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The Impact of the Introduction of Transgenic Crops in Argentinean Agriculture

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Since the early 1990s, Argentinean grain production underwent a dramatic increase in grains production (from 26 million tons in 1988/89 to over 75 million tons in 2002/2003). Several factors contributed to this "revolution," but probably one of the most important was the introduction of new genetic modification (GM) technologies, specifically herbicide-tolerant soybeans. This article analyses this process, reporting on the economic benefits accruing to producers and other participating actors as well as some of the environmental and social impacts that could be associated with the introduction of the new technologies. In doing so, it lends attention to the synergies between GM soybeans and reduced-tillage technologies and also explores some of the institutional factors that shed light on the success of this case, including aspects such as the early availability of a reliable biosafety mechanism and a special intellectual property rights (IPR) situation. In its concluding comments, this article also posts a number of questions about the replicability of the experience and some pending policy issues regarding the future exploitation of GM technologies in Argentina.

Key words: Argentina, biosafety, GMO, herbicide-tolerance, IPR, soybeans.

Introduction

Starting in the early 1990s, Argentinean agricultural production underwent a tremendous transformation, during which there was a dramatic increase in grains production (from 26 million tons in 1988/89 to over 75 million tons in 2002/03) as well as production of many other crops, including fruits (pears, apples, and citrus), grapes and wine, and fresh vegetables. The economic reforms introduced during the first part of the decade led to a significant change in relative prices in favor of the agricultural sector, which in turn triggered a sustained process of investment and technological change with the increasing use of agrochemical inputs (fertilizers, herbicides, pesticides) and farm machinery. Within this general context, however, there is a family of new technologies with an identity of its own: the new genetically modified (GM) varieties.

When looking at general trends, there is no doubt that the changes in Argentinean agriculture are much more comprehensive and far reaching than the incorporation of GM crops; nevertheless, it is also true that genetically modified organisms (GMOs) are one of the success stories of the last decade and have played a strategic role in the growth of the sector—not only because of their direct impact, but also due to their interaction with other technologies and their global macroeconomic effect through their impact on the country's agricultural exports and other key economic variables. This paper looks at the introduction of GMOs in Argentinean agriculture and summarizes some of their impacts on the structure of production and exports. Some tentative comments on more global impacts on the environment and other economic variables, as well as on what to expect in the future, are also included.

The Early Adoption of GMOs in Argentine Agriculture

The first transgenic crop introduced into Argentine agriculture was glyphosate-tolerant soybeans, released in 1996. Transgenic varieties of lepidoptera-tolerant corn and glyphosate-tolerant cotton were commercially released somewhat later (Table 1). Since their release, these technologies have been adopted at an impressive rate. The area sown with herbicide-tolerant soybean increased from less than 1% of the total soybean planted area in 1996/97 to well over 90% of the 12 million hectares planted in 2001/02. This rate of adoption is even higher than that in the United States, which was the first country to introduce this technology. Midwestern US states took about 15 years to exceed 90% adoption, whereas in the Argentinean growing region that level was reached in seven seasons. Adoption curves are also steeper than those of other well-known and popular technologies, such as corn hybrids.

The diffusion of lepidoptera-resistant corn, released in 1998, has also been significant (to a lesser degree),

Table 1. Transgenic events approved for commercialization in Argentina before December 2001.

Species	Introduced feature	Transformation event	Applicant	Resolution #
Soybean	Tolerance to glyphosate	40-3-2	Nidera S.A.	SAGPyA #167 (3/25/96)
Corn	Resistance to lepidoptera	176	Ciba-Geigy	SAGPyA #19 (1/16/98)
Corn	Tolerance to ammonium-glyphosate	T25	AgrEvo S.A.	SAGPyA #372 (6/23/98)
Cotton	Resistance to lepidoptera	MON 531	Monsanto Argentina S.A.I.C.	SAGPyA #428 (7/16/98)
Corn	Resistance to lepidoptera	MON 810	Monsanto Argentina S.A.I.C.	SAGPyA #429 (7/16/98)
Cotton	Tolerance to glyphosate	MON 1445	Monsanto Argentina S.A.I.C.	SAGPyA #32 (4/25/01)
Corn	Resistance to lepidoptera	Bt 11	Novartis Agrosem S.A.	SAGPyA #392 (7/27/01)

Note. Data from National Advisory Commission on Agricultural Biotechnology (CONABIA) website (http://www.sagpya.mecon.gov.ar/0-0/index/programas/conabia/index_conabia.htm).

reaching about 25% of total planted area in the last growing season. It should be noted, however, that diffusion curves are steeper than those of soybeans at the same stage of the process (Regúnaga, 2003). Bt cotton varieties, also released in 1998, show a less dynamic performance, currently representing only about 8% of total planted area.

This adoption history makes Argentina second only to the United States in terms of the area planted with transgenic crops and thus a very important player in the international arena. Several aspects should be highlighted with regard to this process.

It is obvious that one of the main reasons for the rapid adoption is that the new technologies were a very good deal for farmers. Current estimates place cost reductions in the case of soybeans at about US$20 per hectare, mainly because of the reduction in energy costs resulting from more effective weed management techniques. Moreover, when the adoption process started, the patent for Roundup (Monsanto's commercial brand of glyphosate) had expired several years earlier; thus, there was already a significant increase underway in the competitiveness of the glyphosate market, which translated into significant price reductions. By 2001, the price of glyphosate was less than 30% of its 1993/94 level (see Trigo, Chudnovsky, Cap, & Lopez, 2002). At the same time, the new technologies have an important synergy with no-till practices—an interface that not only contributes to cost reduction, but also facilitates the incorporation of double-cropping soybeans (following wheat) in many areas where only one crop was planted before the availability of the GMO varieties. This circumstance has induced a virtual expansion of arable land of about 4 million hectares since 1996.

It should also be noted that irrespective of economic reasons, another key factor in this story was that at the time when the first GM crops became available in the United States, Argentina had already established the required regulatory mechanisms to evaluate this type of technology. The creation of the National Seeds Institute (Instituto Nacional de Semillas, or INASE) and the National Advisory Agricultural Biotechnology Commission (Comisión Nacional Asesora de Biotecnología Agropecuaria, or CONABIA) in 1991 was key in facilitating and speeding up the evaluation and approval process. Given that the Argentinean crop growing areas are analogous to those in the northern hemisphere for which the technologies were originally developed, the existence of the appropriate institutional framework created an ideal scenario for technology transfer and for Argentina to benefit from important spillover benefits; it had to bear only the costs of backcrossing the new genes into already existing varieties well adapted to local conditions—a process which is much simpler than the actual development of a transgenic plant. Actually, the diffusion process was based not on a local research and development effort, but rather on the importation of the innovation by multinational seeds and agricultural input companies, who also seized the opportunity to exploit technological spillovers from their headquarters. The importance of multinational seed companies in the development of the technologies is clearly seen from the records on applications for field trial permits submitted to CONABIA, where they represent almost 80% of the total, compared to less than 1% of applications coming from the traditional agricultural research community (governmental institutions and universities). This trend seems to be characteristic of GMO development in every country where such technologies have become important (Table 2).

The issue of intellectual property rights (IPR) protection (or rather the weakness of the existing system) has been also mentioned as a facilitating mechanism for the rapid adoption (Qaim & Traxler, in press). In this regard, the evidence is mixed. It is true than in the case of soybeans, the herbicide-tolerance genes could not be

Table 2. Permits for the release of GMOs into the environment by type of organization.

	1991/93	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Transnational corporations	11	17	26	28	62	65	70	52	49	62	442
Local companies	8	4	6	6	12	12	10	10	4	4	76
Government agencies	2		4	6	4	13	1		8	1	39
Universities								3	2	3	8
Total	21	21	36	40	78	90	81	65	63	70	565

Note. Prepared by the authors based on data obtained from the National Advisory Commission on Agricultural Biotechnology (CONABIA; http://www.sagpya.mecon.gov.ar/0-0/index/programas/conabia/index_conabia.htm).

patented; however, this was not due to a loophole in the law, but was a consequence of a series of circumstances that made the gene nonpatentable in Argentina at the time when the formal application was submitted (see Qaim & Traxler, in press; Trigo et al., 2002).

A different issue is the existence of a black market for seeds, which, together with the fact that the country's seed law is based on UPOV 78 (1978 Convention of the Union for the Protection of New Varieties of Plants, which allows farmers to keep seed for planting), makes it less expensive than under UPOV 91 rules. In spite of this, it should be noted than in the case of maize, where protection comes from the hybrid nature of the seed, diffusion is taking place at a fast pace as well. The importance of IPR, however, is clearly shown by the case of Bt cotton, where the suppliers of the technology have been able to exert a greater control on seed availability, through individual contracts with farmers and other mechanisms. Existing studies (Qaim, 2002) clearly show that adoption rates would be much higher if seed pricing policies had been more flexible.

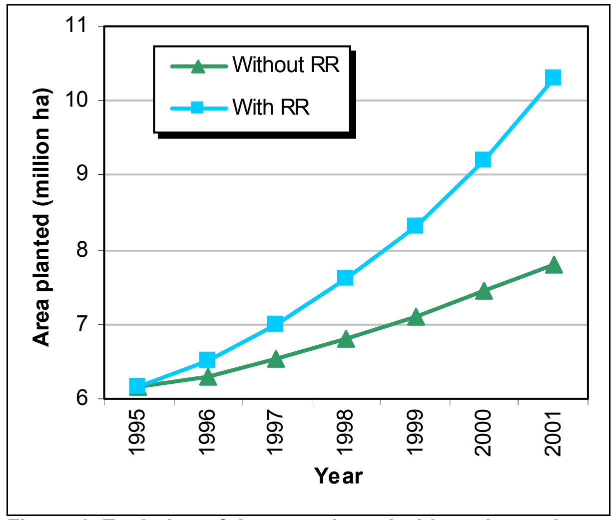

Figure 1. Evolution of the area planted with soybeans in Argentina (two alternative scenarios).

Economic Impacts

In economic terms, the herbicide-tolerant soybeans have been leading the process. This is so, in part, because soybean was the first GM crop to be introduced, but also due to the nature of the innovation itself, its potential interaction with other technologies, and its indirect effects on other important aspects of Argentinean agriculture at the time (such as the growing concern with the drop in soil fertility associated with tillage practices). With Roundup Ready (RR) soybeans, the benefits from the introduction of the new technologies are derived from the reductions in production costs (US$20/ha) and from the way this reduction has impacted over the area planted with soybeans. It is estimated that if GM varieties were not available, the area under soybean cultivation would only be about 60% of the present area (Figure 1). In the case of Bt maize, benefits are derived from a net increase in yields of about 5%; in the case of Bt cotton, benefits derive from an increase in production of about 30%, resulting from the reduction of losses caused by Lepidoptera attacks and not from increases in yield (Trigo et al., 2002)

Transgenic crops—herbicide-tolerant soybeans and Bt maize—account today for more than half of the more than 70 million tons of grains and oilseeds produced in Argentina and are a significant component of the sustained increase in agricultural exports which took place during the 1990s, when they grew by 66% at an average cumulative annual rate of 5.2%. Available estimates place accumulated benefits (extra income which would have not been generated in the absence of the technology) until the year 2001/02 in the neighborhood of US$5.2 billion in the case of soybeans, about US$400 million for Bt maize, and about US$40 million for Bt cotton. Tables 3, 4, and 5 show these benefits broken down by source and beneficiary—that is, whether they accrue to farmers (cost reductions or production increases) or to input suppliers (of seeds and/or herbicides). In the case of soybeans, the lion's share of benefits has ended up in the hands of farmers, who have

Table 3. Adoption of RR soybean—evolution of the distribution of benefits.

	Benefits to growers (million US$)			Benefits to suppliers (million US$)			
Year	Costs	Production	Total	Glyphosate	Seed	Total	Total benefit
1996	50.22	91.43	141.65	28.89	8.01	36..9	178.54
1997	95.91	214.86	310.76	47.76	16.71	64.46	375.23
1998	145.99	306.29	452.27	56.17	24.71	80.89	533.17
1999	186.06	594.57	780.63	74.62	37.62	112.24	892.87
2000	214.25	875.18	1,089.43	93.37	49.54	142.92	1,232.35
2001	234.79	1,469.76	1,704.55	164.27	87.16	251.44	1,955.99
Total	927.22	3,552.08	4,479.30	465.09	223.75	688.85	5,168.15

Note. Data from Trigo et al., 2002.

Table 4. Adoption of Bt corn—evolution of the distribution of benefits.

Year	Benefits to farmers (million US$)	Benefits from sales of Bt seeds (million US$)	Total benefits (million US$)
1998	2.00	7.47	9.48
1999	4.77	17.81	22.57
2000	9.83	36.70	46.53
2001	16.67	62.26	78.93
2002	23.28	86.94	110.21
2003	27.89	104.17	132.06
Total	84.43	315.36	399.79

Note. Data from Trigo et al., 2002.

Table 5. Adoption of Bt cotton—evolution of the distribution of benefits.

Year	Benefits to farmers (million US$)	Benefits from sales of Bt seeds (million US$)	Total benefits (million US$)
1998	0.12	0.59	0.71
1999	0.30	1.49	1.79
2000	0.67	3.37	4.04
2001	1.28	6.42	7.70
2002	1.99	9.97	11.97
2003	2.58	12.91	15.5
Total	6.95	34.76	41.72

Note. Data from Trigo et al., 2002.

captured more than 80% of the total (about 70% from increases in production and some 12% in cost reductions). In the case of cotton, benefits are of a much smaller magnitude and they have accrued mostly to input suppliers (Qaim, 2002).

One final aspect worth highlighting with regard to the impact of the changes that took place in Argentine agriculture over the 1990s, which cannot be fully linked to the introduction of GM crops, but is nevertheless related to this process, refers to the ability of the sector to create jobs. The technological path undertaken by Argentina in the early 20th century meant adopting a labor-saving approach, through mechanization, tractorization, and (over the last three decades) the increase in the average power of equipment, which has induced economies of scale (see Manciana, Piñeiro, Maceira, de Haro, & Cardarelli, 2003). All of this has translated, over the decades, into an important reduction in the number of jobs in the sector, which fell from 1.86 million in 1926 to 783,000 in 1993.[1] However, starting that same year, the trend has shifted, to reach 966,000 jobs in 1999 (latest available data; Instituto de Estudios Economicos sobre la Realidad Argentina y Latinoamericana, 2004; Instituto Nacional de Estadísiticas y Censos, 2004). This positive difference of nearly 200,000 jobs is likely the result of the simultaneous processes of agriculturization (crops substituting for livestock) and the intensification of production systems implied by the incorporation of GM technologies. The introduction and rapid expansion of double-cropping soybean (planted after wheat is harvested) has undoubtedly played a substantial role in this process, if one considers that in the 1999/2000 season, this practice implied a virtual increase of 3 million hectares of arable land and thus an additional demand for labor. The most remarkable aspect is that this improvement in the employment level took place simultaneously with (a) an increase in partial productivity of labor in the primary sector of 3.26% per year for the period 1990–1997 and (b) an almost five-point increase in the total unemployment rate.

1. *This reduction of more than one million jobs had a negative side to it—the layoffs (a socially undesirable effect), and a positive one as well—the amazing increase in productivity of labor, made possible by modern mechanical technologies. This productivity increase has enabled the sector to maintain its international competitiveness throughout the 20th century.*

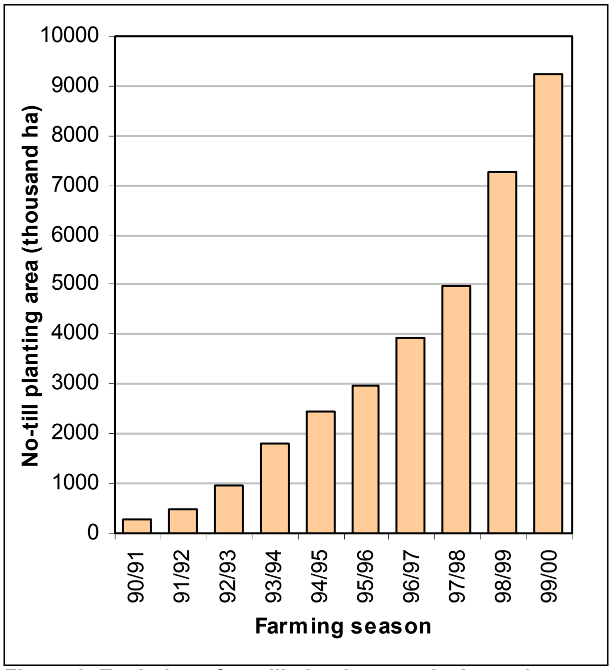

Figure 2. Evolution of no-till planting area in Argentina.
Note. Data from Trigo et al., 2002.

Environmental Impacts

Environmental impacts are an everpresent issue when dealing with GM technologies, even more so when talking about the kind of changes in farming systems that took place in Argentina during the last decade. However, because the introduction and expansion of GMO production has occurred side by side with the significant increase of no-till (NT) practices, we can postulate the occurrence of a *virtuous cycle of technological intensification*.[2]

As can be seen in Figure 2, the no-till planting area has increased from around 300,000 hectares in the 1990/91 growing season to more than 9 million hectares in the 2000/01 season, and it is projected to exceed 11 million hectares in 2002/03 (see Trigo et al., 2002, chapter 5). The expansion of no-till practice was promoted by various factors, which led to a change in the existing agronomic management approach.

The first and probably most relevant issue was that in most major areas of the Pampas, the cumulative effect of soil erosion resulting from conventional tillage practices was beginning to negatively affect operating results[3] of farms. This effect on yields—and therefore on the economic feasibility of farming itself—interacted later with two other factors. The first one was the increased availability of no-till farming equipment due to the reduction of tariffs on imports of capital goods resulting from deregulation and the opening of the economy that took place during the early 1990s. The second one was the reduction of tillage costs with the introduction of no-till planting practices.

The above, together with the possibility of recovering part of the lost land productivity, worked as very strong incentives for the adoption of no-till planting practices. At the same time, it was an important reason for the increase of production, as it increased the area planted with double-cropping soybeans to new regions. This was a consequence of the reduction of the time required between wheat harvest and soybean planting, which allows for the successful use of short-cycle soybean varieties. These two determinants undoubtedly have been the main economic factors leading to changes in farming systems and were the basis for the virtuous intensification or environmentally friendly nature it has bestowed upon the process of adoption of the GM varieties.

The coupling of no-till planting techniques with herbicide-tolerant soybean combines two technological concepts: on the one hand, new mechanical technologies that modify the crop's interaction with the soil; on the other hand, the use of full-range herbicides (primarily glyphosate) that are environmentally neutral, due to their lack of a residual effect and their high effectiveness in controlling all weeds. Both technologies imply a more intense use of inputs, which is usually described as a case of *hard* intensification. However, as can be seen, this is also a *virtuous* one, because it simultaneously lowered the level of use of atrazine, a herbicide that has residual effects and negatively impacts the environment.

The virtuous nature of the process is reaffirmed by two other aspects: One is what happens with herbicide utilization; the other is the overall situation in Argentina regarding fertilizer consumption. As to herbicides, although current crop management strategies use them in larger quantities per hectare, glyphosate is a broad-spectrum herbicide with no residual effect, and it is rap-

2. *The no-till planting system consists basically of laying the seed in the ground at the required depth with a minimal disturbance of the soil structure. This is done with specially designed equipment that eliminates the need for plowing and minimizes the tillage required for planting a crop.*

3. *"Agriculturization" can be defined as the permanent substitution of agriculture for the crop-livestock rotation, which was the dominant farming system used in Argentina until the mid-1970s.*

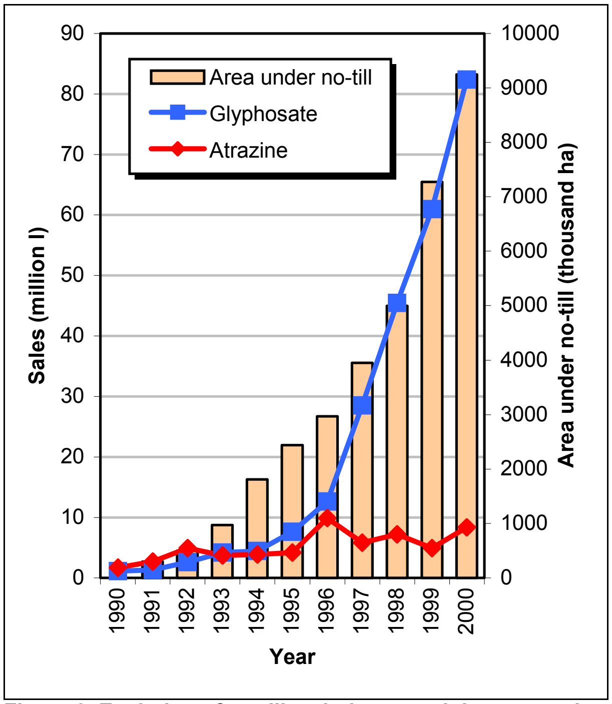

Figure 3. Evolution of no-till techniques and the composition of herbicides used in Argentine agriculture.
Note. Data from Trigo et al., 2002.

idly degraded in the soil. These features constitute a definite advantage over atrazine, which was the most commonly used herbicide before the introduction of RR technology and has high residual activity (Figure 3). Although glyphosate can eventually enter the water table, leading to health risks due to intoxication (according to the classification of pesticides by hazard prepared by the World Health Organization, 1988), it falls into the category of herbicides of toxicity class IV, which are the most benign ones. A recent study (Qaim & Traxler, in press) reveals that the adoption of the RR soybeans in Argentina has led to an 83% reduction in the use of herbicides with toxicity class II and a 100% reduction in the use of herbicides with toxicity class III—they have been phased out (Table 6). Regarding the increase in the use of fertilizers recorded during the decade, fertilizer consumption levels are still far below risk thresholds and are also below those reported for other countries; furthermore, fertilizer use seems to have stabilized after the 1996/97 season (Manciana et al., 2003).

If we also consider that no-till practices have a significant impact on the recovery of soil fertility and other potential positive externalities (such as reduction of the greenhouse effect), there is no doubt that the overall environmental impact of these changes has been a positive one. In summary, Argentina seems to have become a win-win case, in which economic liberalization has encouraged the expansion of production and at the same time has made possible the adoption of environmentally friendly technologies.

Table 6. Conventional vs. RR soybeans—differences as to class and utilization of herbicides.

	Conventional soybeans	RR soybeans	Percentage change
Number of sprays	1.97	2.30	16.8
Amount of herbicide (l/ha)	2.68	5.57	107.8
Which is in			
Toxicity class II (l/ha)	0.42	0.07	-83.3
Toxicity class III (l/ha)	0.68	0.00	-100.0
Toxicity class IV (l/ha)	1.58	5.50	248.1

Note. Data from Qaim and Traxler, in press.

Environmental impacts of the other GM crops currently planted in Argentina are more limited. This is mainly due to the lower rate of adoption. However, available prospective studies also point to rather significant positive effects, at least in the case of cotton Bt technology. According to Qaim and de Janvry (2003), adopting farmers use, on average, 50% less insecticide on their plots planted with Bt cotton than on those planted with conventional varieties. Furthermore, the chemicals that are no longer applied are almost entirely made up of highly toxic substances (toxicity classes I & II), so there is also a parallel positive effect on farmers' health. The importance of these impacts is reinforced by findings of the same studies showing that the commercial life of Bt cotton technology appears to be considerably long, as resistance buildup and its associated pest outbreaks are unlikely to occur if non-Bt refuge area requirements are respected.

Concluding Remarks: Looking to the Future

Argentina indeed offered favorable conditions for the fast adoption of the GMOs. It had, at the time, a well-established seed industry, made up of local companies, branches of multinational firms, and governmental institutions, as well as a long-standing tradition of plant breeding. At the same time, significant policy decisions have been made concerning institutional issues—especially biosafety regulations through the establishment (in 1991) of both the CONABIA and the INASE. These factors—together with the fact that Argentina, which has 26 million hectares of agricultural land, makes up the most important area in the world for the potential application of the new technologies outside their countries of origin—have made possible the existence of both the incentives and an exceptional "landing strip" for the fast adoption of biotechnological inputs.

These elements were reinforced by several idiosyncratic institutional factors that favored the diffusion of RR soybeans in Argentina and somehow also explain why the performance of other GM crops has not been quite as impressive. First, the IPR status regarding the RR gene is not a minor issue, as it has restricted the range of options available to the technology suppliers and facilitated its diffusion at the same time. The second element that sets the soybeans case apart is associated with the way the seed market works and its impact on the price of RR soybean seed. On the one hand, the provisions of the 1978 UPOV Convention enable farmers to keep grains from their own harvest for use as seed in the next planting season. On the other hand, there is a black market for seeds. Both factors have induced a drop in seed prices and consequently have encouraged the fast adoption of this technology. Soybean is a self-pollinated species, which makes it possible for farmers to maintain the genetic quality of saved seed but at the same time encourages clandestine multiplication—something not feasible in other crops (e.g., hybrid maize). The third factor that has favored the high diffusion of RR soybeans in Argentina is the downward trend in the price of glyphosate due to increased local competition resulting from the entry of new manufacturers and dealers into the market.

Finally, completing the picture behind the described innovation process, RR soybeans had already been released in the European Union—Argentina's main export market—by the time they were introduced in Argentina; thus, there was no potential conflict.

The differences between RR soybeans and Bt technologies (maize and cotton) are not only that the latter were released much more recently. Bt technologies are regarded by farmers as insurance, because profitability depends on the level of lepidoptera infestation in a given year, whereas weeds are a permanent crop management concern. At the same time, there is also a pricing issue, as significant technology fees are collected by input suppliers. The evidence about this situation is not a minor point when trying to anticipate future innovation trends. In any case, it is clear that Argentina has, so far, benefited significantly from the adoption of GM technologies. But, a question should be raised: What about the future?

Although it is still too early to analyze the full impact of the crisis that followed the collapse of the convertibility system in January 2002, there is no denying that the currency devaluation has been beneficial for the primary sector, with a relatively significant increase in the share of total income earned by farmers in comparison with that accrued to them before the devaluation; it would be reasonable to expect a consolidation of the trends observed over the last years.[4] However, some qualifying comments should be highlighted.

In the first place, the convergence of favorable conditions that took place in the case of RR soybeans is unlikely to happen again. Therefore, the policies and strategies followed hereafter should not be based on a linear projection of the past. On the other hand, it is true that even in the context of the crisis the country is undergoing, there are positive factors that have remained and should be taken into account in anticipating future trends.

An analysis of the GM pipeline suggests that in the next five to ten years there will be a flow of incremental—rather than radical—innovations. The process will be accompanied by a steady increase in the number of species incorporated and by a diversification of the suppliers of the new technologies, with countries such as China becoming important suppliers. All this considered, the future innovation flow seems to be quite attractive for Argentina's agriculture—first, because the focus will remain centered on temperate and subtropical crops; second, because second- and third-generation innovations benefiting consumers will be released; and third, because in spite of its difficult present context, Argentina still maintains the structural conditions that allow it to take advantage of innovations generated abroad. Among them is its 26 million hectares of market-oriented agriculture, with farmers used to assimilate technological changes, a dynamic sector of inputs and service providers, and a well-structured logistical network. These factors have been strong determinants of

4. *According to a study conducted by the Institute of Economics and Sociology of INTA (National Institute of Agricultural Technology) based on data from the SAGPyA and Márgenes Agropecuarios (Agricultural Margins) magazine, the gross margin for soybeans (in dollar terms) for the 2002/03 agricultural season has been estimated to increase by 52%, reflecting the cost reduction in such components of the production expenditure as tillage, harvest, marketing, and indirect costs.*

the process until now and will surely continue offering important incentives for the incorporation of new GM crops into Argentina's agriculture.

Nevertheless, innovations will likely continue to come from abroad, reflecting the priorities and relative prices of the farm sectors and markets of origin rather than Argentina's specific environment. This would suggest that policy options should emphasize strengthening local biotechnological research as a high priority. This would seem unrealistic in the present situation, and it should be kept in mind when designing strategies for technology transfer, economic integration, and trade negotiations.

A final point must be made in regard to market conditions: As mentioned above, the release of RR soybeans in the European Union prior to its release in Argentina has been an important factor in favor of the dynamic diffusion of these varieties. However, today's scenarios are quite different from those prevailing in 1996. The ratification of the Cartagena Protocol and the recent EU decision regarding labeling and traceability of GM crops and their derivatives are clearly pointing towards a much more complex market situation and demanding a different approach for the domestic handling of this type of innovation. This is a still a developing story, but available evidence emphasizes that for Argentina to continue to benefit from the new technologies, it will need to undertake a much more proactive policy path than the one followed during the last decade.

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