

Intellectual Property in the Seed Industry: a comparative analysis of Argentina, Brazil and the United States

Antonio Carlos L. Nogueira*

Ph.D candidate in Business, University of São Paulo, PENSA Agribusiness Intelligence Center

Av. Prof. Luciano Gualberto 908, room C-14, 05508-010 - São Paulo, Brazil

Phone/Fax: +55 11 3818-4005, E-mail: aclimano@usp.br

Jay P. Kesan

Professor, University of Illinois College of Law

504 E. Pennsylvania Avenue, Champaign, IL 61820, United States

Phone: +1 217-333-7887, Fax: +1 217-244-1478, E-mail: kesan@law.uiuc.edu

Andres A. Gallo

Professor, University of North Florida, Department of Economics and Geography

4567 St. Johns Bluff Road, South, Jacksonville, FL 32224-2675, United States

Phone: +1 904-620-1694, E-mail: agallo@unf.edu

Abstract

This article analyzes how the intellectual property rights affect the seed producers' strategies and results. Like in other industries, the development of new plant varieties requires an adequate level of intellectual property protection. The hypothesis is that a stronger regulatory framework favors contractual arrangements adoption and investment on innovation. Varieties can be protected by two basic regimes: the patent, more strict and adequate for biotechnological events and the plant breeder's right, resulting from traditional methods for varieties development. The study is a comparative analysis of the impacts of the intellectual property on the productive system of soybean seeds in Argentina, Brazil and the United States. The qualitative analysis includes the evolution of legislation and respective enforcement mechanisms, the contractual arrangements in the productive system and the evolution of the new varieties registered. In the United States it is allowed for the breeder to choice the level of protection between the plant breeder's right certificate and patent. In Argentina and Brazil, the regulatory frameworks are similar, based on the plant breeder's right model, and are considered weak for the soybean seed productive system. The results of new varieties registered and participation of saved and illegal seed support the hypothesis.

Keywords: intellectual property, seed industry

* Contact author

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Introduction

The seed has contributed to the results of modern agriculture in production increase, reduction in the use of inputs and aggregation of new attributes to food. The research and development in the seed industry has been conducted by two complementary pathways. The first is plant breeding, which involves natural crossing and selection of generations with specific attributes and suited to local conditions of soil and climate. The second is the biotechnology, comprehends the mapping and changing the genetic structures of living organisms using genetic engineering. The identification of the genes responsible for valuable attributes and the ability of transferring them between specimens improve the efficiency and shorten the time for plant varieties development.

Created by the society to stimulate the innovation, the intellectual property (IP) is a temporary guarantee for authors and inventors of the exclusive right on the respective creations and discoveries. The objective in protecting this right is to create incentives that maximize the difference between the value of the invention when it is explored and the social cost of its creation (Besen and Raskind, 1991). The intellectual property in the seed industry is protected under two basic models: the right of plant breeder and patents.

This article analyzes how the intellectual property rights affect the seed producers' strategies and results for new soybean varieties. The study is a comparative analysis of Argentina, Brazil, and the United States, considering the evolution of the regulatory framework and new plant varieties delivered by seed producers.

The central hypothesis in the study is the existence of clearly defined and enforced property rights reduce transaction costs, which stimulates investments and favors the economic development (North, 1990). In the context of intellectual property in the seed industry, it is expected stronger regulatory framework (legislation and respective

enforcement) favors the delivering of new plant varieties by seed producers. The methodology involves a qualitative analysis of the legislation, the enforcement mechanisms and a descriptive analysis of new soybean varieties delivered by seed producers.

Intellectual Property in the Seed Industry

The Rights of Plant Breeders

In 1961 occurred the International Convention for the Protection of the Plant Varieties in Paris, which resulted in the creation of the International Union for the Protection of New Plant Varieties (UPOV). It is a multilateral agreement with norms for the recognition and protection of the intellectual property of the breeders on the new varieties by certificates of Plant Varieties Protection (PVP) in local legislations (UPOV, 1978).

The UPOV promoted revisions of the initial agreement in 1972, 1978 and 1991. Currently all the States members are signatory of the Acts of 1978 or 1991, which entered in vengeance in 1997. In these revisions, the protection granted to the breeder was gradually brought closer to the patent rights on plants. The possibility of adhesion to the Act of 1978 was locked in April of 1999. Since then, any new adhesion to the UPOV must subscribe the terms of the Act of 1991.

The protection of PVP rights of the Act of 1978 requires distinct, homogeneous or steady uniform varieties. A distinct variety is that one that, independent of the origin (artificial or natural) of the initial variation that originated it, it is clearly designable for one or more relevant characteristic of any other variety, whose existence is of common knowledge at the moment of the application for its protection. The homogeneous or uniform variety is that enough homogeneous in relation to the particular characteristics of its sexual reproduction or vegetative propagation. In other words, all the plants of this variety must have similar characteristics. Steady variety means permanence in its essential characteristics,

remaining itself faithful to the description after repeating the reproduction or propagation (UPOV 1978, Art. 6).

In the Act of 1991, beyond the satisfaction of the three characteristics above, the requirement of newness or innovation was added. To accomplish this criterion, a variety alone can be considered new if, in the date of the application for the rights of the breeder, the harvest or propagation material was not sold or given to others, for exploitation (i) in the territory of the contracting parties more than one year earlier of this date, (ii) in any another territory that is not of the contracting party four years or more earlier or, in the case of trees and vines, six years of the date of application (UPOV 1991 Art. 6).

Since the original Convention until the Act of 1978, the right of the breeder allowed that this agent make a free use of any protected genetic material as initial resource of variation to create new varieties, which constitutes the exemption of breeder (UPOV 1978, Art. 5(3)). There was also the guarantee the farmer could storage grains of the harvest for the owned plantation to be used as seed in the following harvest, that it is the privilege of the farmer. Another characteristic of the Convention was the prohibition of that the countries adopted the double protection of the variety for rights of breeder and patents (UPOV 1978, Art. 2(1)). There was also the right of the States to exclude certain species of any form of protection, according to its specific national interests.

In the Act of 1991 the rights of the breeder were significantly extended. According to Wilkinson and Castelli (1999), the reason was the fact of that the biotechnology companies had started to get ample intellectual property rights by means of patents of genes and species, what threatened the economic survival of the conventional breeders that depended on PVP. The owners of patents of genes could insert them in a conventional variety and demand the property of a new transgenic variety.

While until the Act of 1978, the rights of the breeder were restricted to the multiplication and commercialization of the reproductive material (parts of the plant or seeds), in the Act of 1991 they had been extended for the following aspects: (1) reproduction, storage and selling of reproductive material, (2) the material obtained in the harvest (the whole plant or parts), (3) the products elaborated directly from the material of the harvest of the protected varieties, like oil of soybean or maize, (4) other decrees to be defined by the parts and (5) new varieties essentially derived from others, protected or not clearly differentiated of that protected ones, or those produced with the repeated use of a protected variety. A variety is considered essentially derived from another one (the initial variety) when it is clearly differentiated of the initial variety for the differences that result of the derivation process, but it holds back the expression of the genotype or combination of genotypes of the initial variety.

In the Act of 1991 the period of validity of the rights of the breeder is extended from 15 to 20 years in the case of temporary crops varieties and a minimum of 25 years for trees and vines. There is not the requirement of guarantee to the right of the farmer to keep part of the harvest for use as seed in the next harvest, but it remains the possibility of that any country member admits it. However, if the country decides to keep the exception of the farmer, it must also preserve the exception of the breeder. It is admitted double protection of varieties under regimes of rights of the breeder and that of patents. When eliminating the article of the Convention that vetoed the double protection, the exclusiveness of the PVP for the new plant varieties disappears.

Patents

The patent of one invent is a privilege of temporary monopoly, granted with the intention to foment the innovation. The system grants to exclusive right of production and

commercialization to the owner for a period that generally varies from 15 up to 20 years in the country where the license was granted (Carvalho and Pessanha, 2001).

Lesser (1990) affirms that to be patentable, the invention must have three characteristics: newness (being something really new), utility (having a potential application) and not obvious (it cannot be trivial extension of an existing state of the art). Carvalho and Pessanha (2001) add that the disclosure is an important element of the patent, since the innovation must be described with enough details so that a qualified person in the subject could reproduce it. Disclosure gives to the patents the function to teach.

The patents are applied to products and processes with the intention to protect descriptions of inventive activity and not of abstract thoughts. Therefore, the majority of the laws of patents exclude abstract ideas and statements as formulas and methods of business management. Some legal systems exclude items offensive to the public moral or particular products or technologies that can harm the public welfare, as pharmaceutical products and medical applications. Other national systems exclude any application in agriculture or live organisms as seeds and plants (Lesser, 1990).

According to Sherwood (1992), the modern biotechnology have generated the ability for isolate, recover, imitate and create simple elements of life, like enzymes and proteins, and to produce by genetic engineering specific characteristics in more complex forms of life. He argues this capacity have generated for the legal systems of patents the problem of to define if this new forms are patentable or not. In 1980 the Supreme Court of the United States, analyzing the case *Diamond vs. Chakrabarty*, supported the patentability of an artificial bacterium. This court justified the decision with the argument that the bacterium was not available earlier in the nature but a result of a discovery by an inventor, and fulfilled the criteria of utility. In 1985, the USPTO (United States Patent and Trademark Office) decided

in the case *Ex parte Hibberd* for the patentability of vegetal forms of life, since the material fulfill the standard requirements of patents.

National Regulatory Frameworks

This section presents the regulatory frameworks on intellectual property rights for new plant varieties in the United States, Argentina and Brazil. This analysis involves the evolution of the legislation and enforcement mechanisms available.

Regulatory Framework in the United States

The intellectual property protection regime in the United States is recognized as favorable to biotechnology inventors. The plant varieties developers can protect their inventions with a range of regimes, including the Plant Variety Protection Act of 1970 (PVPA), the Plant Patent Act of 1930 (PPA) and the Patent Act of 1952. Besides these laws, the Supreme Court has reinforced the importance of patents for plants, by allowing the use of utility patents for plants in some key cases.

The patent regime is available in the U.S since 1790. The rights of plant breeders were incorporated to this regime by the PPA in 1930, which only protects plants with non-sexually reproduction. A protection comprehends only the variety, but not the specimen, and allows for the sexually reproduction of the plant. This regime is administrated by the USPTO (Garcia, 2004).

The PVPA regime, established in 1970, protects the varieties with sexually reproduction is similar to the UPOV framework. The PVPA allows for the exception farmer and for the plant breeder. Due to these conditions, it is considered a soft regime, like the UPOV 1978, by the private agents in the American seed industry (Garcia, 2004).

As a result of a stronger regulatory framework for intellectual property protection relatively to Argentina and Brazil, the commercial sales of soybean seeds reach 80 – 85% of

total soybeans planted in 2000, according to the United States General Accounting Office (Kesan & Gallo, 2005).

Regulatory Framework in Argentina

According to Kesan & Gallo (2005), the regulatory framework for new plant varieties in Argentina “has evolved over time to give increased protection to researchers and the industry”. The first law was established in 1935, which provided for the registration of new seeds and required government approval for new varieties, but it did not provide any protection to IP rights for the new seeds. A decree called the “Law of Seeds”, passed in 1973, was the first legislation that gave commercialization rights to the inventors of new seed varieties. It also provided for the creation of the National Seed Commission (Comision Nacional de Semillas, CONASE) to be in charge of advising and evaluating public policies regarding the regulatory regime. This regime was fully implemented only in 1978 and it similar to the PVP certificates of the United States.

The Law of Seeds was modified in 1991 under Decree 2183, introducing important changes to the regulatory regime and updating the legislation according to international standards. This modification was resultant of political pressures exerted by the Argentine Seed Association and the Association for the Protection of Plant Breeders. This modified law created the National Seed Institute, a new agency to manage and enforce the regime for the new seed varieties. Latter, these functions were incorporated by the National Seed Institute (INASE).

In 1994, the Law of Seed, was modified again to be updated with the guidelines of international standards. The model adopted was the Plant Variety Protection Certifications (PVPCs), which were established by the 1978 International Convention for the Protection of New Varieties of Plants (UPOV 78). This regulatory framework seems to be weak in the case of plants like soybean, which is self-pollinated and the grain can be used as seed in the next

season. As a result, the commercial sales of soybean seeds reach 28 – 50% of the total soybeans planted in 2000, according to the United States General Accounting Office.

A relevant event in the Argentine seed industry is described by Gallo and Kesan (2006). In early 2004 Monsanto decided to stop the commercialization of soybean seed, due the lack of property rights protection. This decision caused authorities concern, since genetically-modified seed, as Roundup Ready soybean, represent 95% of the soybean planted in the country. As a reaction to this situation, the government is proposing a tax on farmers' crops, to be distributed among seed producers as a mechanism to compensate them for the lack of property rights enforcement.

The authors argue that, nevertheless an optimal value of the tax eventually could be found, this solution present some weaknesses, as the risk of partial deviation of the collected value in the government, the difficulty to establish the exact market share of seed producers in order to calculate the amount to be distributed and the fact that a general tax does not discriminate among different users and uses of the invention.

Regulatory Framework in Brazil

The industry of seeds in Brazil passed for deep institutional transformations since the decade of 1990. The Law of Protection of Plant Varieties (*Lei de Proteção de Cultivares*, LPC), created in 1997, established the register of new plant varieties and protected the intellectual property of its creators according the Act of 1978 of UPOV. The Law of Seeds, regulated in 2004, defined the regulation of the production and commercialization of seeds of registered varieties. The first version of the Law of Biosafety was established in 1996, and suffered many questioned in the courts, and some judiciary decisions blocked the adoption of genetically-modified seeds until 2005, when a new version finally regulates the research, production and commercialization these products.

The Law n° 9,456, of April 25th 1997 (Brazil, 1997), following the international convention of UPOV 78, institutes the protection right to plant varieties and establishes, in its article 2°, that the certificate of variety protection is the only form of protection to plant varieties and that it will be able to hinder the free use of plants or its parts of reproduction or vegetative multiplication in the Country.

According to article 4°, the new variety or variety essentially derived from any gender and species is subject of juridical protection. The breeders are the persons or organizations that develop a new variety or a variety essentially derived and to them will be granted the property right on the reproductive or multiplication of the whole plant.

The Law defines the procedures to get the intellectual property right on the varieties, being assured to the owner of the Certificate "the right to the commercial reproduction in the Brazilian territory, being forbidden for third parties, during the protection period, the production with commercial objectives, the sale of the material of propagation of the variety without its authorization. The stated period of protection of the variety, as general rule, is of fifteen years.

Some behaviors are allowed, not constituting breaking to the protection of variety the following: (1) to save and plant seeds for proper use, in its property or in a property of a third party whose ownership withholds; (2) to sell or to use as food or raw material the gotten product of its plantation, except for reproductive ends; (3) to use the variety as source of variation in the genetic improvement or the scientific research; (4) being small agricultural producer, to multiply seeds for donation or exchange, exclusively for other small agricultural producers, in the scope of programs for support or financing the small agricultural producers, lead for public agencies or not-governmental organizations, authorized for the Public Power.

Such uses of protected varieties allowed for the LPC is considered by some actors as opportunities that allow the disrespect of the intellectual property. The permission for guard

of grains produced for use as seeds in the following harvest generates chances so that producers keep bigger amounts than their needs of seeds and commercialize the excess in illegal transactions. As these operations demand investments in equipment and warehouses, they are accessible to producers with large production scale. Thus, the inclusion of maximum limits of scale of the producer for the concession of the right to keep seeds could reduce the possibilities of abuse to the intellectual property.

The law foresees the sanction of the behaviors that infringe the right of protection of varieties. The behaviors forbidden are: “to sell, to offer for sale, to reproduce, to import, to export, as well as packing or storing for these ends, or to yield to any heading, material of propagation of protected variety, with correct denomination or another one, without authorization of the bearer”. Anyone who conduct these activities will be “obliged to indemnify it, in values to be definitive in regulation, besides having the material apprehended, as well will pay to fine equivalent as the twenty percent of the commercial value of the apprehended material, incurring, still, in crime of breaking of the rights of the breeder, without damage of the too much respective penalties sanctions”.

The enforcement of the legislation depends on the monitoring of the Ministry of the Agriculture or law suits of the owners of the registered varieties, in cases of suspicion of disrespect to the intellectual property. One perceives that the public monitoring presents limited effectiveness as much for the geographic dispersion of the agents as for the insufficiency of resources of the responsible entity. Therefore, the interested private agents need to invest resources to identify piracy cases, either for private investigations or denunciations of third parties.

Impacts of the Regulatory Framework on the Seed Industry

The United States

According to Gallo and Kesan (2006), the legal framework allowed an impressive increase in private sector participation in seed production and a rush to patent new varieties (Table 1). They also observed an increase in the number of utility patents devoted to biotechnology patents for plant varieties. Furthermore, these legal changes helped to foster research and development efforts in biotechnology and the creation and adoption of genetically modified seeds. As a result, we have a system in which property rights are well defined and enforced, and researchers can choose the level of protection they consider high enough to effectively protect their inventions in the market.

Table 1 – U.S. Agricultural biotechnology patent by technology classification, assignee sector and national origin, 1976-2000

U.S. agricultural biotechnology patent awards by technology classification, 1976-2000 1/						
Technology Class	1976-80	1981-85	1986-90	1991-95	1996-2000	Total
Plant Technologies	54	91	244	576	2,011	2,976
Protection, Nutrition, and Biological Control of Plants and Animals	76	154	277	512	865	1,884
Pharmaceuticals	72	89	150	248	718	1,277
Patented organisms, Nonplant	14	76	214	347	795	1,446
Metabolic Pathways and Biological Processes in Animals	39	25	79	166	454	763
Metabolic Pathways and Biological Processes in Plants	156	181	263	255	716	1,571
Metabolic Pathways and Biological Processes, DNA-Scale	0	5	79	199	961	1,244
Genetic Transformation	25	100	364	908	2,732	4,129
Genomics	0	0	10	54	265	329
U.S. agricultural biotechnology patent awards by assignee sector and national origin, 1976-2000						
	1976-80	1981-85	1986-90	1991-95	1996-2000	Total
U.S. Firm	167	239	481	893	2,551	4,331
U.S. Nonprofit	49	104	231	526	1,434	2,344
U.S. Government	18	27	54	129	193	421
U.S. Independent	0	2	3	7	15	27
Non-U.S. Firm	107	162	434	660	1,688	3,051
Non-U.S. Nonprofit	5	13	31	103	291	443
Non-U.S. Government	14	24	38	79	214	369
Non-U.S. Independent	1	5	7	14	14	41
Unknown/other	21	26	49	106	233	435

1/ Table entries may not sum to totals because some patents are classified in multiple areas, others in none.

Argentina

Gallo and Kesan (2006) inform that, given the increased interest in genetically modified organisms and the high number of registrations of new varieties that are genetically modified (Table 2), the government decided to create a special agency in charge of advising on biotechnology policy. By Resolution 219/2001, the Secretary created the National Advisory Commission for Agricultural Biotechnology, and by Resolution 362/2003 made the Biotechnology Area independent from the Sub-Secretary of Agricultural and Food Policy. Finally, by Resolution 244/04, the Secretary eliminated these two agencies and created the Office of Biotechnology (Oficina de Biotecnología), which is in charge of advising and managing all issues related to the biotechnology policy of the country. Pursuant to this change, the CONABIA depends directly on the Office of Biotechnology. The authors consider that the regulatory framework for biotechnological discoveries in agriculture is in constant flux, with different agencies in charge and changes to the structure of the management system. This differs from the more stable and well-defined system in place in the United States.

Table 2 – Registration of new transgenic soybean varieties, 1995-2003

Year	Transgenic	Non transgenic	Total	Transgenic as % of Total
1995	-	8	8	0.0
1996	5	11	16	31.3
1997	12	23	35	34.3
1998	18	18	36	50.0
1999	28	13	41	68.3
2000	19	7	26	73.1
2001	32	3	35	91.4
2002	13	2	15	86.7
2003	9	-	9	100.0

Brazil

In the aspect of organization of the Brazilian seed industry, occurred the increase of the market share of multinational corporations, resultant of acquisitions and fusing between them, and also of the acquisition of local companies. It had visible modifications in the

international structure of the market of seeds, with the emerging of new challenges for the agents of the sector. This movement was motivated by the advance of the biotechnology in the development of genetically modified varieties in the international centers of research, generating new business opportunities in the Brazilian market of seeds for the owners of this technology

The increase of the relations between public institutions of research and private companies was verified, with prominence for the Brazilian Company of Agricultural Research (Empresa Brasileira de Pesquisa Agropecuária, EMBRAPA), which established partnerships with state institutions of research, multinational companies and foundations supported by seeds producers for the development of new plant varieties.

These movements had generated the regulating framework of the intellectual property in the development and commercialization of registered seeds and had favored the increase in the rate of innovations in the sector, which contributed to increase the agricultural productivity, either in the traditional areas, either in the new regions of culture of grains. However, there is a low capacity of the public and private agents in guaranteeing the intellectual property rights present in the legislation, resulting that the benefits of the law are not disclosed in its full potential. The costs of coordination of the productive system of seeds are high due to the existence of an illegal seed market.

According to Nassar (1998), the generation of new varieties involves the following complementary branches of research: genetic improvement (breeding) and biotechnology, to be discussed in the following paragraphs.

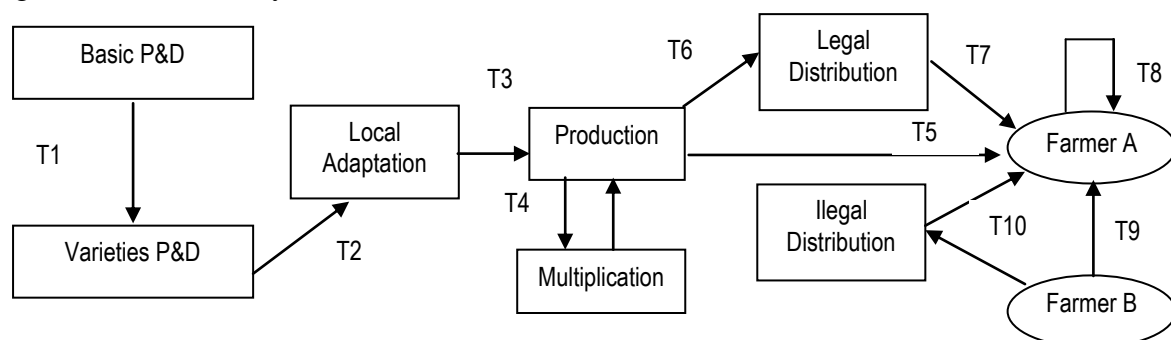
The breeding involves long term research with a high local specificity, since the variety must be adapted to the conditions of climate and soil of the region where it will be cultivated. It is a branch formed for two agents: (i) the owner of germplasm, who carries through specific crossings to generate superior populations and with variability favorable to

desired characteristics e (ii) the agent who promotes new genetic combinations and selects ancestries in regional tests until reaching a new variety (genetic seed) suitable to the local conditions. This new variety is inserted in the system of production of seeds by means of successive multiplications with control of generations.

The research on biotechnology is highly intensive in capital and dependent of the variety that will receive the gene. The development of the genes can be conducted in any the place, but it has necessity of the vehicle spreader of these genes (the variety).

It is important to highlight a distinction between the companies in the system of P&D and those involved in production of seeds. The companies involved with P&D in biotechnology are multinational that started to do business with local firms that are owners of banks of germplasm for the Brazilian conditions, involved with breeding. Usually these local firms made the local adaptation of new varieties developed by EMBRAPA. Figure 1.1 represents the productive system of seeds, elaborated from Zylbersztajn, Lazzarini and Machado Filho (1998) and new primary data from contacts with actors of the sector.

Figure 1. Productive system of seeds in Brazil



Source: Elaboration from Zylbersztajn, Lazzarini and Machado Filho (1998) and primary data.

A simple way to verify the impact of the regulatory framework in the soybean seed market is to analyse the evolution of the new seed varieties and the original seed utilization. The Table 3 presents the evolution of the new soybean varieties in Brazil, from the National Service of Plant Varieties Protection (Serviço Nacional de Proteção de Cultivares, SNPC)

With a relatively recent property right regime, the number of new varieties delivered varies from 31 to 65 by year, and there is a relevant participation by the public sector.

Table 3. New soybean varieties registered in Brazil and U.S.

Year	Private Owned	Public Owned	Total
1998	26	12	38
1999	7	27	34
2000	21	10	31
2001	23	17	40
2002	21	8	29
2003	38	18	56
2004	20	16	36
2005	19	24	43
2006	51	14	65
2007*	4	1	5
Total	230	147	377

Source: Serviço Nacional de Proteção de Cultivares (2007)

* date until March

The origins of the piracy in soybean seed are connected with the introduction of the agricultural biotechnology in the middle of the decade of 1990. The first varieties with the gene Roundup Ready (RR) had been brought illegally from Argentina. After that, the Monsanto initiates the tests and requests the approval of the first commercial varieties. In 1998, the Institute of Defense of the Consumer (IDEC) and the environmental organization Greenpeace had moved a law suit to forbid the use of the technology and had gotten favorable preliminary sentences. This subject became the focus of the debate on the reform of the biosafety legislation, concluded with the approval of the new law in March 2005. During this period, the plantation of transgenic soybean varieties was made with saved or smuggled seed of other countries, since it there was not registered varieties with this technology

According to the Brazilian Seed Association (ABRASEM) there is a trend of reduction of the participation of the original seeds in Brazilian production, since it had passed from 85% in harvest 2001/2002 to 50% in harvest 2005/2006. This percentile is calculated from the ratio of the effective consumption of seed with the potential consumption of seed, being the last estimated by the area of soybean production (Table 4).

Table 4 – Potencial and effective demand of certificated soybean seed in Brazil, 2000 – 2006.

Year	Cultivated Area (ha)	Demand of Seed		Percentile of Certified Seed (%)
		Potencial (t)	Effective (t)	
2000/2001	12.449.044	873.078	650.888	75,0%
2001/2002	11.696.000	702.000	596.000	85,0%
2002/2003	37.068.600	2.224.876	1.891.144	85,0%
2003/2004	21.243.700	1.279.164	831.456	65,0%
2004/2005	23.103.900	1.386.234	790.153	57,0%
2005/2006	22.212.900	1.332.774	666.387	50,0%

Fonte: ABRASEM, 2007.

The Table 5 present the data of rate of original seed use in diverse states in Brazil, according to local associations of seed producers for the season of 2004/05. There are relevant differences in this rate, since in Rio Grande do Sul (RS), the rate is only 3%, due to the diffusion of the black market of genetically modified varieties. In the other hand the situation in Mato Grosso (MT) is opposite, with a level of 90% of original seed use. This is the first soybean producer in Brazil and the climate is not adequate for using saved seed by the farmers, and the illegal GM varieties are not productive in the Center West Region. In this sense, the farmers must by conventional seed varieties, mainly developed by EMBRAPA and private foundations.

Table 5. Original seed production, and percentile of use in Brazilian states

Associated Entity	State	Production Seed 03/04 (ton)	Production Seed 02/03 (ton)	Cultivated Area 04/05 (ha)	Percentile of Original Seed Use (%)
Center West Region					
AOSMAT	Mato Grosso	271876	222734	6024100	90,0
AGROSEM	Goiás	126818	151543	2662000	70,0
APROSSUL	Mato Grosso do Sul	47366	60400	2030800	45,0
Southeast Region					
APPS	São Paulo	34877	32783	772500	85,0
APSEMG	Minas Gerais	90050	87861	1103100	60,0
South Region					
APASEM	Parana	237000	230706	4081500	70,0
APROSESC	Santa Catarina	77467	82763	340800	50,0
APASSUL	Rio Grande do Sul	39964	133825	4090100	3,0

Source: ABRASEM, (2005).

Concluding Remarks

A qualitative analysis of the regulatory framework for intellectual property in the seed industry in Argentina, Brazil and United States allowed for the following conclusions.

The regulatory framework is stronger in the U.S. due the possibility for the plant breeder to choose the intellectual property regime adequate for his products. In Argentina and in Brazil, the regulatory frameworks are very similar, since both are aligned with the UPOV Act of 1978. They are considered weak for the soybean seed market, considering the use of saved seed and the black market observed.

The enforcement of the regulatory framework is stronger in the United States, and relatively weak in Argentina and Brazil. In Argentina, the crisis of the public sector induced the private agents to make efforts to coordinate the enforcement of the property right regime. In Brazil, there is a weakness by the public sector to monitor the soybean seed market, and the private sector is just beginning to control the black market.

With respect to the impact of the regulatory framework in the soybean seed market, it seems to be positive in Brazil, considering the number of the new seeds certified since 1998. The black market is a problem, but mainly concentrated in the South Region, considering the adaptation of illegal GM varieties for the climate of this region. A relevant factor in the soybean seed market is the action of the public sector, by the licensing contracts between EMBRAPA and private foundations.

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