**The Institutional Foundations of Property Rights Strategies**

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**Abstract** – This paper investigates how the institutional environment influences the property rights strategies of firms. The article proposes a heuristic model and defines three strategies for protection of property rights based on the quality of the institutional environment: strategy focused on the legal system, on the establishment of private mechanisms, and on the abandonment of valuable attributes. The study then examines empirical evidence. Specifically, the paper analyzes three cases of protection of property rights on genetically modified (GM) technology in soybean seeds: the US, Brazil, and Argentina. Each case represents, respectively, a strategy as defined by the heuristic model. Overall, this perspective paper develops an approach for examining the appropriation of value, placing itself in the interface between the property rights economics, the strategic analysis and the assessment of the institutional environment.

**Keywords** – property rights, strategy, institutional environment, GM soybean seed

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1. **Introduction**

In his presidential address to the American Economic Association in 2009, Dixit notes that:

*If the government does not protect property rights, at least not as well as the owners require, many alternative private arrangements arise to meet the owners’ needs*.

Building on Dixit (2009)’s proposition, this paper deepens the general understanding on how the institutional environment may influence the mode of governance of property rights. In doing so the paper places itself in the interface between the property rights economics, the strategic analysis, and the assessment of the institutional environment.

According to Foss and Foss (2004), despite the fact that the economic theory has continuously informed much of the thinking in the strategy field, the theory of property rights (Coase, 1960; Alchian, 1965; Demsetz, 1967; Cheung, 1969; Barzel, 1994, 1997) has been explicitly applied to the analysis of strategy in only a few studies (Foss and Foss, 2000; Kim and Mahoney, 2002).

In contrast, much has been written about the relationship between the institutional environment and strategy (Henisz and Williamson, 1999; Oxley, 1999; Henisz and Delios, 2002; Peng, 2002; Javorcik, 2004; Yadong, 2005, Gaur et al., 2007; Dunning and Lundan, 2008; Peng et al., 2008). This literature has two main features. Firstly, the institutional environment works as an independent variable, i.e., shifter parameter.[[1]](#footnote-1) Secondly, the focus of the analysis is the influence of the institutional environment on the governance structure of the firm – or group of firms – that performs international operations. In general, this literature examines the firms’ strategic decisions related to the mode of entry in foreign markets (green field, local partnerships, etc), and the performance of international operations.

The present paper is similar to this literature by analyzing the institutional environment as a shifter parameter. However, it differs in one crucial aspect: we investigate how a specific transaction in the interface of the firm with its customers – collection of royalties on genetically modified (GM) soybean seeds – can be structured in different contexts. It is assumed that an asset is composed of multiple attributes and that different agents may influence the property rights associated with each particular attribute of an asset (Barzel, 1997; Dixit, 2004). The analysis then examines the interaction between the strategic actions undertaken by a firm and the quality of the institutional environment.

The paper is divided into three parts besides this introduction. The next section describes the problem of property rights protection and advances a heuristic model which relates the protection of property rights and the quality of the institutional environment. Section 3 applies the model to the collection of royalties on GM soybean seeds and performs a comparative analysis on the mechanisms of royalty collection in the U.S., Brazil, and Argentina. Section 4 presents the conclusion.

1. **The Problem of Property Rights Protection**

The theory of property rights provides an explanation of how firms can design organizational arrangements in order to fully explore their assets. As discussed elsewhere, *“the development of property rights theory has its roots both in questions related to the origin of property rights, and in the organizational forms asset owners use to exploit their assets”* (Barzel, 2003, pp. 43). This section examines the protection of property rights and discusses how strategic aspects and the institutional environment may be explicitly incorporated into the analysis. Specifically, we start by analyzing the fundaments of protection activities.

As noted by Foss and Foss (2004), protection efforts aim to mitigate the possibility of capturing property rights. According to the authors, protection efforts may involve a multitude of mechanisms such as the use of the legal system, the establishment of private ordering (Williamson, 1996), the design of contracts and governance structures (Williamson, 1996) or the configuration of isolation mechanisms that make it costly to imitate resources (Wernerfelt, 1984; Rumelt, 1987).[[2]](#footnote-2)

Although Foss and Foss (2004) identify a variety of protection mechanisms, one should note that in reality the protection of rights can be essentially structured into two ways. On the one hand, firms can concentrate their protection efforts in the legal system, so that the judiciary works as the core of the protection strategy. On the other hand, firms may choose to establish private mechanisms. In this case the protection strategy does not revolve around the legal system, but it is built around the agent's own effort. This is the case of the establishment of a particular governance structure for the purchase of an asset.

The above argument does not mean that the use of the legal system as the center of the protection strategy implies that the judiciary can fully protect rights. Since transaction costs are positive, the firm can undertake certain protection efforts in combination with the protection granted by the courts. Such efforts, however, are accessories on a particular strategy that is based on the legal system.

Thus, as a general rule, a firm in deciding on its protection efforts may choose between a strategy based primarily on the legal system and a strategy based on private efforts. The choice, in turn, depends on the relative costs of each form of protection. In this regard, it is clear that every protection effort is associated with a given cost which varies in accordance with a set of parameters. Accordingly, we assume throughout this paper that a firm that performs a protection effort has already made an effort to create value and incurs in a certain cost.

One aspect of particular relevance is the fact that the possibilities for property rights protection are strongly connected to the expectations of agents (Foss and Foss, 2001). The design, capture and protection of property rights are based on the estimations made by the different agents in a transaction. When making a choice on the amount of resources allocated to protect (capture) rights, firms tend to estimate the other agents’ level of capture (protection) efforts. On the other hand, the divergence of expectations can lead to inefficient allocation of resources (Foss and Foss, 2001).

Because certain attributes of an asset always escape into the public domain, the protection of property rights is never perfect (Barzel, 1997). As a result, equilibrium occurs when no agent regrets his or her effort, considering the diminishing returns of capture and protection activities () and the relative efficacy of the capture to that of the protection (). As noted by Dixit (2004:131),  and  are properties of the *technology of fighting*, i.e., the technology that characterizes protection and capture of property rights. Both parameters can vary between companies and across time. In the present paper, however, we adopt a more restrictive formulation. By definition,  represents the common element of the technology of fighting, indicating an intrinsic component of every protection effort and every capture attempt. The relative efficacy of capture ($σ\geq 0$), in turn, represents a specific component which characterizes a locality, country or transaction.

Given this configuration, the important question is to determine which elements may influence the relative efficacy of capture. Specifically, this research identifies two key elements: (1) the technological characteristics that influence the reproduction/imitation of valuable attributes of an asset and (2) the quality of the institutional environment that provides support for property rights.

The first condition emphasizes the technical possibilities – and the associated costs – of rival firms and/or consumers to buy or accumulate assets with similar characteristics to the attribute whose property rights a firm aims to protect. That is, the condition emphasizes the existence and the magnitude of *barriers to imitation*. As a general rule, the easier the imitation of an asset, the more insecure the property rights on the economic attributes of the asset. The possibility of imitation throws valuable attributes into the public domain, raising the transaction costs with which a particular firm has to deal with.

The second condition suggests that within a strong institutional environment, the guarantee of rights occurs almost immediately, reducing the relative efficacy of capture. Conversely, the lower the quality of the institutional environment, the lower the security of property rights on the attributes of assets and therefore the greater the relative efficacy of capture in relation to protection.

It is interesting to note that among the elements that affect the relative efficacy of capture, the institutional environment is the major factor that influences the choice of protection mechanisms. Even assuming that a valuable attribute is allocated in the public domain, if the institutional environment is strong enough, the firm may choose to establish a protection strategy based on the legal system. Accordingly, we focus our attention on how the institutional environment may influence the selection of the protection mechanism.

* 1. **The Impact of the Institutional Environment**

In order to compare different protection mechanisms, one has initially to consider the costs associated with each particular mechanism.[[3]](#footnote-3) Since protection efforts may involve the recourse to the legal system (L) or the establishment of a private structure (P), we define two functions that represent the costs of protection. In the functions below,  represents the relative efficacy of capture in relation to protection and *w* corresponds to a set of shifter parameters (e.g., ).

 (1)

 (2)

It is noteworthy that both L (.) and P (.) are increasing functions of : the higher the relative efficacy of the capture, the greater the effort of an agent to secure his or her property rights when a particular attribute escapes into the public domain. This is equivalent to the raising of transaction costs, implying a greater protection effort. Formally,  and .

Regarding the impact of the institutional environment on the protection mechanisms, one should note that in situations where the quality of the institutional environment (*I*) is sufficiently high the relative efficacy of capture tends to zero, i.e. .[[4]](#footnote-4) In this case, it is assumed that the recourse to the legal system is more efficient than any private mechanism of protection. Specifically, the use of the legal system in a strong institutional environment is assumed to be the most efficient way to protect property rights. Consequently, .

Nevertheless, as the quality of the institutional environment decreases, the relative efficacy of the capture increases and the effectiveness of the legal system in providing property rights protection is reduced. In a weak institutional environment, the judiciary tends to be inefficient and time consuming, being inconsistent with the demands required for the smooth conduct of trade relations. Thus, as the quality of the institutional environment is reduced, the cost of using the legal system increases relatively more compared to the cost associated with a private mechanism of protection. In this sense, we have that .

Based on the above discussion, we can construct the figure below which shows the protection costs varying according to the quality of the institutional environment (expressed through the function , where  indicates the fixed level of technology that determines the capacity for imitation of valuable attributes ).[[5]](#footnote-5) The figure also shows the cost level  which represents the maximum cost of protection that a firm can bear.[[6]](#footnote-6)

In the figure, the level of institutional quality  is associated with a level of efficacy of capture  such that the firm is indifferent to protect property rights through recourse to the legal system or through a private mechanism. On the other hand, the level of institutional quality  is such that the firm is indifferent between establishing a private mechanism and abandoning the valuable attributes in the public domain. In the case of abandonment of the attributes, institutional conditions are so adverse that the cost of protection is greater than the maximum cost , and the firm's optimal response is to undertake no protection effort and let other agents eventually capture the valuable attributes. In general, the efficient response of the firm corresponds to the lower envelope of the cost curves expressed in the figure.

Regarding the area between  and , it is worth mentioning that private schemes for protection of property rights are characterized by a huge diversity. There is not a single private mechanism, but a constellation of policy options whose relative efficiency varies in space and time. In more formal terms, one can say that each point on the curve represents a different scheme for protection of property rights. A common feature of these points is that the firm believes that the design of a particular governance structure enables the emergence of property rights that are best protected in comparison with the protection granted by the state. [[7]](#footnote-7)

Figure 1 – Relative efficacy of capture and protection mechanisms



cost













A key aspect of the model refers to the fact that the cost associated with the use of the legal system is neither constant nor equal to zero. The courts are not a ubiquitous structure capable of alone reducing the probability of capture of property rights. Since transaction costs are positive, the firm may decide to take protection efforts in combination with the protection granted by the courts. One may think of a situation where a particular firm creates an internal division dedicated exclusively to the identification of agents who violate property rights. In this case, the protection of rights while focusing on the judiciary also involves a private effort which translates into a positive cost of protection.

Moreover, one should note that the conclusions above are largely dependent on the technological characteristics that influence the imitation of valuable attributes. If the institutional environment is weak but valuable attributes are hardly replicable, firms may still choose to protect their property rights through the legal system because the costs associated with a private mechanism of protection can be comparatively high. The table below summarizes these concepts.

Table 1 – Barriers to imitation and institutional environment: integrated analysis

|  |  |
| --- | --- |
|  | **Institutional environment** |
| **Strong** | **Medium** | **Weak** |
| **Barriers to imitation** | **High** | Strategy centered on the legal system | Private mechanism of protection | Private mechanism of protection |
| **Low** | Strategy centered on the legal system | Private mechanism of protection | Abandonment of value attributes |

In sum, firms determine their protection strategies taking into account the relative efficacy of capture which encompasses the technical possibilities of imitation of valuable attributes and the institutional conditions that give support to property rights. For a given level of possibilities of imitation (), the firm can adopt three basic positions: (i) the establishment of a strategy based on the legal system, (ii) the designing of a private mechanism of protection and (iii) the abandonment of the valuable attributes in the public domain. The firm's decision is based on the relative costs of each position, implying that efficiency can be achieved through an alignment between capture attempts and protection activities. In what follows we apply this reasoning to a particular case: we examine how the mechanisms for collecting royalties on genetically modified (GM) soybean seeds vary across different institutional environments. One should note that we do not try to deliberately test the model. The empirical evidence presented below represents an illustration of the relationship between institutional conditions and the protection of property rights.

1. **The Collection of Royalties on GM Soybean Seeds**

The development of biogenetics has introduced a new competitive paradigm in the seed sector. Any seed may be interpreted as a technology vector composed of different characteristics, being the GM seed a specific case where one or more seed attributes are not normally attainable by the species under natural conditions. Since genetic traits may result from R&D efforts made by different firms, the seed plays the role of a platform that promotes the meeting of a biotech company with the farmers.

One of the most disseminated GM seeds corresponds to the soybean seed that presents tolerance to the herbicide Roundup, whose active ingredient is glyphosate.[[8]](#footnote-8) Value is added with the adoption of GM soybean seeds based on the reduction in production costs – due to lower consumption of agrochemicals – and the small price difference between GM soybeans and conventional ones. On the other hand, the use of GM seeds involves the payment of royalties to Monsanto, the company that holds the technology.

Generally speaking, although royalties represent the return associated with the innovation, it is quite common for innovators to lament the fact that imitators have profited more from the innovation than the firm first to commercialize it (Teece, 1986). In the case of soybeans, the existence of self-reproducibility (i.e., the transmission of genetic traits between generations) makes this issue even more emblematic because farmers can reuse a soybean grain as seed for the next season. As the soybean grain contains the genetic innovation and can be used as a seed, the self-reproducibility makes the cost of capture of property rights on biotechnology innovations greatly reduced (low barriers to imitation). Farmers capture property rights through the reuse of a grain crop as seed for the next season or the purchase of brown-bagged seeds.

The possibility of capture reduces the ability of the firm in appropriating the value created by the biotechnological innovation. As a result, firms undertake protection efforts. The basic hypothesis of this research is that such efforts vary depending on the institutional conditions that characterize a region or country. Biotechnology companies make an effort to maximize its property rights subject to institutional constraints. The analysis implicitly assumes that the technological environment is fixed which means that capture opportunities are unchanging. The cases where firms are able to undertake technological changes that affect the self-reproduction of soybean seeds are disregarded.[[9]](#footnote-9)

Accordingly, a basic point of this research refers to the fact that a farmer who saves a GM soybean seed appropriates the genetic trait within it, capturing the property right originally conferred to the company holding the genetic technology. As a result, biotechnology firms must establish mechanisms for protecting rights. Regarding the model presented in section 2, this technological configuration emphasizes the importance of the institutional environment for strategic choice. Based on this general framework, the next section examines three cases of protection of property rights on GM soybean seeds: the US, Brazil and Argentina. Each case represents a strategy as defined in the model: use of the legal system (US), private mechanisms of protection (Brazil), and abandonment of valuable attributes (Argentina).

* 1. **Comparative analysis**
		1. *Strategy Based on the Legal System: the U.S.*

In the US, biotech firms undertake protection efforts based on the establishment of technology licensing contracts along with the use of the legal system. In order to characterize this protection strategy, we first describe the regulatory framework governing the protection of biotechnology innovations in agriculture and then investigate the collection of royalties in GM soybean seeds.

The US through the enactment of the Plant Patent Act (PPA) in 1930, was the first country to offer a specific intellectual protection for plants. The act allows the provision of patents for new varieties of asexually reproduced plants (except tubers). Under the legislation, breeders have the exclusive rights to reproduce, sell and use the patented plant and its progeny for a limited period of time.

In 1970 intellectual property protection was extended to sexually reproduced plant varieties through the enactment of the Plant Variety Protection Act (PVPA). The PVPA states that plant varieties that meet the criteria of novelty, distinctness, uniformity, and stability[[10]](#footnote-10) become eligible to receive a Plant Variety Protection Certificate through which the breeders’ rights are safeguarded. Originally the PVPA allowed farmers to save and negotiate seeds with other parties. This configuration lasted until 1994 when an amendment to the act removed the right of farmers to sell saved seeds provided that the plant is protected by a Certificate. The amendment, however, upheld the right of farmers saving seed for their own use (farmers’ exception).

In the 1980s an important change took place when the granting of utility patents for firms in the biotechnology sector was made possible[[11]](#footnote-11), extending patent protection for specific genetic traits and biotechnology tools. Nowadays a GM seed has three components capable of patent protection: (i) the plant germplasm (i.e., the seed itself), (ii) the sequences of genes or genetic traits that result in a specific, external change in a given organism, and (iii) the research tools necessary for incorporating the new genetic trait in the plant cell (UNCTAD, 2006). This fact is relevant to the extent that the seed may be understood as a platform composed of different attributes which result from R&D efforts made by different firms. Currently a single seed can tie up a number of patents each of which protects a specific attribute.

It is worth noting, however, that the granting of a patent on a genetic trait is only the first step in the effort to protect property rights. Because soybean is characterized by self-reproducibility, the cost of capturing property rights on technology innovations is small. Farmers capture rights by reusing the grain crop as seed for the next season or by purchasing brown-bagged seeds. In the face of it, the US biotech firms structure their protection efforts around two elements: the establishment of technology agreements and the use of the legal system.

Technology agreements are used by most biotech firms.[[12]](#footnote-12) In general, each purchasing of GM soybean seed involves a contract that basically limits the use of the seed to a single crop and restricts[[13]](#footnote-13) the saving of the harvest for future planting. Contracts stipulate prices, agronomic recommendations, penalties, and incentives to a particular culture or seed. In most agreements the companies inform the record numbers of their patents and the laws that ensure its protection. The agreement provides a limited using license which means that the firm allows the use of the gene by the farmer, but does not hand over its property to him.

In the specific case of GM soybean seeds commercialized by Monsanto, the agreement makes it easy to the firm investigates the farmer’s activities. The agreement allows Monsanto to review information collected by the Farm Service Agency (FSA) for any area cultivated by the farmer, including the analysis of aerial photographs and receipts for purchase of seeds and agricultural chemicals.[[14]](#footnote-14) Access to such information helps the company to determine how many bags of seed a farmer has purchased and how many acres of land were planted with a particular type of culture (CFS, 2005). The agreement also contains a provision that allows Monsanto to examine and copy any records and receipts that may be relevant for monitoring the performance of the farmer.

It is interesting to note that the provisions of the technology agreements are not free of tension. UNCTAD (2006), for instance, identifies three points of dispute between biotech companies and farmers; they are: the principle of exhaustion, the extension of the scope of intellectual protection, and the inconsistency between legal rules. In what follows, we briefly describe each of these elements.[[15]](#footnote-15)

Most schemes of intellectual property protection include a general principle called the "doctrine of exhaustion for sale" or "doctrine of first sale." According to this principle an intellectual property right is typically exhausted by the first sale or the marketing of the assets subject to protection. Based on this principle, American farmers argue that biotech companies lose control over their genetic traits when selling the GM seeds, making it invalid any contractual restriction on the act of saving seeds. The courts, however, state that the general rules of patent exhaustion do not apply in these cases because the transaction is governed by a technology agreement through which the biotech firm allows the use of the gene by the farmer, but does not give it to him.

Another line of reasoning maintains that biotech firms, by means of the restrictions imposed by licensing agreements, are capable of expanding the scope of patent protection. The point is that although the company holds the exclusive right to a particular genetic trait, it can not regulate other features of the seed. However, the licensing agreement actually restricts the use not only of the genetic trait originally protected, but also of the germplasm (i.e., the seed itself). Once more, the argument has been rejected by the courts. In Pioneer vs. Ottawa (2003)[[16]](#footnote-16) the court concluded that a restriction against resale of patented seed represents an assertion of exclusive rights granted by the patent law and not an attempt to increase the scope of the patent.

Finally, restrictions associated with the licensing of patents may contravene the provisions of the Plant Variety Protection Act. In particular, restrictions on saving seeds conflict with the farmers’ exception. In this respect, the Federal Circuit[[17]](#footnote-17) sustained that patent owners may impose prohibitions on the act of saving seed even where such restrictions contradict some aspects of the PVPA.

What the discussion above tells us is that the courts have consistently upheld property rights of biotech firms. This finding highlights the second element that supports the protection of property rights in the US: the use of the legal system.
If technology conditions are such that the cost of capture of property rights is sufficiently high, a law favorable to biotech firms – supported by an active, stable judicial system – is expected to reduce firms’ protection efforts. Given the high cost of capture and the effectiveness of the judiciary, capture attempts occur less frequently and thus less protection efforts would be required. Nonetheless, since the cost of capture of property rights on GM innovations in soybeans is small, biotech companies must make use of more complex schemes of monitoring and enforcing technology agreements. Monsanto, for instance, created a department composed of 75 officials and that consumes US$ 10 million annually whose sole purpose is to ensure the protection of property rights (Enders and Goldsmith, 2007). This is interesting because it reveals that the recourse to the legal system neither represents a set of fuzzy legal claims, nor takes the form of an omnipresent threat that, by itself, automatically reduces the intensity of the capture attempts. *The protection of property rights requires a specialized organizational structure*.

In the case of Monsanto, the operation of such organizational structure has resulted in the filing of 112 legal claims involving 372 farmers and 49 small associations from 1997 to 2007.[[18]](#footnote-18) As described in table 1, approximately 51% of the legal claims resulted in the recognition of damage to Monsanto, 21% resulted in agreements, 12% were rejected (no indication whether any damage was recognized) and 16% had not been completed. In the case of condemnation of the farmer (i.e., recognition of damage to Monsanto), compensation ranged from US$ 5,000.00 to US$ 3 million. The average penalty was approximately US$ 385,000.00 (CFS 2007).

Table 2 – Lawsuits filed by Monsanto against farmers under the claim of saving seed, US, 1997-2007.

|  |  |  |
| --- | --- | --- |
|  | **Number of lawsuits** | **%** |
| Recognition of damage to Monsanto | 57 | 50,9 |
| Agreement(confidential) | 24 | 21,4 |
| Dismissal(no indication of recognition of damage) | 13 | 11,6 |
| Not concluded (up to October /2007) | 18 | 16,1 |
| **Total** | **112** | **100,0** |
| Source: Center for Food Safety (CFS 2007) |

* + 1. *Private Mechanisms of Protection: Brazil*

In Brazil, biotech companies found a way to collect royalties even in a situation where the institutional environment is weak. The solution involves the building of two distinct governance structures: the introduction of contracts in the southern region of Brazil and the issuance of payment slips in the Midwest of the country. In what follows, we present a historical analysis of property rights on plants in Brazil, and investigate the economic rationale that guides the collection of royalties in GM soybean seeds.

It was only in the second half of the 1990s that Brazil began to design a regulatory framework for granting property rights to plants and regulating genetically modified organisms (GMO). The first regulation was passed in 1995, being known as the "First Biosafety Law" (Law nº 8,974/95). This law in conjunction with Decree 1,752/95 created the National Technical Committee for Biosafety (CTNBio) which was in charge of passing sentence upon proceedings related to GMO activities.

One year after the creation of CTNBio the patenting of GM organisms was made possible by the Law of Industrial Protection (Law nº. 9.279/96) passed in 1996. According to the law, the whole or part of GM organisms are patentable provided that it meets the principle of novelty, results from an inventive activity, has some industrial application, and does not represent a mere discovery.[[19]](#footnote-19) In general, a biotech company in Brazil may gain a patent on a genetic trait and/or a biotechnology tool which points out that the Law of Industrial Protection is similar to the concept of utility patent.

In 1997 Brazil became a member of the International Union for Protection of New Varieties of Plants (UPOV).[[20]](#footnote-20) In the same year, the Law of Cultivar Protection (Law nº. 9,457/97) was approved. This law is similar to the Plant Variety Protection Act in that it benefits the breeder through the recognition of ownership rights related to new plant varieties. The law not only establishes the right of temporary monopoly on the commercial reproduction of new plant varieties, but also ensures the small farmers’ right to save and exchange seeds (farmers’ exception).

In view of the above regulatory framework Monsanto obtained in 1998 the permission of CTNBio to market GM soybean seeds tolerant to glyphosate.[[21]](#footnote-21) Nonetheless, the authorization was suspended by the judiciary in 1999 in the face of a legal claim filed by the Brazilian Institute for Consumer Protection (IDEC), a non-governmental organization. Firstly, IDEC claimed that the authorization granted to Monsanto was groundless because CTNBio supposedly failed to request an environmental impact assessment (EIA) specific to the Brazilian conditions.[[22]](#footnote-22) Secondly, and more importantly, IDEC claimed that the power originally conferred to CTNBio with the purpose of authorizing the marketing of GM seeds was in opposition to the responsibilities of local governments and municipalities to regulate environmental issues. As a result, the marketing of GM seeds was banned until the enactment of the "New Biosafety Law" (Law nº. 11.105/05) in 2005.

Despite the ban on planting GM seeds, farmers – especially in the southern region of Brazil – have illegally adopted Monsanto’s technology through the smuggling of Argentinean soybean seeds from 2003 to 2005.[[23]](#footnote-23) As indicated in graph 1 which shows the consumption trend of saved and brown-bagged soybean seeds in the state of Rio Grande do Sul (southern region of Brazil), the year of 2003 marks an increase of 44% in the demand.

Graph 1 – Ratio between the consumption of saved or brown-bagged seed and the total consumption of seeds (soybeans), Rio Grande do Sul, 1999-2006



**44%**

Source: Brazilian Association of Seeds and Seedlings (Abrasem) - prepared by the authors.

It is interesting to note that the prohibition in domestic marketing of GM seeds along with the illegal import of seeds from Argentina restricted the strategies of protection of property rights available to biotech firms. There was no basis for proposition of legal action for recovery of royalties since the presence of GM seeds in the domestic market was legally prohibited. This lack of basis for royalty collection, however, did not last for long. In 2004 the Brazilian market was flooded with GM grains whose existence in the national market was not authorized. In the face of this contradiction, and considering the large production, the Brazilian government had no choice but to implement a series of legal measures that allowed ex-post the planting of GM seeds.[[24]](#footnote-24) More importantly, if adoption of GM seeds is legally permitted and farmers effectively adopted it, then firms may establish mechanisms for recovery of royalties (Zylbersztajn et al., 2007).

In the case of Monsanto, the collection of royalties had to cope with two aspects. On the one hand, it had to be retroactive because farmers had already harvested the GM soybeans. On the other hand, it would be based on seeds purchased on the black market. As described in figure 1, the collection of royalties was based on three components: (i) the existence of an inexpensive field test for the detection of genetic traits in soybean seeds, (ii) the design of a contract involving three parties, and (iii) the establishment of a credible threat.

Figure 1 – Mechanism of collecting royalties, Monsanto, Brazil, the southern region.

R = royalties on glyphosate tolerance technology.

C = percentage of the royalty that corresponds to incentive compensation.

Biotech company

Farmer

Cooperative

Processor

Trading Company

**contract**

**Verification**

**(Field test)**

**(1 – C)R**

**grain**

**Payment – R**

seed

Credible threat

Since farmers in the southern region of Brazil are numerous and the adoption of the technology had already occurred, Monsanto would face a high monitoring cost if it decided to negotiate individually with each farmer. Yet, since the harvested grains have to be transported to cooperatives, processors, and trading companies, the monitoring cost in this stage of the production chain is comparatively lower. Consequently, due to the existence of an inexpensive field test, Monsanto was able to identify the presence of the genetic trait through genetic analysis of soybean shipments carried by trucks into the cooperatives, processors, and trading companies.

Monsanto then established a difficult negotiation with the four largest trading companies operating in the southern region of the country. The biotech firm proposed that traders collect the royalties on the genetic technology based on the ton of soybean grain delivered by farmers, keeping a percentage of the royalties as incentive compensation. Initially, the traders decided not to cooperate. Nevertheless, the resistance was offset by a credible strategic move made by Monsanto. Supported by international laws for the protection of property rights[[25]](#footnote-25), the company intercepted a ship in the Italian port of Trieste which was carrying a large shipment of Brazilian soybeans. For fear of exposure, the trading companies agreed to negotiate. For the same reason, cooperatives and processors also decided to collaborate with the biotech firm. As a result, Monsanto was able to structure a royalty collection scheme based on a contractual arrangement.

A contract was designed so that each farmer had the freedom to state what type of technology had been used on his property. If the farmer declared that he had used GM seeds, a charge was laid and its value was reduced from the payment made to the farmer by the cooperative, the processor, or the trading company. If the farmer did not declare the adoption of the GM technology, the field test was conducted on each shipment delivered by the farmer. If the test was positive for the presence of GM seeds, the farmer had to pay a fine and bear the cost of the test. Given the widespread adoption of GM seeds and the risk of penalty, 98% of farmers in the southern region of Brazil acceded to the contract (Zylbersztajn et al., 2007). [[26]](#footnote-26)

Overall, the analysis of the mechanism of collecting royalties on GM soybean seeds in the southern region of Brazil reveals a subtle aspect. The property rights protection effort undertaken by the firm is based on the unbundling of the attribute (tolerance to glyphosate) from the asset (seed), outlining a particular way to negotiate the attribute regardless of how the acquisition of the asset is made. This is relevant since the collection of royalties is based on seeds purchased in the black market. The result contrasts with the US case where all the protection effort made by Monsanto focuses on combating the saving of seeds.

Although the above argument might suggest that the strategy implemented in the southern region of Brazil is more efficient than that established in the US since the firm is able to collect royalties on the technology even in the case of saved seed, it is worth noting that the contractual arrangement structured in Brazil is more complex than the filing of legal claims. The arrangement entails the coordination of multiple agents and different transactions. In fact, as soon as the problem of illegal seed acquisition became less intense, Monsanto shifted its strategy of collecting royalties. This is the case of the Midwest of Brazil.

The major soybean producing states of the Midwest of Brazil are Mato Grosso do Sul (MS) and Mato Grosso (MT). Industry sources say that GM soybeans represent 80% of soybean production of Mato Grosso do Sul and 40% of soybean production of Mato Grosso. [[27]](#footnote-27) Generally speaking, the Midwest has two distinct characteristics in relation to the southern region of Brazil with regard to soybean production. Firstly, the average farm size in the Midwest is bigger than that of the south. A typical rural property in the state of Mato Grosso, for instance, has approximately 8,000 acres compared to 2,000 acres in Rio Grande do Sul. Secondly, in the Midwest the adoption of GM technology has been slower. In the south, smuggled GM seeds showed rapid spreading due to the correlation of climate and soil between the region and Argentina. In the Midwest, rapid adoption has not occurred due to the need for adaptation of seed varieties to the “cerrado” environment. This type of environment has specific climate and soil which make the planting of a seed originally intended for Argentina far from the most favorable choice. Perhaps more importantly, the climate in the Midwest can cause deterioration of seed storage if specific conditions are not obeyed (e.g., cold storage system). These conditions, in turn, raise the cost of saving seeds. As noted in table 2, after a peak of 80% in 2003 the consumption of saved and brown-bagged seeds in the state of Mato Grosso do Sul decreased faster than in the state of Rio Grande do Sul.

Table 3 – Percentage of saved and brown-bagged seed, Brazil (selected states), 1999-2006.

|  |  |  |
| --- | --- | --- |
|   | **Mato Grosso do Sul** **(Midwest region)** | **Rio Grande do Sul (southern region)** |
| **1999** | 35,0 | 40,0 |
| **2000** | 35,0 | 35,0 |
| **2001** | 50,0 | 45,0 |
| **2002** | 50,0 | 55,0 |
| **2003** | 80,0 | 79,5 |
| **2004** | 50,0 | 99,0 |
| **2005** | 55,0 | 97,0 |
| **2006** | 58,0 | 90,0 |
| Source: Brazilian Association of Seeds and Seedlings (Abrasem) - prepared by the authors. |

In the Midwest the collection of royalties from GM seeds occurs by means of payment slips which are delivered to farmers by cooperatives or dealers at the time of purchase of the seed. Initially, Monsanto had stipulated that the value of the royalty should be R$ 0.88 per kilo of seed (approximately US$ 0.38). Subsequently, the value was set at R$ 0.50 per kilo (US$ 0.23). These values, however, were never charged. In the 2006/07 and 2007/08 seasons, when the system was effectively put into practice, the royalty paid by farmers was R$ 0.30 per kilo of seed (US$ 0.17) which is equivalent to 27% of the value of the soybean seed bag. In the 2008/09 season, the royalty was set at R$ 0.35.

In the case of non-payment of the slip, under the assumption that the farmer is reported in the field test for detection of GM traits, Monsanto can charge a default rate of 2% on production. This default rate, however, is not necessarily applied to the whole production. The scheme works as follows: Each payment slip generates a certain amount of “royalty credits”. When performing the field test and verifying the farmers’ total production, Monsanto compares the amount of credits accumulated by the farmer and the actual level of production. If production exceeds the equivalent amount of credits, the farmer pays a fee of 2% on the excess. The logic of the scheme is simple. If the farmer has not only acquired a certain amount of GM seeds, but also used saved seeds there is an incompatibility in the harvest period between actual production and ideal production – i.e., the production obtained by the exclusive use of seeds purchased legally. It is this inconsistency that is checked by Monsanto[[28]](#footnote-28) and the rate of 2% levied on the difference between actual and ideal production.

It is interesting to note that the stability of the mechanism of collecting royalties in the Midwest of Brazil is still an open question since the relationship between Monsanto and the farmers in the region is not free of tension. Industry sources say that in light of agronomic advances, there are soybean varieties that demand a smaller quantity of seed per acre which reduces the value that farmers are supposed to pay to Monsanto and enables the recovery of undue royalties. Currently discussions move towards the best time for collecting the royalties. Farmers suggest that royalty be charged close to the harvest period when it becomes possible to more precisely measure the effective yield of the crop.

* + 1. *Abandonment of Valuable Attributes: Argentina*

The legal system governing the breeding of plant varieties in Argentina was formally initiated in 1935 with the promulgation of the Law of Grains (Ley de Granos). Although the law stipulates the registration of new seeds and determines the government approval for new plant varieties, the protection of rights was not effectively implemented at that time. Thus, for analytical purposes, the enactment of the Seed Law (Ley de Semillas - Law No. 20,247) in 1973 marks the beginning of the grant of marketing rights for breeders of new plant varieties in Argentina. [[29]](#footnote-29)-[[30]](#footnote-30)

The Seed Law established the creation of the National Commission of Seeds (*Comision Nacional de Semillas*, CONASE) whose duties were to advise and evaluate government policies regarding the sector's regulatory regime. The law also mandated the creation of a national registry of new plant varieties by granting exclusive marketing rights for breeders for a specific period of time. Finally, the law recognized the right of farmers to use – and eventually commercialize – saved seeds (farmers’ exception) and the right of breeders to use a seed variety for research purposes (breeders’ exception).

Important changes were introduced to the regulatory regime in Argentina by means of Decree No. 2,183 of 1991. According to Kesan and Gallo (2007), such changes resulted not only from the need to update the legislation, but mainly from political pressure exerted by certain rural associations (notably the *Asociación Argentina de Semillas* and *Asociación Argentina de Protección de las Obtenciones Vegetales*). As a result, although the CONASE remain as an advisory body, it loses its managerial function in the face of the establishment of the National Seed Service (*Servicio Nacional de Semillas*, SENASE), which takes over management and enforcement of the regulatory regime of new plant varieties. The main consequence of this change corresponds to the centralization of a number of regulatory activities, determining a standard, detailed procedure for the registration and granting of property rights for new plant varieties. Furthermore, the use of saved seeds was made exclusive for research purposes and the use of the farmer himself.

It is interesting to note, however, that the regulatory environment of Argentina was altered in December 1991 with the publication of Decree No. 2,817 which created the National Institute of Seeds (*Instituto Nacional de Semillas*, INASE), replacing the newly created SENASE.[[31]](#footnote-31) Seeking to minimize abuses associated with saving seeds, INASE adopted in 1996 one of its key policies: farmers wishing to use saved seeds should prove that (i) the basic seed was legally purchased in the market, (ii) the saved seed was originated from the basic seed and was segregated from other seeds and (iii) there was no transfer or sale of saved seeds.

In the specific case of genetically modified organisms, Argentina was among the first countries to authorize the planting of GM crops. In this respect, the government created in 1991 the Advisory Committee on Agricultural Biotechnology (*Comisión Nacional Asesora de Biotecnologia Agropecuária*, CONABIA). Composed of representatives from government and the private sector, the committee was originally intended to assist in developing a regulatory framework for the approval and marketing of biotechnology in agriculture. The commission's work resulted in the publication of Resolution No. 656 in 1992 which now regulates matters relating to genetically modified microorganisms. By the same resolution, CONABIA became responsible for evaluating and deciding on requests for use of GM organisms in Argentina.

In general, the process of evaluation and decision on GM organisms involves three steps. First, CONABIA assesses the application for use of the genetically modified organism and eventually grants permission to experiment. The second step is characterized by extensive experimental tests, emphasizing the analysis of environmental impacts of the GM organism. The firm may then be granted an authorization of use. Finally, biotech firms must apply for an authorization of commercialization of the GM organism.

Considering the increasing demand for approving the use and commercialization of GM crops, the government decided to amend the regulatory system. In 2001, the government created an agency devoted solely to biotechnology policy: the National Consultative Commission of Agricultural Biotechnology. In 2004, the commission was replaced by an autonomous agency, the Office of Biotechnology (*Oficina de Biotecnologia*) which became responsible not only for advising the government, but also for managing the entire biotechnology policy in Argentina.

As highlighted by Kesan and Gallo (2007), the fundamental aspect of the regulatory framework in Argentina is the recurring changes in the institutional structure. Moreover, between 2000 and 2004, due to a severe economic crisis, INASE was closed resulting in an abandonment of government oversight over property rights on plants. Regarding the model presented in section 2, such unstable dynamics hinders the establishment of firms’ efforts to protect property rights. Perhaps more importantly, companies operating in Argentina can not claim patent protection for new varieties of plants or genetically modified organisms.

Between 1864 and 1995, the patent system in Argentina was regulated by Law 111. Although this law did not contain a specific provision on plants, there were no patent applications for new plant varieties during this period (Kesan and Gallo, 2007). In 1995 the patenting of plants was formally prohibited (Law No. 24,481 and No. 24,572). In opposition, a law approved in 2000 provided for the patenting of "biotechnical products and organisms" (Law No. 24,575). As noted by Kesan and Gallo (2007), apparently the law passed in 2000 could serve as a basis for the patenting of GM varieties of plants, but the prohibitions introduced in 1995 generated legal uncertainty about the ability of a firm to effectively obtain a patent.

Generally speaking, the weakness of the institutional environment – both in terms of the institutional instability and the absence of an effective patent system – implies that the relative efficacy of capture of property rights on biotechnological innovations in Argentina tends to be high, requiring private protection efforts and, at the margin, leading to the abandonment of valuable attributes in the public domain. The most notorious case of abandonment of attributes refers to the finishing of the commercial activities of Monsanto Soybean in Argentina in 2004.

The start of operations of Monsanto in Argentina dates back to 1996. Since the beginning, farmers start to save, multiply and eventually commercialize GM seeds without any consideration on royalties that would be paid for Monsanto. As a result, the area planted with RR soybean presented a robust increase (graph 2).[[32]](#footnote-32)

Graph 1 – Evolution of GM soybean acreage in Argentina, 1996/97 to 2004/05



Source: Secretaria de Agricultura, Ganadería, Pesca y Alimentación (SAGPyA) – [www.sagpya.mecon.gov.ar](http://www.sagpya.mecon.gov.ar) (accessed in november 18th, 2009).

Due to this situation, US soybean producers started to exert pressure on Monsanto. Producers claimed a competitive disadvantage in relation to soybean producers in Argentina, their main competitors in international markets. Because farmers in Argentina did not pay technology fees on GM seeds, their production cost was artificially reduced. In response, Monsanto set up a campaign against the illegal adoption of GM seeds in Argentina, demanding the enforcement of the regulations established by INASE in 1996. Simultaneously, the company sought to implement private protection mechanisms, establishing contracts signed when the sale of seeds. The contract basically determined an extended royalty system according to which producers would pay $2.00 per bag of 50 kilograms of saved seeds.[[33]](#footnote-33)

In 2004, as a result of the inability of government to provide property rights protection and the difficulty in implementing the billing system, the firm decided to suspend its operation of soybean in Argentina, abandoning the genetic innovation in the public domain so that farmers were able to freely reproduce the GM seed. In accordance with the model presented in section 2, the fragility of the institutional environment in Argentina encouraged the indiscriminate breeding of GM soybean seeds which characterizes a widespread capture of genetic traits in seeds. Accordingly, the relative efficacy of capture () tends to be high enough so that the cost of establishing a private protection mechanism () becomes greater than the maximum cost that a firm is able to support ().

It is noteworthy, however, that the abandonment of valuable attributes is not absolute, that because Monsanto also adopted the tactic of intercepting shipments of soybeans from Argentina. In 2006, for example, the company urged EU customs authorities to intercept three ships that arrived from Argentina in Spain. Additionally, ships were intercepted in England (2005), Denmark (2004) and the Netherlands (2004). In these cases, the exporters were required to pay Monsanto a fee of $ 15.00 per ton of soybean.[[34]](#footnote-34)

Although the Monsanto case can be especially emblematic, it should be noted that the abandonment of valuable attributes does not necessarily involve a sharp break of a company's operations in a specific market. Analyzing US biotech companies operating in Argentina, Enders and Goldsmith (2007) argue that firms can achieve profitability even in a weak institutional environment provided that they adopt non-monopolistic pricing strategies. According to the authors, if the probability of punishment is sufficiently low and farmers seek to maximize their intertemporal utility, farmers may be willing to pay a high price for GM seed in the first planting season.

Under these conditions, the biotech company knows that its monopoly power is sustainable only in the first period and that saved seeds tend to establish a ceiling price as soon as the second period begins (pump-priming pricing strategy). The ceiling price, in turn, varies according to the costs of storage of seeds between planting seasons and the dynamics of the black market. Based on this argument, Goldsmith et al. (2006) investigate some empirical evidence. As shown in graph 3, the average price of seeds in Argentina has declined consistently since 1998 while the formal market has been dominated by the informal market (saved seeds). The point emphasized by Enders and Goldsmith (2007) refers to the fact that Pioneer-Argentina, another major soybean seed producer, decided to remain in the market, following the movement of prices.

Graph 2 – Soybean Seed Market, Argentina, 1996-2000.



Source: Goldsmith, et al., (2006), table 1, pp. 342 – prepared by the authors.

Nevertheless, what Enders and Goldsmitth (2007) do not realize is that the deliberate action of the biotechnology firm to reduce the price of GM seeds in the second period represents the abandonment in the public domain of at least a part of the surplus associated with the technological innovation.[[35]](#footnote-35) The competitive pressure exerted by the illegal market leads to the abandonment of valuable attributes because the firm, in face of a weak institutional environment, has no choice but to witness the capture of part of its surplus.[[36]](#footnote-36)-[[37]](#footnote-37) As the main economic consequence, biotechnology companies may reduce the future stream of innovations in the Argentine market, which can lead to an inefficient technological route.[[38]](#footnote-38)

1. **Concluding Remarks**

The current paper investigates how the institutional environment influences the property rights strategies of firms. The article proposes a heuristic model and defines three strategies for protection of property rights based on the quality of the institutional environment: strategy focused on the legal system, on the establishment of private mechanisms, and on the abandonment of valuable attributes. The study then examines empirical evidence. Specifically, the paper analyzes three cases of protection of property rights on GM technology in soybean seeds: the US, Brazil, and Argentina. Each case represents, respectively, a strategy as defined by the heuristic model.

In general terms, the alignment between the quality of the institutional environment and the selection of the protection mechanism becomes more evident when comparing the three cases in figure 3. The horizontal axis of the figure identifies four distinct levels of relative efficacy of capture (σ). It is noteworthy that these levels correspond to stylized representations rather than precise measurements.

Since the US institutional environment is strong, the relative efficacy of capture in GM soybean seeds in this country () is said to be close to zero, i.e., biotech companies choose legal mechanisms for protecting rights. Nevertheless, because the legal system does not represent an omnipresent threat that automatically reduces the intensity of capture attempts, the protection of property rights requires a specialized organizational structure which translates into a positive cost of protection.

Conversely, once the institutional environment in Argentina is fragile and unstable, it can be assumed that the relative efficacy of capture in this country () tends to be high enough so that the cost of establishing a private mechanism of protection () is higher than the maximum cost that a firm is able to bear (). As a result, agents choose to abandon the valuable attributes in the public domain. Such abandonment represents an extreme strategic option and can present itself in different ways as illustrated by the Monsanto case vis-à-vis the Pioneer case.

In Brazil, the differences between the South and the Midwest can be associated with differences in the relative efficacy of capture of property rights. In the south, due to climatic conditions and the smaller size of rural properties, the efficacy of capture () tends to be relatively higher compared to that of the Midwest (), where soil and climatic conditions discourage the saving of seeds. Accordingly, it can be assumed that the relative efficacy of capture in the Midwest induces the adoption of a protection mechanism whose cost is smaller than the cost of the mechanism established in the southern region. On the whole, however, the institutional environment in Brazil is fragile, requiring the establishment of private mechanisms for protection of property rights.

Figure 2 – Alignment between Efficacy of Capture and Protection Mechanisms in GM Soybean Seeds

















Individual contract + Legal system

Payment slip

Collective contract

Abandonment

In more general terms, one should note that this article represents only a first sketch on the issue of protection of property rights and its relation to the institutional environment. Future studies should deepen the theoretical basis with the express goal of establishing more easily testable propositions. Furthermore, future research should seek to establish the appropriate parameters for empirical tests and the relevant dimensions of measurement.

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1. This paper does not analyze the broad literature on the efforts of agents on changing the institutional environment – e.g. Holbum and Vanden Bergh (2002), and De Figueiredo and De Figueiredo (2002). [↑](#footnote-ref-1)
2. One can also consider the existence of implicit contracts and relational mechanisms (Klein and Leffler, 1981). [↑](#footnote-ref-2)
3. The arguments proposed in this section are similar to those developed by Williamson (1975, 1996). [↑](#footnote-ref-3)
4. Formally, it is easy to see that . [↑](#footnote-ref-4)
5. One should note that the concept of efficacy of capture in the horizontal axis of the figure is broader than the concept of asset specificity as developed by Williamson (1975, 1996). [↑](#footnote-ref-5)
6. For simplicity, we assume that c is constant. This hypothesis, however, does not affect the overall outcome of the analysis [↑](#footnote-ref-6)
7. Barzel (2001:9) notes that *“organizations are formed for the express purpose of creating rights that are more economically enforced by non-state means than by state means”*. [↑](#footnote-ref-7)
8. The soybean tolerant to glyphosate (RR soybean) allows the application of glyphosate for most of the harvest’s life cycle. The impact of this innovation should be noted: before the advent of RR soybeans the farmer could only use glyphosate before the germination of the soybean plant, using other kinds of herbicides after its germination (post-emergent herbicides). Because RR soybean is tolerant to glyphosate, post-emergent herbicides can be replaced by the glyphosate. Accordingly, the RR soybean seed is complementary to the glyphosate and the bundle composed of RR soybean seed and glyphosate is a substitute to the bundle composed of conventional seed and post-emergent herbicides. [↑](#footnote-ref-8)
9. For example, introduction of a gene (*gen terminator*) preventing the self-reproduction of soybean seeds. This type of technology, however, is characterized by intense controversy and it has not yet been adopted. [↑](#footnote-ref-9)
10. These criteria aim to ensure that the new plant is characterized by a progeny having the same characteristics as the original plants. Note that these criteria are expendable in the case of asexually reproduced plants because in this case the original genetic material is transmitted directly to future generations. [↑](#footnote-ref-10)
11. The grant of utility patents for biotech firms dates back to two different moments. In "Diamond vs. Chakrabarty” (1980), the Supreme Court concluded that a particular bacterium generated by genetic engineering could be patented because it represented the result of human research and not the discovery of a "natural species". In "J.E.M vs. Ag. Supply Pioneer Hi-Breed International" (2001), the same logic was applied to the case of a GM plant, resulting in the extension of patent protection for plants obtained by genetic engineering. [↑](#footnote-ref-11)
12. Maxwell et al. (2004) present a summary of the main features of the technology agreements used by leading companies in the agrobiotechnology field. [↑](#footnote-ref-12)
13. In some countries farmers can save its own seeds for use but not for sale. Therefore the contract is more restrictive than the law. [↑](#footnote-ref-13)
14. 2009 Monsanto Technology/Stewardship Agreement. [↑](#footnote-ref-14)
15. The description below is based on UNCTAD (2006), pp. 20. [↑](#footnote-ref-15)
16. *Pioneer Hi-Bred Int'l, Inc. v. Ottawa Plant Food, Inc*., 283 F. Supp. 2d 1018, 1031-33 (ND Iowa 2003). [↑](#footnote-ref-16)
17. McFarling I, 302 F2d 1291 (Fed Cir 2002); McFarling II, 363 F3d 1336 (Fed Cir 2004). [↑](#footnote-ref-17)
18. Data refer to legal claims issued by Monsanto against US farmers under the claim of saving seeds and/or purchasing seeds from unauthorized resellers (brown bagging). Legal claims are not only related to soybean seeds, including also canola and cotton seeds. [↑](#footnote-ref-18)
19. Discovery means the introduction in a particular location of plants collected in other locations. [↑](#footnote-ref-19)
20. The UPOV ([www.upov.int](http://www.upov.int)) is an international convention that establishes a multilateral agreement setting common standards for the recognition and protection of new varieties of plants. [↑](#footnote-ref-20)
21. It is worth noting that in Brazil, Monsanto has a patent on the technology of GM tolerance to glyphosate. [↑](#footnote-ref-21)
22. It was alleged that Monsanto submitted a Risk Analysis which included the examination of evidence for several countries, except Brazil. [↑](#footnote-ref-22)
23. Monsanto began the marketing of GM soybean seeds in Argentina in 1996. [↑](#footnote-ref-23)
24. Medidas Provisórias (provisional measures) nº. 113/2003, 131/2004, 223/2005. [↑](#footnote-ref-24)
25. Brazil joined UPOV in 1997. [↑](#footnote-ref-25)
26. Currently, the royalty payment is set at 2% on the value of total production. The fine was set at R$150.00 per ton. (season 2004/2005) equivalent to approximately USD 53.40 per ton. [↑](#footnote-ref-26)
27. The discussion that follows is based on the report “Organização dos Mercados de Insumos e Relações com a Agricultura” [*Organization of Input Markets and the Relationship with Agriculture*] held at the request of the Brazilian National Agricultural Confederation (CNA). [↑](#footnote-ref-27)
28. Upon completion of field tests Monsanto identifies the farmer and the amount paid in royalties. [↑](#footnote-ref-28)
29. The historical overview presented in this section is based on Kesan and Gallo (2007). [↑](#footnote-ref-29)
30. It is worth mentioning that the Seed Law was put into effect only with the publication of Decree No. 1995 issued in 1978. [↑](#footnote-ref-30)
31. In 1994 Argentina joined the UPOV, characterizing a new but minor adjustment of the legislation. Argentina has joined the 1978 Convention of UPOV. [↑](#footnote-ref-31)
32. Some critics argue that during the second half of the 1990s, Monsanto has adopted a passive policy in the face of deliberate absence of legal protection on GM seeds in Argentina. According to this argument, the uncontrolled dissemination of RR seeds represented an increase of demand for herbicides. That is, while Monsanto would have a loss in the seed business, the firm could leverage its gain in the sale of glyphosate. An example of this vision can be found in [www.organicconsumers.org/monsanto/argentina101104.cfm](http://www.organicconsumers.org/monsanto/argentina101104.cfm) (accessed November 18th, 2009). [↑](#footnote-ref-32)
33. The way such bags of saved seed would be accounted is not clear. [↑](#footnote-ref-33)
34. One should note that the strategy of intercepting shipments of soybeans is based on international law. [↑](#footnote-ref-34)
35. Considering the realistic assumption that the biotech firm is unable to set a first-period price that fully accounts for the monopolistic gain associated with the new technology. [↑](#footnote-ref-35)
36. It should be noted that this case is radically different from the competition among firms that undertake related innovation efforts. [↑](#footnote-ref-36)
37. The abandonment of valuable attributes by Pioneer-Argentina, as in the case of Monsanto, is also relative. As noted by Goldsmith et al. (2006), Pioneer may eventually adopt a strategy of tie-in sales of soybean seeds and maize seeds. In this respect, it is interesting to question to what extent a strategy of protection of economic rights does not violate the antitrust law. [↑](#footnote-ref-37)
38. Representatives from Monsanto suggest that the company will not launch the second generation of RR soybean seeds in Argentina in the absence of greater protection of property rights. If this threat is confirmed, the country may lose competitive advantage in the international market of soybean production. [↑](#footnote-ref-38)