

Intellectual Property as a Driver for Innovation in the Agribusiness

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ABSTRACT: Intellectual Property is the way to guarantee the protection of intangible assets derived from human intellect, and these intellectual productions are important for the innovation process. This article aims to relate Intellectual Property as a means of fostering innovation in the agribusiness sector. To this end, a systematic review methodology was adopted, with a qualitative approach, in which publications that were able to relate Intellectual Property and innovation in agribusiness were selected and evaluated. The results show that, corroborated by previous studies, Intellectual Property has the cord to drive the innovation process in agribusiness.

KEYWORDS: Intellectual Property; Innovation; Agribusiness.

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I. INTRODUCTION

This is a study that seeks to identify the relationship between Intellectual Property (IP) and the innovation process in the agribusiness sector. IP acts as an articulator of the innovation process (CARVALHO; SALLES-FILHO; PAULINO, 2007) and represents a stimulus to innovation, as it rewards the innovator, but can also mean a barrier to the dissemination of knowledge (TIGRE; MARQUES, 2009). As for the agribusiness sector, with the new genetic, genomic, transport and information technologies, the need for new forms of intellectual property protection arose, such as the cultivars protection law (BUSCH, 2010).

IP is the set of protection in which the State grants holders the right to exclusive exploitation of their intangible assets, it has three modalities: industrial property, copyright and other sui generis protections, each with its subdivisions (RUSSO; SILVA, 2018; ARAÚJO et al., 2010; HERSCOVICI, 2007; MATIAS-PEREIRA, 2011). To innovate is to put into society new or significantly improved goods and services, whether products, processes, organizational methods, or marketing (OECD, 2005). To achieve the outlined objective of relating IP with the promotion of innovation in agribusiness, the systematic review method was used, which is a planned study of the publications on the themes object of study, as well as a method that uses systematization to identify, select and evaluate the studies (GASPERIN, 2017).

II. THEORETICAL REFERENCE

Intellectual Property

IP is in various sectors of society, directly linked with human relations and social and economic evolution since maps of Rome of the 16th century to contemporary computing devices (KAMP; HUNTER, 2019). The concerns in protecting intangible property, fruit of the human intellect, is present in society for about two centuries (PENROSE, 1951), currently IP is directly related to technologies and obtaining competitive advantages in the global market (MATIAS-PEREIRA, 2011). IP is a genus that includes some species and subspecies (Table 1).

Table 1. Intellectual Property System (IPS)

Intellectual Property			
Industrial Property		Copyright	Sui Generis Protection
Patent	Invention	Right Author	Integrated Circuit Topography
	Utility model		
Register	Brands	Related Rights	Cultivars
	Industrial design	Computer programs	Traditional knowledge
Geographical	Indication of source		

Indication	Designation of origin		
Industrial secrets and reprehension of unfair competition			

Source: Araújo *et. al.* (2010) The SPI with its modalities each of these divided and submodality, according to Russo and Silva (2018) and Araújo *et. al.* (2010)

Law No. 9,272/1997 regulates industrial property and aims to "grant rights to promote creativity by the protection, dissemination and industrial application of its results, considering its social interest and the technological development of the country" (RUSSO; SILVA, 2018, p. 96). The copyright comprises the works of writers, artists and composers, the Related Rights are the reproductions, interpretations, linkages of creations or recordings and computer programs - the software (ARAUJO *et. al.*, 2010). These rights are regulated in general by Law No. 9610/1998, but the computer programs have a specific law, Law No. 9609/1998 - the software law.

Innovation

The Oslo Manual states that to innovate is to make available to society new or significantly improved products, services, processes, and organizational structure (OECD, 2005), which needs constant updating to keep up with the historical context and social progress (PORTELA, *et. al.*, 2020). Innovation is related to the performance of organizations and their ability to compete, to do IP management and growth (MATIAS-PEREIRA, 2011). For Oliveira, Mota and Barbalho (2013) innovation is a process resulting from the exchange of experiences and knowledge that generate new products, practices or services, being, therefore, in a constant cycle of ideas, creations and improvements (PÁDUA FILHO, 2016).

Innovation has as essential elements IP and the ability to transform knowledge and economic asset, with emphasis on the management of public policies in IP and technological innovation centers in university centers (MATIAS-PEREIRA 2013). In this context, technological innovation stands out, a modality that aims at the production, application and distribution of technology-based products and services in various sectors (WOLFGANG, 2015, p. 13, *apud* LIMA, 2020), which is directly related to the so-called open innovation (CHESBROUGH, 2003). The open innovation mode explains how companies can rely on external technologies to enhance their internal innovation development or how they can leverage external partners to exploit internally developed technologies (HOLGERSSON; GRANSTRAND; BOGERS, 2018).

Brazil has a legal innovation framework with constitutional status and a general innovation law, law no. 10,973/2004, which adopted the triple helix innovation model (ETZKOWITZ, 2008), in which there is cooperation between the state, universities, and society at large.

Agribusiness

Brazilian agribusiness influences the national economy to the extent that it contributes to the satisfactory results of the trade balance, generates industrial development in the field, creates jobs, provides development, and produces food (ZANANDREA *et al.*, 2018). Between the years 1998 and 2017 agribusiness became strategic for Brazil, significantly raising the competitive advantage and making the country one of the most competitive internationally (RODRIGUES; MARTA-COSTA, 2021).

The insertion of novelties or improvements in the agribusiness sector is related to the production, distribution, storage and processing of supplies that meet the needs of consumers, it is called agroinnovation (PIMENTA, 2010). Barbieri and Santos (2020) point out that ecoinnovation, taken as sustainable innovation, is important for the development of management business model and investment in capacity products, process and structure of organizations in the agribusiness sector.

The intellectual property protection works as an articulating mechanism between the actors of the innovation process and technological development, whether public or private agents, as exemplified by the interaction between IPR, the protection of cultivars and the innovation process (CARVALHO; SALLES-FILHO; PAULINO, 2007). Sá (2014) points out that intellectual property violations, specifically in relation to seeds, entail economic risks for agribusiness and food security. Regarding the intellectual property protection of cultivars, for example, in the *sui generis* modality, Brazil has a well consolidated information network in the sector, since the Ministry of Agriculture and Livestock and Supply releases many publications on this subject (PIMENTA *et. al.*, 2016).

Studies related to intellectual property and agribusiness are present in several areas of knowledge, such as: the cultivation of microalgae in Brazil as an alternative for clean production associated with agribusiness in a study that took into account the patent database of the World Intellectual Property Organization and the National Institute of Industrial Property (ANDRADE; TELLES; CASTRO, 2020); and the development of technological innovations aimed at sustainability, export expansion and increased income in the field (MACEDO, 2009). These are examples of the diversity of studies in the agribusiness sector. However, studies suggest that the development of an intellectual property model that is able to stimulate the sharing of knowledge, of the open

innovation modality, is necessary to leverage the development in the agribusiness sector (MEDEIROS et al., 2016).

III. METODOLOGY

This is a bibliographic research, of secondary sources, conducted based on available sources, such as printed documents, scientific articles, books, theses, dissertations (LAKATOS; MARCONI, 2019) and its "main advantage is the fact that it allows the researcher to cover a much wider range of phenomena than he could research directly" (GIL, 2018, p.28). Data was collected by searching for publications in the form of scientific articles, dissertations, theses, and books in the platforms available in the Periodical Portal of the Coordination for the Improvement of Higher Level Personnel (CAPES), in the bases Scopus, Web of Science, SPELL, and Scielo, in the years from 2016 to 2020. The criteria and indexers used in the searches in the bases were as follows (Table 2):

Table 2. Criteria, parameters and indexers used for the searches in the four databases,

Basis	Criteria					Filters
	1 st parameter	Conjunction	2 nd parameter	Conjunction	3 rd parameter	
Scopus and Web of Science	Property intellectual OR innovation	AND	Agribusiness OR Agroindustry OR Agriculture	AND	Quantitative	Open access scientific articles with the words in the Title, Abstract or Keywords
SPELL and Scielo	Property intellectual OR innovation	AND	Agribusiness OR Agroindustry OR Agriculture	AND	Quantitative	Open access scientific articles with the words in the Abstract

Source: prepared by the authors.

From the results of these searches, the data were analyzed qualitatively, in order to identify, select and evaluate the primary studies adding their results and transforming information into knowledge, it also allows to explain the differences in the results of primary studies dealing with the same object (RIERA; ABREU; CICONELLI, 2006). Mulrow and Oxman (2004) establish seven steps to make a systematic review, two phases will be used - for being more appropriate to the research objectives: a) Critical appraisal of the studies: stage of determining the validity of the selected studies, defining which ones can proceed to the next step; and b) Analysis and presentation of the data: at this stage it is expected the grouping of studies according to the similarity of the data.

Initially, the systematic review was used more frequently in health-related research, however, it is currently present in many other areas, such as innovation capacity (VALLADARES; VASCONCELLOS; SERIO, 2014), in scientific production in managerial learning (BOTELHO; MACEDO; FIALHO, 2010), in Marketing and cooperativism (COUTINHO; CARDOSO, 2019), among others. The criteria for the systematic review comprise three steps (Table 3).

Table 3. Methodological steps

Steps	Criterion	Objective
1 ^a	Reading of abstracts and keywords	Select publications that meet some of the study objectives and have some statistical data
2 ^a	Reading of the objective and theoretical framework	Identify the articles that relate the topics under study
3 ^a	Analysis of results and final considerations	To detail the results and identify in them which ones provide possible data to relate IP with innovation in agribusiness, such as quantitative method, sample, correlation coefficient, among others.

Source: elaborated by the authors.

IV. RESULTS AND DISCUSSIONS

The searches resulted in a total of 76 publications that met the established criteria (Table 2); however, because four search bases were used, it was identified that 23 articles were repeated in two or more databases. Thus, we are left with 53 (Figure 1) articles to be systematically reviewed. Of this total, there are only 03 articles related to IP, while 50 deal with innovation. It is noteworthy that this quantity, which may seem small,

but in fact is not, because the set of criteria and indexers used in the searches limits the findings, since all publications must have a quantitative approach.

This highlights the need for more publications that relate IP using quantitative methodology in the agribusiness sector, which also shows a significant limitation of the research

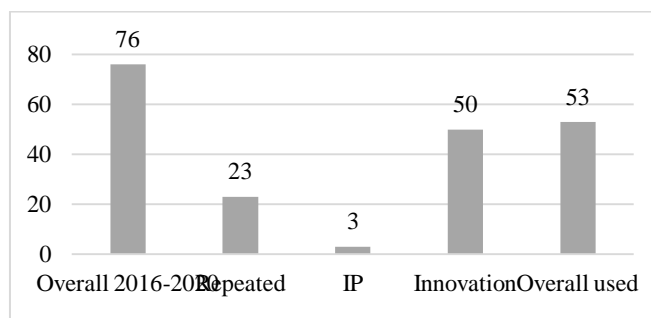


Figure 1: Details of the search results in Scielo, SPELL, Web of Science and Scopus.

Of the 53 articles obtained in the searches, a systematic review was performed using the established criteria (Table 3). In the first stage, of a more superficial character, considering the abstracts and keywords and aiming to locate sufficient statistical data to correlate the themes under study, IP and innovation, it resulted that 48 publications show some type of relationship between in which IP provides conditions for providing innovation in the agribusiness sector, the other 05 publications, although they have a quantitative approach, it is not possible to affirm this fact. This result is in accordance with other studies that point out that IP works as a stimulus to innovation, because it ensures protection and rewards innovators in their creation process (TIGRE; MARQUES, 2009).

In the second stage, a little more in-depth and based on the 48 articles selected in the first stage, it systematically reviews the objects of each study and their theoretical references. As a result, we have that, of the 48 articles, 39 meet the criteria (Table 3), that is, relate IP with innovation in the agribusiness sector. This shows that not only in a superficial analysis, but when increasing the criteria and analyzing the publications more deeply, IP remains fostering innovation in the sector being studied. Herscovici (2012), corroborating this result, states that if there is no IP system that is able to protect intangible assets, the production of innovation and productivity is harmed.

The results of the third, and last stage of the systematic review, as more elaborate and in-depth approach and analysis criteria, focused on understanding the results and final considerations of each finding, shows that, of the 39 findings of the second stage, 24 articles have statistical elements, correlation indexes such as Sample(n), Standard Deviation, Standard Error, t-test, Significance, Pearson's Coefficient (r), ANOVA, Chi-square (χ^2), Cronbach's Alpha (α) and R^2 . These elements show, through the objective figures, that there is a correlation between IP and innovation in agribusiness, that is, IP is able to provide innovation in this economic sector.

These results, whether in a more superficial analysis or with mathematical criteria, show that IP has the ability to foster innovation in agribusiness. This is in accordance with studies that IP evidentially boosts and commercialization of assets in agribusiness, this because it is observed a significant increase in application for protection through patents in Europe, China and the United States (MAT JALALUDDIN; OTHMAN; HARIKRISHNA, 2019).

V. CONCLUSION

The object of this article was to relate IP with innovation in agribusiness, so as to know if it has the capacity to foster innovation in this sector. To this end, a systematic review was used - with a qualitative approach - in which it sought publications - all of them quantitative - in databases that were capable of meeting the proposed objective.

After the analyses, it is possible to affirm that the proposed objective was reached, that is, it is not only possible to identify that there is a direct relationship between IP and the innovation process in agribusiness, but also the nature of this relationship, that is, IP fosters innovation in the agribusiness sector. This conclusion is observed when the analysis is superficial and is confirmed as it is deepened, including with the presence of elements of statistics.

This study presents some limitations. The first is the small number of findings involving IP alone with the quantitative approach, only 03 publications, while innovation was found 50. The second is the time lapse,

the study covered the last five years, from 2016 to 2020. And finally, the restrictions to a specific sector of the economy, agribusiness. As a proposal for future work, it is suggested that more research should be done using a quantitative approach, that the research should increase the time span, and that other economic sectors should be analyzed.

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