

## Collaboration for Innovation in the Brazilian Soybean Market

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ABSTRACT: The establishment of strategic collaborative partnerships is of great value to innovate under uncertainty. The agricultural sector could not be different. Brazil has one of the most complete and complex agricultural research structures in the world and this article focus on the Brazilian soybean, considering its economical relevance. In this context, this article explains the Brazilian Agricultural Research Corporation (hereinafter Embrapa) central role in articulating networks to develop soybean with efficiency gains and overcoming market uncertainties.

KEYWORDS: *Collaboration; Innovation; Uncertainty; Brazilian Soybean Research.*

## 1. INTRODUCTION

Brazil has one of the most complex and complete agricultural research structures. The Brazilian Agricultural Research Corporation (hereinafter Embrapa) plays a central role collaborating with the several actors who contribute to that research.

Considering the broad range of agricultural cultivars in Brazil and the different ways the actors who develop, produce and commercialize them interact, it was necessary to delimit the study to one specific cultivar. Hence, we chose the soybean because of its relevance to the Brazilian economy.

The main purpose of this paper is to explain the collaborative structures for soybean research under uncertainty and Embrapa's role in this scenario.<sup>1</sup> As explained by Professor Charles F. Sabel<sup>2</sup>, contracts are mechanisms employed to enable communication and avoid opportunistic behaviors among the actors. Moreover, rules are necessary to decrease or mitigate the undesired behaviors. Therefore, this paper analyzes the agreements and legislation in these collaborative structures.

This paper proceeds in four parts. The first part explains the history and the relevance of the soybean in the Brazilian context. The second part analyzes the evolution of the agricultural sector in Brazil, including the evolution of soybean research and the applicable legislation. The third part then explains what Embrapa is, showing its main features. It also compares the Brazilian Embrapa and the Argentinian INTA and reviews Embrapa's agreements. The fourth part focuses on governance and specifically, about the local soybean production arrangement in Santarém and Belterra. In conclusion, the main differences between Embrapa's relationship with private and with public partners are highlighted.

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<sup>1</sup> In this paper uncertainty refers to the knightian concept FRANK HYNEMAN KNIGHT, *RISK, UNCERTAINTY AND PROFIT* (1921), explained by Ronald J. Gilson, Charles Fredrick Sabel & Robert E. Scott, *Contracting for innovation: Vertical disintegration and interfirm collaboration*, 109 COLUM. L. REV. 431 (2009). According to them, uncertainty differs from risk because of its impossibility to quantify the probability of occurrence. Uncertainty also differs from asymmetry (one party detains the information).

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## 2. THE BRAZILIAN SOYBEAN HISTORY AND RELEVANCE

According to Bonato and Bonato, the soybean is a species of legume of the pea family whose main products are grain, oil and bran. Its ancient history is unclear.<sup>3</sup> The Chinese literature states that it was domesticated hundreds of years before the first records dated 2838 B.C. in Pen-tSao Kang-mu herbarium. Based on this, it is believed that the soybean is one of the oldest types of cultivars on earth. However, the soybean evolved over time because of the natural and artificial crossing of different species.

Despite the disagreement in research on the origin of the soybean, it is certain that its origin is in East Asia. Between the 2nd century B.C. and 3rd century A.D., the soybean was brought to Korea and Japan. In 1790, England planted soybeans in the royal botanic garden in Kew. Later, the Professor of Vienna University Friedrich Hamberlandt, distributed soybean seeds to Austria, Germany, Poland, Hungary, Switzerland and the Netherlands. The soybean came to the United States in 1840, but only in 1980 did American producers get commercially interested in it. In Latin America, it was introduced in Brazil in 1882, in Argentina in 1909, in 1921 in Paraguay and in 1928 in Colombia.

Until the beginning of the 1940s, the production of soybean was concentrated in Asia. Production in the West, especially in the United States, started growing in 1940 and in 1942 it was the first ranked country in world production.

The São Paulo Agronomic Institute did the first studies about soybean in Brazil in 1892, which were published in 1899. In order to encourage soybean cultivation in Brazil, the Department of Agriculture of São Paulo distributed soybean seeds to farmers in 1900. The first Brazilian state to produce soybeans on a commercial scale was Rio Grande do Sul in 1901. Paraná held the title of the biggest producer of soybean in Brazil for many years, until the production in Mato Grosso surpassed it. Other Brazilian states, such as Minas Gerais, Santa Catarina, Bahia, Goiás, Distrito Federal and Maranhão also produce soybeans, despite not being relevant for commercial production.

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<sup>3</sup> See generally EMIDIO RIZZO BONATO & ANA LIDIA VARIANI BONATO, *A SOJA NO BRASIL: HISTORIA E ESTATISTICA [SOYBEAN IN BRAZIL: HISTORY AND STATISTIC]* (1987).

In the opinion of Guimarães, the expansion in the soybean market in Brazil is a result of many factors such as market favorable conditions, cooperatives' participation in production and commercialization, and the possibility of total automation.<sup>4</sup> However, among all the factors, it is believed that the key to the success of soybean cultivation is the establishment of an articulated research network.

The data reveals the importance of soybean cultivation in Brazil. As stated by Embrapa, Brazil is the second largest producer of soybeans in the world.<sup>5</sup> In the 2014/2015 harvest, the total production was 95,070 million tons, while the United States, the largest producer of soybeans, produced 108,014 million tons. Currently, the agricultural sector corresponds to 30% of the Brazilian GDP and 40% of total exports. In accordance with Albuquerque and da Silva, Brazilian agriculture productivity has grown at an annual rate of 2.51% in the last 30 years due to the investments in research, technology and human capital.<sup>6</sup>

### 3. THE EVOLUTION OF THE AGRICULTURAL SECTOR IN BRAZIL

According to Lopes and Arcuri, the agricultural research in Brazil started in the 19th century with the establishment of the Botanical Garden in Rio de Janeiro, followed by the inauguration of the Baiano Imperial Institute of Agriculture and the Pernambucano Institute.<sup>7</sup> Later, the Agronomic Station of Campinas established by the federal government was subsequently transferred to the state government of São Paulo.

Important events such as the First World War, the economic crisis of 1929 and the Brazilian Revolution of 1930, forced Brazil to rethink its

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<sup>4</sup> Thiago André Guimarães, *A Dinâmica da Cultura da Soja no Estado do Paraná: O Papel da Embrapa entre 1989 e 2002*. [The Dynamic of the Soybean Cultivation in Paraná State: Embrapa's role between 1989 and 2002], *VITRINE DA CONJUNTURA*, Aug. 2011, at 1, 4-6.

<sup>5</sup> See BRAZILIAN AGRICULTURAL RESEARCH CORPORATION (EMBRAPA), *Soybean*, EMBRAPA.BR, <http://www.Embrapa.br/soja/cultivos/soja1> (last visited May 9, 2016).

<sup>6</sup> See generally ANA CHRISTINA SABEGIN ALBUQUERQUE & ALIOMAR GABRIEL DA SILVA, BRAZILIAN AGRICULTURAL RESEARCH CORPORATION (EMBRAPA), *AGRICULTURA TROPICAL: QUATRO DÉCADAS DE INOVAÇÕES TECNOLÓGICAS, INSTITUCIONAIS E POLÍTICAS* [TROPICAL AGRICULTURE: FOUR DECADES OF TECHNOLOGICAL, INSTITUTIONAL AND POLITICAL INNOVATION] (2008).

<sup>7</sup> See generally Mauricio Antonio Lopes & Pedro Braga Arcuri, Ph.D., *Brazilian Agricultural Research Corporation (Embrapa), The Brazilian Agricultural Research for Development (R&D) System*, (Feb. 8 - 10, 2010).

agricultural production, which was mainly focused on coffee and sugarcane. According to Alves and Souza, by that time the agriculture was harmed because of thoughts that it did not respond to incentives, demanded a great deal of work force on the farms, and the international commerce was unfavorable to raw material exporters.<sup>8</sup> Only from 1960 on it is possible to perceive a modernization process of the agricultural sector with the creation of a National Rural Credit Program (provided financing to the acquisition of modern inputs and equipment), the Warranty Policy for Minimum Prices (improved stock control, commercialization and logistics), and the PROAGRO (a rural insurance program). By that time, many state governments created their own agricultural research organizations. Thus, Embrapa and agricultural schools became part of the National System for Agricultural Research (hereinafter SNPA).

As noted by Mathias, the modernization also resulted from policies that increased R&D.<sup>9</sup> The idea was to expand the agriculture production through technological advancements that included research, especially related to genetic engineering, and reduce its costs. Nonetheless, as stated by Rivaldo, most of these policies were discontinued due to economic crisis and high inflation.<sup>10</sup> The stabilization of the Brazilian market in the 1990s attracted private investors. Hereafter, the government started assuming a new role.

Brazil has one of the most complex and complete agricultural research structures. Embrapa plays a central role collaborating with the several actors who contribute to that research, as demonstrated in the figure below.<sup>11</sup>

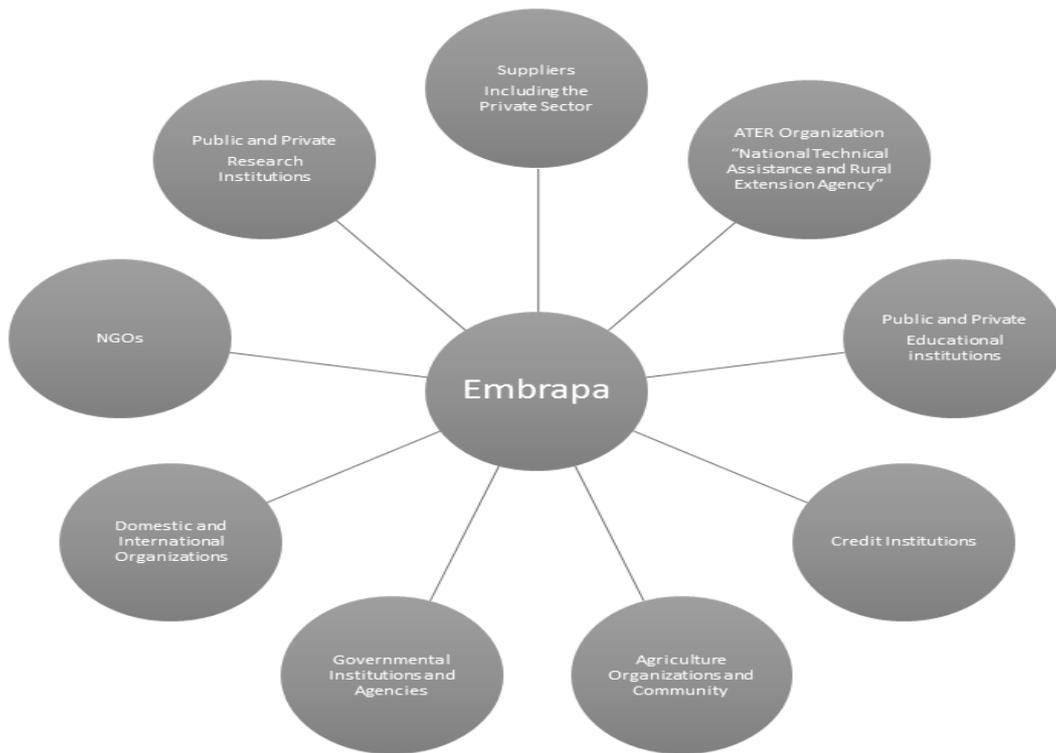
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<sup>8</sup> See generally Eliseu Alves & Geraldo da Silva e Souza, *A Pesquisa Agrícola numa Agricultura Integrada ao Mercado Internacional - O caso da Embrapa e do Cerrado*. [*The Agricultural Research as an Integrated Agriculture in the International Market - Embrapa and Brazilian Savannah Case*], 2 REVISTA DE POLITICA AGRICOLA 56 [REV. POL. AGR.] (2007).

<sup>9</sup> See generally JOAO FELIPE CURY MARINHO MATHIAS, *Modernização e Produtividade da Agropecuária no Brasil* [*Modernization and Productivity in Brazil's Agriculture in How is Brazil?*], in COMO VAI O BRASIL? [HOW IS BRAZIL?], Imã (2014).

<sup>10</sup> See generally ORMUZ FREITAS RIVALDO, *Estratégias para o Fortalecimento do Sistema Brasileiro de Pesquisa Agropecuária* [*Strategies to Strengthen the Brazilian System of Agricultural Research*], Brazilian Agricultural Research Corporation (1986).

<sup>11</sup> Despite Embrapa's important role, the actors also have their own projects and relates to the others without Embrapa's interference. It is important to note that Embrapa's Directive No. 14/2000 that will be reviewed in the Brazilian legislation section, prohibits the actors to develop parallel programs when they are collaborating with Embrapa, to avoid mixing the results.



Embrapa's adapted figure.<sup>12</sup>

As aforementioned, the public structure started in 1970 with the creation of SNPA, of which Embrapa is the most important component. In 1962, the Agriculture Research and Experimentation Department (DPEA), which was later transformed into the Research and Experimentation Office (EPE), substituted SNPA in 1971, EPE was finally transformed into the National Department of Agriculture Research (DNPEA). Also linked to the current DNPEA, Brazil has the State Organizations for Agricultural Research (OEPAS). OEPAS are composed of public and private educational institutes and public institutions that support general research, like the National Scientific and Technological Development Council (CNPq).

In accordance with Fuck and Bonacelli, it is possible to observe a shift in the agriculture research model from a totally public environment to a model

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<sup>12</sup> The fig. is available at <http://embrapa.br>

with more private sector participation.<sup>13</sup> Currently the private sector is the main agent in agriculture research, motivated by possible financial gains. The concern about this model is that in developing countries, poor and small producers cannot access the benefits of the private research.

Considering the expected growth of the world population, estimated at nine billion people in 2050<sup>14</sup>, Vieira Filho asserts that the world's agricultural R&D biggest challenge is to promote sustainable development.<sup>15</sup> Therefore, the specific goals are to develop safe and healthy products that are competitive and meet the environmental needs.

The most important element to agricultural innovation is the establishment of strategic collaborative partnerships. The main purpose of this type of cooperation is to develop the technology with efficiency gains (reducing possible mistakes, disseminating knowledge and transferring technology), ensuring the competitiveness and overcoming the market uncertainties. The key to success of such partnerships is the establishment of a plain policy regarding the intellectual property of the produced knowledge.

### 3.1. THE EVOLUTION OF THE SOYBEAN RESEARCH IN BRAZIL

The first soybean researcher in Brazil was the private company Francisco Terasawa (FT), by the end of the 1960s in Paraná. In the 1980s, FT developed the first Brazilian soybean variations. In 1973, the *Federação das Cooperativas de Trigo e Soja do Rio Grande do Sul Ltda* [Federation of Wheat and Soybean Cooperatives of Rio Grande do Sul Ltda] was created. In the 1970s, the *Organização das Cooperativas do Paraná – OCEPAR* [Cooperatives Organizations of Paraná State] was created and later transformed in *Cooperativa Central de Pesquisa Agrícola – COODETEC* (Central Cooperative for Agriculture Research). In 1975, *Embrapa Soja* [Embrapa Soybeans] was created in Paraná. This unit's

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<sup>13</sup> See generally Marcos Paulo Fuck & Maria Beatriz Bonacelli, *A Pesquisa Pública e a Indústria Sementeira nos Segmentos de Soja e Milho Híbrido no Brasil* [The Public Research and the Seed Industry in the Soybean and Hybrid Corn Segments in Brazil], 6 REVISTA BRASILEIRA DA INOVAÇÃO 9 [REV. BRAZ. IN.], 87-121 (2007).

<sup>14</sup> See generally EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA, SECRETARIA DE COMUNICAÇÃO, EMBRAPA EM NÚMEROS [EMBRAPA IN NUMBERS] (2015).

<sup>15</sup> See generally JOSÉ EUSTÁQUIO RIBEIRO VIEIRA FILHO, *Technological Trajectory and Learning in the Agricultural Sector in Brazilian Agriculture Development and Changes*, Brazilian Agricultural Research Corporation (Embrapa), 2012.

central role is to research conventional, organic and transgenic soybeans and study sunflowers.

Influenced by the international organizations and bound by GATT at the Uruguay round, that by the time was trying to standardize the legislation regarding intellectual property, Brazil promulgated, in 1997, the Federal Statute No. 9.456, known as *Lei de Proteção aos Cultivares* [Protection Act to Cultivars]. This legislation safeguards the intellectual property for cultivars and requires producers to pay royalties and tax to use the technology. As a result, several multinationals came to the Brazilian market. In order to enter the market, these multinationals bought some small national companies. An important example in the sector was the purchase of FT, Sementes Hatã and later, Calgene, Asgrow, Monsoy, Dekaland and Agroceres by Monsanto. In 2005, Monsanto also bought Seminis, the largest producer of vegetable seeds and Emergent Genetics in the world. Other multinationals that entered the Brazilian market in this M&A movement were Agr-Ev and Du Pont. These companies had a lot of expertise, but did not have the germplasm<sup>16</sup> adapted to a different environment. From the M&A transaction on, these corporations have been using licensing, integration and collaboration instruments to develop joint researches. It is essential to mention that the soybean market in Brazil is a differentiated oligarchy; the entrance barriers relate to the access to genetic material and the technical and financial capacities.

### 3.2. THE APPLICABLE BRAZILIAN LEGISLATION

Brazil has an extensive legislation in agriculture and R&D. This confirms the theory that under uncertainty, regulation is necessary. Firstly, the Brazilian Constitution dedicates an entire chapter (IV) to scientific and technological development, where R&D is included. According to Tavares, since the promulgation of the Brazilian Constitution, scientific development is not only a manner of producing knowledge but also generating capital and resolving social problems.<sup>17</sup> This proves the relevance of science and technology to the

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<sup>16</sup> Simply put, the germplasm is the genetic material of germs cells.

<sup>17</sup> See generally André Ramos Tavares, *Ciência e Tecnologia na Constituição [Science and Technology in the Constitution]*, 44 REVISTA DE INFORMACAO LEGISLATIVA, 7, 7-20 (2007).

economic development. Despite some Constitutional scholars defending the idea that the constitutional narrative on this topic is abstract serving only as a recommendation, it is believed that chapter IV is completely self-applicable.

The Federal Statute No. 8.171/1991, also known as Agricultural Law, establishes the objectives and institutional competences of the agricultural research in Brazil. The statute also institutes resources and instruments to achieve these objectives.

The Federal Statute No. 9.279/1996 that protects the industrial property, permits, for example, the patenting of GMOs, complements the Federal Statute No. 9.456/1997, known as the "Protection Act to Cultivars". This legislation is the base for GMO soybean production in Brazil. The Protection Act to Cultivars creates the National Service for Cultivar Protection (SNPC) and is regulated by two Federal Ordinances, No. 527/1997 and No. 199/1998 that, respectively, establish the National Cultivars Register (RNC) and the National Service for the Cultivars Protection.

Following the Federal Statute No. 9.456/1997, Embrapa established the Directive No. 14/1998 to regulate its collaborations. This Directive was updated and resulted in a new Directive, the No. 14/2000, which specifically regulates its collaboration with the private sector for research. It prohibits its private partners from being the proprietors of possible cultivars conjointly developed with Embrapa. In addition, Embrapa forbids its collaborators from creating parallel programs in genetics enhancement, to avoid the mixture of results, the loss of control and quality information. Another concern that can be seen in this Directive is the maintenance of Embrapa's germplasm, to which the collaborators may have access through the genetics enhancement program. By the end of the research, Embrapa collaborators must return all the genetic material to Embrapa. The Directive made explicit the possibility for Embrapa to receive funding resources from its partners. All the collaborations are established by written agreements that must contain an annual work plan that meets some specific technical conditions. Some of these conditions are the number and denomination of the lines that are going to be studied; the number and identification of the progenies that are going to be studied and multiplied, if the work contemplates segregating germplasm; and all the required infrastructure, including the human resources. Embrapa supervises all the

work based in two instruments: the spreadsheet and notebook field. The collaborator fills the first with information of the implementation and follow up of the tests. Embrapa fills the second whenever it sends segregating germplasm with the crossings and/or the advances, among other important information. In a later stage, the partner also fills this document with the enhancement methods, which must be very detailed. Embrapa audits all its agreements, the consequent resources and the eventual remittance of germplasm through an internal audit. The celebration of agreements is preceded by negotiation with the partner, involving the decentralized unit of Embrapa interested in the partnership, Embrapa Technological Deals and the Intellectual Property Secretary. Embrapa Technological Deals is responsible for updating Embrapa system with all the information generated by the research. The Directive also establishes three different models of collaboration, which will be analyzed in the “Embrapa public-private agreements” section. The drafting and signing of agreements that does not follow the Directive are subject to fines. Since the establishment of this Directive, Embrapa had to review all its previous agreements.

Embrapa has several other Directives, among which the most relevant for this study are the No. 22/1996, that establishes Embrapa’s Institutional Policy of Intellectual Property Management; the No. 15/1998, which creates a uniform denomination and identification process to Embrapa’s cultivars and establishes Embrapa’s cultivars bank – BCE; the No. 26/1998 that establishes the bylaws of its Intellectual Property Secretary (SPRI) and the No. 4/2012 that established its Business Secretary – SNE.

The Federal Statute No. 10.711/2004 establishes the national system for seeds and seedlings. The statute’s main goal is to ensure the identity and quality of the seeds and seedlings in the Brazilian territory. In addition, the statute classifies the seeds and seedlings into two categories: certified and non-certified. The public structure is responsible for providing the certification through a formal public structure.

The Federal Statute No. 10.973/2004 establishes incentives for innovation and scientific and technological research.

The Federal Statute No. 11.105/2005 regulates biosafety and introduces safety norms and inspection mechanisms to the GMOs.

According to De'Carli the Federal State No. 11.079/2004 is relevant for establishing public private partnerships (hereinafter PPP) in Brazil, which, according to him, Embrapa is the precursor.<sup>18</sup> However, this does not seem to be the most correct perspective. The definition of PPP varies if it is applied its *sensu lato* and *sensu stricto* meaning. In the *sensu lato* meaning, PPP comprehends any partnership where the public and the private are collaborating with one shared goal. Therefore, Embrapa could be the PPP precursor in this sense. On the other hand, the Federal Statute No. 11.079/2004, in its second article, defines the *sensu stricto* meaning of PPP, as the administrative concession agreement in the sponsored or administrative modalities. In the first section, it is explained that the sponsored concession is the concession of public services or public construction when it involves, besides the tariff (the pecuniary amount paid by the user), a pecuniary payment from the public to the private partner. Certainly, Embrapa collaboration for research cannot be framed into this category, since there will never be pecuniary payments from the public to the private partner. The administrative concession, in turn, is explained in the second section as the service agreement where the Public Administration is the direct or indirect user, even if it involves construction, installation or supply of goods. The concept here is that the Public Administration is the user and not the contractor. An example of this type of concession is the construction and maintenance of prisons. In this case, the Public Administration pays 100% of the tariffs to the private partner. Hence, we can affirm this is not Embrapa's case when it collaborates with the private for research. Finally, in the fourth section, the legislation prohibits the celebration of PPP agreements which total amount is less than BRL 20,000,000 (about USD 5,000,000), that lasts for less than five years and that the only purposes are services, supply or installation of goods or public construction. Most of Embrapa's agreements do not fulfill these conditions. In addition, Di Pietro explains that in Brazil the public concession is more clearly related to maintenance, charging and construction

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<sup>18</sup> See Carlos Ricardo De'Carli. *Embrapa: Precursora da Parceria Público Privada no Brasil*. [Embrapa Precursor of Private Public Partnership in Brazil] (Jun., 2005) (dissertation, Universidade de Brasília, UnB Centro de Desenvolvimento Sustentável).

of highways, airports, ports and railways. In other words, it is intrinsically related to infrastructure projects.<sup>19</sup>

Finally, the Federal Statute No. 8.666/1993 states that a public bidding must precede all agreements involving the Public Administration. Nonetheless, Embrapa does not bid to celebrate agreements to research because the federal law explicitly excepts the cases of research, education and technical services.

Due to its massive legislation in comparison with trade and services, Brazil agribusiness is one of the sectors most susceptible to the effects of judicial decisions.

#### 4. EMBRAPA

According to Moreira and Teixeira, Embrapa is a publicly held corporation created in 1973 through the Federal Statute No. 5.851/1972.<sup>20</sup> Eliseu Alves, a Brazilian scientist, headed Embrapa's establishment as an answer to the supply crisis between 1960 and 1970, and the necessity to diversify products and reduce prices. Embrapa is attached to the Ministry of Agriculture, Livestock and Supply (hereinafter MAPA) and operates through 47 decentralized units that are present in almost all the Brazilian states. Embrapa's success can be attributed to its diversified R&D portfolio, continuous support from the Federal Government, interactivity, decentralization, independent reviews and specialized staff. Currently Embrapa has 2,427 scientists of which 1,789 have a doctorate degree and 242 postdoctoral degree.

Each of Embrapa's units has an R&D sector with administrative and patrimonial autonomy and is supervised by the deputy head of R&D with the Internal Technical Committee support. The group of the R&Ds has an Advisory Committee that is composed by the bosses of the units that are chosen by the Board of Directors. Their competence is related to analyzing, systematizing and consolidating information regarding eventual problems with the R&D policy, sending them to the Board of Directors proposals and updates of the policy.

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<sup>19</sup> See generally MARIA SYLVIA ZANELLA DI PIETRO, DIREITO ADMINISTRATIVO [ADMINISTRATIVE LAW], (19th ed. 2006).

<sup>20</sup> See generally Gustavo Carvalho Moreira & Erly Cardoso Teixeira, *Política Pública de Pesquisa Agropecuária no Brasil [Public Policy for Agricultural Research in Brazil]*, 3 REV. POL. AGR. (2014).

According to Silva an R&D policy is important to guide its professionals and partners.<sup>21</sup> Hence, they can always identify the main problems to draft and execute efficient projects.

The internationalization of Embrapa started almost simultaneously to its creation, through a post-graduation program that sent hundreds of professionals abroad. This was important to establish relationships worldwide.

Simultaneously, Embrapa had the cooperation of the Inter-American Development Bank, the World Bank, the Food and Agriculture Organization of the United Nations, the Inter-American Institute for Cooperation on Agriculture, the Consortium of International Agricultural Research Centers, Agricultural Research for Development, among others, to establish its international structure and implementation of its research program. Initially, the cooperation model was very simple; Embrapa only received benefits. In a later stage, Embrapa was involved in more complex cooperation models. The first example was the Cooperative Program for Agrifood and Agroindustrial Technological Development of the Southern Cone in 1980.

Another important project to internationalize Embrapa is the Virtual Laboratory (hereinafter Labex). This project started in 1990 in the United States and is currently present in France, Germany, United Kingdom, Korea and China. The program was conceived to innovatively strengthen international scientific cooperation. The concept was to create a faster communication flux in the research and development area by the physical presence of Embrapa's researchers in the most advanced research centers, intensifying the collaboration with research organizations around the world. The area of study, which is defined based on Embrapa's priority agenda and made explicit in its master plan, determines the international partner. The potential partners are identified based on a study of excellence in its field of study (this is measured in a range of ways, for instance, by the number of scientific publications and patents), the infrastructure available, the interest in participating in the program, the history and the current technological and scientific performance of the institution. Next, Embrapa starts a negotiation process. In this phase, a technical and governance mission is realized in the

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<sup>21</sup> See generally RENATO CRUZ SILVA, *Política de P&D [R&D Policy]*, Brazilian Agricultural Research Corporation (Embrapa), 1999.

institutions to support the decision process. Strategic purposes and operational mechanisms are discussed. If the negotiation succeeds, collaboration agreements are drafted stating its areas of study, mechanisms, obligation of the parties, and funding resources. The following step is to designate the researches, that working together draft a common interest project (PIC), specifying the objectives, the possible results and the methodologies to develop the research. Embrapa's internal committees select the participants of the program, who can be designated as coordinator or researcher, depending of his personal, academic and professional abilities. Each researcher and/or coordinator is firstly allocated for a two-year term, but with Embrapa's internal committee approval, this period can be extended in one year. Embrapa's internal committee can also early terminate the researcher agreement when it understand that the researcher and/or coordinator is no longer required abroad. A committee composed of the secretary of international relations, the coordinating body of scientific cooperation, and the R&D department, annually evaluates the participant of Labex and the program itself. In this annual analysis, the technical reports developed by the researchers that are working abroad and their coordinator and interviews with them and the appointed responsible in the recipient institution are evaluated. Labex has a guiding document, which states as its objectives: promote international cooperation for innovation in agriculture; generate knowledge and innovative technologies to the development of the agricultural production chains; monitor and identify scientific, technological and innovative tendencies with potential to solve problems.<sup>22</sup>

Labex program also receive senior researchers of international partners at Embrapa in what is called "inverted Labex".

Currently Brazil has seventy international collaboration projects with Africa, Asia and Latin America, including Caribbean, involving more than thirty-seven countries.<sup>23</sup>

An important collaboration raised in the international scenario was with Japan. After the increasing concerns with food safety in 1973, the United

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<sup>22</sup> See generally Secretary of International Relations. Coordinating Body of Scientific Cooperation, *Documento Orientador do Programa Embrapa-Labex [Guiding Document of the Program Embrapa-Labex]*, Brazilian Agricultural Research Corporation (Embrapa) (2015).

<sup>23</sup> See generally EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA, *supra* note 14.

States, Japan's only supplier of soybean by this time, imposed a control in the export of the grains, which resulted in the exponential rise of the price of soybean. Therefore, Japan started searching for different suppliers. In 1975, the collaboration between Japan and Brazil created the Brazilian Savannah (known as *cerrado*) Development Program (PROCEDER). Also, the Japan International Cooperation Agency (JICA) gave technical and financial support for over twenty years to Brazil. Both goals were to promote the cultivation and the consequent capitalization of agriculture at *cerrado*, increasing the production and productivity of the soybean. These programs were executed in collaboration with cooperatives and farmers under the supervision of the MAPA.

According to Fuck and Bonacelli, Embrapa also has collaboration agreements with public and private foundations.<sup>24</sup> Their presence all over the country enables Embrapa to test its cultivars in different regions and consequently adapt them. The foundations main obligations are to provide partial financial, physical and human resources to researches, in addition to supporting Embrapa's collection of royalties. On the other hand, Embrapa's obligations are to provide germplasms according to the region and the foundation interest, transfer technology, researchers and technical team. The main benefit for the parties is the possibility of improving and enlarging the genetic enhancement.

Despite being a Brazilian successful example of publicly held corporation, recently Embrapa's President, Maurício Lopes, in an interview for a Brazilian Newspaper, asserted that Embrapa is not improving in the same rhythm of the other competitors.<sup>25</sup> Annually, Brazil invests only 1.9% of its GDP preventient from agriculture in research. This amount is proportional to half of the United States investment. Thus, Brazil must double its investment to maintain its competitiveness. Currently, Brazil only contributes with 5% of the world's investment in agricultural research. Moreover, Maurício Lopes argues in favor of the establishment of a subsidiary to Embrapa, which will be named "EmbrapaTec". This institution would receive the technology developed in Embrapa's laboratories and would work with the private sector, which

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<sup>24</sup> Fuck and Bonacelli, *supra* note 13, at 87-121.

<sup>25</sup> Cristiano Mariz, *Estamos Ficando para Trás, Diz Presidente da EMBRAPA. [We Are Losing Competitiveness, Says Embrapa's President]*, Exame (last visited May 9, 2016), [exame.abril.com.br/revista-exame/edicoes/1095/noticias/estamos-ficando-para-tras-diz-presidente-da-Embrapa](http://exame.abril.com.br/revista-exame/edicoes/1095/noticias/estamos-ficando-para-tras-diz-presidente-da-Embrapa).

would bring investments. The former Brazilian Minister of Agriculture, Livestock and Supply, Kátia Abreu, agreed with this project. Hence, the government drafted a bill to create this subsidiary, which was sent to Congress in May 2016. Currently the draft is being examined by the Brazilian House of Representatives. The idea is that EmbrapaTec should have more liberty than Embrapa. Maurício Lopes concluded the interview emphasizing that Embrapa's roles must evolve with society. Considering the biggest investments in agricultural research are made by the private sector, the government should invest in different areas.

Embrapa's master plan for 2014-2034 asserts its proposal to expand its partnerships, facilitating innovative mechanisms and models of interaction, and prioritizing open innovation models.<sup>26</sup>

The 2013 Embrapa's activities report stated that during that year 102 technologies were developed in 230 cultivars. The developments include three new soybean variations, that were launched in partnerships with Fundação Meridional (BRS 360RR), with Epamig and Fundação Triângulo de Apoio à Pesquisa (BRSMG772), Centro Tecnológico para Pesquisa Agropecuária, and Emater from Goiás (BRSGO 6955 RR).<sup>27</sup> Embrapa currently owns 260 variations of soybeans. In April 2015, Embrapa totaled 3,185 agreements with national and international organizations.<sup>28</sup>

#### **4.1. THE MAIN SIMILARITIES BETWEEN THE ARGENTINIAN NATIONAL INSTITUTE OF AGRICULTURAL TECHNOLOGY – INTA AND EMBRAPA**

Publicly held corporations, such as Embrapa, are very important to the scientific research and the development of new technologies benefits all society. Therefore, the Brazilian Embrapa and the Argentinian INTA develop these activities in collaboration and in competition with several actors.

Despite the fact that they lived through a financial and institutional crisis that resulted in a necessity of institutional reorganization, they were

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<sup>26</sup> See generally BRAZILIAN AGRICULTURAL RESEARCH CORPORATION, VI PLANO DIRETOR DA EMBRAPA 2014-2034. [VI EMBRAPA MASTER PLAN 2014-2034] (2015).

<sup>27</sup> See generally LABORATÓRIO NACIONAL DE ENERGIA E GEOLOGIA, BRAZILIAN AGRICULTURAL RESEARCH CORPORATION (EMBRAPA), RELATÓRIO DE ATIVIDADES 2013 [2013 ACTIVITIES REPORT] (2015).

<sup>28</sup> See generally EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA, *supra* note 14.

created in different contexts. INTA was created much earlier than Embrapa, in 1956, during the Green Revolution, and its main purpose was to modernize the agriculture in Argentina. Since then, the institution is located in the most important producing regions in its country. Embrapa, on the other hand, was created in 1973 focused on research.

While Embrapa's participation in the soybean market is expressive, collaborating with different partners to enlarge the competition, INTA's participation is decreasing.<sup>29</sup>

#### 4.2. EMBRAPA'S PUBLIC-PRIVATE AGREEMENTS

Adam Smith observed in 1776 that the main source of innovation and improvement comes from the men who work with machines and discover ways to improve it, and the manufacturers that developed such improvements.<sup>30</sup> Edwin Mansfield later confirmed this theory, when he evaluated that less than 10% of the new products or processes in the United States were introduced by academic research.<sup>31</sup> According to him, the successful development of a product or process depends on a detailed knowledge of the production and market. This comes from experience in the company.

As stated by Fuck, Bonacelli and Carvalho,<sup>32</sup> in the recent years the organization for research has been changing. Based on an investigation in twenty different countries, the most relevant elements that are being changed are its funding sources, space, actors and roles and the interaction and coordination between them. The public institutions are collaborating each time more with the private sector.

According to Alves and Souza the main benefits of a public-private collaboration for research are: a) increase the public's research pragmatism, helping it focus in current problems; b) preserve talented researchers in the

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<sup>29</sup> See Marcos Paulo Fuck and Maria Beatriz Bonacelli, *Os Novos Caminhos das Instituições Públicas de Pesquisa Agropecuária: Observações a Partir dos Casos da Embrapa e do INTA* [The New Ways of the Public Institutions of Agricultural Investigation: Observations from the Cases of Embrapa and INTA], 30 REVISTA ESPACIOS [REV. ESP.], no.1, 2009 at 29.

<sup>30</sup> See ADAM SMITH, *WEALTH OF NATIONS*, (Charles Jesse Bullock ed., Bartleby.com 2001) (1901) (ebook).

<sup>31</sup> Cf. Edwin Mansfield, *Contributions of New Technology to the Economy*, in *TECHNOLOGY, R&D AND THE ECONOMY* (Bruce Smith and Claude Barfield eds., 1996).

<sup>32</sup> Fuck and Bonacelli, *supra* note 29.

public sector; c) increase the research's budget; d) reduce the total costs of research in the public and private sector; e) increase the knowledge; f) facilitate the international interaction.<sup>33</sup>

In accordance with De'Carli an example of Embrapa's collaboration with a private foundation is the agreement with Fundação MT, which is composed of twenty-two seed producers in Mato Grosso.<sup>34</sup> The partnership was successful, resulting in the production of several cultivars adapted to the soil and climate conditions of Mato Grosso. This includes the production of three types of soybean cultivars (Uirapuru, Crixás and Pintado). Considering the agreement was celebrated before the Federal statute No. 9.456/1997 and the Directive No. 14/2000, it had to be amended. Nonetheless, Fundação MT did not accept the new rules, which among others, established that Embrapa would be the exclusive proprietor of the soybean cultivars. Hence, Fundação MT decided to create its own program, which is against Embrapa Directive No. 14/2000. With the breach, Fundação MT proposed Embrapa to divide equally all the genetic material obtained by the crossings achieved by Embrapa with the Foundation resources. This would mean that Fundação MT would have a copy of the enhanced germplasm. Embrapa did not agree with the proposal since the genetic material is a national patrimony, developed with society's resources (considering it is a publicly held corporation). Next, Embrapa required Fundação MT to return the genetic material that was with the Foundation, and all the related technical information. Thus, Embrapa proposed Fundação MT to maintain the exclusive right to commercially use all the cultivars developed in collaboration, considering this would be sufficient remuneration to the Foundation's investment. After several months trying to negotiate, the parties did not reach an agreement. Hence, Embrapa filed a lawsuit against Fundação MT in the Federal Courts, that held that the Foundation had to return all the genetic material to Embrapa.

Another example brought by De'Carli is the collaboration between Embrapa and Fundação Centro-Oeste, that took place after the collaboration

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<sup>33</sup> See Eliseu Alves and Geraldo da Silva e Souza, *A Pesquisa Agrícola numa Agricultura Integrada ao Mercado Internacional O caso da Embrapa e do Cerrado*. [The Agricultural Research as an Integrated Agriculture in the International Market. *Embrapa and Brazilian Savannah Case*], 16 REV. POL. AGR., no. 2, 2007, at 56.

<sup>34</sup> See generally De'Carli, *supra* note 18.

between Embrapa and Fundação MT had finished.<sup>35</sup> Indeed, Fundação Centro-Oeste was treated as Fundação MT successor. Embrapa aims with this collaboration to regain its lost market share in the region that is currently owned by its former ally and now competitor, Fundação MT. The collaboration works the same as it used to work with Fundação MT, except for the fact that it does not limit the entrance of new collaborators and respects the rules of the Directive No. 14/2000.

One of Embrapa's most important private partnership in Brazil is with Monsanto, a multinational headquartered in St. Louis, Missouri. According to Moura and Marin in attempt to expand its production diversity Monsanto started investing in genetics engineering, which was absorbed as a complimentary asset for the agrochemical.<sup>36</sup> Monsanto was stimulated to start working with biotechnology when its herbicide Roundup's patent, that was expiring, was extended. Their plan was to avoid other companies to use generic versions of its product. Hence, Monsanto invested in researching plants that were resistant to Roundup to put in the market a technological combo consisted of the selling of the GMO seeds and the Roundup herbicide.

In 1970, Monsanto synthesized the glyphosate, the main component of Roundup, which was registered in 120 countries. This product revolutionized agriculture in the world since it efficiently controlled the weeds. Initially, the product was exported to Brazil, but later, when Monsanto started investing in research in Brazil, it was technologically improved and started being produced in the country.

According to Moura and Marin based on the Federal Statutes No. 9.279/1996 that protect cultivars, the No. 9.456/1997 that protects the industrial property, and Embrapa's Directive No. 14 /2000, Embrapa developed three types of agreements with the private and public sector.<sup>37</sup> The first model is a technical cooperation for crossing planning. In this case, the partner must have a technical team with its own enhancement program and must participate in the whole process of the creation of a new cultivar. In this situation, the

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<sup>35</sup> De'Carli, *supra* note 18.

<sup>36</sup> See generally Luís Cláudio Martins de Moura & Joel Bevilaqua Marin, *Rede Empresarial: A Estratégia da Produção de Sementes de Soja Transgênica em Goiás*. [Business Networking: The Strategy of Transgenic Soy Seeds Production in Goiás], 14 INTERAÇÕES (CAMPO GRANDE) [INTER. C. G.], n. 1 (2013).

<sup>37</sup> *Id.*

final product is registered in co-participation with the public partner and the commercial benefits are rated. The private partner can commercially use the cultivars for ten years. In the second model, the technical cooperation regards lines. The private partner co-develops with Embrapa soybean cultivars, receiving genetic material and realizing the necessary tests for an eventual commercial use. Embrapa owns alone the intellectual property registry and the private partner can commercially use the soybean cultivars for five years, with a subleasing option. The third model is a financial cooperation which the partner provides the financial and human resources and Embrapa research. In this case, the private partner may exclusively multiply and commercialize the cultivars for a period to be established between the parties. The production, distribution and marketing are structured in licensing agreements that establish obligations to each party linked to this network. According to Santini and Paulillo Embrapa celebrates two types of agreements.<sup>38</sup> The first one is the collaboration agreement that must be framed within the three previously mentioned models and when the research has positive results, the licensing agreement.

By analyzing Embrapa's agreements, it is possible to note the generality of its terms. In most cases, the agreements state as objectives the integrated effort among the parties to research in a general area; for example soybean.<sup>39</sup> The technical specifications of the research are part of the first annex, that are discussed in a later moment (after the signing of the agreement). Another possibility for Embrapa's agreement is the establishment of an annual work plan that is also discussed after the signing of the agreement. In both cases, technical specifications or annual work plan, the projects are formally specified and must accompany a research protocol. Generally, Embrapa is responsible for guiding the research, but the agreement does not mention in which ways, which defers to Embrapa lots of authority. In the agreements, it is clearly stated where the research is going to take place and the materials (including the quantity) that must be transferred. The

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<sup>38</sup> GIULIANA APARECIDA SANTINI & LUIZ FERNANDO PAULILLO, ENCONTRO NACIONAL DE ENGENHARIA DE PRODUCAO, ASSOCIAÇÃO BRASILEIRA DE ENGENHARIA DE PRODUÇÃO, ESTRATEGIAS DAS EMPRESAS DE SEMENTES FRENTE AOS ASPECTOS CONCORRENCIAIS [STRATEGIES OF SEED COMPANIES FACING THE COMPETITION ASPECTS], 2002.

<sup>39</sup> The agreements' analysis was made considering the agreements that are available on the internet and other studies. Most of Embrapa's agreements are not available in full for general consultation, considering its confidential information.

parties cannot disclose, in any hypothesis, the technological invention, improvement or innovation obtained as the result of the agreement. In most of the situations Embrapa will own the intellectual property. In each agreement, one representative of each party is designated to coordinate and supervise the research. It is also estimated a cost and the way in which it will be shared (or completely privately funded). Considering Embrapa is a public corporation, the extract of its agreements<sup>40</sup> are published in the “Official Journal of the Union” and in all cases the disputes are settled by the Judiciary.

It is important to note that according to Ronald J. Gilson, Charles F. Sabel and Robert E. Scott in contracting for innovation, hard and soft terms do not solve problems.<sup>41</sup> While the first is inefficient because of its inflexibility, the latter depends on vague standard that invites subsequent adjustments. Embrapa’s agreements for research use many soft terms that force the parties to negotiate all the time. This can create undesired opportunistic behaviors, for depending very much on good faith.

According to Fuck and Bonacelli, Embrapa entered into its first collaboration agreement with Monsanto in 1997.<sup>42</sup> By that moment, the Brazilian government opted for the GMO technology. Moreover, it chose to defend the substantial equivalent principle, whereby there are no substantive and nutrition differences between conventional and GMO products. Hence, these products are not harmful for the health or environment. This agreement aimed to develop soybeans resistant to glyphosate herbicide that would be registered in Embrapa’s name. The agreement was extended and incorporated in its object the commercial use of the GMO soybean. This agreement was amended in 2000 and 2002.

In the original agreement, dated 1997, Embrapa was obliged to use only the Roundup herbicide. This violates the free competition agreement. Thence, the Brazilian Administrative Council for Economic Defense (hereinfter CADE) interfered in the agreement to require its modification. This adjustment was materialized in 2002. The new wording of the agreement excludes all

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<sup>40</sup> The extract of the agreements comprehends its basic information, i.e. the name of the parties, the object, the amounts involved, and the term.

<sup>41</sup> Gilson, Sabel and Scott, *supra* note 1.

<sup>42</sup> See generally Marcos Paulo Fuck & Maria Beatriz Bonacelli, *A Pesquisa Pública e a Indústria Sementeira nos Segmentos de Soja e Milho Híbrido no Brasil*. [*The Public Research and the Seed Industry in the Soybean and Hybrid Corn Segments in Brazil*], 6 REV. BRAZ. IN. 87 (2007).

references to Roundup, that was substituted for herbicides with glyphosate as its main component. Despite this, the agreement was still valid and among other obligations, it was required for the partners indicated by Embrapa to also sign an agreement with Monsanto to use the cultivar. Afterwards, the seed producers licensed by Embrapa, after signing an agreement with Monsanto, would pay royalties to Embrapa for the use of the cultivar. Monsanto would receive from these seed producers a tax correspondent to the technology use, which is an agreement and not a classical licensing. The tax amount is negotiated between Monsanto and the seed producers. Embrapa and Monsanto continue to be completely independent. Monsanto interest is in receiving the technological tax and the possibility of increasing its herbicide sales. Embrapa, in turn, benefits from accessing RR gene that is Monsanto's propriety. According to Santini and Paulillo this new model benefits Embrapa in obtaining scale and scope economies.<sup>43</sup> Both are important factors to reduce the costs, but the first mainly relates to the increasing investments in R&D, sharing risks and exploring the complementarity of the assets. Scope economy, in turn, is gained when they use the same infrastructure to commercialize and distribute its grains.

In 2006, Embrapa has published a note mentioning that it received BRL 800,000 (about USD 200,000) from Monsanto as one of the results of the research partnership and that it was going to invest in its biotech research fund. More specifically, the agreement states that this amount is going to be invested in accordance to the definitions of a manager committee composed by Embrapa's and Monsanto's representatives. In the occasion, Embrapa also announced the launching of three other conjoint projects with Monsanto: the book "Basis for the Collection of Vegetal Germplasm"; another cooperation agreement to develop cotton with Roundup Ready®Flex technology (also resistant to the glyphosate herbicide), and the result of the project which also

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<sup>43</sup> See generally Giuliana Aparecida Santini & Luiz Fernando Paulillo, *Estratégias Tecnológicas e Aspectos Concorrenciais das Empresas de Sementes de Milho Híbrido e Soja No Brasil. [Technological Strategies and Competitive Aspects of the Hybrid Corn and Soybean Seed Companies in Brazil]*, 32 *INFORMAÇÕES ECONÔMICAS*, no. 10, 2002, at 20.

involved the MAPA that consisted of empowering farmers to produce different cultures.<sup>44</sup>

Despite the apparent success of the collaboration between Embrapa and Monsanto, many parcels of the Brazilian society disapproved it. This can be seen in some of the news of the period. The news informed that more than 1,200 rural workers protested against the collaboration, alleging that it was harmful to the Brazilian economy. They pled that Embrapa was “giving” to Monsanto the technology developed by Embrapa to be transformed in transgenic seeds Roundup’s herbicide resistant. Their dissatisfaction also regarded the fact that the U.S. multinational would have the monopoly of transgenic soybean in Brazil and in the herbicide market. Moreover, they claimed that it is an outrage to the Brazilian technological and food sovereignty. Finally, they were against the commercial planting and consumption of transgenic products while its biosafety conditions were not completely proven.<sup>45</sup> The discontentment was also manifested by the Citizenship and Human Rights Commission of the Legislative, who publicly asked Embrapa to disclose the terms of the agreement with Monsanto, alleging that rather than being concerned with economics they were trying to defend the sustainable social and natural environment.<sup>46</sup> A critical term of the agreement is the non-disclosure term, since it restrains the access to the research results. Some scholars affirm that this clause is harmful to the society, since the disclosure of the results would result in a social benefit.

Embrapa signed the agreement in an unstable scenario since only in 2005 Brazil approved the commercial production of GMO soybeans. In an attempt to solve this matter, Embrapa and Monsanto asked CADE to further analyze their commercial agreement that was celebrated in April 2000. In its opinion, CADE explained the agreement’s objective: commercial use of the GMO soybean developed to tolerate the glyphosate (that is heavily used in

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<sup>44</sup> See Embrapa Media Advisory. *Embrapa e Monsanto Apresentam Resultados de Pesquisa*. [Embrapa and Monsanto Present Research Results], Renorbio. Rede Nordeste de Biotecnologia. EMBRAPA.BR (last visited May 9, 2016).

<sup>45</sup> See MST Brasil, *1200 Trabalhadores Rurais Protestam Contra Contratos com a Monsanto [1200 Rural Workers Protest Against Monsanto Agreements]*, GALIZA (2001), [http://www.galizacig.gal/actualidade/200110/mst\\_brasil\\_1200\\_trabalhadores\\_rurais\\_protestan\\_monsanto.html](http://www.galizacig.gal/actualidade/200110/mst_brasil_1200_trabalhadores_rurais_protestan_monsanto.html), 2001, (last visited May 9, 2016).

<sup>46</sup> See generally Vera Monteiro, *CCDH Pedu Divulgaçãu das Cláusulas do Contrato de Pesquisa Embrapa-Monsanto [CCHR Request the Disclosure of the Terms of Embrapa-Monsanto Research Agreement]*, PORTAL DA AGÊNCIA DE NOTÍCIAS ALRS, Sept. 12, 2001.

herbicide production). The agreement allows Embrapa to develop, produce and commercialize directly or through licensed third parties, GMO soybean cultivars with Monsanto technology that makes the seeds resistant to glyphosate. CADE concluded for the legality of the agreement, considering it is not an exclusivity agreement, meaning that Monsanto can license its technology for other corporations and Embrapa can use technology owned by the competitors.<sup>47</sup> In addition, Embrapa publicly explained the main controversial issues of the agreement. Basing in research, Embrapa proved that Monsanto's technology is in fact efficient. It also explained that Embrapa owns the soybean cultivars that are resistant to glyphosate. Thus, Embrapa was not licensing its germplasm to Monsanto, but Monsanto was licensing its soybean technology to Embrapa. Based on the Federal Statute No. 9.456/1997 and the Directive No. 14/2000, Embrapa owns all the GMO cultivars obtained by Embrapa. Besides, Embrapa decides where, how much and who must produce. It is also stated that the technological tax due to Monsanto cannot be higher than Monsanto's competitors and partners. Embrapa also maintains its soybean enhancement program and has partnerships to provide alternatives to the producers. Finally, it highlighted that the farmers can stock seeds for their own use in a new planting, according to the Federal Statute No. 9.456/1997. However, this possibility has been intensively discussed, since not determining the volume limits the farmers can stock may incentivize an informal market. Fuck and Bonacelli are examples of scholars that vehemently defend this theory.<sup>48</sup>

The idea of Monsanto and Embrapa's agreement is in some aspects similar to Warner-Lambert-Lingand agreement, explained by Gilson, Sabel and Scott.<sup>49</sup> Both aim innovation as a result of a collaboration that is necessary to maintain simultaneously a variety of researches. Its high uncertainty requires a close monitoring. However, in Embrapa's case, the Judiciary solves the eventual conflicts.

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<sup>47</sup> See generally Ricardo Villas Bôas Cueva, Minister of Braz, Ministério da Justiça, Conselho Administrativo de Defesa Econômica (CADE), *Ato de Concentração n. 08012.004808/2000-01* [Concentration Act n. 08012.004808/2000-01], [www.cade.gov.br](http://www.cade.gov.br) (last visited May 9, 2016).

<sup>48</sup> M. P. Fuck & M. B. M. Bonacelli, *As Interações entre os Setores Público e Privado no Lançamento de Novas Cultivares de Soja, Milho e Trigo no Brasil* [The Interactions Between the Public and Private Sectors in the Launch of New Soybean, Corn and Wheat Cultivars in Brazil], ANPAD.ORG.BR, 17- 20 (Oct. 17 - 20, 2006), <http://www.anpad.org.br/admin/pdf/RED567.pdf>.

<sup>49</sup> Gilson, Sabel & Scott, *supra* note 1.

In Goiás State, the most important GMO soybean production is organized under a public-private agreement between Embrapa, Monsanto and CTPA (Technological Center for Agricultural Research), which is a non-profit company created by the private seed production companies. The main purpose of the partnership is to enhance GMO cultivars in the Brazilian *cerrado*. Monsanto detains the soybean GMO's technology that is resistant to the glyphosate herbicide and Embrapa, in turn, keeps the property over the cultivars adapted to the soil and climate conditions of Goiás. According to Moura and Marin,<sup>50</sup> Embrapa and CTPA are responsible for researching to enable the GMO soybean in Goiás (Embrapa licenses its cultivars and CTPA offers financial support and contact the producers).

Another example of a collaboration agreement with the private sector is with BASF, chemical world leader. The collaboration agreement was signed in 2001 with an initial five year term, aiming the development of new technologies that are interesting for both corporations regarding the sustainable growth of the Brazilian agriculture. The agreement follows the idea of open innovation. Both companies can trigger each other when they identify new development opportunities, where the partnership can add value. They are investing together seeking productivity enhancement. For the first two projects, the partnership is focusing on biotech products, but for the future, they aim for genetic enhancement, fertility, soil mechanization, plant protection, and physiology. The largest benefits of the collaboration are experiences and know-how exchange with the possibility of generating new agricultural technologies.<sup>51</sup> Embrapa received BRL 1,000,000 (about USD 250,000) for this partnership until the final product was launched because then BASF would also pay royalties to Embrapa.<sup>52</sup> One of the most important researches conducted by Embrapa in its collaboration with BASF is the development of other type of GMO soybean cultivars resistant to the herbicide that belong to the imidazolinones group.

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<sup>50</sup> See generally de Moura & Marin, *supra* note 36.

<sup>51</sup> See *Embrapa e BASF Anunciam Acordo de Cooperação*. [Embrapa and BASF Announce a Cooperation Agreement], UOL Rural, (June 17, 2011) <http://ruralcentro.com.br/noticias/Embrapa-e-basf-anunciam-acordo-de-cooperacao-42418#y=303>.

<sup>52</sup> See Daily Trading Industry and Services. *Embrapa Reforça as Parcerias Privadas*. [Embrapa Strengthens Private Partnerships] UOL, (2007) [ruralcentro.uol.com.br/noticias/Embrapa-reforca-as-parcerias-privadas-2019](http://ruralcentro.uol.com.br/noticias/Embrapa-reforca-as-parcerias-privadas-2019).

According to De'Carli, in March 2005 Embrapa realized a workshop to discuss its partnerships.<sup>53</sup> It was concluded that Embrapa's operations through partnerships are successful. However, it still must work in new managing proposals for its collaboration agreements, which must be approved by its Board of Directors. The main issue is to improve the definition of each party's obligations with a straightforward approach. Nonetheless, it is believed that under uncertainty, it is impossible to know *ex ante* all the features of the agreement. Moreover, according to Gilson, Sabel and Scott contracting for innovation is a new tool that should use a formal and informal braiding of governance mechanisms to avoid opportunistic behavior, instead of base only in formal structures.<sup>54</sup>

In order to maintain its competitiveness in the agricultural sector, the private sector has adopted Embrapa's similar behavior. It is very open collaboration with universities, research agencies and even other companies, and it uses the main appropriation mechanisms and technological transfer. According to Santini and Paulillo Monsanto is the only company that opts for a vertical integration, maintaining the integration between the chemical and seed areas in its own company for biotechnology development, even when there are several other companies that may offer chemical solutions, like Sygenta, Pioneer (Du Pont), and Dow AgroSciences.<sup>55</sup> General perception is that vertical integration is the most beneficial type of organization. According to Zylbersztajn, this is not true, especially in the agribusiness R&D sector, for its uncertainty.<sup>56</sup> This confirms the idea of Gilson, Sabel and Scott when they state that vertical integration is the wrong answer for uncertain markets. Therefore, there is a historical decrease of its use.<sup>57</sup>

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<sup>53</sup> See generally De'Carli, *supra* note 18.

<sup>54</sup> See Gilson, Sabel & Scott, *supra* note 1.

<sup>55</sup> See generally Santini & Paulillo, *supra* note 43.

<sup>56</sup> Decio Zylbersztajn. *Estruturas de Governança e Coordenação do Agribusiness: Uma Aplicação da Nova Economia das Instituições [Governance Structures and Coordination of Agribusiness: An Application of the New Institutional Economics]* (1995) (dissertation, Universidade de São Paulo, Faculdade de Economia Administração e Contabilidade).

<sup>57</sup> See generally Gilson, Sabel & Scott, *supra* note 1.

## 5. GOVERNANCE

The purpose of governing a relation is to reduce its transactional costs, related to limited rationality and opportunistic behavior. While the first can result in an agreement with gaps, the second carries the risk of benefiting from these gaps. The magnitude of these factors depends on each transaction. In order to choose the most adequate governance standard, it is important to analyze the frequency the transaction takes place, the available assets and the type of uncertainty, according to Williamson, cited in Feltre.<sup>58</sup> Still according to Feltre the frequency is important because the higher the recurrence, the higher the motivation of its agents to not impose losses on its partners.<sup>59</sup> Otherwise, it can result in the termination of the agreement. Uncertainty, in turn, is important because in an environment where it is impossible to know *ex ante* the result of the external impacts, renegotiations are necessary, and consequently, more exposed to opportunistic behaviors. As previously mentioned, the research agreements are a good example of this kind, since the practical and technical results are not known in advance of the celebration of an agreement, being impossible to totally define in the agreement terms. Finally, the available specific assets are important due to the adaptation costs.

According to Sologuren competitiveness problems are not solved based only on the individual choice of a governance model based on collaboration, but also depend on government policies to reduce opportunism and externalities, where the collective rationality is not achieved because of the individual rationality preponderance.<sup>60</sup> However, there are situations that the government can negatively impact through policies or with its high interference.

An agreement is not able to fill all the gaps created by the uncertainty, because of the limited rationality and the informational asymmetry. This

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<sup>58</sup> See generally Cristiane Feltre, *A Diversidade de Mecanismos de Governança na Multiplicação de Sementes de Milho Híbrido e Soja no Brasil* [The Diversity of Governance Mechanisms in the Multiplication of Hybrid Corn and Soybean Seeds in Brazil] (2005) (dissertation, Universidade Federal de São Carlos, Centro de Ciências Exatas e de Tecnologia).

<sup>59</sup> *Id.*

<sup>60</sup> See generally Leonardo Junho Sologuren, *Integração Vertical, Grupos Estratégicos e Competitividade: O Caso do Sistema Agroindustrial da Soja* [Vertical Integration, Strategic Groups and Competitiveness: The Agroindustrial Soybean System] (2004) (dissertation, Universidade Federal de Uberlândia, Instituto de Economia)

results in the need for a combination of agreements and organizational forms. Gilson, Sabel and Scott also express this concept, when they mention, “the higher the level of uncertainty, the more difficult it is for parties to write and Courts to interpret complete state-contingent contracts”.<sup>61</sup> The structure to govern the relation must mix formal and informal tools to foster information exchange. Accordingly, no contract theory offers a general solution.

Sologuren based on Williamson, identify three types of existing agreements. a) classical agreements, which are the most basic ones and must meet the following conditions: the agent’s identity is irrelevant for the transaction, the dimension and nature of the agreement is completely defined, there is no corrective flexibility in the case of non-celebration of the agreement. In this type of instrument, the judicial form of dispute resolution is the most used. b) neoclassical agreements, which are long term agreements celebrated in an uncertain environment. In this type of agreement, the identity of the parties is relevant, in order to assure the relation continuity. There is flexibility in the agreements structure that is negotiated every time there is a need to avoid losing the investments. In this kind of agreements, arbitration is heavily used. c) Relationship agreements that, as defined by Williamson, are kind of “mini societies”, where the description is substituted for the exercise of authority. Based on this classification, Williamson, cited by Sologuren (2004), defines three types of governance: a) Market Governance (classical agreements), where there is no effort to sustain the relationship; b) Trilateral Governance (neoclassical agreements), that is a hybrid form of governance situated between the market and the integration; c) Specific Transaction Governance (relationship agreements), where the transactions risks are high and the possibility of conflicts are expensive and uncertain since there are no standards.<sup>62</sup>

Professor Charles F. Sabel<sup>63</sup> explains that in the governance process, it is important to establish a target, despite not having all the information; a timeline; the milestone to follow the progress and information exchange, so people could talk openly.

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<sup>61</sup> See Ronald J. Gilson et al., *Text and Context: Contract Interpretation as Contract Design*, 100 CORNELL L. REV. 23 (2014).

<sup>62</sup> See Sologuren, *supra* note 60.

<sup>63</sup> *Supra* note 2.

Finally, the most efficient contracting structure must:

- 1) induce efficient transaction-specific investment by both parties;
- 2) establish a framework for iterative collaboration and adjustment of the parties' obligations under conditions of continuing uncertainty – responding, that is, to coordination cascades; and 3)
- limit the risk of opportunism that could undermine the incentive to make relation-specific investments in the first place.<sup>64</sup>

### 5.1. GOVERNANCE IN THE LOCAL SOYBEAN PRODUCTION ARRANGEMENT

Considering Embrapa is still incipient in the use of governance in its agreements for innovation<sup>65</sup>, in this section the governance in the local soybean production arrangement in Santarém and Belterra municipalities is addressed, since it seems to be a more mature type of governance.

According to Williamson, governance is a coordination structure where the participants interact to reduce their transaction costs related with contractual risks.<sup>66</sup> Accordingly, the more efficient the governance, the lower the transaction costs. Also, according to Williamson governance has three specific features: the specificity of the involved assets, the uncertainty and the frequency.<sup>67</sup> The first feature is the most relevant for governance.

Santarém and Belterra have a considerable soybean production headed by Cargill Agrícola S.A that acts as a monopoly in the area.<sup>68</sup> It is the only soybean buyer and supplier of the low Amazon area. This allows Cargill to dictate the rules and norms for the producers. The local producers highly depend on Cargill as a funding partner.<sup>69</sup> Except for the National Program of Family Farming, all the credit comes from Cargill, which anticipates in up until

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<sup>64</sup> See Gilson, Sabel & Scott, *supra* note 1.

<sup>65</sup> Considering Embrapa's documents and contracts that are available on the internet and other studies. Most of Embrapa's agreements are not available in full for general consultation, because of its confidential information.

<sup>66</sup> See generally OLIVER EATON WILLIAMSON, *THE MECHANISMS OF GOVERNANCE* (Oxford University Press ed., 1999).

<sup>67</sup> See Oliver Eaton Williamson, *Comparative Economic Organization: The Analysis of Discrete Structural Alternatives*, 36(2) *ADMIN. SCI. Q.* 269 (1991).

<sup>68</sup> At least until 2003, when the analysis was made.

<sup>69</sup> Considering in this region of Brazil it is common for producers not to get bank loans because they do not have the required documents and due to Brazil's high level of bureaucracy.

40% of the production or providing supplies, through a contract named *Soja Verde* [Green Soybean]. This is Cargill's way to incentivize the producer to keep producing and minimize the producer uncertainties regarding the cost.

The soybean production has visible uncertainties such as incomplete information of all the links of the production, opportunism, necessity of high investments, and the possibility of financial losses. All this happens in a rapidly changing market. This proves that in this market, technology is an important competition element. In the mentioned municipality, other common uncertainties arise such as price (because of the buyer manipulation or domain of information in the spot market) and technology (because of the difficulty to locally access research and information). In this context, the producers' cooperative is essential to minimize the uncertainty and opportunism. Governance is crucial to the creation of cooperatives with the aim of reducing the producers' limited rationality.

In global value chains, it is possible to determine three types of governance, that according to Kaplinsky are the legislative (agreements between the parties, the environmental and labor law and production and quality standards), judicial (the performance and applicability of the legislative rules) and executive (assistance for the chain participants to find operation rules) governance.<sup>70</sup> These forms of governance regulate the economic activity.

As explained by Gilson, Sabel and Scott in the Deere–Stanadyne Agreement, Cargill has a set of rules and norms for the soybean producers integrated in the corporation, being called *Cultivo Responsável* [Conscious Cultivation].<sup>71</sup> Firstly, there is the *Moratória da Soja* [Soybean moratorium], that is the compromise of not commercializing soybean from deforested areas, since July 2006, inside the Amazon biome. In addition, there is a concern with the labor laws, in order to incentivize the regular registration of all workers and avoid the slave work. Hence, similarly to the Deere–Stanadyne agreement, Cargill has a hierarchy relation with the soybean producers and it does not depend on them. Nonetheless, Cargill decides most of the time without the

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<sup>70</sup> See R. KAPLINSKY, SPREADING THE GAINS FROM GLOBALIZATION: WHAT CAN BE LEARNED FROM VALUE CHAIN-ANALYSIS?, Institute of Development Studies, (1985).

<sup>71</sup> Gilson, Sabel & Scott, *supra* note 61.

participation of the cooperatives. Cargill's relation with the soybean producers is also an example of an intersection of contract and regulation.

Cargill rules and norms rise from the concerns in the region regarding the environmentalists and the organized society. These sectors tend to influence the public agencies against the soybean production, due to the potential negative environmental impacts it may produce in a fragile ecosystem. Another challenge for the soybean production is the Sustainable Development Plan BR-163 that aims to harmonize the progress and environmental conservation. In 2003, Cargill had 160 producers, which enabled it to create an organized society to bargain with the competent authorities to develop technologies that increase the productivity and decrease the investments.

Despite importing researches from Mato Grosso, which is considered the most advanced technological research center of Brazil regarding soybean, many of the techniques cannot be employed in such a different biome. In this sense, the lack of specific research for this region increases the producer uncertainty, provoking losses for the sector. This situation corresponds to a governance failure. The local soybean production arrangement in Santarém and Belterra should solve this situation with a governance involving Embrapa, universities, the private sector and the state and municipal governments to foster the activity.

In sum, despite being a source of progress to Pará, the local soybean production arrangement must improve its governance relations. The best way to do it would be involve not only the multinational (private sector), but also to engage the public sector and social organizations.

## **6. CONCLUSION**

The key to success for the Brazilian expansion in the soybean market is the establishment of an articulated research network. Considering that the soybean market in Brazil is a differentiated oligarchy, a collaborative network is necessary to develop technology with efficiency gains, ensuring the competitiveness and overcoming market uncertainties.

In this context, Embrapa celebrates several collaborative contracts with other actors, public and private, mostly based on formal agreements with soft terms that are structured according to the legislation, its directives and its internal policies.

The requirements for a partnership with the public partners are the signing of a technical collaboration agreement and the use of Embrapa's germplasm. Further, both parties must have researchers working in collaboration and have shared infrastructure. The main benefits for both parties are the co-ownership of the possible future intellectual property, the royalties share and the indication of the partner's name in the cultivar. On the other hand, the requirements for a partnership with the private partners are the signing of a technical collaboration agreement, no maintenance of the private partner's own genetic enhancement program and the private partner must perform the technical works described in the annual work plan. The main benefits for both are Embrapa's exclusive license, through royalty's payments to the private partner, to multiply and sell the seeds (in the crossing program ten years, in the line program five years).

Despite being a successful example of a publicly held corporation, Embrapa still must develop its collaboration tools, especially the informal ones, in order to give the institution more flexibility, but at the same time security. The way its contracts are currently structured heavily depends on constant negotiations. This practice results in opportunistic behavior, even when each research collaboration has a managing committee composed of Embrapa's and the collaborator's representatives. Improving the definition of each party's obligations, as desired by Embrapa, will not be useful, since under uncertainty it is impossible to know *ex ante* all the features of the agreement. This confirms the idea that the most successful way of contracting for innovation is through the combination of formal agreements and organizational forms.

The most efficient contracting structure must:

1) induce efficient transaction-specific investment; 2) establish a framework for iterative collaboration and adjustment of the parties' obligations; 3) limit the risk of opportunism.<sup>72</sup>

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<sup>72</sup> See Gilson, Sabel & Scott, *supra* note 1.