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**CONTRACTING UNDER WEAK**

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Contracting under Weak Institutions: a note on illegal seed markets

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Abstract: After many years of debate, in 2005 Brazilian environmentalists, religious groups, scientists, farmers and seed companies reached an agreement on the rules for biotechnology research in general and of genetic modified crops in particular. While the debate at the two houses of congress was carried, Brazilian soybean growers have already adopted genetic modified soybean varieties since 1999 especially in the state of Rio Grande do Sul. Long lasting discussions in the congress offered no solution to the question of the legality of the adoption of GMO seeds particularly the cost saving technology owned by MONSANTO. Most farmers have taken the decision to buy uncertified seeds in the shadow market originated from Argentina creating a de facto situation where the illegal use of proprietary technology was predominant. Since Brazil recognizes property rights of plant varieties as well as of utility patents, in case of adoption the legal owner has the right to collect royalties. However how to harvest the rights if the transaction was carried in the shadow market? How to write contracts to bound transactions in the absence of law? The focus of this paper is the description of the institutional arrangement designed to collect



royalties in a situation of weak property rights. The paper describes how a private solution has been designed, however at a higher transaction cost.

Key words: Property Rights, GMO.

JEL codes:D23

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## Contracting under Weak Institutions: a note on illegal seed markets

### 1. Introduction:

Low production cost is the key target of commodity producers. The case of soybean growers is not different. Being a commodity, and showing scale economies, farmers have incentives to lower production costs to survive in a global competitive environment. The mostly known example of cost saving genetic modified organism introduced in agriculture is known as RR technology, developed by MONSANTO. Considered as the first representative of a promising family of new products the gene introduced in soybean varieties enables the adoption of cost saving technological package. Its introduction has motivated different reactions of interest groups leading to distinct regulatory propositions mostly based in arguments related to environmental as well as consumers' safety concerns. Since the introduction of genetic modified organisms in the seed market different countries are discussing the design of regulatory measures of the new generation of technologies. Different solutions reflect beliefs and the way organized political groups are positioned.

This paper describes the case of royalty payment by adopters of GMO proprietary technology, showing that even in absence of institutional rules defining property rights, still royalties could be collected based on alternative institutional arrangements, however at a higher transaction cost. The paper is structured in five parts. The second describes the institutional evolution of property rights of GMO technology in Brazil and places the political debate. The third presents the measurement cost theoretical model that supports the analysis. The fourth chapter describes and discusses the

institutional arrangement that allowed the collection of royalties and finally the fifth chapter concludes.

## 2. Institutional Fragility

The study of intellectual property rights applied to biotechnology (in human genome) has been addressed by Epstein (2003). There are studies on gmo's regulatory systems in agriculture, as addressed by Birner (2004) with emphasis in the role of political interest groups in India and Germany. The impacts on farmer's decisions and costs have been studied by Alexander (2003), Alston, Marra and Mitchell (2003) and Evenson (2003) discussed the complementarities between the green revolution techniques and the gene revolution techniques.

The literature about property rights of technology in agriculture is very prolific. Alston and Venner(2000) studied the effects of plant variety protection law on research investments. Lesser (1998) discussed the effects of property rights on the agricultural industry structure, and Lele, Lesser, Horstkotte-Wessler (2000) did for property rights in agriculture.

Not so rich is the literature that addresses the question of how institutional arrangements are designed to market the new family of products carrying the genetic modified organism innovation. This point becomes even more relevant in cases of countries characterized by weak definition and enforcement of property rights. The aim of the present case study is to describe how the technology is in fact being traded and royalties collected even in situations where property rights are not properly defined or enforced by local authorities.

Institutions of formal and informal nature affect the way transactions are carried particularly in our case, how royalties are charged by the inventor. Markets can be enhanced created or otherwise, disappear depending on

whether institutions protect the legal and/or economic rights associated with transactions. Seed companies are facing problems of different types. Farmers exemption is usually accepted, to that is legal to save seeds to be used in following crop season<sup>1</sup>. However piracy has emerged since the monitoring costs are high and farmers have incentives to adopt if expected sanctions do not match the benefits of adoption.

The shadow market of proprietary seeds is similar to the piracy observed in the editorial and phonographic markets. Easy access to technology added to weak definition and enforcement of intellectual rights result in the reproduction of proprietary seeds, books or records meaning a decline in the incentives to operate in these markets. In that particular case the governmental role is relevant to lower transaction costs by protecting property rights.

Can the transaction be carried?

The natural question that emerges is whether the technology can be traded in such high transaction cost environment. Similarly to the discussion of the impossibility to charge tolls to the vessels which crosses the coast of England has been addressed by Coase (1974) in his paper Lighthouse in Economics. His argument against market failure explanation is that even without formal ways to collect the toll and high costs of exclusion, still a private solution emerged, so that the Royal Navy did not have to force the ships to collect the toll. Coase concluded that so many important economists have mistakenly used the lighthouse case as an example of market failure, because “ ...no economist, to my knowledge, has ever made a comprehensive study of lighthouse finance and administration” (Coase, op. cit. p.211). In fact institutions have been placed in such a way

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<sup>1</sup> In Brazil the plant breeders’ rights admits farmers’ exemption but the regular patent law, if applied to the use of a particular gene, does not. It is left to the court to decide.

that it has been possible to collect the rights allowing the private exploration of the British lighthouses. The role of the government and private organizations was to define property rights in the lighthouse operations and shape efficient institutional arrangements, allowing the existence of private contractual arrangements.

Likewise, in Brazil, the proprietor of the GMO technology found a way to harvest the royalties in a situation of high costs of transaction. As far as the 2004-2005 crop seasons, soybean growers had not a definitive decision of Brazilian Congress about the adoption of GMO technology in agriculture. The discussion held in the Congress confronted different beliefs with regard to the adoption of the new family of technologies very much alike the debate described by Birner (op. cit.) in India and in Germany related to cotton bt.

Being a large soybean producer and exporter, the cost saving technology developed and patented by MONSANTO has shown to be attractive for Brazilian farmers, but the lack of definition about the legality of the adoption left them with the dual option of not to adopt and bare higher costs of production or to free ride and adopt the technology, in spite of not being legally approved. The debate involved different political groups, ranging from radical environmentalists to supporters of free of patents technologies, religious groups, farmers and scientists. In the middle of the turmoil private and public organizations involved in the research and production of GMO's were waiting for institutional signals to define its research programs and marketing strategies

#### Property Rights of GMO's in Brazil:

Brazil recognizes and enforces the international patent structure to protect intellectual property rights. A system of intellectual protection is

specialized to deal with utility patents including the patent office where the patent deposits are made. In 1997 Brazil became member of UPOV-Union for Protection of Plant Varieties, under which the property rights of new plant varieties could be protected. Both systems coexist and companies could choose either to protect the intellectual property depending where the innovation is a variety or a gene to be inserted in a commercial variety. Being a member of WIPO and UPOV, in the case of illegal production, local companies are not allowed to trade the GMO soybean at the international markets, being subject to penalties to be defined by local courts.

The development of GMO's technologies in the 90's motivated the government to regulate the matter. An inter-ministerial commission has been created with regulatory power to define whether any GMO should be released for research or commercial purposes<sup>2</sup>. Therefore the debate over the regulatory power of CTNBIO has emerged, since the environmentalists considered that the scientists held too much power within the commission and place specific demands as the requirement of report of environmental impact. In 2003 a legal suit was placed by a consumer's rights association claiming that the commercialization of GMO's should be prohibited until a clear definition of the issue by defined by the Brazilian Congress. The draft of the Biosafety Law has been presented to the Congress and has received a final approval in March 2005.

The legal vacuum has implied that in the two crop seasons, of 2003-2004 and 2004-2005, southern states farmers, having largely adopted the technology, became subject to formal sanctions. In states of Rio Grande do Sul and Santa Catarina basically 100% of farmers have adopted the technology, meaning the use of uncertified seeds, no royalties being

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<sup>2</sup> CTNBio: Comissão Interministerial de Biotecnologia



collected with impacts on the institutional arrangements of seed marketing companies. In other states the benefits of the RR technology are not so pronounced, therefore the observed level of adoption was small<sup>3</sup>.

Since MONSANTO is the legal owner of the technology, a perverse situation has been created. Being the commerce of certified seeds regulated by law, the government is responsible to monitor the adoption of certified seeds. The government failure in enforcing property rights, led farmers to interpret that the likelihood of sanctions for using the proprietary technology was low, in face of the benefits of cost reduction. The decision then was to adopt and run the risk. Benefits of illegal adoption have been interpreted as larger than the expected penalty costs.

Each player faced a difficult decision. The farmers had the GMO seeds at their hands whatever its origin and the adoption of the cost saving technology introduced a risk to deal with the justice. Legally established seed companies that wanted to sell GMOs could not do it, since it was illegal. It was impossible to compete with informal trade that has been established, in spite of the uncertain quality of the uncertified seed. The government has been focused on the political debate involving the different political groups.

With no option left, in face of the de-facto adoption, a temporary law allowed the farmers to do what they had already done, to use the GMO only at the particular crop seasons of 2003-2004 and 2004-2005. The decision offered a temporary waver to adopt the technology, before the Congress reach a solution. Being a temporary law it was valid only for that season offering an unstable legal regime for long term planning.

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<sup>3</sup> We carried a survey with 100 farmers at the southern states to gather information about the shadow market. The data is being presented in a related paper.

MONSANTO, as the legal owner of the technology, had to define its commercial strategy. One possibility was not to care about property rights and give-up with the Brazilian market, leaving the country or restricting geographically its operations. An alternative was to find a way to charge royalties, since the Government issued the temporary permits for adoption. If the adoption of GMO technology is legal and if farmers have adopted, then the company could legally charge the royalties. How to charge if farmers have already harvested the 2003-2004 crop? How to charge royalties if the seeds have been acquired in the shadow market? How to do business in such uncertain property rights environment?

### 3. A Theoretical Digression.

The theory of property rights offers an explanation of how firms define institutional arrangements to explore a given asset. Barzel (2003, p.43) states that: “The development of property rights theory has its roots both in questions related to the origin of property rights, and the organizational forms asset owners use to exploit their assets.” Efficiency reasons are in place.

The GMO seed case represents a situation of costly property rights definition and enforcement. To explore the property rights issue it is relevant to describe what is transacted when a farmer buys a seed bag. First he buys the seed itself that will be destroyed in the production process. He also buys quality attributes of the seed that are related to its “difficult to observe” technological content, cleanness and purity, and the specific genetic attributes as for instance, the RR gene. The decision to buy seeds in the market instead of saving it from the last harvest or to buy at the shadow market relates to the attributes or dimensions that are traded. If

the farmer buys a certified seed and proprietary technology, a legal liability is also being bought and the rights can be enforced in courts, in case of underperformance. Otherwise, if farmers decide to use its own resources or to buy at the shadow market, then no rights can be claimed with respect to the difficult to measure attributes. Moreover, no reputation mechanisms are in place to control opportunist behavior.

The difficult to measure attributes represent an explanation for costs to operate external transactions. Barzel (1982) develops the theory based on the existence of several dimensions traded in any single transaction, being the difficulty to measure, different for each dimension. Easy to measure dimensions are contracted and difficult to measure dimensions demand other means to support the transaction as reputation and firm guarantees.

The cost of measurement theory adds to Williamson (1975) and Klein, Crawford and Alchian (1978) asset specific investments and the risk of quasi-rent expropriation. If one considers that investments in technology made by seed companies are specific assets, and if farmers can costless appropriate the technology, then seed companies face high transaction costs to operate and farmers will vertically integrate backwards in the seed production. The cost of sub-specialization is expected to show up in that case since farmers cannot invest in research and technological development, so that in the long term the productivity is expected to decline.

The theoretical concepts of economic and legal rights also support the following analysis. Barzel (2003, p.51) defines economic rights as the ability to benefit from a good or service. Legal rights are the rights that the state recognizes as those of a particular individual or set of individuals. Being transaction costs, the costs of the resources used to establish and

maintain economic rights then the link between the cost minimizing institutional arrangement and the definition of legal rights is possible.

In a situation of legal rights being defined and enforced, contracts can be designed at a given transaction cost. In the absence of legal rights the enforcement costs rise, especially if associated to the difficulty to measure attributes of a specific dimension. In such cases economic rights are expected to be guaranteed by other means.

In the Brazilian GMO seed markets previously to the 2003-2004 crop season the undefined property rights on the GMO technology made it difficult to charge for its adoption, since its illegal status left no legal right available. However, once the Brazilian government admitted that farmers have adopted the technology even based on a temporary permit, then legal rights could be enforced and economic rights are potentially enhanced.

The theory permits to predict that in the presence of legal rights, difficult to measure dimensions of the seeds are more likely to be transacted. The remaining problem is to design a low cost manner to harvest the royalties after the transaction between the farmers and the seed companies has already been made. The institutional arrangement is described in the following part.

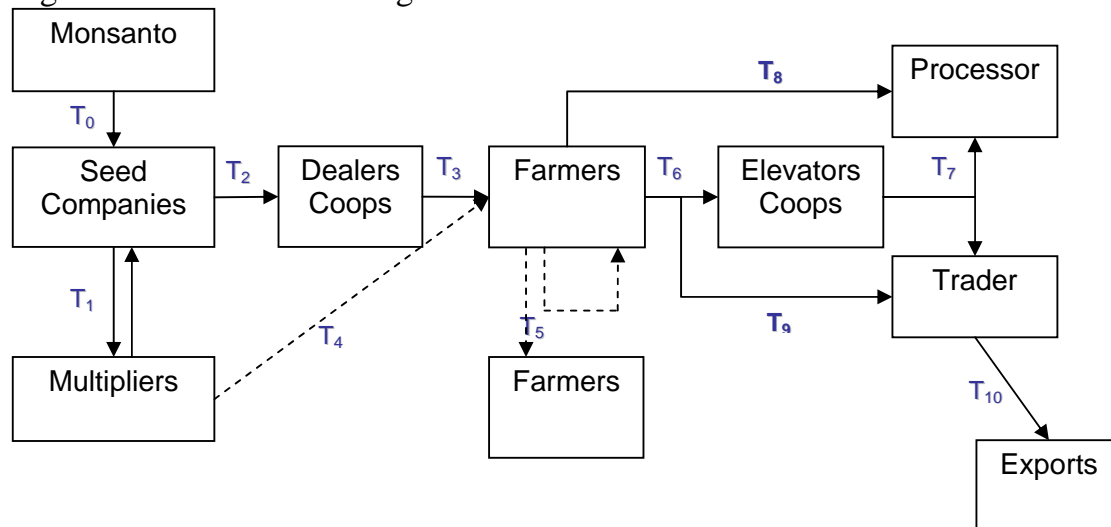
#### 4. Institutional Arrangement

MONSANTO has decided to charge for the use of the proprietary technology. The decision was supported by the existence of property rights defined by Brazilian law, also supported by international property rights agreements (UPOV and WIPO) and two observations. First, the de facto adoption was going on with no evidence of enforcement of proprietary rights by the local government. Second, the Brazilian government passed a

temporary law making legal the already harvested crop of RR technology. A contradictory situation was in place and the company had to find a way to design an institutional arrangement that should embody incentives to the different players involved in the chain, namely: traders<sup>4</sup>, farmers, cooperatives, elevators, port authorities, and government to participate in a post transaction contracts.

The relevant strictly coordinated sub-system<sup>5</sup> from the seed companies to the final markets is represented at figure 1.

Figure 1: Alternative Arrangement



At T0 the high tech genetic corporation trade proprietary technology with some specialized seed company. The company usually contract specialized farmers to multiply the seeds to reach the contracted volume (T1). One the seeds are produced go to the distribution channels, usually through specialized seed dealer (T2) that can be farmers’ cooperatives. Seeds then reach the farmers (T3). Transaction T3 is complex since includes joint ownership of the cooperative and also the supply a bundle of products and services to farmers as technological assistance, credit, insurance among

<sup>4</sup> The ABCD group composed by ADM, Bunge, Cargill and Dreyfus.

<sup>5</sup> See Zylbersztajn, D and Farina for conceptual details on strictly coordinated agribusiness systems.

others. Generally speaking it is possible to observe T1+T2+T3 being carried by vertically integrated firms.

Transaction T1 is based on a contract between seed multipliers and the seed company. It is possible, that some seed suppliers sell it at the shadow market (T4) however this is unlikely since genetic companies have tight control over the production.

Soybean farmers might buy seeds from dealers in the formal market, from shadow market agents or alternatively can save seeds for their own use. The difficult to observe transactions at the shadow markets are pictured by transaction T5. Therefore T5 represents one of the fragilities of the system, since farmers are allowed to save seeds for their own use, but some might also sell at the shadow market, being costly to monitor transaction.

Transaction T6 represents the flow of grains to specialized elevators or cooperatives, being a key locus to implement the alternative arrangement, since the product must go through it, being less costly to monitor the adoption. It is possible that large farmers sell directly to processors, as pictured in transaction T8. Finally T7 represents the contracts with local processors and traders to reach the international markets.

In terms of incentives of the different players, farmers have incentives to buy the uncertified seed, since margins are low and the technology is cost saving. Elevators, are usually farmers also, do not care about the GMO attribute in the absence of property rights enforcement mainly due to the fact that the premium paid to GMO-free are considered insufficient to overcome the segregation costs. Cooperatives represent farmer's interests and have incentives for low cost production but some were under pressure from industry and traders to include traceability costly information about the GMO status of the product being traded. Same happens with ABCD

that control the international channels and are technically able to handle GMO of GMO-free crops.

International Law and Risk of Sanctions: MONSANTO realized that the costs of transaction to deal individually with farmers were prohibitive, since farmers are dispersed, have already adopted the technology making very difficult to implement a monitoring system to collect royalties *ex-post*. However the grains must go through the elevators, silos and ports, so it would be possible to monitor the reception at T6, T8 and T9. That means to monitor farmers trucks at the elevator’s gate with low cost biological test to identify the presence of the gene at the crop. With regard to T9, MONSANTO handled a difficult negotiation with ABCD which was the fundamental strategy to organize the arrangement. They invited the companies to cooperate, charging royalties per ton of the grain already harvested. Initially ABCD did not perceive incentives to cooperate. MONSANTO sent 250 letters of precaution to each relevant player stating that the proprietary technology allows the charge of royalty fees and that refusing might lead to risk exposure related to legal sanctions.

In face of a refusal of ABCD to negotiate, MONSANTO did a credible strategic movement. Based in international laws and sanctions considered by WIPO, the company targeted a ship at the port of Trieste in Italy carrying Brazilian GMO soybean. In face of the risk exposure, ABCD accepted to negotiate. Cooperatives followed the same strategy and as a result the company was able to charge for the adoption of the technology.

Contractual Arrangement:

The contract was designed in the following way: Farmers had the right to <sup>6</sup>declare formally which technology they have adopted. If they reveal that they have used GMO technology, then they were charged and the royalty deducted from the payment to be made at T6 and T8. Farmers associations and cooperatives likewise accepted the conditions. For farmers who did not declare the adoption of RR technology a biological low cost test was made for each shipment. In case of non conformity, i.e. if the test shows positive for GMO, then farmers were charged a penalty, also would have to cover the costs of the test and other costs.

For the first year the royalty was defined as R\$ 20.00 (approximately US\$6.00) per ton but farmers have been waived of 50% of that amount. For the second crop season, 2004-2005, the full price was signaled to be charged. In case of penalty farmers will be charged by R\$ 150.00 per ton plus freight and costs. Only 0.2% of cases of false declaration have been observed in year 1.

In face of the risk of penalty and given that the adoption was widespread it resulted that 98% of farmers signed the agreement creating the condition to collect royalty payments. The contract design was twofold, first the “collaborator” defined as being the industry and port authorities (40% of the total), in which case 15 % of bonus reduction was introduced. The other contract with the participant (60% of the total) made basically with large farmers and cooperatives. About 900 delivery points have been checked and 350 firms have been involved. Considering the two southern states of Rio Grande do Sul and Santa Catarina, about 100% of the production was under contract.

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<sup>6</sup> The exchange rate Reais-USD is R\$ 2.80 / USD, as in November 2004.



Transaction Costs and Property Rights Digression: Defined as the costs to shape and enforce property rights, transaction costs to operate the institutional arrangement were high. In fact, MONSANTO is paying a cost to handle the issue of the definition and enforcement of rights, related to the legal regulatory systems of countries where they operate. In order to have a complete picture of the transaction costs, the enforcement costs have to be considered, related to the implementation of mechanisms as described. The cost includes the traceability system, lawyers around the world, private enforcement and other efforts.

In the episode just described, the Government was not an active player and the solution has been privately defined.

##### 5. Conclusions:

If transaction costs are too high, markets might not operate at all. Otherwise, if institutions are properly built, then markets can be augmented and flourish, as argued Olson (2000)<sup>7</sup>. At the present case, a seemingly impossible transaction was made possible based on several aspects present in the theory: First the measurability of the attribute is possible based on a simple and low cost biological test. Second the institutional environment was relevant, both internal and international. Since Brazil is signatory of the international patent convention and the enforcement at the international port is feasible, the international players have been signaled by the high costs to trade the proprietary product. Third, the contract, which has been signed by local players placed the responsibility with participants and collaborators. Since about 4.10 million tons have been harvested in the crop season of 2003-2004, about R\$ 41 million in royalties (US 14 million) have been collected by MONSANTO.

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In a survey with 100 farmers in the soybean region we found that farmers reject the arrangement. In fact it should be impossible to negotiate individually and farmers are very suspicious about the “ethic behavior” behind the arrangement. They tend not to foresee the long term impacts of the absence of incentives to seed companies to operate and ignore the high sanitary risk related to the commerce of uncertified seeds. The conclusions tend to show that patents and property rights in general are difficult to operate and the absence of a legal definition due to the disputes between political groups adds more uncertainty to the picture. Even in this uncertain environment the existing institutions offered a minimum ground to carry the transactions, but market augmenting institutions are needed in the Brazilian seed markets.

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