ARGENTINA IN THE INTERNATIONAL SOYBEAN MARKET: DID WEAK IPR LED TO GREATER PERFORMANCE?

Mgter Félix Sebastián RIERA
Alumni FCE – Ayudante de cátedra, Economía y Política Agrícola
FCA - UNCuyo

Introduction

Globalization could be understood as the market and companies tendency to expand, reaching such a dimension that exceeds their national limits. Along with this expansion, the economic activities are subject to positive and negative effects. The role of the government is to establish clear laws that promotes economic incentives and defines clear sustainability limits of the activities.

In the agricultural sector, biotechnology is one of the main sources to increase the productivity of factors and achieve greater yields of crops. This branch of science has developed important characteristics of the plantings, such as bug resistant, tolerance to adverse climate factors, nitrogen increments, etc.

The expansion of Genetically Modified Organism (GM) is centre of a permanent discussion. On one hand, the world interest to combat hunger and increase productivity per hectare. On the other hand, stands the private incentives of agricultural biotechnology, opposite to social welfare in the short-run.

Along the history of Argentina, the agricultural sector has assumed an important role in economic growth and development of the country. Radical changes in production functions of the Argentinean Agricultural sector have to been explained by advances in Biotechnology.

Unfortunately, the experience of Argentina in the treatment of Intellectual Property Rights (IPR) it is ruled by prior legislation that have not been renewed according to the latest international treaties. This lack of law-update has implied several dysfunctions in the development of determined industries, such as transgenic crops, traditional and organic production.

The country's performance in the world market has been improving since the introduction of GM crops. Other advances in sowing technology have assisted the *soy revolution* in the country. Private companies have played a major role to introduce GM technology. An

interesting insight is given to the economic impact of the Herbicide Tolerant (HT) soybean introduction in the farm-level, as well as the aggregated economic effects.

The market structure, consumer preferences and law enforcement of intellectual property rights in agricultural biotechnology led to welfare improvements of society. Although, the distributional effects of the enhanced equilibrium were not equal among market agents. The better-off situation was achieved by the sector that assumed the higher risk.

Chronological history of IP in agriculture in Argentina

The objective of this part is to expose the main guidelines followed by the government of Argentina to establish the intellectual property law in agriculture innovations. An important resume of the legal advancement in intellectual property of biotechnology, could be reviewed in INASE (2010).

Nowadays, the plant improvements combine traditional knowledge with biotechnological techniques. The commercial varieties have become more productive, resistant to illness, richer in nutrients and other characteristics. In order to develop new plant varieties great investment are located in time-consuming activities. This is the main reason to protect the breeders' effort and hold the incentives for future investments, Louwaars et al. (2005).

International Agreements

The most influential international treaty affecting plant-related intellectual property is Trade-Related Aspects of Intellectual Property (TRIPS). It is a multilateral agreement between the 134 World Trade Organization (WTO) member countries that negotiated during the 1986–94 Uruguay round of the General Agreement on Tariffs and Trade (GATT).

TRIPS requires member countries to pass legislation setting minimum standards for all major types of intellectual property rights (copyright, trademarks, geographical indications, industrial designs, patents, topographies of integrated circuits and trade secrets). Further, it details how countries should enforce these rights and how disputes are to be resolved. In this respect it carries substantial legal weight.

Additionally, the International Union for the Protection of New Varieties of Plants (UPOV) was founded. The UPOV became as the intellectual property protection in the form of Plant Breeders rights (PBRs) for member countries. Over the decades, UPOV has undergone two important revisions, one in 1978 and another in 1991.

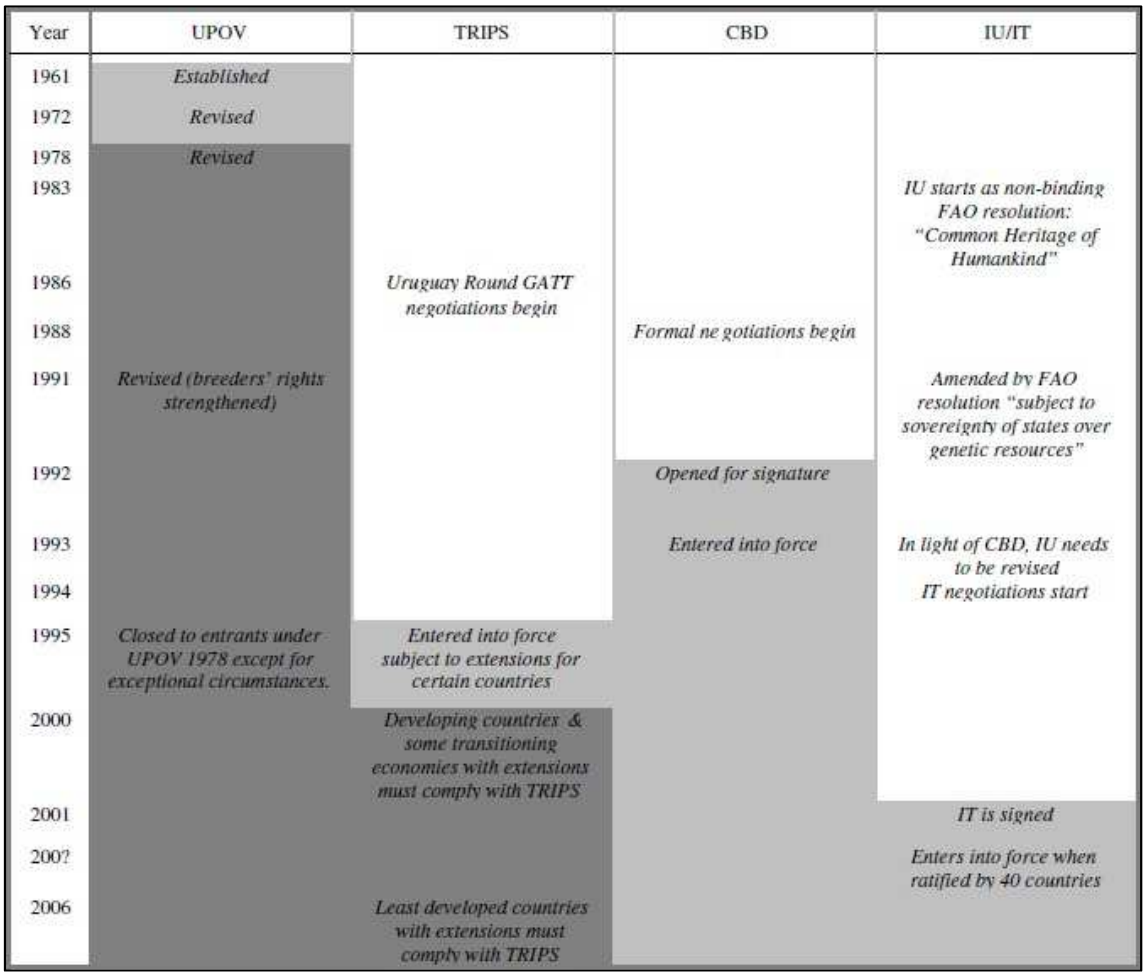
New country members of UPOV must follow the legislation of the treaty in force at the time they joined the union. In this order, the new members (mostly developing countries) must adopt the version of 1991; which enforces stronger intellectual property rights, than the earlier version.

As with UPOV, it leaves individual member countries the flexibility to design their own legislation as long as they are effective in meeting certain minimum standards.

Other important international treaties in this matter are: Convention on Biological Diversity (CBD) and the treaty fostered by FAO (IU/IT).

A revision of the different international agreements can be seen in figure II.

Figure II: Evolution of international agreements on intellectual property rights



Source: Boettiger et al. (2004).

As it could be read in the image, the UPOV is the oldest international treaty. However, the TRIPS represent the most influencing treaty since includes the participation of least developed countries.

The core description of treaties below represents the most important advances in the intellectual property law signed by Argentina.

UPOV Convention, Act of 1978

The International UPOV realized their first international convention on December 2nd, 1961 and later revised on October 23rd, 1978. The aim of the UPOV convention is to provide a valuable instrument for international cooperation in the field of the protection of the rights of the breeders (WIPO, 2008).

Article 5 states that the following items are subject to breeders' right: production with commercial purposes, offering for sale and commercialization of the reproduction or plant propagation material, as such, of the protected variety.

The international agreement received extended support since the US, EU, Brazil, and Argentina signed the treaty.

Breeder's Right

Gives the innovator the exclusively to exploit the new variety and creates a temporary monopoly for the technology owner. According to Belleflamme and Peitz (2010), this right acquires the characteristic of excludable good in legal terms, which will led to underutilization in the short run but contributes to the dynamic efficiency in the long run.

According to the UPOV 1978, the breeder shall determine the conditions and restrictions for third parties interested in the use of his development. In other words, breeders' authorization was only required for "production with commercial purposes". Then non-commercial activities, such as own grown of plants were out of the scope of breeders' enforcement.

In other words, individuals that were interested in adopting the technology for personal use or consumption would have to buy the product the first time. If the grown plant could be used as input for future plantations, the adopter could use his own production avoiding the purchase of the new variety in the market.

Therefore, the so-called***farmer's privilege*** was created, in order to give the farmers the possibility to replant their seeds without paying royalties to the creator of those varieties. When the UPOV understood that the created privilege could lead to an abusive use by the farmers, the new reform took place.

UPOV Convention, Act of 1991

The convention of this year extended the breeders' right in the article 14, not only for commercial and marketing issues, but to propagation, international trade and storing purposes. Argentina did not sign the agreement but the United States and the European Union agreed and signed the agreement.

One of the objectives of this convention was to minimize the farmers' privilege. From now on, the breeders' authorization was extended to the entire production or reproduction process. Clearly, the enforcement of the breeders' right was an intended direction to a dynamic efficiency, giving clear signs of protection to the biotechnology developers.

The 16th article of the 1991 convention states that once the propagation material has been legally placed into de market, the breeder can no longer exercise his right. This represents the so-called***exhaustion of the breeders' right***. Unless, the exploited material is utilized to grew a new reproduction variety. In other words, the royalties are paid only one time, except a new variety is created and if the variety is exported to a country that has not developed it.

In both conventions of the UPOV an ***exception*** to the breeders' right was stipulated (article 9 in 1978 and Article 17 in 1991). The restrictions to a private right have ***public interest*** reasons. Therefore, a country is able to declare the public interest of utilization and reproduction of a plant variety. To conclude this exception, every country must announce the reasons to declare the public interest and each country must determine an equitable compensation or remuneration to the breeder.

Intellectual property legislation of Biotechnology in Argentina

Argentina has different rules to regulate the farmers' exception. Most of this regulation would require a relevant participation of the state in order to enforce the intellectual property rights accordingly.

Act Nº 20247 on Seeds and Phytogenetic Creations

The purpose of this law was to promote an efficient activity of the production and trade of seeds. The article 27 states that *if a farmer stores and sows seed for his personal use does not require the authorization of the breeder*. Naturally, the farmer was supposed to pay the royalties the first time purchase.

Statutory Decree 2183/91 of the Seeds and Phytogenetic Creations Act

This decree reinforces the article 27 of the act 20.247. "The authorization of the breeder of a variety shall not be required, when a farmer saves and uses as planting material on his own".

Decree 2817/91 of Creation of INASE

The purpose of this decree was the creation of the National Institute of Seeds (INASE), a decentralized organism that enforces the law 20.247 and the regulatory decree 2183/91. Additionally, this institutes evaluates

Resolution Nº 35/96 on personal use

This resolution determines the conditions eligibility for the farmer's privilege.

a. To be a farmer.

b. Acquire the seed legally.

c. Having obtained the present seed from a legally acquired.

d. Storing the amount of seed from the harvested grain that will be used for subsequent sowing. Identity and individuality by variety and quantity, prior to processing.

e. The purpose of the setting aside seeds is to sow the seed in his own farm and for his own use.

The purposes of sale, permutation or exchange by the farmer himself or by an intermediary were expressly excluded.

Table II: Farmer's exceptions

	Normative	Exception	Details
European Union	R (CE) 1768/95	Farmer	Own or leased exploitation
		Use the product of the harvest of a protected variety	Farmer must pay a "fair compensation"
		With propagation purposes	Small farmer is not obligued to pay (<92 tons)
		In its exploitation	
United States	Plant Variety Protection A94 - S113	Person that stores seeds derived from protected varieties, uses it in the production of a crop or sells seed through the 'normal commercialization channels'	
Andean community of Nations	Pact Article 26	Those who store and sow the product obtained from the protected variety for its personal use	

Source: INASE (2010).

In summary, Argentina has agreed on two international agreements (TRIPS and UPOV-including 1978 Act), whichgave form to the intellectual property scheme in the country. Regarding international trade, the TRIPS agreement (article 27.3) establishes that country members may exclude plants and animals from registering patents, but they cannot exclude microorganisms and essentially biological processes, which shall be effectively protectedby patents inside the country. The Seeds Law (20.247) aims to give protection in Argentina.

Regarding the Breeder's right, the country signed the agreement and subsequent Act in 1978

Market players

The evolution of markets includes new actors, new incentives and evolution of the products. The objective of this seminar paper is to note the influence of intellectual property rights in the development of the soybean market in Argentina.

Table III: Market players

	Creation | Production | Commerce	Users	
Before	Phytoproducers	Farmers	
	Breeders		
	Seed Producers		
	Traders		
After	Owners of genetic and biological resources	Farmers	
	Owners of Ggenes		
	Owners of transgenesis procedures	Consumer of food poducts	
	Phytoproducers		
	Breederts		
	Seed Producers	Exporters	Seeds
	Traders	Importers	Grains

Source: INASE (2010).

Overall, the major agents of the market could be represented by consumers, producers and technology innovator. The correct enforcement of IP could determine big differences in the remuneration received by each agent. A detailed analysis is given in the next chapter.

Economic effects

Any intention to explain the broad spectrum of the effects provoked by intellectual property in agricultural biotechnology in Argentina must consider the relevance of the farmers' privilege cited above.

The ***farmers' privilege*** is an authorization by law to save seeds given by production and use them in next season/plantation, as long as related to personal use. This interpretation is substantial to understand that the farmer will only pay royalties once, that is, the first time this agent purchases the innovated seeds. The production of most of grains, except for hybrid maize, gives out seeds in the plant that could be used for future planting.

In other words, the breeder or the technology holder will only have one opportunity to achieve earnings from each farmer that innovate soybean seeds, in this case. This means, that the innovators might face a problem of appropriability(Belleflamme and Peitz, 2010), as the return of the research and development investments will be collected partially.

The Genetically Modified (GM) soybean has the characteristic to be Herbicide Tolerant (HT). The feature gene *Agrobacterium tumefaciens*, obtained from the soil, was introduced in the recipient plant, FAO (2011). This gene develops tolerance to the broad-spectrum glyphosate application. This technology can facilitate weed management to farmers and also reduce the production cost by the replacement of glyphosate for expensive fertilizers. Herbicide tolerance for various crops was developed by Monsanto by the name of RoundupReady™ (RR) in the United States.

In 1996, HT soybeans varieties were released in Argentina and United States, by Nidera and Monsanto respectively. Even tough, the US firm (Monsanto) had developed the technology by 1991; it was Nidera, a foreign company that initiated activities in Argentina in 1988 by the acquisition of Asgrow Argentina, the technology introducer in this country.

At the end of the 1980´s decade, Asgrow Argentina had signed an agreement in the US with Monsanto, which allowed access to the germplasm banks. A few years later, Nidera would still benefit from the agreement previously signed by Asgrow Argentina, and acceded to the germplasm banks, which contained all the materials developed by Monstanto (Fuck, and Bonacelli, 2009).

According to Traxler (2004), Monsanto failed to patent the Roundup-Ready technology in Argentina. Nidera, the largest seed company in the country obtained the *royalty-free* access to Monsanto's RR technology. Additionally, the company followed the liberalization terms imposed by the Argentinean government and was able to patent the GM crop before 1996, when the government liberated the GM production.

At the time that HT soybean was firstly developed, the Argentinean government have not shown major interests in biotechnology. Monsanto, who hold the patent for glyphosate, did not initiate the process to patent the GM soybean. This non-strategic decision had an unfortunate outcome. When the company intended to patent the HT soybean, the country denied the first proposal, since the technology had already been *liberated*.

Many issues occurred in the following years, between the Argentinean government and Monsanto, the latter tried to thread the government with avoiding biotechnology investments in the country. In 2005, the multinational company managed to block some ships of

Argentinean soybean in the Netherlands, as a claim of the unpaid royalties. Later on, the national government of Argentina presented a formal document to the World Commerce Organization (WCO) Correa (2006).

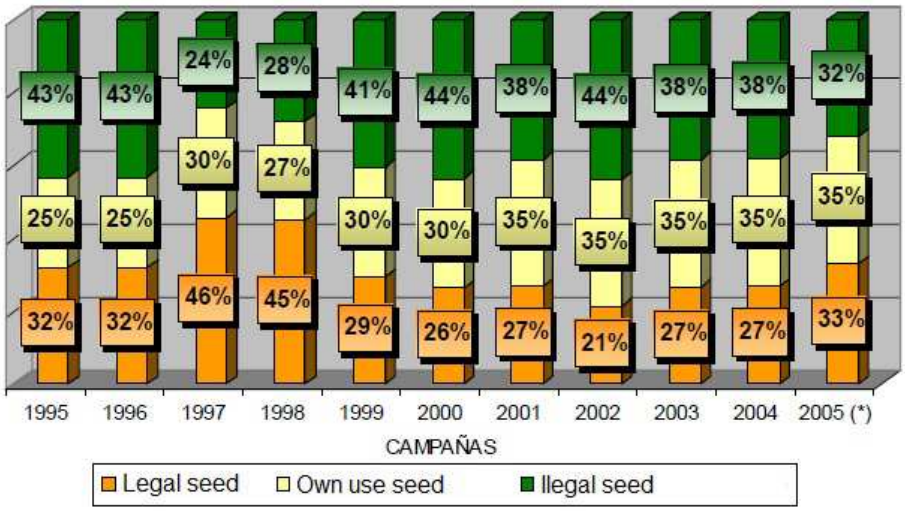
Even tough, Monsanto had still many reasons to remain operating in Argentina. The country was a pioneer introducer of GM technology in South America. The low restriction of international borders, allowed the easy transportation of seeds to nearby countries like Brazil, Paraguay and Bolivia. Meanwhile, the technology was being adopted at high rates by Argentinean farmers and the illegal spread throw the region was delicate, but at the same time overwhelming for the company.

Monsanto and other companies achieved the commercial release in the subsequent years. By 2001, seven companies commercialized more than 50 RR varieties in Argentina. All of them paid license fees to Monsanto, except Nidera.

Adoption of technology showed important signs of consolidation. In 2001, 68 percent of US area was cultivated with RR seeds, while the adoption reached 90 percent of the Argentine soybean area.

The case of soybeans in Argentina represents an important example of intellectual property rights (IPR) loophole for farmers and a disadvantaged market for GM innovators.

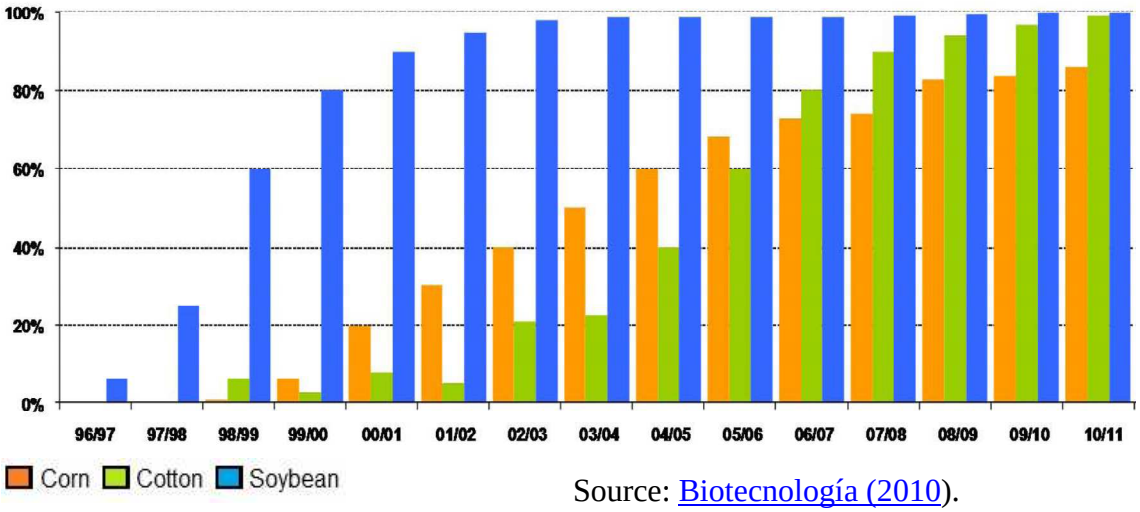
Figure III: Origin of soybean seeds in the Argentinean market



Source: Martilonich (2006).

As the graph shows, only one third of the soybeans planted in Argentina did pay royalties and the cost of IPR to the developers for the use of the technology. Almost two thirds of seeds used were obtained by the farmers' privilege and illegal seeds (*white-bag*). This fact addresses the appropriability problem of innovators as cited by Belleflamme (2010) and represents relevant losses to the private sector and negative effects to the country reputation.

Figure V: Evolution of harvested area with GMO (as percentage of each crop)



Source: Biotecnología (2010).

As the precedent graph explains, almost the total harvested area of soybeans and cotton in Argentina are planted with transgenic seeds. Although, this information was not issued by an official source; the situation explained by the graph could not be argued.

In the United States, the sale and use of technology innovations is regulated though patents and sale contracts. By law, farmers in Argentina are allowed to retain their seeds for own use but not for commercial purposes. The Argentinean government rarely controls the quantities of seeds retained in farms.

Micro-level effects

Moschini (2010), have documented differential yields on GM soybean. On the other hand, Traxler (2004), does not consider important differences in yield per hectare. However, Qaim (2009) found that GM soybean showed yield improvement in farms with weed management problems.

Farmers in Argentina and United States had large welfare gains. The surplus received by argentine farmers reached USD 300 million by the year 2001; while the US farmers achieved USD 145 million in the same year.

In Argentina a new sowing technology was applied, the so-called ***direct sow methodology***, has contributed to improvements in yield performance. According to Fuck and Bonacelli (2009), the new sow method showed an impressive growth between 1990 and 2000. The area adapted to this new technology grew from 300.000 ha in 1990 to 9.25 million hectares.

Three main factors would have contributed to this fast adoption. The farmers' intentions to increase their revenue have led to the introduction of the sowing method to the Pampas, Argentina's biggest productive area. Additionally, the low prices of the herbicides (glyphosate in particular) and the farmers' organizations to promote this technology.

Table V: Reduction of variable cost of production. HT soybean

Argentina	USD 21	2003
	USD 23	2005
United States	USD 17-31	1996
	USD 20	2000
	USD 40	2002

Souce: Adenle (2001).

Jointly, the introduction of HT soybean and the adoption of a new sowing methodology were determinant to achieve higher yields per hectare. The technology adopters were able to lower their costs since the herbicide used to control farm weeds was also imported from China with tax exemptions. Additionally, the excess of supply of seeds given by illegal sales did not let the technology innovator to catch their short-term earnings, improving the society welfare and the subsequent prices diminish of seeds that benefited the producers.

Macro-level effects

In the aggregate level the major economic implications among agents are considered. The welfare framework establishes the guidelines for the analysis. Several aspects influence the distributional effects between the producers, the consumers and the technology innovator. The role of government is of major relevance. The law and enforcement of IPR can determine a temporary monopoly rent for the GM innovator. The tax scheme related to international prices influences consumers and producers whether to buy or to adopt a GM crop.

Falck-Zepeda et al. (2000), Traxler (2004), Qaim and Traxler(2005), and Zilberman et al.(2010) followed the same approach to measure the social welfare, including the producers, consumers and the technology provider.

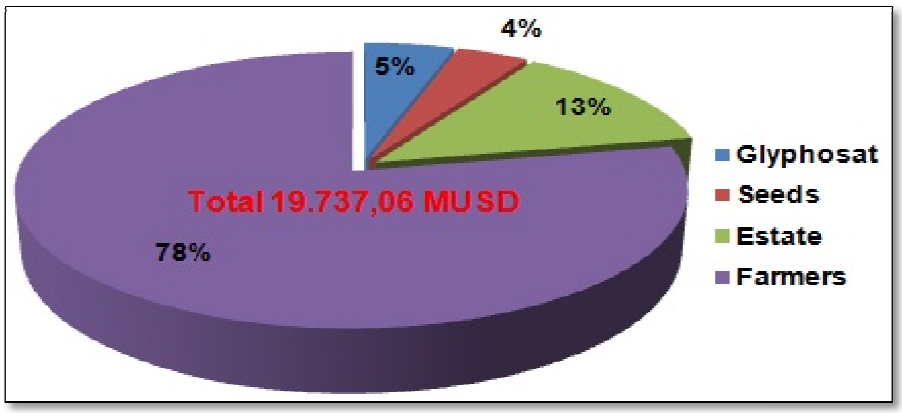
Table VI: Benefits generated from the introduction of RR soybeans (million USD)

Year	Benefits to producers	Benefits to Consumers	Technology revenue	Total benefits and technology revenue
Argentina				
1996	-1.2	0.1	0.0	-1.1
1997	9.6	0.8	1.4	11.8
1998	64.5	2.1	10.5	77.1
1999	144.5	3.0	18.4	165.8
2000	201.2	4.7	23.3	229.2
2001	303.2	4.3	27.6	335.0
United States				
1996	10.7	3.2	9.9	23.7
1997	70.5	24.4	70.0	165.0
1998	166.2	67.1	208.7	442.0
1999	136.5	99.0	271.1	506.7
2000	113.9	117.3	304.9	536.1
2001	144.9	149.4	393.1	687.4

Source: Traxler (2004).

Regarding the HT soybean, the introduction produced in the late 1990s welfare gains estimated in USD 1 billion around the world. The welfare distribution was quite different among innovating countries due to the IPR enforcement. In Argentina the producers captured almost 90% of the innovation benefits while the US producers only achieved the 20% of their nations' welfare gains (Qaim, 2009).

Figure VI: Distributional effects of the soybean liberalization in Argentina



Source: Trigo and Cap (2006).

The figure above clears out the uneven relationship in the participation of benefits. On the other hand it can certainly, give an approach of the royalties obtained by Monsanto for the sales of glyphosate. Considering the fact that farmers do not receive any state support in terms of subsidies, minimum price for imported inputs and credit constrains, they are pure risk receivers of the agricultural investments. Therefore, the positive pay-offs of the risk assumed, could be correctly addressed.

Table VII: Regional welfare effects of HT soybean (2001)

	MUSD	Producers		Consumers		Innovator	
USA	687	145	21.1%	149	21.7%	393	57.2%
Argentina	335	303	90.4%	4	1.2%	28	8.4%
Worldwide	1229	160	13.0%	651	53.0%	418	34.0%

Source: Qaim and Traxler(2005).

The above table gives a relevant approach of the distributional effects in countries with strong and weak intellectual property protection. In the US, the technology innovator is able to capture almost 60 percent of the total welfare gains; while the producers and consumers distribute the rest evenly.

In Argentina, the distributional effects are quite different. Firstly, because the innovator is unable to capture the social welfare gains generated by him. This fact has different lectures. On one side, incentives for future R&D investments are boost by the IPR weaknesses. On the other side, the society does benefit for the technology developed, achieving lower price of inputs, reactivating the agricultural sector and the positive spill-over effects from the greater expenditure in goods and services.

Secondly, it is surprising the uneven position of the non-producers. A brief explanation could be found in this aspect if we mention that farmers in Argentina face world prices of crops, with a small export-tax initially. The positive effects of HT soybean seeds in the cost structure and the diminishing cost of the new planting methodology, created a significant decrement in the farmers' cost. Therefore, an outstanding increase of the producer surplus was achieved.

Lastly, the participation of consumers is really small in comparison with other countries. It is relevant to cite the intensive negative effects of the economic crisis in Argentina in 2001-2002. As usual, the consumption is the first expenditure to receive the economic impacts. Additionally, the consumption of soybean and derivatives was not larger in among citizens, but oriented as an input for the industrial live-stock sector.

Today, the overall picture of the effects has possibly changed due to differences in the world food price, the tax-scheme faced by producers and the economies of scale of larger farms. Even tough, the overall distribution of benefits would possibly remain equal.

Conclusion

Agriculture production is considered as a relevant activity worldwide, not only because of the basic needs covered by the sector, but for the positive spill-over generated. In general terms, agriculture is considered as prime activity by poor households and technology improvements have an upscale return.

Intellectual property rights have an important impact in the distributional effects of biotechnology in agriculture. Technological change will improve yields and efficiency in agricultural sector, but clear property laws have to be drawn in order to foster the dynamic efficiency. The strength of intellectual property in the dissemination of technology, could delay the profit achievements of small and medium farmers.

Farmers' privilege was stated as a development purpose by international conventions of property law. The application of vintage property law system and lack of incentives to update the legislation in Argentina, gave free pace to farmers to act non-legally since the local government in Argentina was not able to impose the *police power* to audit the seed activity in farms.

The agricultural sector does not currently receive financial aid by the government. Therefore, the main motivation of farmers is to maximize their profits. In order to adopt technology, a basic rule of investment is done by the client: measure the positive outcomes of investing money today. In the case of HT soybeans, farmers had no incentives to pay royalties when the cost of intellectual property may not reflect a potential improvement in yields per hectare. Besides, they could purchase the product at a lower price in the non-legal market.

The impressive adoption of HT soybean in the country during the first decade of GMOs introduction was primary due to the technological improvement of sowing methodology and herbicide resistant seeds. The weakness of intellectual property allowed a greater adoption rate at the cost of poor revenue from the technology developer.

In terms of sustainable R&D agricultural biotechnology, results are ambiguous. Private companies will not execute the monopoly power, sub-efficiently according to Belleflameand Peitz(2010); but still will be active in the local market in terms of inputs sales and technology diffusion. Participating in the third largest world producer of soybean, it is still attractive for private companies.

In order to achieve better reputation and attract investors to the biotechnology sector, Argentina could intent to imitate the intellectual property system of United States or legislation of an important development country with recent good experiences.

Bibliography

I. Adenle, A. A. (2011). Global capture of crop biotechnology in developing world over a decade. *Journal of EGeneticEngineering and Biotechnology*.

II. Belleflamme, P., and M. Peitz. (2010). *Industrial organization: markets and strategies*.

III. Biotecnología, C. A. p. l. I. y. e. D. d. l. (2010). Biotecnología para periodistas. *ArgenBio*.

IV. Boettiger, S., G.D., Graff, P.G. Pardey, E. Van Dusen, and B.D. Wright. (2004). Intellectual property rights for plant biotechnology: International aspects. *Handbook of Plant Biotechnology*, 1090-1113.

V. Correa, C. M. (2006). Monsanto vs Argentina. *Revista: Le Monde Diplomatic*. 82. http://www.insumisos.com/diplo/NODE/813.HTM

VI. Falck-Zepeda, J. B., G. Traxler, and R.G. Nelson. (2000). Surplus distribution from the introduction of a biotechnology innovation. *American agricultural Economics Association, 82*(May 2000), 360-369.

VII. FAO. (2011). Biosafety resource book (pp. 573). Rome, Italy: Food and Agriculture Organization of the United Nations.

VIII. Fuck, M. P., and M.B. Bnacelli. (2009). Sementes geneticamente modificadas: (in) segurança e racionalidade na adoçap de transgenicos no Brasil e na Argentina. *Revista CTS, 12(4).*

IX. INASE. (2010). Intellectual property rights on vegetable varieties. The breeder's Right (pp. 181). Buenos Aires: National Institute of Seeds. Ministry of Agriculture, Livestock and Fisheries of Argentina.

X. Louwaars, N. P., R. Tripp, D. Eaton, V. Henson-Apollonio, R. Hu, M. Mendoza, F. Muhhuku, S. Pal and J. Wekundah. (2005). Impacts of strengthened intellectual property rights regimes on the plant breeding industry in developing countries. *Wageningen UR*, 176.

XI. Martilonich, A. (2006). Derechos de propiedad intelectual en las obtenciones vegetales: el caso de la soja y el conflicto Monsanto-productores agropecuarios. *Bolsa de Comercio de Rosario*.

XII. Moschini, G. (2010). Competition issues in the seed industry and the role of intellectual property. *Choices, 25*(2), 14.

XIII. Qaim, M. (2009). The economics of genetically modified crops. *Annual Reviews of Resource Economics, 2009*, 665-693.

XIV. Qaim, M., and G. Traxler. (2005). Roundup Ready soybeans in Argentina: farm level and aggregate welfare effects. *Agriculture Economics, 32*, 73-86.

XV. Traxler, G. (2004). The economic impacts of biotechnology-based technological innovations. [Working paper]. *ESA.*

XVI. Trigo, E. J., and E. J. Cap. (2006). Diez años de cultivos genéticamente modificados en la agricultura argentina. *ArgenBio, Diciembre 2006*, 22-35.

XVII. WIPO (2008).*UPOV Report on the Impact of Plant Variety Protection*. Intellectual Property Handbook, WIPO Publication No. 489(E).pp174-178

XVIII. Zilberman, D., S.E. Sexton, M. Marra, and J. Fernandez-Cornejo. (2010). The economic impact of genetically engineered crops. *Choices, 2nd Quarter 2010*(25(2)).