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Argentina's bitter harvest

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Abstract (Summary)

When genetically modified soya came in Argentina, it seemed like a heaven-sent solution to the country's agricultural problems. But now soya is being blamed for an environmental crisis that is threatening the country's fragile economic recovery. Branford investigates how it all went wrong.

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[Headnote]

When genetically modified soya came on the scene it seemed like a heaven-sent solution to Argentina's agricultural problems. Now soya is being blamed for an environmental crisis that is threatening the country's fragile economic recovery. Sue Branford discovers how it all went wrong

A YEAR ago, Colonia Loma Senes was just another rural backwater in the north of Argentina. But that was before the toxic cloud arrived. "The poison got blown onto our plots and into our houses," recalls local farmer Sandoval Filemon. "Straight away our eyes started smarting. The children's bare legs came out in rashes." The following morning the village awoke to a scene of desolation. "Almost all of our crops were badly damaged. I couldn't believe my eyes," says Sandoval's wife, Eugenia. Over the next few days and weeks chickens and pigs died, and sows and nanny goats gave birth to dead or deformed young. Months later banana trees were deformed and stunted and were still not bearing edible fruit.

The villagers quickly pointed the finger at a neighbouring farm whose tenants were growing genetically modified soya, engineered to be resistant to the herbicide glyphosate. A month later, agronomists from the nearby National University of Formosa visited the scene and confirmed the villagers' suspicions. The researchers concluded that the neighbouring farmers, like thousands of others growing GM soya in Argentina, had been forced to take drastic action against resistant weeds and had carelessly drenched the land - and nearby Colonia Loma Senes - with a mixture of powerful herbicides.

The villagers took their neighbours to court and won an order banning further spraying. The judge also found the tenants guilty of "causing considerable harm to crops and human health". But it was a pyrrhic victory. In September, new tenants took over the land and started spraying again. When challenged, the farmers said that the ban did not apply to them, which was technically true.

Colonia Loma Senes is not an isolated case. Over the past eight years, GM soya farmers have taken over a huge proportion of Argentina's arable land, leading to regular complaints by peasant families that their crops have been harmed by glyphosate and other herbicides. "We really don't know how much damage is being done throughout the country, because the authorities are not monitoring the situation properly," says Walter Pengue, an agro-ecologist from the University of Buenos Aires who has studied the impact of GM soya. But he predicts that such incidents will become more common as a consequence of Argentina's rush into GM soya. And other experts are warning of potential problems that include the emergence of herbicide-resistant weeds and destruction of the soil's natural micro-organisms.

GM technology is not entirely to blame for Argentina's agricultural woes. Economic problems have also played their part. But the country's experience with GM soya holds worrying lessons for the rest of the world, particularly developing countries such as Brazil, the world's second largest soya producer after the US. After refusing for years to authorise GM technology, Brazil is now rethinking its policy. Farmers in the south have been illegally planting GM soya smuggled over from Argentina, attracted by reports of higher yields and lower production costs. This has left the government with little option but to accept the cultivation of GM soya as a fait accompli. Last year it reluctantly gave temporary authorisation for the sale of GM soya on the domestic market and is now debating the finer details of permanent approval. Argentina's experience suggests that Brazil would do well to opt for tight controls with rigorous environmental impact studies.

In 1997, Argentina became one of the first countries to authorise GM crops, when Monsanto's Roundup Ready soya was introduced there and in the US. This GM variety is resistant to glyphosate, which Monsanto sells under the trade name Roundup. Argentina's farmers jumped at the new technology, which seemed just what they needed to solve

some of their most pressing problems. Since the late 1980s, Argentina's largest and most fertile farming region, the Pampas, had been suffering from serious soil erosion. About half of the 5 million hectares of the Pampas's core grain-producing region was suffering severe erosion, according to the country's National Institute of Agricultural Technology (INTA), and yields on these lands had fallen by at least a third. To try and alleviate the problem, farmers were experimenting with no-tilling - a system in which seed is sown directly on the land without ploughing or any other form of cultivation. But with no ploughing, weeds were starting to get out of control, and the farmers were at a loss as to what to do.

Roundup Ready soya seemed a solution made in heaven. Farmers were able to make the no-till system work because, instead of needing five or six applications of various herbicides, they could spray only twice with glyphosate at key moments in the season. What's more, the seed companies made the move into Roundup Ready easy by supplying the seeds, machinery and pesticides in a single convenient "technological package". The new technology was also cheap. While farmers in the US paid a premium of at least 35 per cent to plant GM varieties, Argentina had not at that time signed an international patent agreement so Monsanto was able to charge only a modest fee or risk being undercut by companies making generic copies of its technology.

Driven by the world's apparently insatiable demand for soya to feed to cattle, Argentinian farmers stampeded into soya, one of the few profitable sectors in a depressed economy. Desperate to join in, urban investors rented land from impoverished smallholders and turned it over to soya. Anta, the farming group that did the damage to Colonia Loma Senes, benefited from such schemes.

By 2002 almost half of Argentina's arable land-11.6 million hectares - was planted with soya, almost all of it GM, compared with just 37,700 hectares of soya in 1971. Soya moved beyond the Pampas into more environmentally fragile areas, especially in the northern provinces of Chaco, Santiago del Estero, Salta and Formosa. Not even Monsanto had imagined that the move into Roundup Ready soya would be so rapid.

At first everything looked rosy. From 1997 to 2002 the area under soya cultivation increased by 75 per cent and yields increased by 173 per cent (see Diagram, p 43). In the early years there were also clear environmental benefits. Soil erosion declined, thanks to the no-till method, and farmers moved from more damaging herbicides to glyphosate, widely regarded as one of the least toxic herbicides available.

Even when world soya prices started to decline as global supply increased, Argentinian farmers continued to do well financially. Monsanto progressively cut the price of Roundup and by 2001 it was selling at less than half its 1996 price. Overall, Argentina's farmers made a profit of about \$5 billion by adopting Roundup Ready soya.

Some years ago, however, a few agronomists started to sound alarm bells, warning that the wholesale and unmonitored shift into Roundup Ready soya was causing unforeseen problems. In a study published in 2001 by the Northwest Science and Environmental Policy Center, a non-profit organisation in Sandpoint, Idaho, agricultural economics consultant Charles Benbrook reported that Roundup Ready soya growers in Argentina were using more than twice as much herbicide as conventional soya farmers, largely because of unexpected problems with tolerant weeds. He also found that they were applying glyphosate more frequently than their US counterparts - 2.3 versus 1.3 applications a year. Saying that "history shows us that excessive reliance on any single strategy of weed or insect management will fail in the long run, in the face of ecological and genetic responses", he advised Argentinian farmers to reduce their Roundup Ready acreage by as much as half in order to cut glyphosate usage. If they did not, he warned, they would run the risk of serious problems. Among his predictions were shifts in the composition of weed species, the emergence of resistant superweeds, and changes in soil microbiology.

The warning fell on deaf ears. Argentina's economy was in deep trouble, and with soya now its main export earner the government was in no mood to intervene. The area under Roundup Ready has continued to grow, and farmers hurt by the collapse of Argentina's currency at the end of 2001 are increasingly moving into soya monoculture, as other crops for the domestic market have become unprofitable. Glyphosate use continues to rise. Pengue estimates consumption reached 150 million litres in 2003, up from just 13.9 million litres in 1997.

Initially Pengue believed that with careful rotation of crops and adequate controls over the way the herbicide was applied, the move to glyphosate would benefit the environment. But he is now concerned that the unmonitored use of this one herbicide is leading to the problems predicted by Benbrook. In a study into the impact of Roundup Ready soya on weeds, Delma Faccini of the National University of Rosario found that several previously uncommon species of glyphosate-tolerant weed had increased in abundance. In another study, agronomists from INTA's office in Venado Tuerto, near Rosario, found that farmers were having to use higher concentrations of glyphosate. For now, the problem appears to be limited to the proliferation of weeds that are naturally resistant, but some agronomists are warning that it is only a matter of time before glyphosate resistance is transferred to other weed species, turning them into superweeds.

The third problem that was predicted by Benbrook - changes in soil microbiology - also appears to be happening. "Because so much herbicide is being used, soil bacteria are declining and the soil is becoming inert, which is inhibiting the usual process of decomposition," says agronomist Adolfo Boy from the Grupo de Reflexion Rural, a group of

agronomists opposed to GM farming. "In some farms the dead vegetation even has to be brushed off the land." He also believes that slugs, snails and fungi are moving into the newly available ecological niche.

Similar problems are occurring to some extent in the US. According to Joe Cummins, a geneticist from the University of Western Ontario in Canada, studies of the impact of herbicides, particularly glyphosate, on soil microbial communities have revealed increasing colonisation of the roots of Roundup Ready soya with the fungus *Fusarium* in Midwestern fields.

Argentina's farmers are also having to deal with the proliferation of "volunteer" soya, which sprouts from seeds dropped during harvest and which cannot be eradicated with normal doses of glyphosate. This has created marketing opportunities for other agrochemical companies such as Syngenta, which has been placing adverts with the slogan "Soya is a weed" advising farmers to use a mixture of paraquat and atrazine to eradicate volunteer soya. Other companies, including Dow AgroSciences, are recommending mixing glyphosate with other herbicides, such as metsulfuron and clopyralid.

Market forces

Not all scientists in Argentina are convinced that the farmers' problems have been caused by heavy use of glyphosate, and others say that the difficulties are not yet critical. "We are experiencing some problems of tolerant weeds, but they are not on a large enough scale to affect overall yields seriously or to jeopardise the future of soya farming," says Carlos Senigalesi, director of investigative projects at INTA. He believes it is the tendency for farmers to grow nothing but soya, rather than the prevalence of GM strains, which is at the root of the problem. "Monoculture is not good for the soils or for biodiversity and the government should be encouraging farmers to return to crop rotation," Senigalesi says. "But here everything is left to the market. Farmers have no proper guidance from the authorities. There are no subsidies or minimum prices. I think we must be the only country in the world where the authorities do not have a proper plan for agriculture but leave everything to market forces."

For the first time however, INTA recently expressed concern. In a report published in December it criticised "the disorderly process of agricultural development", warning that if nothing was done, a decline in production was inevitable and that the country's "stock of natural resources will suffer a (possibly irreversible) degradation both in quantity and quality". It called for changes in farming practices in the Pampas, saying that the combination of no-till with soya monoculture was "not a sustainable alternative to crop rotation farming". It also warned that, in the north, soya farming "is not compatible with the sustainability of farming".

Monsanto's Argentinian headquarters has refused to comment directly on these accusations. But the company has expressed concern about the situation, saying it believes that crop rotation is more sustainable than monoculture. It is also starting to suffer from the lack of government controls. In January it unexpectedly halted sales of Roundup Ready soya, saying that farmers were buying about half of their seeds on the black market and depriving the company of royalties.

To Benbrook, this adds up to a very worrying outlook. "Argentina faces big agronomic problems that it has neither the resources nor the expertise to solve," he says. "The country has adopted GM technology more rapidly and more radically than any other country in the world. It didn't take proper safeguards to manage resistance and to protect the fertility of its soils. Based on the current use of Roundup Ready, I don't think its agriculture is sustainable for more than another couple of years."

Argentina used to be one of the world's major suppliers of food, particularly wheat and beef. But the "soyarisation" of the economy, as the Argentinians call it, has changed that. About 150,000 small farmers have been driven off the land. Production of many staples, including milk, rice, maize, potatoes and lentils, has fallen sharply.

Many see Argentina's experience as a warning of what can happen when production of a single commodity for the world market takes precedence over concern for food security. When this commodity is produced in a system of near monoculture, with the use of a new and relatively untested technology provided by multinational companies, the vulnerability of the country is compounded. As yet, few countries have opted for GM technology: the US and Argentina together account for 84 per cent of the GM crops planted in the world. But as others, including the UK, seem increasingly prepared to authorise the commercial growing of GM crops, they may be well advised to look to Argentina to see how it can go wrong.

[Sidebar]

Argentina's farmers embraced GM soya with an enthusiasm that surprised even the biotech industry. Greenpeace activists in Argentina protest about the addition of unlabelled GM soya to processed food.

[Sidebar]

"History shows us that excessive reliance on any single strategy of weed or insect management will fail in the long run, in the face of ecological and genetic responses"

Around half of Argentina's arable land is now under GM soya cultivation

[Sidebar]

Roundup is widely recognised as one of the safest herbicides available, but has spraying got out of hand?

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