There were cuts and privatisation in health and education, and even

scientific research passed from the public sector to the private sector, becoming reliant on private finance. These changes meant that more loans were necessary to pay off previous debts and fulfil the objectives of state reform. With wide support from the middle-class and politicians, who did not question the potential implications of such radical free-market adjustments, the process was swift and aggressive, and protests from those who soon began to lose their jobs, their income, livelihoods, homes, or savings, were duly ignored.

When the creditors called in the IMF and the World Bank, "economic reform" was prescribed in the following manner:

- Monetary reform was implemented through the so-called convertibility law to stop inflation and the value of the peso was pegged to the dollar
- Fiscal reform meant tax breaks for business, especially on imports and exports (the aim being to encourage international commerce and inward-investment to guarantee the inward flow of capital)
- Reform of the public sector and privatisation of state enterprises
- Restructuring of the welfare system and shifting from state pension contributions to private pension funds
- Market reform, removing taxes and restrictions on imports.

Carlos Menem's government told the Argentine public these changes had three aims: to cut unnecessary state (public) expenditure; obtain foreign exchange to enable the treasury to pay the debt; and make public services more efficient. However, the national debt in fact tripled during this period. It had previously been reduced to less than 4% in 1992 but then grew rapidly, partly because the state took on the debt contracted in the past by the newly privatised public companies. By 1997, the debt had already reached 125 billion dollars, by 1999 it was some 145 billion dollars and by 2003 it stood at 198 billion dollars. This new debt had a new aspect: the systematic flight of capital, a problem that was not addressed by the economic establishment of the time.

All this forced the increased exploitation of natural resources and the reduction of industrial activity, which could otherwise have added value to the raw materials produced in the country. The freeing of the markets, supported by monetary reform, favoured imported products at the expense of Argentine products. The latter ceased to be competitive, not only on international markets but at home as well. Thus it was that Argentina found itself once more exporting leather and importing shoes, exporting cotton and importing textiles and clothes; exporting cereals and importing pasta and biscuits, exporting gas and petroleum and reducing production of petrochemicals and refined oils. As a result, the balance of trade deteriorated, increasing

indebtedness and leading to the crisis of December 2001.

Structural change and biotechnology: how soya monocultures were installed in Argentina

Changes in agriculture during the 1990s were based on three pillars of the programme for structural adjustment outlined above:

- Monetary reform
- Fiscal reform
- Market freedom

In addition, agricultural commodities were commanding high prices that peaked in 1997, coinciding with the entry of GE seeds into the market.

In 1996 the Secretariat for Agriculture, Cattle, Fisheries and Food (SAGPyA) gave a licence to Monsanto for the commercial production of GE (RoundUp Ready or RR) soya resistant to glyphosate, the herbicide produced by the same company. Because the peso was artificially over-valued, grain exports from Argentina had not been able to compete on the international market. Soya was different not only because of the high price it commanded, but also because at that point Monsanto was offering GE soya seed for sale without royalty charges, at a price only a fraction higher than that for conventional seed. Glyphosate was also cheaper than it was for US farmers, for example.

For creditors, GE commodity crops are a blessing because they do not require large investments or external loans. Everything is in the hands of the companies, which hold the land and exploit it. The production of GE commodity crops suits the state in the short term because the high price generates foreign exchange, which reduces pressure on the national currency. From 2002 export taxes were re-established and treasury reserves began to grow, so the multilateral credit institutions were able to start collecting interest again. Moreover, the taxes on soya exports were intended to help to fund the assistance plans (see page 16) such as the Family Heads Plan (Plan Jefas y Jefes de Hogar which provides £25 (US\$48) a month to unemployed heads of households) that, in turn, were designed to keep social unrest to a minimum. Soya beans, soya oil, and soya flour top the list of goods exported, amounting to some US\$6.271 billion of the US\$31.500 billion earned by the country between January and November 2004. 23% of this income went to the treasury but less of it reached the unemployed than had been promised.

Argentina is one of the largest global exporters of processed soya products, such as oil and flour, accounting for 50% of world production. Little is consumed internally, so between 90 and 95% of Argentina's soya production is exported to 150

destinations, primarily in China and Europe.⁶ Structural adjustment caused a dramatic growth in exports of GE soya and conventional maize, due to the rapid conversion of cattle pasture to soya monocultures. Foreign exchange was thus generated through exports.

The free entry and repatriation of investment capital made Argentina one of the best markets in Latin America for investment. Companies like Monsanto found it profitable to establish factories in Argentina for the production of herbicides, using imported raw materials. They could then sell their chemicals on the local market and take their profits out of the country without restriction. The purchase of imported agricultural machinery and agrochemicals increased significantly.

Changes in the regulations meant that until 2002 exports were exempt from taxes, so the high prices of 1997 speeded up the expansion of GE soya and in spite of later fluctuations in price, soya production continued to be profitable.

Because high interest rates made credit expensive, many producers decided to take the packages offered by the seed, chemical and fertiliser distributors, which they paid for after the harvest. Since there is no legal framework in Argentina to protect small producers from market forces, many can no longer afford to farm. Some who got into debt due to the recession have tried to find a way out by renting their land to the companies for soya production because the returns on soya are higher than for, for example, milk. However, the price for soya fluctuates a good deal and when it falls, rents for land also fall, making life still harder for such people. Renting out their land to others is thus often the first step towards losing it altogether (see also page 16).

Present and future perspectives

In 2003, soya and its derivatives represented 25% of the country's total income from exports and 50% of the taxes raised on the income from exports. A quarter of the debt service charges were paid with these taxes. GE soya exports have two functions:

- To keep the peso stable against the US dollar
- To provide the national treasury with significant income from taxes

By the end of 2003, Argentina's external debt, including interest, stood at US\$198 billion dollars, 68% of which was owed to private investors and 22% to multilateral credit agencies.

In September 2003 Argentina agreed with the IMF to repay US\$4.2 billion a year over the next three years. This is based on the assumption that Argentina's gross national product (GNP) will increase by 3% per year. It is expected that 40% of the total repayment will come from taxes on exports of soya and its derivatives.

Soya and the economic forecast

During 2004 the government hoped to raise US \$2.5 billion from soya export taxes, to help stabilise the Argentine peso against the US dollar. However, by the end of 2004 it expected to collect only US\$ 1.7 billion. Even though this figure is less than expected, it enables the government to reach the fiscal targets imposed by the IMF. The reduction was due mainly to the fall in the international price of soya, following its record high in March 2004 of \$US380 per tonne. This fall has had wide consequences.

At the beginning of 2004 the Argentinean government was forecasting an increase in the value of the Argentina peso against the US dollar between 2004-2006. This forecast was based on the assumption that both the price and production levels of soya would increase during the year. Thus local banks began to prepare new financial products based on the international price of soya. However, these forecasts were based on weak premises, such as forecast quotes for international commodity prices. The market is based in just a few countries. There are few producers and buyers and any change in the situation can provoke abrupt price fluctuations. In fact, the forecasts did not coincide with the actual harvest for 2004. In view of the fluctuation in harvests and international prices, it is unwise to rely on soya as a way out of Argentina's crisis.

In conclusion, under the current neo-liberal model, the only way forward for indebted countries such as Argentina is to exploit their natural resources for export, regardless of the needs of their citizens and the threat to the environment in the short, medium and long term.

The silent introduction and expansion of GE crops in Argentina threatens food sovereignty

Under the title of "Agricultural Biosafety", the National Advisory Commission on Agricultural Biotechnology ⁷ (*CONABIA - La Comisión Nacional Asesora de Biotecnología Agropecuaria*) says:

"In Argentina, from 1991 onwards, the private sector and national research organisations began to be interested in trials of GE organisms. CONABIA came into being as a consultancy offering technical support and advice to the Secretariat of Agriculture, Fisheries and Food on how to formulate and implement regulation for the introduction and deliberate release into the environment of GE materials."

During the government of Carlos Menem a large number of GE trials took place. CONABIA can account for 667 trials granted between 1991 and 2003. In 1991, Calgene received permission for trials of Bt cotton, Nidera S.A for RR soya, and Ciba Geigy and Argentina SAIC for maize. Gradually other transnational companies joined in, such as

Monsanto, Cargill, AgrEvo, Pioneer, Mycogen, Zeneca, Novartis, Dow AgroScience and Syngenta.

Ordinary Argentineans were excluded from the discussions. Both state and private organisations considered it unnecessary to inform the public before they took the decision to introduce GE crops to the country. Nor did they consult the National Congress. The contracts with the companies were agreed through a purely administrative process.

The crops that received the largest number of trials before 2003 were maize (47%), sunflower (12%), soya (16%) and cotton (8%). These were followed by wheat (2%), potato (2%), alfalfa (3%), rice (6%) and others (4%). The specific traits incorporated in these crops ranged from herbicide tolerance (34%), insect resistance (40%) fungus resistance (6%) and virus tolerance (2%) crops with more than one GE characteristic (4%), nutritional quality (1%), and unspecified modifications (13%).

In Resolution 39/2003 SAGPyA the Secretariat for Agriculture, Cattle, Fisheries and Food set out their requirements in connection with information about the deliberate release of GE crops. The requirements do not measure up to concerns over democracy, safety, and contamination issues.

For example, once the authorisation for a deliberate release has been given, the company may request a flexible permit. If this is granted, it means that, based on the information presented, no biosafety problems are foreseen. For future deliberate releases of the same crop, only information regarding the size of the area planted, the location and the date of harvest are required. CONABIA only recommends inspection of the harvest and final disposal of the GE material. The companies seeking these releases considered that information about them should be treated as confidential.

CONABIA consists of, among others, members of the department of Agriculture, Cattle, Fisheries and Food, the University of Buenos Aires, the former Institute of Seeds, the National Institute of Cattle Farming Technology (INTA), Natural Resources, The National Service of Food Quality and Safety, the National Research, Science and Technology Commission. In addition there are high-ranking employees of Monsanto, Syngenta, Dow Agrosiences, Bayer CropScience and the Argentine Forum on Biotechnology. CONABIA does not include a single member of consumer or environmental organisation.

Amidst all the proposals for deliberate release to the environment, there was one that failed to receive authorisation in April 1997: transgenic GT73 canola, aimed at multiplying seed for export to Canada. It was argued that there are too many wild relatives of this crop in Argentina to justify deliberate release. Those who wrote the paragraphs denying permission had to be very careful not to contradict the basis for other releases, such as those for potato, wheat and maize, for example. Perhaps the canola case was

simply designed to demonstrate that, amidst all the permissions granted, there was at least one refusal.

CONABIA supplies experts to examine the confidential information provided by the companies. Many are employees of the biotech industry. The scientists in CONABIA depend directly on the funds the companies provide for their research and resent any challenge to their position.

Fear of losing funding or employment means that few voices are raised in the biological departments of the academic system. Until 2001, even the scientists working on molecular biology had no idea that in Argentina millions of hectares of GE soya were being planted. These are health professionals with years of experience in molecular science, many of them involved in investigating diseases related to rural poverty. For many, discussion of GE crops is purely theoretical, a phase of investigation. If this is the case in the scientific world, the ignorance of the rest of the population can only be imagined. This casts doubt on the risk assessments of CONABIA, which constantly defends the agricultural policy of recent years, in spite of mounting evidence against it.

Beneficiaries of commercialisation of soya

The companies that have commercialised RoundUp Ready Soya seed are Nidera (58%), Monsanto (19%), Don Mario (16%) and Relmo (3%) and they all have a licence to use Monsanto's technology. For Monsanto, soya seed represents only 10% of its business in Argentina. The other 90% includes agrochemicals, maize hybrids and sunflower and sorghum. Once they had succeeded in turning Argentina into a soya nation, the companies began to pressurise the government to allow them to collect royalties from the producers of RR soya.⁹ They threatened to "stop investing in scientific research in the country", if the government did not devise a method of doing so. A number of different schemes have been proposed but none has yet been finally

adopted and the black market and seed saving continue. On December 14th 2004, the SAGPyA announced that a Compromise Agreement for payment of royalties had been agreed between the Secretary of Agriculture, Miguel Campos and a number of Argentine organisations involved in seed production and agriculture.¹⁰

Argentina was also the point from which GE soya seeds were dispersed to the rest of the southern part of Latin America. From Argentina, GE soya seed was taken illegally to Brazil, Paraguay and Bolivia despite the fact that none of these countries had at that point legalised the commercial growing of transgenic crops and Monsanto soon began demanding royalty payments from these countries. However, Brasil and Paraguay have now legalised commercial growing. With the GMO law still pending in Congress, President Lula of Brasil passed a further decree permitting cultivation of GMOs from October 2004 until 31 January 2006.¹¹ At the same time, Paraguay, the sixth largest world producer of soya, with some 1.5 million ha, licensed the cultivation of herbicide tolerant GM soya and the agreement includes rules for the collection of royalties.¹²

In the "Report on Progress in Argentina", produced in connection with workshops held in Chile in November 2003 by the UNEP-GEF programme for the Development of a National Biosafety Framework,¹³ the writers only take into account what is put forward in support of the transnational seed and chemical companies. No mention is made of the organised acts of violence and intimidation carried out by the GE soya producers against the peasants of Santiago del Estero and indigenous groups in Salta. There is no mention of the problems caused by the huge increase in the use of agrochemicals and the contamination caused all over the country since the introduction of GE soya. There is no mention of the deforestation, the flooding, or the climate change, the impact on the native flora and fauna in the areas of greatest biodiversity, or the

Period	Soya: Increase in surface area [ha x 1000]	% Increase in area compared to previous period	Productivity [tonnes x 1000]	Yield [kg / ha]	% Variations in annual yield
Jan 1970 – March 1972	95.65	-	136.33	1425	-
Jan 1980 – March 1982	2,100.00	2095	3,973.30	1892	32.0
Jan 1990 – March 1992	5,088.67	142	11,031.30	2168	14.5
2000 - 2001	10,300.00	102	25,500.00	2476	14.0
2001 - 2002	11,639.00	13	29,955.30	2573	4.0
2002 - 2003	12,607.00	9	34,800.00	2760	7.2
2003 - 2004	14,100.00	12	34,770.00	2466	-10.6

Table 1: Evolution of soya production at national level ⁸

impact on indigenous people. Nor do they mention that public opinion was not consulted before or since commercial cultivation began, even though the production of GE soya for export as animal feed has been at the expense of the production of traditional crops, food security and sovereignty. Only in 2003 was there a project for consultation, long after the event.¹⁴ UNEP's failure to provide this information could be described as dangerous negligence, similar to that shown by the companies and those who defend them in the national institutions, CONABIA and SAGPyA.

The Expansion of GE soya

Soya production has increased from 95,650 hectares in 1970-72 to more than 14 million ha in 2003-4, as shown in **Table 1**. The significance of the data presented in Table 1 is that the growth in surface area dedicated to GE soya has been at the expense of other crops and the marginalisation of cattle and dairy farming.

A graph showing the evolution of the area planted, yields and production levels up to 2002 may be found at the SAGPyA website.¹⁵

However, even though the area planted with soya in the period 2003 to 2004 increased by 12%, production actually fell in the early 2004 harvest¹⁶ by 10.6%. This means that a further 1.5 million hectares of other crops and forest areas were sacrificed, yet overall production fell. Nevertheless, record prices meant that soya was still worthwhile for companies profiting from either the sale of exports or the agrochemicals essential for the crop's continued cultivation.

The Ministry for Agriculture, Cattle, Fisheries and Food (SAGPyA) continues to claim:

"The principal objectives of agricultural biotechnology are to improve the quality, security and safety of agricultural products, increase yields and promote a more rational use of agrochemicals."¹⁷

Table 2 shows the increase in the area planted with soya in the different Argentine provinces comparing two three-year periods: 1990-1993 and 1998-2001.

Provinces	Córdoba	Santa Fé	Buenos Aires	Entre Ríos	Santiago del Estero	Tucumán	Salta	Chaco	National
Area planted	111%	49%	50%	620%	262%	74%	74%	293%	82%

Table 2: Percentage increases of soya cultivation comparing 1990-1993 with 1998-2001 ¹⁸

Food sovereignty threatened by the GE soya export model

From the 19th Century, Argentina became used to thinking of itself as a country that produced 8-10 times as much food as its population needed. In spite of unjust land distribution, hunger was uncommon. However, the package of GE soya, agrochemicals and direct drilling agriculture has aggravated social injustice and concentrated capital and land management in the hands of a few companies. It has also supplanted traditional crops and changed the landscape, threatening food sovereignty as never before.

Defining Food Sovereignty

Via Campesina (the alliance of small scale farmers organisations, landless peasants and indigenous communities) described Food Sovereignty for farmers and countries of the South in the following terms in 2003:

Food Sovereignty is the people's, Country's or State Union's RIGHT to define their agricultural and food policy, without any dumping vis-a-vis third countries.

Via Campesina further states:

Food sovereignty includes:

- Prioritising local agricultural production in order to feed the people, access of peasants and landless people to land, water, seeds, and credit. Hence the need for land reforms, for fighting against GMOs, for free access to seeds, and safeguarding water as a public good to be sustainably distributed.
- The right of farmers, peasants to produce food and the right of consumers to be able to decide what they consume, and how and by whom it is produced.
- The right of countries to protect themselves from too low priced agricultural and food imports.
- Agricultural prices linked to production costs: they can be achieved if the countries or union of states are entitled to impose taxes on excessively cheap imports, if they commit themselves in favour of a sustainable farm production, and if they control production on the inner market so as to avoid structural surpluses.
- The populations taking part in the agricultural choices.
- The recognition of women farmers' rights, who play a major role in agricultural production and in food.

Year	Rice	Maize	Sunflower	Wheat	Soya
1996 to 1997	226.573	4.153.400	3.119.750	7.366.850	6.669.500
2001 to 2002	126.519	3.064.276	2.050.365	7.108.900	11.639.240
Change	- 44,1%	- 26,2%	- 34,2%	- 3,5%	+ 74,5%

Table 3. Changes in the production of the most important crops between 1996 to 1997 and 2001 to 2002 [hectares].¹⁹

Other definitions include that of the People's Food Sovereignty Network Asia Pacific:

Food sovereignty is the people's and communities' fundamental right to determine their food and agricultural policies. It is the right to access and control of their means of production. It is the right to safe, culturally appropriate foods and sustainable food production.

Finally, the full political statement of the NGO/CSO Forum for Food Sovereignty at the World Food Summit 2002, Rome, states:

Food Sovereignty means the primacy of people's and communities' rights to food and food production over trade concerns. This entails the support and promotion of local markets and producers over production for export and food imports.

Losing traditional crops

Tables 3 and 4 show how the advance of GE soya has displaced traditional crops.

In the 2002 to 2003 season, soya cultivation increased to 13 million hectares. Estimates suggest soya cultivation increased to over 14 million hectares during the 2003-2004 season.

Cotton

One of the industries that benefited from devaluation of the peso was the textile industry, which began to prosper in 2002 after a long period of decline. The best cotton harvest of the decade was 1997-1998, when 1,133,950 hectares of cotton were planted and 877,900 tonnes of the crop were harvested. In 2002 –to 2003 only 157,930 hectares were planted and 146,230 tonnes harvested, according to the

Argentine Chamber of Cotton. Apparently this fall in cultivation occurred even though climatic conditions had been excellent and there were few disease problems, so the yield had been good. However, because cotton plantations required a considerable amount of initial investment, farmers instead opted for soya, even though the economic returns for cotton are more favourable. In 2002-2003 only 64,000 tonnes of cotton fibre were produced, even though the domestic textile industry needs 120,000 to 130,000 tonnes. The shortfall had to be imported at a higher cost.²¹

Moreover, when problems with pests were observed, no funds were made available to prevent them, as has been the normal practice historically.²² However, it was reported that there had been plenty of investment to develop the INTA Laboratory for GE Biotechnology (Estación Experimental del INTA Sáenz Peña) and to develop new GE cotton varieties.²³ Biotechnology is receiving the majority of financial support instead of cheaper techniques that have stood the test of time and are effective when applied properly. The same has happened in health care, where funds have been reduced for preventive medicine.

Falling production and higher prices: vegetables, meat and milk

The loss of certain traditional crops and the fall in production of others means that some must now be imported. Prices increase in the local market, which means that the poor, whether badly paid or unemployed, find it harder to purchase traditional foods. Those who cannot pay must survive on handouts, leftovers and produce that cannot be sold.²⁴

Year	Rice	Maize	Sunflower	Wheat	Soya
1996 to 1997	1.205.140	15.536.820	5.450.000	15.913.600	11.004.890
1997 to 1998	1.011.135	19.360.656	5.599.880	14.800.230	18.732.172
1998 to 1999	1.658.200	13.504.100	7.125.140	12.443.000	20.000.000
1999 to 2000	903.630	16.781.400	6.069.655	15.302.560	20.206.600
2000 to 2001	859.140	15.365.047	3.179.043	15.959.352	26.882.912
2001 to 2002	713.449	14.710.352	3.843.579	15.291.660	30.000.000

Table 4: Changes in production between 1996/1997 and 2001/2002 [tonnes].²⁰

During 2002, the most severe price increases affected dried lentils (272.27%), maize oil (218.9%), wheat flour 162.7%, tomatoes (159.3%), tinned peas (157.5%), potatoes (138.5%) and white rice (130%).²⁵ Between January and March 2004, the price of meat increased by 20%.²⁶ In addition to losing pastureland to soya, producers preferred to fatten their animals for the international market in order to get a better price for them. As a result, many Argentines can no longer afford to eat meat. The same is true of milk, where people are forced to buy costly imported milk, or use soya instead. At the same time, producers are not paid enough for their milk to enable them to keep afloat financially, so many of them closed their dairy farms, sold their cattle to the meat markets and started to plant soya or maize instead. The result was that milk production fell from 10,500 million litres in 1997 to 8,000 million litres in 2002, while the price rose steeply. According to a study by the Agronomy Department at the University of Buenos Aires, the number of dairy farms halved, from 30,141 to 15,000 between 1988 and 2003.²⁷

By the end of 2002, imported milk from Uruguay was on sale in the supermarkets.

It is worth noting that a trade agreement that may shortly be signed between the countries of MERCOSUR (the countries of the southern cone of South America) and the EU, could lead to the EU dumping cheap milk on Argentina, Uruguay and the other MERCOSUR countries. It would be deeply ironic if GM feed, whose cultivation has already pushed many small farmers off the land, was exported from these countries to feed cattle in the EU to intensify milk production (which will destroy more small farmers in the EU) for dumping milk back on South America, this time to undermine what remains of the dairy industry.

Soya, unemployment and hunger expand

In the province of Entre Rios, GE soya expanded steadily, by 14% in 2000, 60% in 2001, 37% in 2002 and 30% in 2003. However, unemployment and poverty increased over the same period. At the same time sunflower cultivation fell from 160,000 to 46,400 hectares and rice from 151,600 to 51,700 hectares. The area sown with soya increased from 600,000 hectares to more than 1,700,000 hectares in 2003. The Faculty for Agricultural Sciences at the National University of Entre Rios warned of the dangers of substituting traditional diversified production with monocultures, given the vulnerability brought by dependence on one crop, even when destined for external markets.²⁸

Meanwhile, according to preliminary figures from the National Agricultural Census, 1991-2001, the number of crop and cattle producers in Entre Rios fell by 25% (or 1 quarter) from 27,132 to only 20,226. At the socio-economic level, the production of GE soya is not even advantageous in the short-term, as

the province has no share in the revenues raised on exports of crops that are grown there. Even though the type of agriculture employed extracts vital nutrients from the soil and is sometimes compared to mining, no royalties are payable for the exploitation of the soil. The province ceased almost a decade ago to collect taxes on primary production.

Hunger and Poverty

The growth of hunger has taken Argentina by surprise. It could not longer be concealed when so many people were seen searching for food in the rubbish heaps of the big cities every day. Since most of Argentina's population is urban, rural problems remained invisible for much of the time during which GE soya was expanding. People could not believe that there was hunger in a country that produced so much food. What they did not realise was that the country no longer produced food, but animal feed for livestock in far-off countries.

As a consequence of increased prices, cuts in salaries, job losses in industry, and migration to the cities, poverty in Argentina increased alarmingly. According to a report by Alejandra Barcelá y Virginia López Casariego,²⁹ area of health, Institute for Studies and Development (Instituto de Estudios y Formación) at the Argentinean Labour Centre (Central de Trabajadores Argentinos) approximately 5% of households lived below the poverty line throughout the 1970s. In the 1980s this figure increased to 12%. Since 1998, the number of people living below the poverty line has grown to more than 30% and in 2002 it reached 51%. The report also notes that 66% of people under 18 years old live in poverty. Other sources, for example the newspaper *El Clarín*,³⁰ quoted the Centre for Studies on Infant Nutrition, a consultant organisation to the World Health Organisation, which reported that in 2001 malnutrition affected between 11 and 17% of infants. Some analysts believe this will soon rise beyond 20%.³¹ INDEC (National Statistics and Census Institute - Instituto Nacional De Estadística y Censos) reports that 7 out of 10 children are born into poverty and 4 of every 10 are destitute.³²

Such figures demonstrate the falsity of the claims that biotechnology in agriculture can solve the problem of hunger in the Third World. Yet, in spite of all the evidence, the Secretariat of Agriculture, Cattle, Fisheries and Food, together with UNEP-GEF, continue to use that justification for Argentina.

The rural exodus, demographic change and peasant resistance

Ramón's story is typical of thousands. Now he is a taxi driver living in a small town in Entre Ríos, where he was born. Until recently he had his own small farm. While we drove around the country he told us how he was obliged to abandon it because he could no longer make a living from maize and chickens. As we talked he showed us land on either side of the road where rice, maize and sorghum had formerly been produced. Now it was all soya.

When we said goodbye, Ramón said with resignation: "now the taxi is my land."

In 1992, the under-secretary for Agriculture, Carlos Ingaramo, announced that 200,000 producers would have to disappear from rural areas and that farms of less than 200 hectares could not compete in global markets. The preliminary results of the agricultural census of 2002 from INDEC showed that the number of farming units has declined by 24.5% since 1988. The number of small farms has diminished by more than 103,400, but the size of remaining farms has increased by an average of 27.8%, from 421 to 538 hectares between 1988 and 2002.

A fundamental reason for the rural exodus, as with Ramón's case, is the inability to make a living from farming, due to the exposure to the international markets and the impacts of the green revolution. Although the so-called green revolution arrived in Argentina in the 1970s, the biggest structural change in agriculture came with direct drilling and GE soya. The appearance of "sowing pools", consisting of groups of investors who speculate in agricultural production, has helped to force up the price of land. Such pools sometimes hire poor farmers to produce (GE) soya for them, on land that may formerly have belonged to those farmers, who have now become hired labour (see page 10, Structural change and biotechnology). Reports show that small provincial towns remain extremely poor, even though they are surrounded by soya cultivation. Their populations

have increased as people sell their land because they can no longer make a living from it, but it sometimes sells for a good price, helping to pay some of their outstanding debts. They then move to the towns, where there is no work, so they are often forced to seek state support (see page 10). There is no longer any work on the farms either: companies use their own employees and only two or three people are needed to farm areas that used to support many families, as farming has become highly mechanised, sometimes dubbed "robot(ic) farming". The situation is irreversible: people cannot return to farming because the price of land is now beyond their reach.

Table 5 shows the changes in population in rural and urban areas between 1991-2001. The data for Sgo. Del Estero is further explained in the following section.

Peasant Resistance

The province of Santiago del Estero has a long history of exploitation and almost feudal rule. In the nineteenth century it produced goods for both export and internal consumption by producing a variety of crops using diverse methods of agricultural production. In the early twentieth century the forests in Santiago del Estero were exploited to produce 27 million sleepers for the national railway project, referred to earlier, and the railway had a profound effect on the social and economic structure of the province. Many of those migrant labourers, who had made a precarious living from extracting the timber for railway sleepers, settled on the land once that work was complete.³⁴

Although the province's urban population grew by 30% between 1991 and 2001, the rural population also increased, by 4%, in spite of the spread GE soya. The peasants of this province have organised themselves into the Peasant Movement of Santiago del Estero (MOCASE – Movimiento Campesino de Santiago del Estero) to resist attempts to force them off their land for soya cultivation. They have suffered

Province	Urban	Total Rural	Rural Villages and towns	Farms
Buenos Aires	10.94%	-14.32%	13.15%	-25.97%
Córdoba	14.22%	-11.23%	7.13%	-22.56%
Santa Fé	10.03%	-12.10%	0.63%	-20.87%
La Pampa	25.72%	-16.61%	-6.87%	-28.66%
Chaco	35.51%	-23.17%	24.01%	-29.57%
Formosa	39.14%	-13.87%	-1.05%	-16.03%
Entre Ríos	20.22%	-10.31%	16.21%	-13.16%
Sgo. del Estero	30.11%	4.38%	9.28%	2.94%

Table 5: Migration from rural areas to the cities and towns. Source: INDEC.³³

Population growth and decline (% of total comparing censuses of 1991 and 2001)

acts of terror carried out by police and paramilitaries defending the interests of landowners, many of whom acquired their lands illegitimately during the dictatorship between 1976 and 1983. In Argentina, the "Twenty Year Law" states that land rights can be granted, providing the claimant can prove that they have been living on the land in question for more than 20 years. This is the legal instrument being used by the peasants in MOCASE. A report presented to the Inter-American Commission on Human Rights during a visit to the province explains that the law is complex, requiring legal advice whose high cost excludes the poor from access to their rights. Many peasants are therefore expelled from their land illegally by self-styled owners or buyers.³⁵

The Argentine Ministry of Justice describes how such people go about removing families from the land. First the person claiming to be the owner visits the community announcing that the land belongs to him. He proposes some kind of solution or threatens them with violence, often citing illegitimate documents as "proof" of his right. Then gangs may be hired to take measurements, put up fences, cut down and burn forest, destroy property, steal cattle and remove evidence of occupation by the peasants. Access to wells may be blocked, tracks may be closed, animals poisoned and there is always the threat of violence from the gangs. Then, with the help of a deliberate misinterpretation of the law, the self-styled owner often gets an eviction order and people are removed, often with the connivance of the police and the local justice department. Once their property is destroyed, their land burnt, and their cattle stolen, it becomes extremely difficult for the dispossessed peasants/local farmers to prove they were living on the land and are thus its rightful owners. If once they are driven off that land, it becomes almost impossible for them to reverse the situation through legal channels.^{36, 37}

In January 2004, there were reports from the province of Chaco that an indigenous cemetery had passed into private hands and the owner had ploughed it up to prepare for planting soya. The indigenous community consider the cemetery a sacred place of rest for the bodies and souls of their ancestors and protested that the provincial authorities did not recognise their rights as indigenous peoples and had not responded to their petition.³⁸

Such events are taking place all over the country, as the soya frontier expands.

The environmental and health impacts of GE crops: the risks become a reality and threaten the future

Doctor Kiroku Kobayashi, expert in phytopathology from Japan's International Co-operation Agency, has been carrying out studies in collaboration with the INTA (National Institute of Agricultural Technology).³⁹ He warns that although the enormous quantity of chemical pesticides and fertilisers used in Argentina has increased production, they have also increased environmental contamination. He explains that rotating livestock with crop cultivation on a seasonal basis used to be an important aspect of Argentinean farming. This system promoted the recycling of resources and nourished the soil with organic compost and manure, which limited the damage caused by pests and diseases. In the 1970s, extensive areas were devoted to mixed cattle and crop farming in rotation, which ensured fertility without chemical fertilisers and reduced the incidence of disease. Many varieties of potato and maize were grown, plus wheat, sunflower, coriander, linseed, lentils, beans and carrots.

Kobayashi adds that the soya model increases the incidence of soil pathogens. Producers ignore the threat posed by the excessive use of pesticides, fungicides and fertilisers.⁴⁰ More and more farmers are adopting the direct drilling method. "Direct drilling", also referred to as "no-till", "lo-till" or "conservation tillage", depending on slight variations in technique, was first introduced in the US to save time and money for farmers, and also to counter soil erosion. The land is not ploughed, but instead the farmer incorporates the old crop residue into the top few centimetres of soil, drills in the seed and presses down the soil. With the machinery developed for the purpose, the whole process can be completed in a single operation by one man. This is direct drilling. Although perhaps not originally developed to promote chemicals, direct drilling has now become widely associated with the use of glyphosate and RR crops, and is promoted by Monsanto under the term "con-till".

This system may limit soil erosion, but it is not a good way to protect plants.⁴¹ Direct drilling encourages repeat attacks from disease, because the spores of pathogenic fungi persist in the roots and stems that are left on the soil until the following year. This means producers have to use even more pesticides and fungicides to combat them. Since the introduction of direct drilling, new disease problems such as Asian rust have arisen. Weed communities are also changing with a number showing increasing tolerance to glyphosate. This means that producers are now using 2,4.D, metsulfuron methyl, imazetapir and atrazine in addition to glyphosate. They also use paraquat and atrazine to deal with soya volunteers (fallen seeds which grow after the harvest). In the

future they may also have to use fungicides on a massive scale to deal with Asian rust.

Nevertheless, soya continues to expand its frontiers. BSE, also known as mad cow disease, was a consequence of feeding cattle with protein sourced from other animals. Ending this practice led to increased demand for vegetable protein-based feed. This, coupled with growing demand from the Chinese market,⁴² caused the price of soya to rise still further in world markets reaching a peak in 2004, when a further increase in the renting out of land was announced. However, the price fell heavily soon afterwards and remains extremely volatile.

According to a local newspaper,⁴³ this increase in renting land for production is due to the short-term economic benefits that soya brings, which means that 8,000 to 9,000 kilos of soya can be produced per hectare, while the sale of just 1,000 kilos of soya pays the rent for using the land. However, renting land means that the producer has no incentive to care for the long term health of the land they exploit, with serious implications for future production. In the same article, Luciano Miguens, President of the Rural Society of Argentina, is quoted as saying: "The producer knows what the land can do. If monocultures are not good, because they remove properties (nutrients) from the soil, [then] we have fertilisers to rectify the situation [...]. Technology gives us lots of possibilities." He considers that "this situation is to the advantage of the country as well as the producer" and believes that "besides generating income, it generates infrastructure, roads, waterways and industry."

Such a statement is problematic, as it ignores the role of soil for plant health and the nutritional value of crops. Soil is a living, highly interactive system, full of micro-organisms that are crucial for providing not only soil fertility but also counteracting plant pathogens and increasing the plant's defence capacity. Denial of these factors will ultimately lead to soil becoming mere dead matter, jeopardising the use of the land for any kind of farming, especially sustainable farming, for years to come. Nutrients provided through fertilisers represent only a fraction of what plants and production of nutritious foods require.

Some publications from INTA itself say that this kind of agriculture is not sustainable, but that: "current prices, the ease of production, and the lack of state programmes to guarantee the long term sustainability of mixed farming, all favour current tendencies."⁴⁴

Recent proposals from industry to rotate intense cattle rearing with soya monocultures are quite different from traditional rotation practices and cannot be claimed as providing similar benefits in terms of soil health and disease limitation. They are being suggested as part of a campaign to promote the idea that large-scale soya production can be made more sustainable and are further touched on in the conclusion.

Phytosanitary problems

In the summary that follows about problems that have already occurred, we shall only mention what has been reported by the scientists in INTA and the Argentine universities.

Asian rust disease

During the 2000-2001 season, a serious disease affected the soya crop in North-east Argentina, known as *Phakopsora pachyrhizi* or Asian rust.⁴⁵ Since then it has also been detected in Brazil and Paraguay. It can cause losses of up to 80% of the crop and the spores, which remain in the plant residues left on the surface as part of the direct drilling regime, are spread by the wind, so it is likely to be a serious problem for the soya sector in the future. Some fungicides are effective, but could cost US\$50 per hectare to apply. Resistant varieties of soya will take some years to develop. All this has come about within just a few short years of the implementation of the GE soya and direct drilling model of farming.

Research in the US suggests there may be a relationship between the use of glyphosate and the incidence of *fusarium* fungus species. This is currently being studied.

Tolerant weeds, herbicides and insecticides

The GE soya model of farming, with direct drilling and the massive use of glyphosate, is provoking changes in the weed community, including the appearance of species which are not normally common. The agronomist Delma Faccini describes some of the weeds that show different levels of tolerance to glyphosate.⁴⁶ All tests were carried out using a commercial formulation of glyphosate.

Commelina erecta tolerates applications of up to 6 litres per hectare of 48% glyphosate. In stronger doses, only plants with three or four leaves are susceptible. In larger plants, glyphosate is never completely effective.

Convolvulus arvensis: 6 litres per hectare of 48% glyphosate when in flower was 90% effective 21 days after application.

Ipomoea grandifolia, *Ipomoea purpurea*, *Ipomoea rubriflora* and *Ipomoea nil* are common species of weeds in the convolvulus family. 3 litres per hectare of 48% glyphosate gives good control of plants with up to 3 or 4 leaves, but in larger plants control is incomplete. Similar results have been obtained with *Ipomoea nil* with a dose of 2560 grammes (74.7% glyphosate).

Iresine diffusa: 6 litres of 48% glyphosate per hectare on plants between 40 and 70 cm in height showed a low level of control.

Hybanthus parviflorus has tolerated applications of 2.5 L/ha of 48% glyphosate + 500 cc of 2,4-D.

Parietaria debilis has tolerated applications of 3 L/ha of 48% glyphosate + 500 cc of 2,4-D, at 10-25 cm.

Viola arvensis has tolerated applications of 2.5 L/ha of 48% glyphosate at 10-15 cm.

Petunia axillaris has tolerated applications of 2.5 L/ha of 48% glyphosate at 20-30 cm

Verbena litoralis survived applications of 3 L/ha of 48% glyphosate + 500 cc of 2,4-D.

Other species are mentioned such as:

Trifolium repens, *Triodanis biflora*, *Dichondra repens*, *Portulaca oleracea*, normal doses of Glyphosate applied mostly in the vegetative state (on plants taller than 15 cm) have shown deficient levels of control.

Delma Faccini notes that so far, no weeds have been identified that are actually resistant to glyphosate, but some are tolerant to it. She defines the difference between these terms

- Tolerance: the capacity, due to innate characteristics in individuals of a species, to withstand a normal dose of glyphosate.
- Resistance: when individuals of a species acquire the ability to withstand a normal dose of glyphosate, when previously the species was susceptible.⁴⁷

However, whatever the different definitions, the selective pressure exerted by the application of herbicides (in this case glyphosate and 2,4-D) mean that weeds, whether tolerant or resistant, have an advantage. This applies whether the tolerance has always existed or whether the weed has adapted to the use of herbicides. In either case, the weeds grow and reproduce in the presence of herbicides, thus becoming the problem that herbicides were meant to solve. Direct drilling leads to a greater use of herbicides, including some which were meant to have become unnecessary according to the seed and agrochemical companies that argued in favour of the benefits of developing glyphosate resistant soya.

Since the arrival of GE soya in Argentina, the volume of glyphosate use has increased from under 10 million kgs in 1996/7 to nearly 70 million kgs in 2003/4, with glyphosate application on soybean increasing in the same period from 0.82 to 45.86 million kgs.⁴⁸ Given that 0.400 million hectares were planted with RR soya in 1996/7 and 14.112 million hectares in 2003/4,⁴⁹ the initial average of 2.05 kg of glyphosate per hectare of RR soybeans in 1996/7 increased to 3.25 kg in 2003/4.

Glyphosate is being used in combination with 2,4-D, metsulfuron methyl, imazetapir. Aerial spraying is the most popular method of application. Some information about the cost of applying pesticides, including that of aerial spraying can be found on the web.⁵⁰

Referring to volunteer plants, a Syngenta advertisement notes that soya itself can be a weed. It recommends paraquat and atrazine, two of its own

herbicides, to counter the spread of these volunteers.

Insecticides recommended for use include deltamethrin or cipermethrin with endosulfan, which are recommended against the southern green stink bug (*Nezara viridula*) a frequent pest of GE soya in Argentina. Although normally found on soya, this pest has started to infest wheat crops as well. In 2004 there was an alert about the soyboll weevil, a member of *Sternechus* family in the province of Santa Fé. Slugs, which flourish in direct drill agriculture, also affect soya. This adds metaldehyde (a slug killer) to the armoury of pesticides used in GE soya.⁵¹

From December 2003, the national newspapers *La Nación* and *El Clarín* published a Syngenta advertisement proclaiming that Argentina, Brazil, Paraguay, Bolivia and Uruguay now form a new "United Republic of Soya". Syngenta claims that soya knows no boundaries while its "Sentinel" service is benefiting from the threat of soya rust.

In Paraguay, the planting of GE soya was illegal until 20th October 2004, when about 70% of their cultivated soya was already GE, having been introduced by Brazilian and Argentinean producers in complicity with the companies. Hundreds of peasant families have suffered from the spraying of these illegal plantations. In January 2004, peasants on their way to join a protest against these aerial sprayings were shot at by groups of armed police protecting the producers. Two men were killed and several were injured.⁵²

This is the reality for peasants and indigenous groups living in areas that form part of Syngenta's imaginary map of the soya republic.

RoundUp Ready Maize, the new menace

On 21st March 2004, it was announced that the Argentine government was considering whether to allow commercial planting of a variety of RoundUp Ready (glyphosate resistant) maize, (NK603). It was not made clear whether they were also considering the maize variety that is both resistant to glyphosate and also expresses an insecticide (NK603-MON810). In 2002, Monsanto received 10 permits for deliberate release, while Holden Foundation Seeds L.L.C. and Status Ager S.A. received two each. The processing of these deliberate release permits can be explained by the fact that North American companies were putting the Argentine government under tremendous pressure to support the US and Canada's complaint to the WTO on the EU's moratorium regarding the approval of GE crops. Permission to import RR maize into the EU was refused once again in February 2004.

The refusal of the EU to import RR maize had been one of the reasons why it had not been approved for commercial cultivation in Argentina. But *La Nación* reported that, according to Monsanto, "the 2 million tonnes that are currently exported to the EU could be

used as feed for Argentine cattle. This would also help crop rotation,” The same source added, “In fact, maize exports to the EU are only a small part of the total.”⁵³ The note continues: “the approval of RR maize would place it on an equal footing with RR soya. This would reduce production costs.”

Jorge Romagnoli, who produces in Montebuey (Córdoba), thinks that it is logical to introduce the glyphosate-resistance gene into products for the market, and says that apart from anything else, maize requires an expenditure of \$US40 per hectare for herbicides alone: “\$US15 for atrazine, \$US6 for a preliminary spraying of glyphosate and \$US15 to \$US20 for a selective herbicide. When you consider that the pre-emergence glyphosate application is used in RR maize too and that the graminicide usually has to be used 40 to 50% of the time, this makes a difference of \$US22 to \$US25 dollars per hectare.

Juan Avellaneda, president of the Argentine Association for Maize, cites other reasons.⁵⁴ “when growing maize next to GE soya, sometimes when you spray the soya, the wind blows the spray across and this burns the maize, which means you either lose the maize or your spraying is unsatisfactory and you lose a lot of the soya. To be able to grow RR maize next to [RR] soya would solve the problem.”

In spite of the fact that tolerant weeds are already becoming established in RR soya fields, leading to increased use of other herbicides,⁵⁵ the defenders of RR crops continue with their line, as can be seen from the words of another producer, when interviewed in the same consultation: “The possible increased cost of RR maize seed can be balanced by the lower cost of using glyphosate in place of atrazine and the graminicide.”

The Argentine Association for Direct Drilling Producers (AAPRESID - *Asociación Argentina de Productores de Siembra Directa*) claims that: “the RoundUp Ready gene would also be useful for producers in mixed farming, where maize lots have problems with Aleppo (millet) grass (*Sorghum halepense*) or Bermuda or devil grass (*Cynodon dactylon*) or are in rotation with pasture.

INTA agronomists say: “a variation on the technology is to apply, some 10-15 days after emergence, a mixture of glyphosate with a “residual” herbicide. In this way one can perhaps avoid early competition from weeds. The longer life of the residual herbicide means you can do without another herbicide during the cultivation cycle. Any advantage conferred by this method depends on the degree of success of the weed competition and the type of weeds present. For example in the case of perennial species such as Aleppo (millet) grass (*Sorghum halepense*) or Bermuda or devil grass (*Cynodon dactylon*) early control is only partial, making further applications of glyphosate necessary.

Later the INTA professionals warn that technological innovation cannot alone deal with the problems involved. Other disciplines, such as economics or

sociology, need to inquire into issues raised by the consolidation of RR crops in the region.

From the impacts of the great RR soya experiment in Argentina, we can guess at the likely consequences if the Secretariat for Agriculture submits once more to the corporate lobby for RR maize. However, on 17th July 2004 the commercial cultivation of RR maize NK603 was approved in Argentina.⁵⁶ Within days the EU finally approved NK603 maize for import and processing. At that point Monsanto’s shares rose to US\$36.

The planting of this RR maize is therefore likely to intensify the problems described above, as it will enable land planted with soya and maize to be treated under the same regime, all the year round. Fewer refuges for plants and animals will remain. Blanket spraying from the air is likely to be encouraged still further. In fact the promotion of the so-called “rotation” of RR soya with RR maize, means moving from crop monocultures to RR gene monoculture, with all its consequences. However, it must be acknowledged that RR maize potentially simplifies the application of herbicide because farmers will no longer have to worry about killing a contiguous non RR maize crop. This makes it attractive in the short term for larger farmers, whatever the future impacts on biodiversity, small farmers and the rural fabric may be.

Pesticides flood the country

All over the country, people are reporting the devastating impacts on communities living close to RR soya fields due to the increased use of pesticides. We will now describe some of the cases that have been reported. Disgracefully enough, the daily poisonings of people, animals, crops and vegetation are hardly mentioned in the national press, since the media relies on the companies to fund them through their advertising contracts and is complicit in perpetuating the information vacuum.

Peasant Movement of Formosa, MOCAFOR

Formosa is a province of North West Argentina, considered one of the poorest in the country, governed on almost feudal lines like Santiago del Estero. In the last decade, the urban population increased by 39%, and the rural diminished by 14%. Approximately 39.6% of the population of Formosa capital (Formosa’s capital city) lack the basic necessities of life.

Benigno López, the president of MOCAFOR (Peasant Movement of Formosa), has said in interviews⁵⁷ that the movement works with small farmers and landless rural workers. It also includes some indigenous communities and local organisations from the city of Formosa, where more

than 40% of the population originally came from rural areas. Many people are unemployed or work seasonally. Land in the region has been heavily concentrated in the hands of a few landowners and companies, many of the latter originally linked with the British company La Forestal, which exploited timber for railway sleepers at the beginning of the twentieth century.

Nowadays, many small farmers have lost their livelihoods. Small farmers account for 95% of the total number of farmers. 80% of these now have land holdings too small to enable them to produce enough for their families. Many of the slightly larger farmers have rented their land to the companies and also work for them. However, others have been forced to sell their land.

In recent years several companies have moved onto rented land in the area to produce RR soya. It is alleged that some of Formosa's local politicians are involved, together with private enterprises from other parts of the country and foreign interests from North America and even Australia. The indiscriminate use of dangerous pesticides has increased because of the severe lack of national and regional regulation, legislation, or mechanisms employed to monitor their impact.

Benigno López believes that these companies benefit from the fact that the land they are destroying with RR soya and pesticides is not their property but simply rented. He says that the soil structures are changing, as RR soya drains its fertility and then leaves the soil exhausted. The RR system needs no labour, as it is completely mechanised.

Loma Senés: A violation of food sovereignty⁵⁸

A study published on 6 October 2003 by the Rural Studies Group describes what happened in Loma Senés, Formosa:

"In February [2003] during one of the regular sprayings carried out by the Agricultural Project of Formosa, at least 23 small-holdings were contaminated. This company is actually an entity called a 'Transitory Union of Companies', which means that it is funded by capital from Salta and local capital, whose sources are not formally identified. Since 2001 the company has rented land from farmers to produce GE soya. Of the 4000 hectares (some half of the total in the province) it cultivates in the area ... some 150 hectares are close to the small farmers of Loma Senés."

On 23 October 2003, the Buenos Aires newspaper *Página Doce* (Page 12) published an interview between the journalist Irina Hauser and the families affected by the pesticide spraying that took place on 2 February 2003 in neighbouring fields. As a result of this spraying, small farmers lost their crops. Hauser talked to two women, both members of Formosa's Peasant's Movement (MOCAFOR – Movimiento Campesino de Formosa), who said that until the end

of the 1990s they planted cotton, but the fall in cotton prices forced them to produce vegetables and a limited amount of dairy products, since they only had a few cows. Most of what they produced was for their own consumption. Any surplus would be traded at the local market. However, they soon noticed that production was decreasing, finally collapsing completely on 2 February 2004. Neighbours complained of diarrhoea, headaches, and nosebleeds. "They had used a mixture [of pesticides] on the soya [plantations] next to us, a poison to kill off the soya volunteers, and they sprayed it without taking into account there was a storm and a north wind." The women went to the police, local public organisations, and the local government. While waiting for the results of an appeal, they were not able to produce anything. They survived by bartering amongst themselves. One of the women has now become a cook at a local school. She says: "planting and cooking is what I know." To try and get back on their feet again, the community has set up a small project to produce maize flour. They have acquired some simple machinery that is available to all the neighbours.

Technical reports on the contamination in Loma Senés

The producers of Loma Senés contracted an agronomist, Luis Castellan, to produce a report on the damage that had been done to the different crops.⁵⁹ Castellan visited Loma Senés four days after the incident. In his report he noted that while the group of small producers rarely own more than 10 hectares of land, many holdings larger than 30 hectares in area have been rented out for the production of RR soya, mostly using the direct drilling method. Many of these rented plots are next to the small-holdings.

Castellan also describes the abnormalities he saw in the small farmers' crops and in the weeds, trees and general vegetation. In some broad-leaved plants, such as cotton, citrus, green banana, manioc, and beans, he recorded incidences of anatomical malformation and physiological damage. This damage is attributed to herbicides with hormonal action, such as those used after the RR soya harvest to clear the land of weeds and volunteer soya plants (which are of course also glyphosate resistant and so require other treatments). The report says that a mixture including hormonal herbicides was used in spite of the fact that the wind was blowing towards the affected small farmers at the time of spraying.

Not all losses could be calculated until harvest. Losses recorded include: 180 tonnes of manioc, 44 tonnes of sweet potato, 5.4 tonnes of pumpkin, plus beans, melon, banana and various garden vegetables, impossible to value because household food security depended on them. On top of this, 80 tonnes of cotton were lost.

Another report was produced by Máximo Gorleri, of the University of Formosa in March 2003,⁶⁰ using the report by Castellan as a basis. He learned that the spraying was carried out by spray trucks in the mornings and evenings, in January and February when temperatures were high and the wind was blowing. The small-holders said that immediately after each spraying, the whole community would be covered with a dense mist smelling strongly of chemicals and that the trucks were re-filled with water from small dams close to the tracks along the edge of the plantations.

Damage to animals included: deaths among birds (hens, chickens and guinea fowl) and cattle, pigs and horses, which also suffered miscarriages. It seemed that horses were the worst affected, with diarrhoea.

People suffered from dizziness, nausea, vomiting, diarrhoea, stomach pain, rashes, allergies, skin lesions, spots, eye irritation and vision disturbances. In some cases, diarrhoea persisted for a long time. Gorleri noted that the people affected were frequently without access to public services, social services or medical assistance. He asks who will pay the costs of the damage caused. He also says that the state did not perform any tests to find out what pesticides had been used.

Environmental damage is harder to estimate, and he believes it would be necessary to analyse samples scientifically. It is impossible to estimate damage done to beneficial insects and arthropods, nitrogen-fixing bacteria, fish and other aquatic organisms. There is very little information about the impact on wildlife. For example there have been many instances of fish mortality reported.⁶¹

Local action

After the events in Loma Senés, local people remained vigilant. They blockaded the roads to prevent further spraying. They also took a small plane hostage in a neighbouring area, and later made an agreement with the police, released the pilot, but held on to the plane.

On 24th March a local farmers' organisation went to court and demanded an end to the spraying. A judge ordered spraying to be suspended for 6 months, and then extended the suspension for 3 months more, but in September, spraying started again. On 8th September MOCAFOR and other groups put out a press release in protest against the inadequate response of local government departments, saying that their attitude to the peasant farmers was insulting and careless, that medical treatment had been completely inadequate and that no proper analysis of the impacts had been carried out.

They finished by denouncing the system of GE crop cultivation as being completely incompatible with small-holder production. They called for respect for the integrity of the community, traditional crops, natural resources, small-holder family food security and secure markets for their products.

The case of Loma Senés is typical of how the model of GE crops for export is violating the food sovereignty and the right to health of communities throughout the country. However, instead of acknowledging any of the above, Dr Esteban Hopp, a member of CONABIA, a researcher with INTA until some months ago, and member of staff at the University of Buenos Aires, said in a paper for the 10th National Congress of AAPRESID (August 2002): "many people believe that if they eat GE crops, the genes will mix with their own genes." He also claims that: "contrary to what many believed, with the advance of GE crops the use of agrochemicals has decreased."⁶²

Mariano Levin, a specialist in Chagas disease, which affects rural communities throughout Latin America, speaks glowingly in an interview in a Science programme in Argentine TV of GE biotechnology:

"We must implement this technology. We are very backward and I shall continue to push the government to press ahead with it. Let them give us the funds we need, to establish genomic programmes so that we can add value to Argentina's products. With this technology we could progress economically by leaps and bounds. We could have better cattle, better wheat, better soya, better cattle production and better protection against endemic diseases such as the protozoan that causes Chagas disease." He additionally notes that he does not think that genes should be patented, because they are the patrimony of humanity, but says that: "what people want to patent is the application of DNA as a kind of medicine and in this case, since it has been developed by a person or groups of people, it should be patentable."

It is striking that an Argentine scientist who specialises in a rural disease very common in Santiago del Estero, where he has projects, does not understand the reality of what has been suffered by the peasants.

Deforestation

Two reports were published in November 2003 by the management of the System of Forestry Evaluation Unit, the Forestry Department and the Secretariat of the Environment and Sustainable Development in the Ministry of Health. They show that the increase in the area cultivated for soya is responsible for deforestation in Salta, Chaco, Santiago del Estero/provinces all over the country. In the report on the province of Chaco,⁶³ they present data from the provincial Ministry of Production:

“In the year 2003, the cultivated area of the province was approximately 1,300,000 hectares, with soya constituting the principal crop. It has increased from 500,000 to 700,000 hectares between 2001-3.”

In the report on the area of the Chaco Park in the transitional Zone between Yungas and Chaco in the province of Salta, between 1984-2001,⁶⁴ the authors say:

“In recent years, diverse socio-economic and ecological factors have come together to create a favourable context for the expansion of the agricultural frontier in the transitional zone between Yungas and the Chaco region... Some of the factors that assist this agricultural expansion (principally soya) include: road improvements, technological innovations, economic conditions that favour foreign investment, and good market conditions for agricultural products. From the point of view of ecology, there are deep soils close to the Tartagal mountains, but limited rainfall formerly prevented expansion. In recent years there has been an increase in rainfall in North West Argentina, which has promoted the expansion of agriculture into zones that used to be marginal. This always implies a high level of deforestation, which is why we undertook this particular study.”

Satellite images show the development of deforestation in the region between 1984-2001. Their conclusions indicate deforestation levels higher than the global average and similar to those found in studies carried out in the Lacandon forest of Mexico and the Bolivian lowlands, both of which are considered important forest regions in Latin America outside Amazonia. The rate of deforestation nearly doubled in the period 1997-2001, as against the period 1984-1991.

Disease connected with deforestation

Leishmaniasis (*Leishmaniasis tegumentaria* - an intracellular protozoon) is a parasitic infection of people and wild and domesticated animals. It is carried by small sandflies, 1/3 the size of mosquitos. There are a number of varieties, and broadly two types: cutaneous, affecting the skin, and visceral, affecting the internal organs. It was earlier thought that clearing forest might actually reduce incidence of the disease, but it is now apparent that the reverse is true.⁶⁵

Salomón *et al.* (2001)⁶⁶ describe an outbreak of *Leishmaniasis tegumentaria* in October 1997 in the province of Salta. “Given the large number of sandflies found in primary forest and the large amount of recent deforestation in the region, it is possible to postulate a connection between outbreaks and intense deforestation. ... In Rio Blanco, incidence among human beings is greater due to the proximity of secondary forest and remnant primary forest ..., intensified by methods of animal husbandry.”

They conclude that:

“Outbreaks caused by extensive deforestation are maintained and intensified by human settlements in completely or partially deforested areas. Transmission is intensified by activities that increase contact between the human and the vector (recreational and subsistence activities in areas of primary and secondary forest, animal husbandry).”

Dr Nestor Taranto, head of the Institute for investigations of Tropical Diseases in the National University of Salta, describes cases of leishmaniasis following the deforestation of 9000 hectares in Campichuelo. He says that 4000 cases have been recorded. The cost of treatment is 1500 pesos per patient, which is covered by the state. “Here we have a clear and quantifiable example of activities often promoted as profitable and progressive, and for which severe and irreversible environmental impact is deemed acceptable. Not only do they not generate employment or progress, but they also bring serious impacts on the health of the people they are supposed to benefit.”

Patients treated for the disease are susceptible to re-infection by *Leishmania sp.* The World Health Organisation bulletin (2000:78(8) page 1) says that *L. cutánea Americana* (a form of the disease that attacks the skin) caused by *Leishmania (Vianna) braziliensis* leads to some 10% of relapses, with some patients developing mucocutaneous leishmaniasis, a horribly disfiguring type of the disease. Where deforestation has permanently altered the environment, it is almost impossible to design strategies to control diseases transmitted by insect vectors.

Deforestation in Entre Ríos

On 1st October 2003, “The Nation” newspaper carried a story about a six month prohibition on deforestation in the province of Entre Ríos.⁶⁷ A report from the National University of Entre Ríos led to the declaration of an environmental emergency. The report announced that nearly 1.2 million hectares of forest had been lost in recent years, leaving only between 800,000 and 1 million hectares of virgin forest. In total there are 4 million hectares of forest and grasslands at risk, with species of animals and plants in danger of extinction. The deforestation is attributed to soya, which has been advancing swiftly in this province. The local government ordered a halt

to the removal of forests, both public and private, for 6 months. Sanctions for breaking the ban include expropriation of land and machinery used for deforestation.

Disquiet has been expressed not only about the deforestation but also the proliferation of agrochemicals and their impacts. According to the Department for Production in the state, soya has expanded from 600,000 hectares in 1994 to 1,200,000 hectares in 2003. Ancient forest trees are being cut down and burnt to give place to agriculture. The department says that 30% of this agriculture is carried out by sowing pools from outside the area. When they have destroyed the land in their search for immediate profits, they move on to another part of the province, leaving behind them a desert.

Left-overs for the poor: neo-liberal soya solidarity

At the end of 2001, the campaign called “Soya Solidarity” was launched by the Argentine Association for Direct Drilling Producers (Asociación Argentina de Productores de Siembra Directa (AAPRESID)). It was based on a donation of 1 kilo of soya for every tonne exported.⁶⁸ For some time the media had been bringing soya to the attention of the public as the solution to all Argentina’s problems, especially that of hunger. This hunger, which surprised many in a country that believed it was capable of producing more than enough food for its people, could no longer be hidden. A campaign like Soya Solidarity arouses the anxiety of those movements that believe that any real solution to the socio-economic problems generated by the GE agro-export model must be based on food security and sovereignty. Otherwise the hunger of the poor is merely combated with the left-overs from the activity that has caused their hunger in the first place, the production of GE animal feed for export.

Among those involved in the food aid plan are large farming organisations, vegetable oil producers, promoters of the use of soya, organisations from the port of Rosario involved in exports and finances, a church organisation, Cargill, and Chevron Texaco.

It describes itself and its objectives as follows:

“We are creating nothing new, just a morning of workshops to demonstrate the nutritional value of soya and a practical session on how to make soya milk, soya steaks and hamburgers. We finish with everybody sampling what has been produced and each person leaves with a bag of soya and some recipes, so they can practice at home. Soya is only given to people who do the workshops because soya is not consumed in Argentina. People are not familiar with it and they have alternatives, such as meat, milk and eggs. **We are trying to introduce a change of habit.**” (emphasis added)

The objectives are made clear in the “Food Plan of San Lorenzo, Province of Santa Fé”

- “Give information about the properties of soya as a rich source of proteins and calories, able to satisfy the basic needs of an individual
- Promote its use in the community, encouraging new food habits, with information to ensure best use of soya
- Co-ordinate and promote the project to other communities
- Provide free soya for those families that cannot afford basic food
- Respond to the companies that wish to collaborate with the families in our city”

The broad aim is:

- “To gain acceptance for soya as a new eating habit through training and information about its nutritional values.”

From the start, “soya solidarity” encountered a problem: the traditional food culture of Argentina. This is evident in the “soya solidarity” document:

On the Soya Solidarity website, Padre Julio César Grassi of La Fundación Felices los Niños is recorded as saying: “As no-one knew how to use the beans, everyone went to the course ... At first, it was hard to adapt. First the soya fritters broke because they had no rice, or the milk ‘dulce de leche’ came out watery because it hadn’t been cooked enough. The children would not accept it. In this country we are carnivores and it is very hard to change that. It made me sad to see how, when someone came to ask for food for his family, we gave them noodles with soya, and he threw it away just a few yards from the door. I understood then the importance of going along first to train people, to create a different culture, and to teach them.”⁶⁹

In their journey through North West Argentina, the authors of the present report witnessed first hand that soya was not readily accepted. In speaking to doctors from public hospitals, municipal workers, and volunteers at the public dining projects for women and children, and school teachers, they always heard the same thing: Children don’t like soya. It gives them a stomach ache.

The authors saw donated bags of soya left on a table in an office in a school in the province of Jujuy, because, as someone said, there is no point in cooking something that no-one will eat. A woman from Catamarca said: “They don’t like it; they spit it out, so we prefer to give them meat, cheese and greens.”

At the dining projects, where the authors always arrived unannounced when the food was already cooked, they were proudly invited to sample the results. Everyone had passed through the initial stage of experimentation with soya, but they had decided it was not worth the trouble to purchase something the children would not eat, no matter how cheap it might be. A mother from Tucumán told how

her children had taken soya "milk" when there was nothing else to give them, and it made them sick. But in the dining project she attended with her children, they didn't give them soya. They gave them meat and the food was good.

It was common to find that the dining project managers had all been given a donation of soya at first, but later they had to buy it, and it made no sense to do so. They also said, everywhere, that producers and others had come from Santa Fé, Cordoba and Buenos Aires to give courses to the recipients of the soya, in which they endlessly repeated that soya can replace meat and milk and insisted that it contains all the essential amino-acids and is rich in minerals.

Soya and nutrition issues

However, the Argentinean state recommends that the juice extracted from soya should not be called milk, and that soya products should not be given to children under 5 and never to children under 2, except where prescribed specifically by a doctor, for example in the case of allergies to milk products.⁷⁰ The reasons were set out by professionals and NGOs concerned with the theme of soya in the "National Forum for a Feeding and Nutrition Plan" adopted in 2002. However, there is no mention either by the government or the National Forum Plan of the particular potential risks of consuming genetically engineered soya. The Rural Reflection Group wanted its name removed from the list of the plan's contributors because our recommendations on that issue were not taken on board. However, the plan does address the problems that arise from the consumption of conventional soya. It concludes:

"The standard mineral composition of soya shows inadequate calcium/phosphorus balance, which can cause problems with essential minerals for bone development in children, adolescents and pregnant women. Soya cannot be used as a meat substitute because it does not have enough iron, and the iron it does contain is less bio-available, while soya protein must be supplemented with other vegetables."

In spite of this, the soya promoters continue with their promotion:

"The reasons why soya was chosen above any other vegetable speak for themselves: it provides proteins, healthy fats, vitamins, especially group B, and minerals such as calcium, iron and phosphorus.

"It has double the protein content of meat, four times that of eggs and twelve times that of cow's milk. It has no saturated fats or cholesterol and it possesses polyunsaturated fatty acids, which protect the heart. Besides, with just one kilo of beans, which cost around 1.20 pesos, one can make 10 litres of soyamilk. According to the experts, one glass of this milk provides a child with the proteins necessary for its development."

This shows the complete impunity enjoyed by the GE soya lobby in Argentina. Furthermore, it has not

been possible to get the government to acknowledge the potential additional risks from GE soya.

Some of the main allies of "Soya Solidarity" are the organisations "Caritas", Pro-Huerta, which is a government project to encourage city dwellers to grow basic foods (not to be confused with autonomous food garden projects) and the government agriculture department INTA. There are also citizen organisations like Free Participation for Unity and Solidarity which are promoting soya to combat hunger and malnutrition.⁷¹

The desire to sell products made available by the excess of soya in the country has led to the construction of "mechanical cows". On 23rd June 2003, the wife of the president of AAPRESID presented a machine (AMT100L) to a worker's co-operative in the province of Santa Fé. The idea is to construct processing plants to make soya "milk" for poor children.⁷²

The "Clarín" newspaper⁷³ describes the establishment of the first "solidarity plant" for processing soya: "'Kill hunger right at the start of the life of the poor'. This is the dream behind the project for the construction of the first 'solidarity plant' for soya processing in La Plata. The objective is to use 1000 kg of soya to produce some 30,000 rations of food each day, which will be shared between various dining projects in the area. The undertaking is the project of the 'Thrice Admirable Mother' centre, directed by the priest Carlos Cajade, who looks after the needs of more than 800 poor each day. He works through Children's Houses, dining projects and centres for street children."

This project persists in ignoring the recommendations of the Nutrition Forum and calling the juice produced from soya, "milk".

For the promoters of Soya Solidarity, food diversity means a diversity of camouflaged soya products, meant to imitate traditional foods.

DuPont has now pledged itself to soya aid:

"The programme 'Proteins for Life' developed with the help of DuPont Argentina, is helping to improve the diet of some 6,500 children who attend 17 dining projects in greater Buenos Aires. The distribution of soya protein and protein-fortified soya milk, combined with plans for education in nutrition and permanent follow-up of the beneficiaries, guarantees the children who participate in the programme 19-43% of their daily requirement of protein and 21-27% of calcium."⁷⁴

In the publications on the page "Why Biotechnology" which Monsanto sends to everyone who subscribes to its list, there is a paper: 'Tecnología, producción y alimentos: un círculo virtuoso' by Victor Trucco, president of AAPRESID (Asociación Argentina de Productores de Siembra Directa) who says: "I shall refer to technology, production and food, as a virtuous circle which leads to progress which enables humanity to have enough food."

The Food Bank ⁷⁵

The NGO "The Food Bank", founded in 2000, describes its work under the strap-line: "The useful from the useless, the essential from the superfluous" as follows:⁷⁶

"A food bank is an association that acts as a bridge between the food industry and NGOs that fight hunger and give food to those who lack it. This is achieved by seeking, selecting and distributing perishable and non perishable foodstuffs that were previously wasted, so that they can reach the most needy sectors of society in the best possible condition ..."

The idea is therefore that the poor should be supplied with foodstuffs rejected by those who benefit from the system that generates their poverty. The concentration of the food system in the hands of the big corporations that monopolise the seed, the land, the machinery, the agrochemicals, all the way up the food chain to the supermarket sale, is responsible for hunger in Argentina. Right up to the last page of the Food Bank's presentation, the myth continues

"From the beginning, the Food Bank has worked to collect and distribute freely different kinds of food. To this end it puts itself equally at the service of the companies in the sector that have problems with too much stock, and the organisations that continuously distribute food to those who need it. The Food Bank is the ideal path between 'waste' and the charities."

In other words, the Food Bank helps the companies in the food sector to avoid having to take responsibility for their own rejects by passing products that can no longer be legally sold, to those who need food, in the guise of charity.

The President of the Food Bank, Luis Sisto, says:

"If the companies have merchandise which they will not be able sell because, for example, the competition has brought out a better or cheaper product, or if they have stock that is costly to store, the bank is able to bring it to those who need it."

He continues by saying that in December 2002 the Food Bank signed an agreement with the petrol company REPSOL YPF, which transported 10 tonnes of food over six months to 114 dining projects in two different areas proposed by the municipalities and chosen by the company. The donor food companies include Procter and Gamble, Swift Armour Argentina, Cargill, Kraft Foods Argentina, Nestlé Argentina and Pepsico Snacks.⁷⁷

Science and hunger at the service of marketing

DuPont has been working with the National Council of Scientific and Technical Research (Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)) to promote "local research", setting aside funds "for the development of scientific

research projects that can rapidly be industrialised in Argentina" and which have "high social impact". They also state that part of their aim is to "reinforce the position of DuPont as a company dedicated to science".

Chosen from some 3000 researchers and 59 projects focusing on food, the winner of the US\$25,000 prize was the Reference Centre for Lactobacillus for the development of a food containing soya. The title was: "Design of a functional soya food fermented with pro-biotic lactic bacteria" so introducing the new genus of "functional foods". They claim that by fermenting it with the bacterium *Lactobacillus reuteri*, they can increase the nutritional value of the soya juice, enriching it with vitamin B12. They insist that "functional foods" could be an interesting alternative of great social impact, possibly providing a response to the current situation, especially infant malnutrition. It seems they hope to eradicate all recollection of cow's milk from the memory of the poor.

But this is not all. In its charity programme with the Food Bank, DuPont's objective is to provide access for 3500 homeless people in the capital to foods fortified with "Proteins Isolated from Soya (PIS)". The objective is to make people aware of the importance of including soya protein in their daily diet. To this end DuPont says it will donate 9000 KG of PIS as a daily dietary supplement. In its publicity, it speaks of all the usual benefits, such as preventing heart attacks, but there is no mention of the evidence about the dangers of the phyto-estrogens found at high levels in soya. Nor is it mentioned that the soya is genetically modified. The experiment continues without any kind of control. It began in Argentina but is now being extended to other countries suffering under the neo-liberal model, where soya is an important tool. One commonly hears the following argument in defence of these "feeding plans": with so much hunger, how can it matter if the poor eat GE food, particularly when there is nothing else. A denigrating attitude to those who cannot choose what they eat and who depend, whether they like it or not and through no fault of their own, on the caprice of food aid donors.

During 2004 CONICET established a programme to stimulate Technological Development with Monsanto and set up a competition "Get Going" in the area of Biotechnology and the Environment with a prize of US\$30,000 for the project judged to be the best.⁷⁸

In December 2004, Argentina's Commission for Ethics in Science and Technology issued a resolution in response which considers the prize incompatible with ethics in science and technology. This is because there are implications for the public good and the integrity of science which make it inappropriate for a public institution to have such a relationship with a private company whose ethics and actions are under question as regards their impact on public well-being and the environment.⁷⁹

Conclusion

Even though soya exports are unlikely to solve its debt problem and address its economic crisis, the government of Argentina currently depends on them to do so. In this context, a good, stable international price for soya is imperative.

However, the price of soya on the international markets fluctuates constantly, leading to uncertainty and fuelling speculation. The price of land, payments to farmers and tax revenues are all intimately connected to the varying price of soya. In June 2004, ExportaPymes, an economic analysis resource,⁸⁰ featured an interview with the consultants AgriPac who claim that soya represented some 25% of Argentina's exports in 2003, mainly due to China's insatiable demand. Now, however, China is pushing for lower prices. This is linked with the deceleration of economic growth in China. The price of soya peaked in March 2004 at \$US 380 a tonne⁸¹ and had gone down to 335 by the beginning of April 2004. By the end of May 2004 it was about \$US 286 a tonne and by October 2004 it had dropped to \$US219 a tonne.⁸² ExportaPymes notes that for every dollar the price of soya falls on the international market, the state loses 5 million dollars in taxes. This means a loss of some \$US 480 millions in tax, between March and October 2004

Now there are plans to increase Argentina's production of grains including soya from 70 million to 100 million tonnes *per annum* and to increase the area for soya production by 10 million hectares. The companies and associations involved realise this proposal will provoke resistance because of the impacts it will have in causing further deforestation, concentration of land, expulsion of small farmers, and increased dependency at all levels on export crops. They are particularly concerned about the response in Europe, where millions of tonnes of soya are imported for animal feed. A number of development and environment agencies and NGOs working in Europe and South America have realised that the situation in Argentina is problematic and have started to become involved in the discussions relating to sustainable agriculture, food sovereignty, and export driven soya production. Some of these agencies and NGOs are exploring with agro-industry the idea of producing soya "sustainably", which in this context means in rotation with cattle production plus following certain guidelines which are currently being developed. They are meeting and planning how to project the idea of "sustainable soya" to the public under the leadership of WWF. Others involved include Andre Maggi, the world's largest single soya producer, who is also the governor of Mato Grosso state in Brazil. Companies involved include Unilever, Syngenta, Pioneer Overseas International, Monsanto, Cargill and Dow Elanco. The last three are part of "Conservation Production" whose project "100 million tonnes" is projecting the image of South America as the world's major feed producer. Whilst NGOs have good intentions, they risk becoming the

instruments of the powerful interests involved. WWF is open about its perception that it is important to talk to the powerful, i.e. the companies, but its remit and outlook are limited. There is little representation of small scale farmers and peasant organisations, indigenous people's organisations, food sovereignty groups, human rights organisations, groups opposed to GM and other civil society organisations, reflecting the difficulty of finding a way out of the current downward spiral. With "sustainability" narrowly defined the NGO and Industry round tables are in danger of adding to the problems and making it even harder to achieve a holistic solution that also addresses poverty, indigenous peoples rights, land rights, food security, agro-biodiversity and food culture.

This case study argues that agriculture based on soya monocultures can never be sustainable. The "sustainable soya" proposal to rotate soya monocultures with cattle production merely implies alternating extensive monocultures with intensive livestock production, both heavily mechanised and reliant on chemicals. Both occupy vast stretches of land, displacing other crops, whilst using minimal labour. Industry's main obligation is to maximise profits which means seeking immediate returns. It understands sustainability merely as the way to achieve sustained commercial benefits. Soya produced on a mass scale in countries where it is not part of the food culture but is simply a commodity for export, upsets the social, cultural, ecological, political and economic balance. It destroys the human rights of peasant and indigenous communities as well as the knowledge and practice of diverse farming and food production.

The idea that hunger in the third world can be addressed by biotechnology and the production of GE crops is shown to be false by the recent history of Argentina. Millions of hectares managed by the commodity companies, where GE soya is currently the main crop, generate new hunger daily. The argument that GE crops will reduce the application of pesticides has already been contradicted by the statistics. Argentine agriculture has not only fallen into dependency on inputs but is using pesticides that are banned or under question in the countries of origin, so poisoning people and their traditional crops and animals.

The so-called "Free Market" with its international institutions and treaties has become the justification by which corporations and economically dominant countries compel countries like Argentina to produce commodities. Argentina and other countries over-exploit their natural resources and compromise future generations, to service debts which were often illegitimately accrued.

The catastrophe that is unfolding in Argentina, as described in this case study, shows how genetic modification of crops creates hunger and dependency. The Argentine case is a warning that must not be ignored by people who want to defend their political sovereignty and their food security.

Glossary

CONABIA: National Advisory Commission on Agricultural Biotechnology (Comisión Nacional Asesora de Biotecnología Agropecuaria)

INTA: National Institute of Cattle Farming Technology (Instituto Nacional de Tecnología Agropecuaria)

SAGPyA: Secretariat of Agriculture, Cattle, Fisheries and Food (Secretaría de Agricultura, Ganadería, Pesca y Alimentos)

INDEC: National Statistics and Census Institute (Instituto Nacional De Estadística y Censos)

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