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THE POLITICAL ECONOMY OF AGRICULTURAL BOOMS

Managing Soybean
Production in Argentina,
Brazil, and Paraguay

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Cover illustration: Pattern adapted from an Indian cotton print produced in the 19th century

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A Super-Seeding Business

Abstract The international political economy structure of agriculture is currently a corporate-driven, vertically integrated system of global production. This is the result of two mutually reinforcing traits: the technological transformation into agrochemicals and genetically modified (GM) seeds and the economic globalization of grain trading. The strategic value of a unique asset—GM seeds with proprietary traits—has propelled these companies to a dominant position. The power of input suppliers in the new soybean mode of production has given them overriding influence, allowing them to appropriate a sizeable portion of the rents generated along the chain. These multinational corporate actors have exerted their power to create the institutional structure to govern the new resource (GM soybeans).

Keywords Agriculture · Agribusiness · GM seeds · Biotechnology · International political economy · Soybeans · Latin America · Monsanto · Embrapa · INTA · Roundup

Arguably, the single most important determinant for soybean expansion has been technological. The adoption of a cluster of three advances known in the literature as the soybean “technological package” (Barsky and Dávila 2008) has radically transformed the means of (agricultural) production:

Genetically modified (GM) seeds + Glyphosate + No-till or Direct seeding

- GM¹ seeds were first developed by US chemical company Monsanto in the mid-1990s. In 1995, the US government approved GM soybeans resistant to its broad-spectrum herbicide—glyphosate—sold under brand name *Roundup*. Monsanto's soybeans are known as "RR," which stands for "*Roundup Ready*." Resistant to *Roundup*, the soybeans can be sprayed with the herbicide without being affected. Fumigation is done by large machines or airplanes without damaging the crop itself. RR soybeans were Monsanto's first commercial seed product resulting from biotech research and became commercially available in 1996, followed by Roundup Ready corn in 1998.
- No-till sowing establishes plants by sowing seed directly onto the site to be vegetated. It was introduced to reduce soil erosion, maintaining the value of the land over time. However, the technique also reduces labor, fuel, irrigation, and machinery costs. Less tillage improves soil quality by enhancing its carbon and water-retention capabilities, preventing compaction and structural breakdown.² Without tillage, crop residue is left intact in the field, decomposing and helping water infiltrate the soil, thereby limiting evaporation. This way of direct sowing has allowed yields to increase: less-eroded soils retain higher water content, and so instead of leaving fields fallow, it makes economic sense to plant another crop with or before the second harvest. This is why in the same soybean field, it is common for another crop to be planted, increasing a field's output and productivity. The cost equation of the producers under these conditions greatly affects the decision to plant soybeans. Even if each crop earns less, the total amount earned can be larger due to the fact that more crops can be produced at the same amount of time.
- Monsanto developed and patented the glyphosate molecule in the 1970s, and marketed *Roundup* from 1973. It retained exclusive rights in the USA until patent expiration in September 2000, and maintained predominant market share by switching operations overseas. With a GM mode of production that requires less plowing, weed control becomes a problem. Thus, the synergy between a production mode (direct sowing) and input of production (glyphosate) is natural and binding: instead of plowing to remove the weeds from under the earth, farmers eliminate weeds before planting by applying a non-selective herbicide: *Roundup*.

These technical developments were the result of a corporate strategy before anything else. In the 1980s, agrochemical corporations were experiencing declining profit margins and dwindling expansion opportunities as a result of increased regulations and fewer markets in which to expand. In response, they built on their existing relationships with farmers to enter into another, more promising agricultural input industry: the seed industry. In the 1990s, Monsanto positioned itself as a high-growth “life sciences” company, focused on agriculture, food ingredients, and pharmaceuticals. CEO, Robert Shapiro, pursued a vision of venturing into cutting-edge science to raise profits, adding seed and genomics to spin off the company’s core business. The plan was to use the revenue generated by hugely profitable *Roundup* to finance R&D in biotechnology (biotech). The result was the GM technology and a series of GM seeds. In a fiercely competitive environment, Shapiro’s R&D initiatives ensured the market position of his agrochemical products.³ This development overturned existing products and markets, in a perfect Schumpeterian⁴ logic of “creative destruction”: permanent innovation as an imperative for survival through market share increase.

Monsanto had to diversify in order to avert losing its massive herbicide investment; this sunk capital had to be mobilized into more productive and profitable activities. Pelaez and Poncet (1999: 142) identify the two fundamental dilemmas the company faced:

- a) How to induce agricultural producers to increase their consumption—and hence prolong the value—of Monsanto’s main asset (*Roundup*) in the face of more stringent environment regulations?
- b) How to generate brand loyalty in order to minimize the approaching market share loss derived from patent expiration?⁵

RR seeds were the answer to both questions. Quite literally, these were the seeds of a new agribusiness model of production. In the process of leveraging its technological base and innovating in biotech, Monsanto revolutionized agricultural production. Biotechnology is a disruptive technology and successive breakthroughs require the industry to radically rethink its very existence. Successful development of biotech markets came when companies flocked to the sector, mainly capitalizing on their chemical expertise and branching out into biotech. As a result, GM seeds spread worldwide like wildfire. By 2016, Argentina, Brazil, and Paraguay occupied the second, third, and seventh place in the “biotech mega-countries”

International Service for the Acquisition of Agri-biotech Applications (ISAAA) list with 44.2, 24.5, and 3.6 million hectares each of biotech crops, mostly soybeans. The global hectareage of biotech crops has increased 100-fold from 1.7 million hectares in 1996 to 179.7 million hectares in 2015.

A new agricultural market structure was thus established with new rules. First, the weight of private companies expanded as GM seeds spread, since GM expansion was the spearhead that would guarantee a steady flow of income derived from agrochemical sales. Ultimately, the big earnings for companies in the sector come from the chemical products. Secondly, profit would increasingly be derived from patents and royalties from seed sales. Indeed, by 2016 Monsanto owned over 16,000 biotechnology patents worldwide. Because now innovation had become the key element to enhance competitiveness in the agricultural sector, protection of the asset against imitation was paramount to safeguarding R&D investment returns (Teece 2000: 135). Organizational routines and business strategies continuously clustered around adding new and—due to intense competition—specific value to crops. The overriding trend is toward permanent development of complementary assets that will enable the appropriation of the benefits of innovation (Fuck et al. 2008: 225). Those complementary assets are integrated, inter-related components of a technology-intensive agricultural model, which in 2014 represented market values of \$39 billion for seeds, \$116 billion for agricultural equipment, \$54 billion for agrochemicals, and \$175 billion for fertilizer. As early as 1998, the Wall Street Journal reported that “most seed companies have either aligned themselves with or been acquired by crop-biotech juggernauts like Monsanto Co., DuPont Co., and Dow Chemical Co.”⁶ These companies are in the chemical business, and hence see the seed industry as a way to insure a growing market for their herbicides: as head of investor relations for Bayer CropScience, Alexander Rosar stated that the company’s strategic priorities were “to drive top-line in agrochemicals” by means of “targeted cost savings through successful integrated crop platforms” and to “expand seeds and traits business by leveraging proprietary trait assets.”⁷

In this concentrated corporate landscape, the so-called “Big Six” group stands out through the control of agrochemicals and GM seeds: Bayer, Monsanto, Dupont, Dow, BASF, and Syngenta. According to the ETC Group, the B6 collective 2015 sales were over US\$65 billion in agrochemicals, seeds, and biotech traits. Together, they control 75 % of the global agrochemical market and 63 % of the commercial seed market and account for more than 75 % of all private sector agricultural research in

seeds and chemicals. Moreover, the Consultative Group on International Agricultural Research (CGIAR) estimated the combined B6 R&D budgets were 20 times higher than R&D spending at international crop breeding institutes and 15 times higher than the US government's (USDA/ARS) crop science R&D spending. This means they determine priorities and future direction of agricultural research. Indeed, 2013 data from ETC showed that in the agrochemical market three companies have a 51% market share: BASF 13%, Bayer 18% and Syngenta 20%. Brazil and Argentina occupied in 2014 the first and eight positions in the top 10 agrochemical markets by country. In the global proprietary seed market, six companies control 62% of the business: Bayer 3%, Dow 4%, Syngenta 8%, DuPont 21% and Monsanto 26%. In December 2015, DuPont announced a US\$130bn merger of its crop science division with Dow Chemical. In February 2016, the China National Chemical Corporation announced the buying of Swiss seed company Syngenta in a US\$43bn deal. In September 2016, Bayer bought Monsanto in a US\$66bn deal. If all these mergers go through regulatory hurdles, the three biggest companies that will emerge (Bayer-Monsanto, ChemChina-Syngenta, and Dow-Dupont) will sell 59–62% of the world's patented seeds.

Because extraordinary gains can be captured if scale advantages are leveraged and barriers to entry raised, there is a powerful collective incentive for the sector to concentrate through vertical integration and to guard knowledge creation. In practice, vertical integration translates into significant barriers to entry for new seed companies. These include limited access to funding (established companies have built on cutting edge developments in order to consolidate a credit circuit⁸), lack of marketing experience,⁹ an insurmountable R&D development capacity gap,¹⁰ and the consequent difficulty to attract qualified scientists (in shortage in the biotech field). This is further accentuated in the countries under study, where capital markets are small and weak. For example, Bisang and Gutman (2005) estimate that the adoption of the soybean “technological package” demands an initial investment of at least US\$100,000, “which makes vertical integration unviable for agricultural producers with less than 100 ha.” Knowledge protection is implemented through intellectual property right (IPR) protection, which is increasingly important for guaranteeing rights and stimulating investment. Nevertheless, it could end up being utilized as an instrument to maintain oligopoly on knowledge creation and regulate the volume and pace of technology transfer according to corporate demands. As US Assistant Attorney General for Antitrust Christine Varney (the Justice Department's

top antitrust official) acknowledged in reference to the American case: “patents have in the past been used to maintain or extend monopolies; and that is illegal.” Because firms in the biotech field control technology distribution chains, they are political actors. They are agenda-setters, enforcing regulatory and enforcement capacities through governmental contacts and lobbying activities.

THE INSTITUTIONAL FRAMEWORKS

The structure of economic appropriation plays a key role in determining the strategies of the organizations involved in the research process, and ultimately in shaping the seed market. The distribution of the economic benefits from agricultural biotech is decided by the manner in which states have reacted to the global agro-biotech tide of innovation: what kind of regulatory frameworks were put in place, how does the institutional structure work, what have been the main interests of the actors, and what resources have they mobilized.

The basic design for the process regulating biotech crops worldwide has been modeled after the US system. It begins with a permit application for the experimentation and/or release into the environment of a lab developed crop. Tests are then carried out in order to assess potential impacts on the agricultural system, on the environment, and on the human health. After biological traits of the organism are examined, it is released in experimental crop form. During this five to seven year period, the crop is subject to recurring controls. Then, genetically modified organism (GMO) crops are authorized for commercialization. More importantly, the process is implemented differently and enforced in varying degrees in each of the BAP countries. Different national IPR protection structures will strengthen or weaken the actors in competition for control of this link in the soybean commodity chain by setting different incentives. These incentives will in turn condition investment decisions and ultimately the pace of innovation. Hence, the key arena is the R&D process and the main players are the state institutions governing it and the corporations attempting to shape it. It is this interaction that primarily determines the accretion and distribution of the benefits of innovation and, in turn, structures the domestic seed markets.

Regarding the biotech companies, they can be said to have four main avenues to advance their interests:

- *Legal*: To enforce IPR, seed companies have used out-of-court settlements and lawsuits primarily—but not exclusively—targeting farmers.

For example, after failing to reach an agreement with Argentine farming organizations and soy exporters, Monsanto's IPR claim conflict escalated in 2005. The company had freighters with Argentine soymeal cargo detained in the ports of Denmark, the Netherlands, England, and Spain in order to prove that they carried RR soybeans. In Italy, the same enterprise remained unsuccessful as the state denied Monsanto the right to detain freighters. Monsanto's purpose was to claim the cargoes illegal, as RR beans are registered in EU patent law. In June, Monsanto sued import enterprises Danish Lokale Andel and Cargill at the Danish High Court and the firm Cefetra at the Dutch Rechtbank's Gravenhage. The company issued a foreboding statement in which it claims: "The right to begin legal actions on the assumption of uncovering imports from Latin America of unlicensed Roundup Ready soy in countries where technology is protected by intellectual property rights."¹¹ Legal conflicts concerning seed patent rights have never been relevant in the agricultural market. With an increasing number of crops patentable, the international agricultural inputs market might—in the coming years—increasingly resemble the pharmaceutical market. If the comparison can serve as a proxy, then no better access to food products is to be expected; the patent-protected prices of pharmaceutical drugs have often put them out of reach of the poorest of the world.¹²

- *Economic:* More importantly, companies consolidate their position in the sector by a dense and complex web of subsidiaries and licensed distributors. "Cross-enabling agreements" create de facto niche monopolies. Sharing and mutual licensing of traits and technology combine R&D efforts and put an end to sector intellectual property (IP) litigation.¹³ Agrochemical and seed companies are reinforcing market power from the top through deals and alliances that render futile the notion of competition. The boldest examples are BASF and Monsanto's US\$1.2bn R&D and commercialization collaboration agreement in plant biotech, characterized by ETC Group as a "non-merger merger," the 2008 Syngenta and Monsanto settlement of all outstanding patent, antitrust, and commercial litigation relating to the two companies' global corn and soybean businesses, and DuPont and Syngenta's crop protection technology exchange of chemical substances. Market power exercised by dominant seed firms limit farmers' choices. By providing multipliers with incentives to limit access to seeds with weaker IP protections, they reduce the availability of non-GMO varieties. This reduction in quantity also increases the price, further

discouraging acquisition. The situation even replicates for GMO seeds with single traits, which lose to seeds stacked with multiple traits. Even if multiple traits are not necessary, farmers are faced with no option to avoid purchasing them. This is why stacked traits increased from 51.4 million hectares in 2014 to 58.5 million hectares in 2015, or 14 % according to ISAAA 2016 data.

- *Political*: Subtle avenues include sponsorship agreements of public and research institutions, such as grants, joint projects, and prizes. A positive development as it may be in terms of knowledge sharing and cooperation, it should not come at transparency's expense. Financial leverage can be used in the sponsor's favor, especially in countries where institutions are weak. Not infrequently the companies use their unique expertise to advise in the drafting of national biosafety bills. Industry-friendly experts in key decision-making positions then rotate toward corporate jobs.¹⁴ The problem here would be not lack of capabilities but of oversight, disregarding potential conflicts of interest while in public office. Lobbying for the development of strong IPR frameworks is probably the most vital element for the seed companies. The legal recognition of their proprietary traits over genetic material—by law or in court—is the most important enabler to a steady stream of profit. A final avenue is corruption, buying the laws or regulations needed through payments to officials, as was the case of Brazilian congressman Lupion, explained later.
- *Scientific*: Since companies hold an almost exclusive control over cutting-edge advanced genomics, leveraging biotech capabilities could compensate for legal or political uncertainty. Increasing “codification” of proprietary traits reduces room for piracy, though also for local adaptation. Genetic use restriction technology (GURT) has the potential to achieve IPR protection by itself, by means of science rather than law. V-GURT “terminator” seeds are genetically engineered to be sterile in the second generation, while T-GURT “traitor” seeds would not germinate until the crop plant is treated with a chemical activator compound sold by the biotech company. With adaptation and dissemination probabilities reduced, the balance of power in public/private relations could be tilted definitively in favor of the corporate sector.

Before going into the details and specificities of each country, a graphic outline of the internal workings of the seed circuit or process of production can be outlined; see Fig. 2.1.

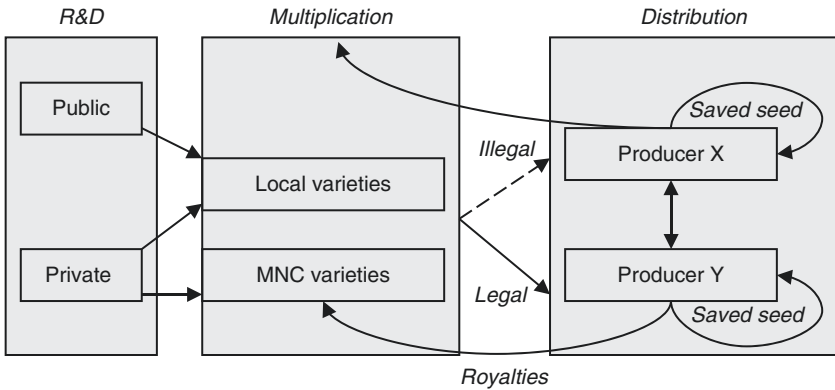


Fig. 2.1 The seed production circuit

Source: Author

THE POLITICAL ECONOMY OF SEEDS

When international chemical companies pushed forward a global biotech revolution, they created a new model of agricultural production: capital and technology—not labor—intensive. Knowledge in the biotech field was the main asset, and hence the struggle was for knowledge creation and protection through IPR enforcement. MNCs in the biotech field controlled technology distribution chains, and they exerted a political role by attempting to influence the design of the regulatory framework, lobbying for the enforcement of property rights or having “friendly regulators.” The results varied in each national case: the more dispersed Brazilian power system gave rise to a decentralized governing structure, devolving power to the subnational states units and through mobilization of local producers. This led to coordination with the private sector R&D. Embrapa consolidated as a top-tier agricultural public institution, but at the same time continued to operate under profit-driven guiding principles. Argentina’s research institution, National Agricultural Technology Institute (INTA) did not face incentives to develop new genetic varieties, for its climate conditions allowed direct import of foreign varieties and its institutional framework did not create incentives for profit. Its institutional structure was strong and its political mobilization was even stronger. Argentina is the only case in which there was an open *confrontation* that challenged the role of multinational seeding companies.

The impugnation of IPR debate was along rights. Finally, Paraguay's institutional structure was overwhelmed by fragile initial conditions, collective action insurmountable hurdles, and overwhelming power from the global corporate actors. Institutionally weak, it could not develop indigenous seed capacity or even regulate the power and actions of MNCs. As a result, Paraguay's structure has been *colonized*, relegated to a dependent position in the global value chain through the loss of potential benefits from soybean biotech research and development to foreign actors.

Argentina

The Argentine seed industry has been one of the cornerstones of the country's agricultural development. Scientific genetic improvement can be traced back to mid-twentieth century, with the industry organized around the activities carried out by the INTA in the public sector, and a group of local firms such as Buck and Klein, Morgan, and the subsidiaries of MNCs like Cargill, Asgrow, and NK-Nidera (Gutiérrez, p.196). In the soybean seed market, however, INTA has far less power of intervention and articulation than Brazilian counterpart, Agricultural Research Corporation (Embrapa), which was purposefully designed and institutionally sustained to be the key technological development agency underpinning the seed industry. This arrangement led to a competitive relationship with the seed companies in creating and controlling genetic material. As a result, not only is the Brazilian seed segment less concentrated, but state institutions also have a vested interest in enforcing IPR, which in practice means less lenience with the illegal seed circuit. Argentina does not have this kind of public R&D institution for soybeans. INTA has weaker capabilities because it was never able to build advantages over the MNCs as Embrapa did. Import and adaptation of technologies developed abroad was much easier in Argentina than in Brazil, where Embrapa developed a unique expertise in tropical agriculture. In consequence, Argentina held no incentives to create synergies or spillovers with local agents, or to partner with the private sector to extend the range of products or to support small and medium seed producers organized around local foundations. With the no significant public role in the soybean seed business, control was handed to the private sector and market concentration is higher. However, in Argentina, a general lack of enforcement regarding IPR and widespread circulation—both production and distribution—of illegal seed¹⁵ results in a situation characterized by de facto transfer of the benefits of R&D from the developer to the user.

Argentine seed law 20.247 dates from the early 1970s, though enforcement began only in the late 1980s as a result of action by wheat breeders. The law provides two kinds of plant variety registration, via the National Registry of Cultivars¹⁶ (RNC) and the National Registry of Cultivar Property (RNPC). Regulatory Decrees 2.183/91 and 2.817/91, which set up the National Seed Institute (INASE), supplemented the law. Resolution 124/91 organized the biosafety regulatory system around the National Advisory Committee on Agricultural Biosafety (CONABIA), within the Secretary of Agriculture, Livestock, Fisheries and Food (SAGPyA¹⁷). An advisory agency, CONABIA scientifically assesses the potential impact of the introduction of GMOs and reviews applications for field tests, supervising release of new species. However, CONABIA's weak institutionalization affects policy decisiveness. Without the competence to fix penalties for non-compliance, policy quality is also diminished. Commitments undertaken by Argentina as a member of the Convention on Biological Diversity, which requires that biosafety regulatory systems be ruled by laws, somewhat compensate for this state of affairs. During 2001, SAGPyA actively cooperated with members of the Argentine Congress in the drafting of a law on biosafety. With the crisis that wrecked the country in 2001, the draft was never brought to the floor and there is no evidence that it will be in the near future.

Argentina was the first among the BAP countries to approve RR production in 1996, and from there it was introduced illegally into Paraguay and Brazil, countries that at that time had a ban on GM crops. The loosely controlled tri-border area was used as a launching platform to introduce the seeds into Brazil and Paraguay. Black market seeds are known as “white bag” (*bolsa blanca*) for the white, unlabeled sacks in which they are stashed. Monsanto had an agreement with Asgrow in the USA for access to the RR gene. Thus, Asgrow Argentina had the right to use the gene in its registered varieties.¹⁸ When Nidera acquired Asgrow Argentina, it gained access to the gene and widely disseminated it. The corporate strategy is the same Monsanto has used in other places of the world with other biotech crops: introduce the seed and then demand property rights based on patent law. The gambit did not pay in the Argentine case. Despite the absence of definitive evidence as to Monsanto's role, the spread of RR seeds was so instrumental to the company's objective that—given the evidence gathered during research—it is a reasonable assumption that Monsanto at least turned a blind eye to the process. When Monsanto tried to patent the gene in the country, it

could not do so because the gene had already been “released.” Moreover, the patent law in Argentina did not cover plants, and National Seed Law allowed farmers to save seed.

Through private settlements that explicitly recognized ownership over this patent and stipulated the royalties to be paid, Monsanto licensed the RR gene to other companies. However, institutional conditions were not granted for a biotech company to either charge a “technology fee” or restrict the use of the seed to farmers. When the company threatened in January 2004 to withdraw from the soy business in Argentina and to halt all in-country R&D programs, SAGPyA published a legal draft to initiate a “technology compensation fund.” Producers challenged this “masked farmer tax” with support from the oil industry and the office of state revenues (AFIP), and the proposal was dropped.

For the eight years after 2007, Argentina laxly enforced system of “extended royalties” for soybeans, even though it is directly against the provisions of Seed Law 20.247¹⁹ regarding free use of saved seed. Extended royalties mean that payments are in force every time that the producer (farmer) multiplies seed. Upon purchasing original seed, current price is shown on the company’s list and a special emblem is stamped on the invoice mentioning which system the purchased variety falls under. Before the next crop year, the producer must make a sworn statement attesting to the amount of seed saved for planting, and the seed company will then emit a debit note for royalties. However, and because of the way in which GM soy expanded, estimates put the legal Argentine seed market at between 20 % and 35 % of the total, the rest being divided into saved seeds and the illegal market. Nidera leads the certified soybean seed market with 48 %, followed by Don Mario (29 %). Among the minor top 5 players are La Tijereta (5 %), Santa Rosa (4.6 %) and SPS—acquired by Syngenta in 2008—with 2.5 %. In this context, seed companies found it difficult in practice to enforce their IP rights to protected soybean varieties.²⁰

Almost all legal GM soybean seed in Argentina is sold by the US company, which account for 50 % of the total grain production of the country. The Argentine seed market is more concentrated and private sector-driven than the Brazilian, which is more diversified and with stronger public sector participation. The evolution of soybean seed development illustrates my claim about the power of international actors wielding their power to consolidate corporate strategies. GM soybean seed developments in Argentina are performed exclusively by the private sector.

INTA's participation in the soy seed market is very limited, circumscribed to crop management, sowing techniques, and disease control. Advances achieved by soy growers in recent years are due to the diffusion of herbicide-resistant transgenic varieties and mass adoption of minimum tillage. The Institute encourages this process by "supplying an integrated crop management package," but is not a player in plant breeding like Brazilian counterpart Embrapa.

After failing to collect royalties on its first-generation Roundup Ready technology in Argentina, Monsanto started in 2011 to build a private IP regime specific to a second generation of GM varieties of soybeans. It established a private system to collect royalties on its second-generation technology. The company signed signing contracts with rural producers that wanted to have access to the new GM varieties. The system established private royalty collection. This implied rural producers would have to pay royalties on saved seeds. For Argentine Agrarian Federation (FAA), this was a direct infringement of the law of seeds. In the 2013/2014 campaign, Monsanto released the *Intacta RR2 PRO*²¹ technology, which stacks insect plus glyphosate resistance together with a new private system of royalty collection, based on scientific testing. When crops get to port, before being loaded they are charged an extra fee per ton of soybeans testing positive for Monsanto's GM seeds. On average, US\$15 per ton is charged to farmers if the technology is detected. Exporters such as Cargill, Bunge, Dreyfus, Vicentín, and ADM-Toeffer have agreed to act as inspectors in order to avoid having problems when handing over the grains, after cargo ships have been stopped by Monsanto in Europe over the last few years in order to collect royalties. Argentine farmers have accused Monsanto of imposing "private duties" via exporters to make producers pay for GM seed property rights. FAA has argued since 2008 that Monsanto had signed confidential agreements with exporters to act as retention agents on its behalf. On April 15, 2016 the incoming government of President Mauricio Macri passed a resolution giving the Agriculture Ministry exclusive control of the analysis of seeds in the country, rendering obsolete the Monsanto-funded network of laboratories set up to detect its seeds at Argentine ports to help enforce payment. On May 7, Monsanto issued a press release²² explicitly defying the government's decision, saying: "The soybean technology royalty system would remain operational" and that company "will enforce its private contracts and intellectual property rights both inside and outside Argentina." In August 2016, the Argentine Ministry of Agroindustry

submitted a draft seed bill to regulate the use of saved seed and copyright payment for genetically modified material. By September, it was being redrawn after complaints from farmers. Changes included limiting royalty payment to the first two harvests—currently Argentine farmers are free from any obligation to pay for the rights to use second-generation seeds—and payment exemption for the roughly 19,000 small-scale producers.

Paraguay

GM seeds were prohibited in Paraguayan soil until the 2004/2005 season. Although the Ministry of Agriculture (MAG) received requests from international companies to carry out experiments and tests with GMOs, the authority responsible for authorizing the use and release of GM seeds is the National Service of Plant Health Quality (SENAVE). SENAVE was created in 2004 by law 2459, merging the National Seed Direction, the National Direction of Plant Protection, the National Control Office for Tobacco and Cotton, and MAG's office that is in charge of domestic and international commercialization of vegetable sub-products. In October of that year, Agriculture Minister Antonio Ibáñez Aquino approved the introduction of GM seeds by Resolution No. 1691. As in the case of Brazil, since the late 1990s, RR soybeans had been smuggled from Argentina into Paraguay. Once the cultivation had reached a large scale, Monsanto started to demand compensation for the use of RR technology, as it had been doing in Argentina and Brazil.

The Biosecurity Commission (COMBIO)—modeled after Brazilian counterpart CTNBio—was created by Decree 14.841 in 1997. Dependent on MAG, COMBIO was never regulated, and Decree 14.841 remained the one insufficient institutional reference governing GMO-related activity. COMBIO itself participated in drafting Decree 12.706 of August 2008, which replaced the former and changed COMBIO's name to Agricultural and Forestry Biosecurity Commission (CBAF). Roles and functions of SENAVE and COMBIO were never defined, and so the MAG is currently under process of reassigning competencies. CBAF's core functions will remain: analysis, advice, and approval of all issues concerning GMO research and experimentation, GMO evaluation, introduction and release authorization, biosecurity norms establishment, monitoring, and enforcement. CBAF will have representatives from the Environment Secretary, the Ministry of Industry and Commerce, MAG, Health Ministry, and the National University of Asunción. This inter-institutional nature is complemented with civil society and private sector representation. All ministries

involved would have to jointly enforce directives, although bureaucratic interests widely vary. Without the MAG pushing forward the initiative, Paraguayan NGOs²³ and Environment Ministry²⁴ were its only supporters. The most comprehensive UN-sponsored study states: “There is not a defined national policy on the use of biotechnology nor on the biotechnology security. Even though some institutional initiatives in certain sectors, started with help from international organizations, appeared in the country, a national policy formulation process on biotechnology, has not yet been approved by consensus.”²⁵ This regulatory gap is a severe state of affairs for a country where GM soybeans account for 31 % of its total cultivated land, not only with respect to the potential health or environmental consequences, but also in terms of an opportunity cost of capturing the benefits of national innovation policies.

Law on Seeds and Protection of Crops 385/94—regulated six years later by Decree 7797/00—established the creation of the National Regime of Protected Crops, providing precautionary measures to the farmer and the researcher in their tasks through the regulation of the “farmer’s privilege” (which allows the farmer to save and reuse seeds and seedlings from protected varieties for the next season) and the “privilege of the researcher,” which allows breeders to use protected varieties as sources of a third variety. These regulations attempt to stimulate long-term research investments and were complemented with the inclusion of biological material in patent law 1630/2000. Moreover, Paraguay has no legal provision for either traceability or labeling systems, nor have they been included under any proposed law. More importantly, there is no established policy on stacked genes.²⁶ Provisions and omissions of the legal framework regarding GM seed development stimulate private—and only private—investment. Public investment for national biotech developments is not encouraged; indeed Paraguay lacks a national agricultural research institute. Devoid of strong public sector research institutions and in the presence of a weak private sector to compete against multinational corporations, Paraguay has been losing out on the opportunities to capture value in this segment of its soybean chain. This situation is in line with the interest of corporations, who have located their research activities to Brazil, where they can capitalize on a strong public institution that is at the same time receptive to joint development and agreements with the private sector. From the first approval for the planting and marketing of GM seeds—which introduced four RR soybean varieties—the number of approved GM seed varieties has expanded to ten. These licenses belong to Monsanto (4 varieties), Dutch/Argentine Nidera (3 varieties), and Brazilian COODETEC (4 varieties).

The absence of native GM seed development is indicative of a poor S&T structure. The *colonization* of the Paraguayan institutional structure regulation IP in seeds is in part due to the weak capacity of the Paraguayan state in IP and in agricultural R&D. According to the latest Agricultural Science and Technology Indicators, the total agricultural R&D spending as a share of agricultural GDP is 0.26 % (\$27 million), less than what spent in 2001. Neighbors, Brazil and Argentina, are at 1.82 % (\$2.7bn) and 1.29 % (\$732 million), respectively. The country still relies on technologies from corporations or neighboring country competitors, and there are no institutional incentives or material capacity to develop a technological treadmill. Only 35 % of the US\$30 million USD in royalties paid annually by Paraguayan soy growers stay in the country through local breeding companies and INBIO (*Instituto de Biotecnología Agrícola*).

Institutional weakness²⁷ has political sources. Between 2003 and 2007, Paraguay had five different ministers of agriculture. Needless to say, this situation severely hampered political decision-making, bureaucratic coherence, and policy stability. Despite the fact that agricultural products represent 54 % of total Paraguayan exports, only in 2008 a project to create a national-level R&D agency—the Paraguayan Institute of Agrarian Technology (IPTA)—was presented to Congress (3788/08). Having a strong national agricultural research institute is of key importance in the context of the centrality of the role of the technological component for the soybean chain. In August 2009, President Fernando Lugo vetoed the bill (Decree 2720/09), in response to MAG’s attempt to exert more technical control over the agency. Minister Cardozo had promised to write up a new bill “agreed upon by producer organizations and farmer unions in no more than 15 days, having within a month a newly created IPTA.”²⁸ Paraguay is in the worst scenario relative to its neighbors. It lacks a privately owned—yet concentrated—seed market like Argentina, and at the same time, institutional weaknesses have prevented it from developing public sector participation. The result is a dependent position and the transfer of rents from the Paraguayan seed segment of the soybean chain to multinational seed companies or producers from Argentina and Brazil.

Paraguayan agricultural lobby groups under the Farmer’s Union Syndicate (UGP) agreed in March 2005 to pay royalties to Monsanto’s Paraguayan branch for the use of GMO soybeans retroactive to the 2004/2005 crop year. Organizations involved include: the Paraguayan Chamber of Exporters and Traders of Grains and Oilseeds (*Cámara Paraguaya de Exportadores y Comercializadores de Cereales y Oleaginosas*, CAPECO) representing soybean

growers, the Association of Soy Growers of Paraguay (*Asociación de Productores de Soja, Oleaginosas y Cereales del Paraguay*, APS), the Agricultural Coordination of Paraguay (*Coordinadora Agrícola del Paraguay*, CAP), and the Federation of Cooperatives of Production (FECOPROD), gathering cooperatives of rural producers and accounting for over half of the country's agricultural production. Since then, Monsanto and the farmers have agreed upon the price based on the yields of the last campaign. The price is negotiated between the provider of the technology (in this case, Monsanto) and the user (the farmer), informing the government once the price is set. This royalty collection system has only been negotiated for soybeans. The system used to remunerate inventors for their technology is similar in structure to the grain program implemented in southern Brazil, designed by grower associations, grain handlers, technology providers, and seed companies. In November 2010, amidst discontent on the part of soy growers and local seed companies, the system of royalty collection was changed. Option is given to rural producers to pay when they purchase seeds, against a certificate to exempt them from payment of royalties on the sale of grain (proportionally to the amount of certified seeds purchased). Opposition to Monsanto escalated in 2012 with the news of judicial victories by Brazilian farmers. In March 2013, Monsanto offered Paraguayan soy growers a waiver on royalties on RR soybeans starting in 2014 as a way of encouraging an "orderly transition" to the second-generation GM varieties.

The weak mobilization of soybean associations made the sector vulnerable to corporate cooptation, what is in this book classified as *colonization*. The Paraguayan case illustrates a failure of the preference aggregation and interest articulation. For example, APS is a member of UGP, one of the most important business associations in Paraguay. However, UGP also includes APROSEMP (seed companies) and CAPECO (exporters). Rural producers' organizations (FECOPROD, UNICOOP, and CAP) were unable to mobilize independently from organizations of seed companies and exporters (APROSEMP, CAPECO). It is impossible to perform Olson's function of internalizing externalities in such a diverging interest scenario. Barriers to coordinated action were too high. APROSEMP and CAPECO have transnational seed companies among their members. Monsanto was a small, focused group, with a clear business orientation. With greater organizational and financial capacity, this led it to a more successful group to exert political pressure. This interwoven and overlapping structure of political representation made it possible for a corporate interest to prevail, to the extent of shaping (*colonizing*) the institutional structure.

Brazil

Federal Law 8.974/95 first established the norms regulating GMOs, and in 1998 Monsanto's RR seed was approved. However, the Brazilian consumer rights association (IDEC) and Greenpeace filed an injunction challenging the legitimacy of government biosafety policy and questioning the National Technical Commission of Biosafety's (CTNBio) scientific authority. IDEC challenged the government's claim that an environmental impact assessment was not necessary because Monsanto had testified that the GM variety was biochemically identical to conventional ones. IDEC argued CTNBio did not have the legal basis to waive the assessment, since it is required by the 1988 Brazilian Constitution. IDEC even asserted the decree which established CTNBio was unconstitutional. After 21 months of appeals by Monsanto, federal judge Antonio Souza Prudente declared in June 2000 that clause xiv of article 2 was indeed unconstitutional. After the federal court in Brasilia upheld the ruling, a non-defined moratorium on commercial planting of GM crops was enforced. Months later, in September 2003, the European Parliament adopted two regulations imposing traceability and labeling of GMOs in food products for human and animal consumption. Faced with the potentially massive losses that would accrue to the Brazilian agricultural sector, President Lula da Silva signed a decree authorizing the temporary sale of RR soy for the 2003 harvest and planting and sale for the 2004 season (provisional measure MP 113), making the courts' decision invalid. From then on, the government's strategy was to issue successive provisional measures *Medidas Provisórias* (131 and 223, PLV 67/04). Ultimately, the issue would be decided in the battle for the Biosafety Law and for CTNBio's control.

Congress approved the Biosafety Bill (N. 11.105) in March 2005. This bill replaced the previous legal framework from 1995, under which agricultural biotech was first developed in Brazil. Signed by Lula on March 24, the law includes provisions for stem cell research. On November 23, the president signed Decree N. 5591 implementing the law, thus establishing the two pillars of the Brazilian regulatory framework for agricultural biotech:

- The National Biosafety Council (CNBS) falls under the Office of the President and is responsible for the formulation and implementation of the national biosafety policy. Presided by the Chief of Staff of the

- Office of the President, 11 cabinet ministers comprise CNBS, with a minimum quorum of six needed to approve any relevant issue.
- CTNBio is under the Ministry of Science and Technology and not under the Ministry of Agriculture, as is the case with Argentina and Paraguay. Although under the current law CNBS is supposed to handle all political, social, and economic issues that might impact regulatory decisions related to agricultural biotech, it is CTNBio which has been the object of corporate lobby and anti-biotech groups (these latter ones challenging its existence on constitutional grounds). In spite of formal attributions indicating otherwise, actors identify the real locus of power as being in the CTNBio.

Environment minister Marina Silva was the main political power behind the approval of the Biosafety Project by the Deputies' Chamber in March 2004. The battle for the law gave rise to the formation of two coalitions around the GM issue: the one in favor was composed of scientists, representatives of biotech companies, farmer's associations,²⁹ and representatives of the government like Agriculture Minister Roberto Rodrigues. IDEC and Greenpeace spearheaded the opposition coalition, but public appeal was weak and, in consequence, support was dislocated. The opposition included a variety of interests and objectives that—overall—weakened the unity of purpose and action. In a perfect example of Olson's collective action, the smaller, more coherently integrated group succeeded. Minister Marina Silva's coalition suffered a complete defeat at the Senate with the approval of a modified version of the bill, which concentrated decision power on CTNBio. The new composition of CTNBio included several environmentalists opposed to biotech, leading to frequent deadlock with regards to decisions on research and commercial approvals of new products. However, as power shifted, this situation gradually changed. CTNBio's course illustrates a shift in the balance of power indicative of the consolidation of the agribusiness model. In March 2007, the Commission's quorum requirements for votes on GM products were lowered. In 2008 alone, CTNBio approved 7 of the total 12 licenses since it began work. Increasingly isolated in the government for her views on infrastructure projects, biofuels, and GM crops, Silva left the Environment Ministry in May 2008.³⁰ She cited "growing resistance found by our team in important sectors of the government and society" as the reason for her resignation. However, M. Silva's model of growth was opposed to Lula's, who has put all his political capital behind a decisive championing of the Growth Acceleration Program (PAC).

This program is currently seen as the cornerstone to unlock the country's economic potential and to boost its growth rate, accelerating economic activity through increased public sector investment, particularly in infrastructure and social programs.

Regarding the institutions governing the Brazilian seed market, the National Plant Variety Protection Service (SNPC) was set up in 1997 to provide support for activities involving plant variety protection. The Seeds and Plants National System Law of 2003 created the National System of Seeds and Plants that foresees the identification and quality of multiplication materials and of vegetal reproduction used and marketed in Brazil. The law creates two registration authorities: the National Registry of Seeds and Plants (RENASEM) and the National Registry of Plant Varieties (RNC). Seed law number 10.711/2003 explicitly prohibits purchasing seeds from a producer or trader not registered in RENASEM, or growing seeds or plants using not registered in the RNC. By May 2015, out of the 32,542 total registrations of RNC only 6 % (1,954 crops, 811 of them) were soybeans. The remaining 30,588 were classified as conventional cultivars and species. GM crops established IP rights for plant varieties, thus favoring the creation of an association of breeders and seed companies, Braspov, with oversight and enforcement role. In 2004 Braspov joined ABRASEM, the national association of seed and seedling producers and leading representative entity for the segment engaged in research, development, multiplication, and commercialization. According to ABRASEM's President Iwao Miyamoto, 80 % of soy GM sales are made by Brazilian companies: Cooperativa Central de Pesquisa Agrícola (Coodetec) produces 50 %, Embrapa 31 %, and the remaining volume is distributed between Pioneer (DuPont), Monsoy (Monsanto), Syngenta and Fundação Centro de Experimentação e Pesquisa (Fundacep), and the Mato Grosso Foundation (Fundação MT).³¹ They all develop their own research programs, alone or in cooperation with Embrapa and other private or public research organizations.³² The private sector in Brazil has taken more interest in developing soybean varieties as a result of law No. 9456, which spawned the growth of the market for transgenic seeds. Embrapa and Monsanto have the most soybean cultivars³³ protected under the SNPC. However, Brazil is the only country in the world in which the state agency holds more IPRs than Monsanto: 34 % against 19 % of the total pool (Fuck et al 2008: p.229). When the Brazilian market opened up for the GM soybean, Embrapa lost its preferential position (Fuck et al. speak of "hegemony") in the soy seed market. The change in

the property regime limited Embrapa's public function: the commercial criterion for the development of new varieties was bolstered and low-price distribution reduced. Indeed, the institution's self-perception changed. The seed portfolio was increasingly viewed as an asset to be protected, so Embrapa—unlike Argentine INTA—had a stake in supporting IPR enforcement. The portfolio could now be exploited commercially as well, so Embrapa charged royalties and launched agreements with MNCs and local foundations, preserving thus its public function and maintaining ownership and control of its seed traits. This articulation made it possible to adapt soy to tropical conditions, enabling it to be grown in various regions of Brazil and expanding the agricultural frontier.³⁴ At first, companies obtained regulation of royalty payments by the stipulation that the seeding company had to present a fiscal receipt for the sale of those seeds for which it intended to collect payment. But under the reality of widespread seed piracy, collection was rendered impracticable, and so the strategy was adjusted. Producers—mainly led by the southern states—agreed to pay a percentage (sales tax per bag) at the moment of handing over their harvest to the traders (who keep a percentage as well for taking on this service). Soy harvested had to be declared GM or be subject to testing and eventual penalties. However, the other component of the technological package, the herbicide Roundup, was not legal. Paraná congressman Abelardo Lupion pushed through a series of federal amendments that legalized glyphosate in Brazil. On May 8, 2006, the *Correio Braziliense* uncovered Lupion's corruption: he had received in return from Monsanto the Santa Rita *fazenda* for a third of its market value.³⁵

When on September 15, 2009, Representative Nazareno Fonteles held public hearings at the Committee of Agriculture in the Chamber of Deputies to discuss IP agricultural issues, the Brazilian Ministry of Agriculture stated that the government had decided not to interfere in agreements that had been reached by private actors, since rural producers had agreed to pay for the use of the RR technology. The weak coordination between civil society (rural trade unions and federations of the rural sector) and politics meant institutionalization would only happen at the state and not at the federal level. This is consistent with the structure, dynamics, and historical patterns of Brazilian politics. Unlike the Argentine *confrontation* example, in Brazil the pattern of *coordination* is exemplified by the fact that there is no contestation from the producers to private IP rights on seeds. In April 2012, a first-level judicial ruling on the lawsuit started by soy growers led by APROSOJA-RS determined the suspension of royalty

payments on RR soybeans. According to the ruling, the only IP law that could regulate the relation between Monsanto and soy growers was the Law of Protection of Cultivars. Monsanto did not have the right to charge royalties on the total output sold by rural producers, and the latter had the right to cultivate saved seeds at no cost. The ruling included an inspection that determined patents on which Monsanto was basing its claims had expired in Brazil. Immediately following, the Federation of Agriculture and Livestock of the State of Mato Grosso (Federação da Agricultura e Pecuária de Mato Grosso, FAMATO) started another lawsuit against the company to carry out another technical examination. This one also concluded Monsanto's patents on the RR technology had expired in 2010. While FAMATO-MT was battling in court, APROSOJA-MT was explicitly declaring: "*We approve of royalty payments. However, we defend the fact that their charging should be fair and supported by Brazilian patent legislation*"³⁶

Monsanto suspended royalty collection nationwide, but negotiated new IP agreements with organizations of rural producers at the state levels. By January 2013, the company had reached understandings with CNA and five rural associations at the state level. Mid-year attempts to co-opt farmers were partly effective. In exchange for a 16 % discount on royalties to be paid on the second generation of GM soybeans over the next four years, FAMATO decided dropped its lawsuit. This system eventually collapsed for being rejected by the producers associations. By 2015, the situation had changed. Justice of Rio Grande do Sul granted an injunction prohibiting Monsanto to collect 7.5 % royalties on soybean sales with *Intacta RR2* technology produced with seeds saved by farmers themselves. The lawsuit had been filed by the Association of Rio Grande do Sul Soybean Producers (Aprosoja-RS), the Federation of Agricultural Workers (FETAG) of the three southern states (Rio Grande do Sul, Santa Catarina, and Paraná) and by rural unions. *Gaúcho* producers, represented by FETAG and rural unions also have since 2009 a court dispute against payment of 2 % royalty on sales of the first-generation Monsanto soybean RR1, which already had the patent considered expired. The company had lost the action in the first instance but reversed the decision before the Court of Justice in 2014. The producers appealed, but there is no date for the retrial of the case. The ruling strengthens similar decisions adopted by the Justice of Bahia and Mato Grosso, again with scope only in those States.

Public discourse and institutional practice in Brazil does not fundamentally challenge the agribusiness model and its technological or economic basis. It is focused on distributional aspects of IP (the balance between

R&D investments, productivity gains, and the precise royalty pricing). Nor is it framed in terms of private gain vs. public interest. Different organizations and state-level associations have carried out mobilization of Brazilian soybean growers over seeds. They all diverge in the approach they take, do not coordinate their actions nationally, and articulate a public discourse focusing on short-term distributional issues. Producers are more concerned with short-term distributional implications of IP rights than with their long-term substantive nature as legal rights, a perspective that can be only brought in through national, public institution political presence.

NOTES

1. The literature also uses the terms genetically modified organism (GMO) or genetically engineered organism (GEO). The notion, however, is the same: organisms whose genetic material has been altered using genetic engineering techniques known as recombinant DNA technology. DNA molecules from different sources are combined into one molecule to create a new gene. This DNA is then transferred into an organism, giving it modified or novel genes. Transgenic organisms—like RR soybeans—are organisms which have inserted DNA that originated in a different species.
2. Although direct sowing reduces soil erosion, it does not counteract the impacts caused by continuous cultivation of the same crop and the intensive use of agrochemicals as the only weed management.
3. Covers herbicides, fungicides, and insecticides.
4. Joseph A. Schumpeter coined the term “creative destruction,” as the “the opening up of new markets, foreign or domestic, and the organizational development [. . .] illustrate the same process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one” (1942: 82–85). Trying to understand what firms would be better positioned to innovate, he connected the ability to innovate to a company’s size. Larger corporations with some degree of monopolistic power would have an advantage to innovate because of resources and scale. “Innovatory discontinuities” upset the equilibrium and generate a transitional dynamics converging to a different state of technology that will restructure the whole market in favor of those who grasped them first.
5. As a result of patent expiration, Roundup pricing was expected to fall. Monsanto took several measures to build barriers of entry: it lowered the price of glyphosate 16–23 % in 1998. It built a huge facility in Camacari, Brazil, to increase capacity by 35 % and thus dissuade competitors from committing the capital for capacity additions. Finally, it set up long-term

supply agreements with several major manufacturers and potential competitors Cheminova, Dow Chemical, Microflo/BASF, Nufarm, and Syngenta (through Zeneca and Novartis). It was able to maintain an 80 % market share in glyphosate for six years after the patent expired by tying its use to proprietary Roundup Ready seeds, even though its prices were three to four times higher than generic glyphosate.

6. "Germany's Agrevo buys Cargill seed operations," *Wall Street Journal*, September 29, 1998.
7. *Positioned for Growth* investor handout, June 20, 2008.
8. Initial biotech successes provided the capital to support ("cash cow") several seed varieties while earning revenues from seeds already in production.
9. Early successes like RR soybeans have positioned companies to market new products to growers and soybean processors who have had experience working with the previous generation seeds.
10. A simple comparison will illustrate this point. Brazil's Embrapa 2009 budget stands at US\$777 M, while Argentine INTA is almost a third of this amount at US\$260 M. Paraguay has a bill to create an institute (IPTA), but has not even been assigned a budget line item. On the other hand, Monsanto estimates its R&D budget at 9.5 % of its sales. Net sales for the company's fiscal year 2008 were US\$11.4 bn, 9.5 % of which is US\$ 1.1 bn. Even considering that Latin America accounts only for 22 % of the company's global sales and assuming a proportional relation between sales and R&D budget, the figure would be US\$240 M. This is just one company and does not include collaboration agreements or joint developments.
11. "Seeds of dispute," *The Guardian*, February 22, 2006.
12. See Jeffrey Sachs, "Patents and the Poor," *Project Syndicate*, April 2001. Also Jagdish N. Bhagwati, "Patents and the Poor: Including Intellectual Property Protection in WTO Rules Has Harmed the Developing World," *CFR*, September 2002.
13. Litigation over R&D issues but not over wholesaling. This reveals companies are in drive toward increasing the volume of the market without relinquishing control. On May 18, 2009, Monsanto filed a lawsuit in federal court in St Louis against DuPont and its subsidiary, Pioneer Hi-Bred International, for unlawful use of its proprietary RR technology. Monsanto argues DuPont may not combine ("stack") its herbicide technology with any soybeans already containing Monsanto's Roundup Ready trait.
14. The "revolving door" phenomenon is by no means limited to emerging markets: former Monsanto attorney Michael Taylor was appointed FDA Deputy Commissioner for Policy (a newly created post), in July 1991. Having formerly worked on the legalization of GM bovine growth hormone, Taylor helped declare GM seeds "substantially equivalent" to non-GM seeds, hence establishing tracking and labeling unnecessary.

Former USTR Chief Agricultural Negotiator Richard Crowder was CEO of the American Seed Trade Association for the three years prior to his appointment from 1994 to 1999, as Senior VP International of DEKALB Genetics Corporation.

15. In soybeans, official Ministry of Agroindustry 2016 figures put the share at 85 % of total production, in a market in the range of \$300–\$450 million.
16. A cultivar is a plant variety that has been produced in cultivation by selective breeding.
17. The Secretary depended of the Economy Ministry. On October 2009, President Cristina Kirchner upgraded the Secretary to a Ministry. In December 2015, the incoming Macri administration renamed it Agroindustry Ministry.
18. Monsanto has grown its seed business lines by acquisition: starting in 1982 with Jacob Hartz Seed Co. Monsanto has purchased 15 different seeds (Asgrow Agronomics, Holden’s Foundation Seeds LLC, Corn States Hybrid Service LLC, DeKalb Genetics Corp., Channel Bio Corp., Seminis Inc., NC + Hybrids, Fontanelle Hybrids, Stewart Seeds, Trelay Seeds, Stone Seeds, Specialty Hybrids and Stoneville’s cotton) and biotech companies (Agracetus and Calgene).
19. The Mauricio Macri administration (2015–2019) is working on a new seed law, since 20.247 dates from 1973, when agricultural biotechnology did not exist.
20. According to GM Campaign Coordinator for Friends of the Earth Europe Helen Holder, patents have allowed the company to legally prohibit seed saving and to sue farmers that save seed. In the USA alone, Monsanto has 75 employees and an annual budget of US\$10 M allocated to target around 500 farmers a year. Taking “out-of-court” settlements into account, Monsanto has collected between \$85 and \$160 M from farmers. *The Future of Food: Transatlantic Perspectives* International Conference, Boston University, May 9, 2009.
21. Monsanto argues Intacta RR2 Pro is a biotechnology invention that is protected in Argentina and other countries around the world by patent rights owned by Monsanto and its affiliates. In Argentina, two patents have been issued that protect Intacta RR2 Pro (Patent AR026994B1, “New constructs expressed in plants and method for expressing a DNA sequence in plants” and Patent AR010897B1, “Method for controlling infestation of a soybean plant by an insect of the family tortricidae.”) Additionally, Monsanto has four patent applications pending for Intacta RR2 Pro soybean products in Argentina.
22. <http://news.monsanto.com/press-release/vegetable/monsanto-discussions-ongoing-argentinass-government-latest-soybean-innovation>

23. The most visible of which are: the Asociación de Organizaciones No Gubernamentales del Paraguay, Red de Organizaciones Ambientalistas del Paraguay, Red Rural de Organizaciones Privadas de Desarrollo, Federación Amigos de la Tierra América Latina y Caribe, Red de Acción en Plaguicidas y sus Alternativas para América Latina and the Movimiento Agroecológico para Latinoamérica y el Caribe.
24. Sources inside the Ministry explained the main reason for this support is that under the Cartagena Biosafety Protocol, Paraguay was eligible to receive funding from the United Nations Environment Programme to develop a national biosafety framework.
25. Development of the national framework of security of biotechnology for Paraguay, United Nations Procurement Division, Project N. 47.054, 2007.
26. The combination of several genetic traits into one line.
27. According to Levitsky and Murillo (2005), institutional weakness should be defined negatively, as the absence of those attributes that define institutional strength. Institutions are strong when the rules that exist on paper are enforced and stable and weak when they lack one or both of these dimensions (2–3).
28. “Redactarán nuevo proyecto de ley para crear IPTA,” *ABC Digital*, August 17, 2009.
29. “I like (Minister of the Environment Carlos) Minc because he will not be as radical as Marina, she is an obstacle to economic development” said in an interview Rui Prado, head of the agriculture federation of Mato Grosso.
30. Director of public policy for Greenpeace Brazil Sergio Leitao said on that occasion, in reference to the Amazon: “It is time to start praying.”
31. Presentation at the Seed Association of the Americas Congress, Brasilia, September 29, 2008.
32. Examples of these are the Monsanto/Embrapa project to use conventional soybean varieties adapted to the Amazon climate and introduce the glyphosate-resistant gene and the Embrapa/BASF project to create new transgenic seeds for the warmer climates outside southern Brazil.
33. Plant variety deliberately selected because it carries specific desirable traits. For genetically modified plants, having the appropriate cultivar is directly related to propagation success.
34. As an example of the astounding market segmentation allowed by GM technology, Syngenta’s NK 7074 RR seed was developed especially for the Center-West region of São Paulo and Minas Gerais, while VMax RR and Spring RR are suited to Mato Grosso do Sul.
35. Sources from the Comissão Pastoral da Terra (CPT), Regional Paraná state have confirmed Lupion was known as the *Deputado do latifúndio*.
36. www.aprosoja.com.br/noticia/aprosoja-esclarece-perguntas-e-respostas-sobre-royalties-rr