



Original Article

# Enforceable and unenforceable laws in agribusiness systems

## *Leis que Pegam e leis que não Pegam em Sistemas Agroindustriais*

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### Abstract

The statement that there are laws that are simply “unenforceable” is quite common in Brazil. This study aims to analyze how incentives contribute to the enforcement of formal rules. The laws chosen in this study are: land use and conservation law and agrochemicals law, focused on the storage and return of containers. The theoretical framework is based on transaction and measurement costs, and property rights. Five propositions were developed for this study related to the incentives for the enforcement of formal rules, namely: the alignment of the formal rule with the social norms; the influence of private interest; the influence of the State’s interest; monitoring costs; and adoption costs to formal norms. For the empirical part, we opted for the multiple case study method, contemplated by analyses of descriptive statistics. It is worth noting that a cut out was made in relation to the agricultural crops and regions selected. The results support four of the five propositions of this study. The exception was due to the effect of the cost to adopt the rule. It was concluded that rules addressing assets of common ownership are characterized by a more complex enforcement mechanism, since it does not involve a purely economic issue. Actions that raise the awareness on these rules and the awareness regarding the scope of the subject are important so that the social rules, which do not change rapidly, can be in line with the formal rule, thus promoting its enforcement.

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**Keywords:** Law enforcement; Unenforceable law; Agribusiness rules

### Resumo

É comum a afirmação de que existem leis que “não pegam”. No presente estudo foi feita uma análise acerca dos incentivos que contribuem para o cumprimento das normas formais. As leis escolhidas foram: a lei de uso e conservação do solo, e a lei dos agrotóxicos, com ênfase no armazenamento e retorno das embalagens. Como base teórica custos de transação e mensuração, e direitos de propriedade são utilizados. Foram fundamentadas cinco proposições de trabalho, que consideram os incentivos ao cumprimento das normas formais, a saber: alinhamento da norma formal às normas sociais; a influência do interesse privado; a influência do interesse do Estado; custos de monitoramento; e custos de adesão às normas. Para a parte empírica optou-se pelo método de estudo de casos, contemplados por análises de estatísticas descritivas. Destaca-se que foi feito um recorte com relação às culturas agrícolas e regiões selecionadas. Os resultados dão suporte a quatro das cinco proposições de trabalho. A exceção ficou por conta do efeito do custo de adesão à norma. Concluiu-se que normas que tratam dos bens de propriedade coletiva se caracterizam por um mecanismo de cumprimento mais complexo, já que não se trata de uma questão puramente econômica. Ações que promovam o conhecimento de tais normas e a conscientização da amplitude do tema são importantes para que as normas sociais, que não se modificam rapidamente, estejam alinhadas à norma formal promovendo o seu cumprimento.

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**Palavras-chave:** Cumprimento da lei; Lei que não pega; Normas no agronegócio

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## Introduction

The Brazilian environmental legislation is one of the most advanced in protecting the environment. However, its enforcement represents a challenge. According to Lunardi (2011, p. 67), “the mismatch between the elaboration and implementation of laws and the official policies in the Brazilian state have proved to be a major problem [...]”. Freitas (2008), in turn, emphasizes that in terms of environmental laws Brazil has one of the most advanced legislations in the world. What is necessary, in fact, is to enforce them. Starting from this point and observing the agribusiness systems (SAGs), it is noted that legal and regulatory issues have always had relevance for dealing with activities that involve food safety, sustainable management, preservation and recovery of the environment. In this sense, the present work focuses on the legal subject that deals with the environment and agriculture.

Following this notion, the objective of this study is to *analyze how incentives influence the enforcement of positive norms in agribusiness systems*. This way, it discusses propositions which present evidence and translate the different types of incentives for enforcement of the chosen laws in the scope of agribusiness systems. These incentives are divided into: alignment of the formal rule with social norms, interest of the State and private agents, costs to comply with the formal rule and the coercive effort of the State. The focus of this study and its innovative effort is to identify the incentives to enforce the rule *ex ante*, that is, before reaching the judiciary. Within the universe of legal rules relating to the agribusiness systems, we selected environmental legal rules. This choice is explained by the importance of the environment, as a subject, and the growth of its strictness as of the 90s.<sup>1</sup> By analyzing the activities related to agribusiness systems, it is possible to note that they are based on natural resources or environmental assets.<sup>2</sup>

The balance between the preservation of environmental conditions and agricultural development is an issue of great importance. In 1981, Romeiro and Abrantes postulated that the accelerated modernization of the sector, through the intensive use of supplies and equipment, encouraged by the official policy, had a negative impact on the environment. They also mentioned that, in terms of productivity, these changes indicated no significant results at that time (Romeiro & Abrantes, 1981). While the productivity mentioned by the authors has since made significant progress, the other aspect that they highlight still lacks, however, effective improvement. It is a challenge for which the environmental legislation tries to establish the guidelines, in the form of rules, but that faces problems in the implementation phase.

<sup>1</sup> The study does not address the Forest Code because it is in the implementation phase.

<sup>2</sup> According to the Brazilian Law, environmental assets are those of general public interest, essential for the maintenance of the environmental quality. Thus, it overrides the public or private legal nature that an asset may have (Direito ambiental, 2002). The holders or owners of the environmental asset shall be at the same time the government and civil society. Thus, there is the possibility of having a private asset of general public interest and public asset of general public interest (Direito ambiental, 2002).

From a theoretical point of view, this work falls in the scope of the New Institutional Economics (NIE). Within the NIE there are studies that focus on the subject of enforcement, among which the works of Rubin (2005), Libecap (2005) and North (1990, 1992) stand out. In this logic, a non-positive norm can become a positive norm depending on the incentives and interests involved, much in the same way a positive norm can be adopted in order to modify habits and customs.

It is reasonable to assume that institutions do not always evolve in an efficient manner (Zylbersztajn & Sztajn, 2005). Williamson (1996) addresses intentionally inefficient institutions by stating that, in many cases, these intentional failures are motivated by the capture of value from groups organized in society. Organizational failures arise when the organizational structure implemented is less efficient than the best feasible structure. Thus, there is an intentional inefficiency, inefficient by design, as the author classifies it. In addition, North (p. 05, 1992) states that “institutions and the way they evolve shape economic performance. Together with the technology employed, they determine the cost of transacting and producing.” Based on this guidance, the regulatory environment in which agents are inserted has to be considered to avoid the risk of misleading or inaccurate conclusions (Zylbersztajn & Sztajn, *op. cit.*).

Ronald Coase, in the article *The problem of social cost* (1960), highlights the third-party effects that occurs in exercising the right to perform certain actions. According to the author, the rights of use production factors may be limited by the institutional rules or may be negotiated privately. In this way the exercise of the right to use a production factor may generate cost to the other party (externality<sup>3</sup>). In this logic, considering the transaction costs, the reallocation of rights will occur when the increase in the social value generated is greater than the costs incurred to implement it. Thus, the initial delimitation of the legal rights influences market efficiency (Coase, 1960). Public regulation, as it stands, does not operate cost-free and it not always increases the efficiency of social arrangement (Coase, 1960). The State through governmental action can also seek to correct negative externalities caused by the incorrect or imperfect definition of property rights (Rubin, 2005). It is in this field that we find the laws of environmental preservation and of natural resources, the focus of this study. The purpose of such rules is to control externalities and allocate property rights.

Transaction costs, which are related to the costs of transfer, capture and protection of property rights (Barzel, 1997), or, from the perspective of Arrow (1969), represent the costs of making the economic system work, are presented as a central item in the analysis of the state regulation’s impact on economic activity, as well as on the efficiency of the social arrangement. Alston and Mueller (2005) define property rights as a set of formal and informal rights regarding the use and transfer of resources. They determine the incentives for using the resources. Alchian (1977) states that the rights of individuals to use the resources in a given

<sup>3</sup> According to Milgrom and Roberts (1992), externalities are positive or negative effects that the actions of an economic agent have on the welfare of others, and which are not regulated by the price system.

society are built and supported by the power of social customs and the State's power of punishment.

Eggertsson (1990), in turn, distinguishes three categories of property rights. The first is defined as the rights to use a good, including the right to physically transform or even destroy it. Occasional restrictions that limit the set of permitted uses will affect the economic value of the good. The second refers to the right to obtain income over the asset and on the contract with other individuals. The third is the right to transfer the property rights of the asset to other parties, that is, the right to dispose of or sell an asset. It is understood that property rights are almost always restricted and partitioned in some way, for example, through rules governing fishing seasons and fishing equipment or the sale of drugs (Eggertsson, 1990). Therefore it is desirable that a legal system determine the property rights, that is, it is important that the parties are able to unequivocally determine who is the owner of the asset and what this set of property rights implies (Rubin, 2005). From this brief thematic and theoretical contextualization we present the study propositions. They refer to the incentives to enforce positive rules. Following, the rules of the empirical part are detailed. They are three formal rules belonging to two environmental laws. After this, the article presents a description of the method, the analysis of the data collected and, finally the conclusion.

### The propositions of study

#### *Proposition 01: alignment of the formal rule with social rules*

The first proposition presented is that laws that have low acceptance are formal rules that come into total or partial confrontation with informal, socially accepted rules. Ellickson (1991) states that social rules represent a spontaneous order, that is, voluntary agreements in the absence of coercion. However, this spontaneous order does not mean no rules. De Soto (2003) states that the compatibility between social rules and codified laws ensures that the law is followed by most citizens. When a formal law does not fit in to extralegal conventions, the parties affected by such law will react and reject it, according to the author. From an economic standpoint, a state-sponsored system of legal rules that ignores habits and customs incurs high transaction costs compared to a system of formal rules deriving from the community itself (Buscaglia & Ratliff, 2000).

According to Buscaglia and Ratliff (2000), when the informal rules are captured by the formal legislation, the law will promote efficiency. Laws that seek to impose and implement standards of behavior unrelated to the local reality tend to increase the attrition, thus generating transaction costs, according to the authors. However, it should be noted that the "corrective rules"<sup>4</sup> have their role in Law and in the construction of codes to society.

<sup>4</sup> The corrective rule is related to situations where there is a market failure or anomaly. Thus, the market balance is not Pareto-optimal (Arida, 2005). It is in this situation that the corrective rules are applied, that is, rules able to correct the distortions found. An example of this case is given by externalities.

#### *Propositions 02 and 03: the influence of private interest and the State's interest*

The second proposition is: *The higher the private interest of the parties affected by the formal rule, the greater the possibility of its enforcement.* Private interest addresses the interest of groups of influence, which may be unions, associations, professional associations, among others, the so called organizational environment.<sup>5</sup> Therefore, it is necessary to know the distributive impacts of the legal rule on individuals or groups of influence who may incur losses with the adoption of laws, even if socially desirable. The adversely affected groups may block the adoption of proposed advances (Acemoglu & Robinson, 2006) or, conversely, contribute to the adoption of laws that generate value for the group. Since government restrictions on the economic activity may give rise to revenues, it is necessary to consider the competition to obtain them (revenues), which interferes with the effectiveness of the laws (Krueger, 1974). The author explains the social inefficiencies of the actions to achieve revenues by organized groups.

The third proposition is related to the State's interest and can be defined as follows: *the higher the interest manifested by the State for the legal rule, the greater the possibility of enforcement.* Manifested interest, in this case, is understood as mechanisms that demonstrate the State's interest in the subject in question. Thus, both legislators and judges can contribute to the inefficiency of a certain law. In addition, it is necessary to understand that laws are formulated, approved and enacted through government entities, that is, it is the governments that supply the formal institutions (Alston, 1996). Therefore, government actors often have the power to change or modify the rules regardless of their constituents, in addition to considering that the State is the only agent that has police power, that is, government agents, who supply the institutions and make up the state, often have greater power and means for a particular rule of interest to be approved and actually implemented.

#### *Propositions 04 and 05: costs incurred to adopt the rule and costs to monitoring the adoption of formal rule*

Proposition 04 is related to the costs incurred to monitor the adoption of the laws, and can be expressed as: *the higher the cost of monitoring the formal rule, the lower its level of enforcement.* According to Barzel (1997), a good is constituted by a finite and potentially large set of attributes that allow variability. In a transaction, it may be prohibitive for the State to protect all the attributes that make it up. Thus, despite the knowledge of damages to public goods (common goods), it is not always interesting to face the problem fully, since many resources may be necessary in comparison to the benefits achieved

<sup>5</sup> The organizational environment is responsible for the provision of public and collective goods, whose supply is subject to the action of the State or private interest organizations (Pereira, Souza & Cário, 2009). This environment is characterized by structures developed to support the operation of the SAGs, including companies, universities, cooperatives and associations of producers, research institutes, etc. (Zylbersztajn, 2005).

(Libecap, 2005). In this way, often the transaction costs for defining and enforcing restrictions may be prohibitive for the State.

From the perspective of Barzel (2001), measurement costs are at the origin of transaction costs. Specifically, the author highlights the importance of measuring the information costs in the analysis of institutions. For the author, the transaction process implies exchange of information, which has costs to be measured or externalized, so the level of difficulty in measuring such information will determine the type of relationship that exists. It is possible to extend this logic to the relationship between the State (supervising agents) acting as an entity of control and the economic agents affected by the laws. Thus, the lower the level of difficulty of measuring the attributes involved, the greater the incentive for the State agents to put in practice the norm, and also the incentive of economic agents to comply with the norm at stake. Following this logic, as the costs to obtain information regarding the breach of the rule increase, the smaller the incentive for its enforcement.

Proposition 05 is related to the costs affecting the economic agents, defined as: *The higher the cost to comply with the formal rule by the economic agents, the lower its level of enforcement.* This proposition is related to the transaction and monetary costs incurred to comply with certain law. For a farmer to comply with the law, it may be necessary to modify its production model, thus incurring costs, direct and administrative costs. In the presence of positive costs, the incentive to comply with a certain law/rule falls. Often, there are levels of compliance or levels of enforcement of the law (which consists of several rules). Thus, it is possible that the farmer complies with a certain rule that makes up the law but not others. Therefore, there are levels of compliance with the laws.

## Rules studied

### *The agrochemicals law: the storage and return of containers*

Brazil is the largest consumer of pesticides in the world (Agência Nacional de Vigilância Sanitária – ANVISA, 2012). According to IBGE's Report "Indicators of Sustainable Development" 6.9 kilos of pesticides per hectare of planted area were commercialized in 2012 (IBGE, 2015). This fact is reflecting in large part of its history, the extension of cultivation areas, besides its agricultural "vocation." And the interest of the industry in Brazil is explained: between the years 1977 and 2006 the consumption expanded by an average of 10% a year, and since 1970 the country has been among the six largest consumers in the world (Terra, 2008). The storage and the disposal of the containers is regulated by Federal Law No. 7.802, July 11, 1989, as subsequently amended by Law No. 9.974 of June 6, 2000 and regulated by Decree No. 4.074/02, No. 5.549/05, No. 5.981/06 and No. 6.913/09.<sup>6</sup> The Law of 1989 addresses the regulation of

the survey, production, packaging and labeling, transportation and storage, commercialization, advertising, use, import and export, disposal of waste and packaging, registration, classification, control, inspection and inspection control of pesticides, their components and the like (Brazil, 1989). The Law of 2000 included the disposal of containers, assigning to the manufacturer the responsibility for the disposal of the product after its consumption, in addition to sharing the duties between resellers, farmers and the State. Thus, the State was geared toward assigning to the manufacturers the responsibility of controlling the life cycle of the products offered by them (Boldrin et al., 2007).

In response to this understanding of the law, manufacturers created the National Institute for Processing Empty Containers (INPEV) in 2001, which is responsible for the transportation and disposal of empty containers for recycling or incineration, in addition to carrying out educational and awareness campaigns together with other members of the system (INPEV, 2012). According to the 2011 Sustainability Report conducted by INPEV, 34,202 tons of empty containers of pesticides were processed, a figure that represents 94% of all plastic containers placed on the market and 80% of the total volume of containers sold. This information reflects the development of a coordination in the process of return of empty containers, which was mainly coordinated by the manufacturers responsible for the disposal. INPEV has 421 receiving units (307 stations and 114 centers) throughout the country, in addition to conducting itinerant receiving initiatives. This modality represents 10% of the amount of returned containers (INPEV, 2012).

Worth mentioning also are the main responsibilities assigned by the law to each agent in the production system. *Farmers* are responsible for the triple wash of the containers and returning them to the places indicated in the invoice. The storage follows the manufacturer's instructions and the current legislation (Brazil, 2002) in an exclusive, covered, ventilated place with waterproof floors. *Merchants* are responsible for receiving the empty containers from the users and provide adequate facilities for receiving and storing the empty containers until they are collected by the companies responsible for the disposal of the containers. *Manufacturers* are required to use appropriate labels and leaflets containing instructions regarding the procedures of use and disposal, and provide proper containers in order to prevent leaks, evaporation, loss or change of the content, to facilitate washing, sorting and recycling, and collect the empty containers in the receiving units, and provide them the adequate disposal. Thus, the non-fulfillment of the obligations of each agent may cause administrative, civil and criminal penalties, in accordance with the legislation on environmental crimes.

Depending on the severity of the irregularities, as judged by the inspectors, the penalties may be light, a warning notice with a deadline to correct the founded irregularities, but also can be serious. In these cases there is an enforceable judgment and the offender faces environmental crime charges. There is a fine provided in a state law (São Paulo state), but its application is unconstitutional due to federal decree No. 4.074, of 2002. This

<sup>6</sup> The State of São Paulo relies on laws No. 4002/84 and No. 5.032/86 regulated by Decree No. 44.038/99 that address pesticides.

study chose the rules<sup>7</sup> for storage on farms and correct disposal of empty containers by farmers as a target of empirical research.

#### *Land use and conservation: erosion*

“The erosion of agricultural land has been characterized as a problem caused by agriculture both from the perspective of environmental effects and from the problems caused to agricultural production itself” (Marques & Pazzianotto, 2004). It is estimated that 616.5 million tons of soil are lost on an annual basis as a result of erosion (Dechen, Telles, Guimarães & De Maria, 2015). Approximately 80% of the area occupied by any agricultural activity in São Paulo has a certain degree of erosion (Coordenadoria de Assistência Técnica Integral [CATI], 2013).

The Federal Law No. 6.225 of July 14, 1975, regulated by Decree No. 77.775 of June 8, 1976 provides for the mandatory implementation of land protection plans and to combat erosion. This law states that the applications for funding shall be granted only if accompanied by a certificate that provides such implementation (Brazil, 1975). In addition to this federal law, the state of São Paulo has the State Law No. 6.171 of July 4, 1988, as amended by Laws No. 8.421 of November 23, 1993, and No. 11.970 of June 30, 2005 that provide for the use, conservation and preservation of agricultural land.<sup>8</sup>

The law of 1988 considers agricultural land as a heritage of humanity, leaving its users with the obligation to preserve it – Art. 1 (São Paulo, 1988). Thus, everyone who exploits agricultural land is obliged to, among other things, pursuant to Article 2 of Decree No. 41.719/97: ensure the proper use and conservation of water in all its forms; control soil erosion in all its forms; prevent processes of desertification; prevent the deforestation of areas unsuitable for agriculture, forestry and pastoral exploitation and promote possible permanent vegetation in these areas, when deforested; and recover, maintain and improve the physical, chemical and biological characteristics of the agricultural land (São Paulo, 1997).

The non-compliance with the state laws by the users of agricultural land may lead to fines (ranging from 20 to 1000 Fiscal Units of the State of São Paulo – UFESP<sup>9</sup>), payment of services rendered by the State to promote the recovery of the areas in process of desertification and degradation, and publication in the Official Gazette of the names of the owners and their properties. However, the violator may submit, alternatively to a defense, a commitment to develop a project containing the determination of the classes of land use capacity of the determined area and a plan for the definition of the technology used for agricultural land conservation to the Coordination of Agricultural Defense – CDA (Agency responsible for enforcing this law),

formally undertaking to implement it within the deadline. By choosing to develop the project, the application of the penalty remains suspended up to the end of the deadline specified for the implementation of the technical conservation project and, if duly fulfilled, the notice of infraction is canceled (São Paulo, 1997). Thus, the rules related to the combat and control of erosion set out in the state law of 1988 were applied in the empirical phase of this study. See below a table related to CDA’s activities over the years.

According to the data, it can be seen that the inspection activity increased up to 2004, decreased in the following years, and started increasing again in 2008. In the following years there was an oscillation in this tendency of growth and in recent years it is possible to notice a decrease in the number of inspections. Regarding the number of notices of infraction, there was growth until 2003, following the growth in the number of inspections that declined from 2004 to 2008. Since 2009, although there has been a general decline in inspections (compared to previous years), it can be noted that the number of notices of infraction had a tendency for growth only to fall down again in recent years.

Moreover, the larger the area inspected, the higher the number of damaged areas detected. These represent approximately 10–20% of the number of total inspected area until 2008, except for the years 2000, 2004, 2007 and 2008, in which this percentage represented, respectively, 2.7%, 24%, 7.3% and 8.6%. Between 2009 and 2012 there was an increase in the proportion of damaged areas, compared to the total inspected, of over 20%. However, in the following years the percentage returned to between 10% and 20% of the total inspected, according to Table 1. In this sense, CDA has been able to increase efficiency in its work over the years. This can be verified by the percentages of damaged areas and the total area inspected over the years, and also by the data indicating that even with the decrease in the number of inspections there was an increase in the number of notices of infraction, even if in percentage terms.

The agrochemicals law imputes obligations and rights to all agents integrating the SAG and imposes incentives for the development of coordinated actions between the links of the chain so that they comply with their obligations. The land use and conservation law assigns the obligations exclusively to farmers, and does not determine the involvement of any other segment of the chain to share the responsibilities regarding the enforcement of the rules. It can be seen that the incentives for the enforcement of positive regulations, especially in the environmental area, are sufficiently complex, given their characteristic of regulating the use of common goods (Rubin, 2005).

#### **Methodological procedures**

The method chosen was a multiple case study, accompanied by descriptive statistics and correlation analysis (Pearson’s correlation). The choice of cases is intentional, and contemplates two levels of compliance with the rules. The laws chosen were the Agrochemicals Law (Law No. 7802/089 and Law No. 9974/00), focused on the rules for the storage at farms and rules for the return of empty pesticide containers, and the State Law for the Use and Conservation of Agricultural Land (Law No.

<sup>7</sup> The legal rules (formal rules/positive rules) are created by a legislative channel that we call law, expressed in words, properly ordered, which take the form of an article, paragraph, item or section (Schmieguel, 2010). Therefore, law is a set of formal rules.

<sup>8</sup> These laws are regulated by the following State Decrees: Decree No. 41.719 of April 16, 1997; Decree No. 42.056 of August 6, 1997; Decree No. 44.884 of May 11, 2000; Decree No. 45.273 of October 6, 2000.

<sup>9</sup> A UFESP unit corresponds to R\$ 23.55 in the year 2016.

Table 1  
Summary of inspections carried out between 1999 and 2015.

Year	Inspections	Total inspected area (ha)	Area with damage (ha)	Area with damage/fiscalized (%)	Notice of infactions
1999	10	200	20	10	10
2000	34	1825	50	2.7	34
2001	956	35,412	4110	11.6	93
2002	1296	104,816	19,397	18.5	378
2003	1203	100,214	17,289	17.3	482
2004	1841	71,242	17,066	24	411
2005	1677	34,155	5202	15.2	301
2006	1228	8639	939	10.9	57
2007	1094	14,636	1062	7.3	72
2008	1529	11,502	993	8.6	73
2009	942	10,747	4091	38.1	160
2010	1834	52,359	18,311	35	373
2011	1208	34,023	11,308	33.2	223
2012	959	40,036	9685	24.2	257
2013	651	48,656	7015	14.4	328
2014	803	44,337	8247	18.6	261
2015	644	28,873	3525	12.2	148

Source: Internal data of CDA.

6171/88, Law No. 8421/93 and Law No. 11970/05), focused on rules to prevent and control the erosion of agricultural land. The rule for the return of empty pesticide containers present high adherence, while the norms of storage and use and conservation of land have lower adherence.

The research was divided into two phases: the first phase identified the formal rules that are addressed. Two semi-structured interviews were conducted with the supervisory body of the laws of interest, in this case the Coordination of Agricultural Defense of São Paulo – CDA. Each interview was made with the person responsible for each law of interest. We elected the sugarcane production and cattle farming activities as the target of the second phase of the research. The choice of sugarcane is justified because it is a crop with intensive use of agrochemicals and also for offering adequate land coverage, with possibility to, if properly managed, prevent erosion. As for cattle farms, they were chosen because they adopt a technology that is less intensive on agrochemicals and also because they indicate a lower protection of the soil.

Therefore, in the first phase, we outlined the formal rules under study and the crops on which the second phase was based. We selected five regions of sugarcane cultivation and cattle farms,<sup>10</sup> in the State of São Paulo, based on the latest Census of Agriculture of the State of São Paulo – LUPA Project 2007/2008 and data from IBGE (2013). The regions chosen were: Andradina, Araçatuba, Presidente Prudente, Ribeirão Preto, and São José do Rio Preto. The second phase of the research was to identify, from the perspective of the farmers, the costs and incentives for the compliance with the rules and the enforcement mechanisms. The information was collected via

<sup>10</sup> For data from IBGE (Brazilian Institute of Geography and Statistics), for sugarcane crops, we took into account the planted area in hectares by region. As for cattle farming, the effective number of cattle (heads) by region was adopted as criterion, together with data from the 2007/2008 LUPA Project (Census Survey of Agricultural Production Units in the State of São Paulo).

questionnaires,<sup>11</sup> seeking to address the research propositions described above, especially the first, fourth and fifth propositions. We asked assertive questions based on which the farmers would indicate the level of agreement for each one of the rules, on a scale of zero to five (zero being disagreement, five strong agreement). **Chart 01** shows the correspondence between the statements and the propositions, and **Chart 02** shows the questions for the identification of the compliance with the rules.

To obtain additional information about all the propositions studied we conducted semi-structured interviews<sup>12</sup> with the five regional offices of CDA. The purpose was to have access to the inspection procedures and regional characteristics, such as: type of soil; relief; profile of the typical farmer; level of adoption of technology, etc. We also surveyed the support structures that monitor law enforcement.

Thus, the second phase included five interviews with representatives of the inspection body in the regions – Regional Offices of CDA, and a total of 38 questionnaires applied to sugarcane producers and/or cattle farmers in the regions under study. Of this total, 07 questionnaires were applied in the Andradina region; 10 in the Araçatuba region; 06 in the region of Presidente Prudente; 07 questionnaires in the São José do Rio Preto region; and 08 in the region of Ribeirão Preto. It should be noted that the sample is non-probabilistic. It is an intentional sample based on the indication of typical producers and agronomists from the

<sup>11</sup> It is worth noting that for the application of the questionnaires we chose one municipality in each one of the regions studied. The choice of these five cities followed the suggestion of regional offices. Thus, for conducting the in loco application of the questionnaires to producers, we initially made a telephone call to each one of the Agricultural Houses in the municipalities selected. Based on that, we scheduled a day for the researcher to visit the Agricultural Houses to apply the questionnaires to the producers who were there and met the established criteria (being a sugarcane producer and/or cattle farmer).

<sup>12</sup> It is worth noting that all interviews with the inspection body, at the headquarters and regional offices, were made in person. The only exception was for the regional of São José do Rio Preto, in which the interview was answered via email, due to the impossibility to schedule a personal interview.

## Chart 01

Correspondence between the research propositions and the assertive questions of the questionnaire.

	Propositions	Logic used
Monetary cost	05: cost of compliance with the formal rule by farmers	Production costs
Bureaucratic cost	05: cost of compliance with the formal rule by farmers	Transaction costs
Amount of time spent	05: cost of compliance with the formal rule by farmers	Transaction costs
Difficulty in adapting the method used previously	01: formal rule versus informal rules	Compatibility between formal rule (positive) and informal rules (habits and customs)
Intensity of inspection	04: Cost incurred by the State to monitor the rule	Transaction costs/measurement costs
Difficulty in conducting the inspection	04: Cost incurred by the State to monitor the rule	Transaction costs/measurement costs

Source: Authors.

## Chart 02

Questions to identify the compliance with the rules.

Rules	Requirements of the rule <sup>a</sup>	Identification of compliance – questions
Land conservation	<ul style="list-style-type: none"> <li>• Apply conservation techniques when working with the land;</li> <li>• Prevent/control erosion processes;</li> <li>• Recover, maintain or improve soil conditions.</li> </ul>	<p>How is the land of the agricultural property?            What are the land conservation practices that the farmer performs?            Do you use grid or plow? In which situations?            Is there any point of erosion on the property?</p>
Storage of pesticides	<ul style="list-style-type: none"> <li>• Exclusive for pesticides;</li> <li>• Covered place, masonry construction;</li> <li>• Waterproof floor.</li> </ul>	How is the pesticide storage facility?
Return of empty containers	<ul style="list-style-type: none"> <li>• Triple wash (when necessary) of containers;</li> <li>• Return the containers at the place indicated in the Invoice.</li> </ul>	<p>Are the empty containers used for any purpose, or are they unusable?            Where are the empty containers returned to?            How far is the property from the place of return of empty containers?</p>

<sup>a</sup> Some requirements of the rules were chosen under consideration that they could indicate, through the application of questionnaires, the compliance or not with the rule in question.

Source: Authors.

farm houses visited. After these steps, the information collected was tabulated in order to allow its analysis.

## Presentation of results

### Profile of respondents

Most of the rural producers interviewed are aged between 46 and 55 years old, representing 42% of the sample, and have completed primary education, also representing 42%. Most respondents (45%) have more than 30 years of experience in the activity. We noted that 17 (45%) are cattle farmers (cattle breeding of meat and/or milk) only; 16 (42%) are sugarcane producers; and 05 (13%) are cattle farmers, but have lands that are leased for sugarcane.<sup>13</sup> In relation to cattle farmers, corn stood out as an alternative crop. For sugarcane producers, soybeans stood out more often. It was observed that 37 of the 38 respondents are owners of the property in which they work, with only one partner. Among the 37 owners, eight are also tenants. Half of the respondents (18) have another source of income. Most

respondents (47%) have an area under cultivation<sup>14</sup> of between 51 and 200 hectares; 29% have areas smaller than 50 hectares and 24% have areas exceeding 200 hectares. With regard to the characteristics of the land of farmers, 81.6% – 31 of the 38 respondents – have a source of water (spring, river, stream, dam) available. Most have rough terrain in specific areas, usually near the water source: 26 (68.4%) producers checked this option; 10 (26.3%) stated that their lands are virtually flat; and only two (5.3%) have rough terrain.

### Land use and conservation

With respect to soil conservation practices, the most widely used technique was the use of contour line, followed by the pasture renewal practice. The third practice was crop rotation and the fourth, green manure. The use of built-in terrace<sup>15</sup> appeared in six answers; the use of direct planting appeared in four answers, all sugarcane producers that make crop rotation with soybeans. The least frequent practice was the use of

<sup>13</sup> There was also a single sugarcane producer who was also a cattle farmer. However, we decided to include him in this category.

<sup>14</sup> It includes: own areas and leased areas in which the producers work.

<sup>15</sup> The use the built-in terrace was not among the options in the questionnaire. The answers were spontaneous.

irrigation.<sup>16</sup> Nine producers among the 38 respondents stated that they have points of erosion on their properties and three of them said that the point of erosion is in the leased area. Among the nine producers in question, two stated that the erosions on their properties are old; three said that they were recent erosions, because of the rains; one said that it was a gully; and three said that the erosion was dry. Regarding the costs to adopt the rules, the respondents indicated, on a scale of zero to five, the level of costs to apply the practices that prevent erosion.

With respect to the *monetary cost*, the average of the answers was the index of 2.8 with coefficient of variation of 42.2%. The *bureaucratic cost*, which sought to, along with the amount of time spent, capture the transaction cost, obtained an average of 1.8 with a coefficient of 82.4% for the entire sample, a wide variation. *The amount of time spent* indicated an average of 2.6 with a coefficient of variation of 39.4%. With respect to the *difficulty of adapting the previous practices to the current practices*, the average of the sample was 2.5, with a coefficient of variation of 57.5%. As for the *intensity of inspection*, the average was 1.6, with coefficient of variation of 69.3%. With regard to the *difficulty for the inspection body do conduct its work* in the opinion of producers, the average was 2.0, with coefficient of variation of 71%. In all of the above items there was no statistical difference<sup>17</sup> between the averages of sugarcane producers and cattle farmers. In addition, a correlation matrix<sup>18</sup> between the variables associated with propositions 01, 04 and 05 (Chart 01) and the variable representing the compliance (or not) with the rules studied (obtained through the questions in Chart 02) was made. For this norm there was no significant correlation<sup>19</sup> between the variables representing the propositions and the dependent variable.

### Storage of pesticides

Most producers interviewed are irregular in this practice. Only three farmers (all from Ribeirão Preto region and sugarcane producers), of a total of 36 respondents (for this rule), are regular, that is, the place of storage is exclusive, covered, with waterproof floor and masonry. Thirteen respondents answered options that categorize them as partially irregular, because the place of storage is not exclusive to pesticides, although they meet the other requirements. Seven producers have a covered facility for the storage, but the site does not have waterproof floor and the construction is not made of masonry. Six respondents answered that there is no facility previously determined for the storage of pesticides. The other producers have a covered facility but the construction is not made of masonry and/or the floor is not waterproof.

Next, the respondents indicated the adoption costs to rules, on a scale of zero to five, for the storage of pesticides. Regarding

the *monetary cost*, the average of answers was 1.7 with a coefficient of variation of 62.5. The *bureaucratic cost* had an average of 1.5 with a coefficient of 92.3% for the entire sample, a wide variation. *The amount of time spent* indicated an average of 1.1 with a coefficient of variation of 63.2%. With respect to the *difficulty of adapting the previous practices to the current practices*, the average of the sample was 2.2, with a coefficient of variation of 67.2%. As for the *intensity of inspection*, the average was 1.3, with coefficient of variation of 71.7%. With regard to the *difficulty for the inspection body do conduct its work* in the opinion of producers, the average was 1.8, with coefficient of variation 72.3%. Statistically, in all of the above items, there was no statistical difference between the averages of sugarcane producers and cattle farmers. For this norm, the correlation matrix also did not present significant indices between the variables associated with the work propositions and the variable that represents the compliance (or not) of storage rules in the farm.

### Return of pesticide containers

The vast majority of producers return the containers, at the retailers or at the receiving units, or they wait for the itinerant collections. Out of the 36 respondents, in relation to the Agrochemicals Law, one respondent uses pesticides, but has not yet returned the containers. Another respondent, a cattle farmer, stated that he uses a low amount of pesticide and has always incinerated the containers. With regard to the use of empty containers, among the 34 producers who return them, two answered that they use part of the empty containers. Thus, out of a total of 35 respondents to this rule, three are not in accordance with the law. One because he burns the containers instead of returning them and the other two because they use part of the empty containers for other purposes instead of returning them. With regard to the costs to adopt the practice, the respondents indicated, on a scale of zero to five, the level of costs to return the empty containers. With respect to the *monetary cost*, the average of the answers was 1.4 with coefficient of variation of 81.8%. For the sugarcane producers, the average obtained was 1.8 and for cattle farmers the average was lower (0.9). The *bureaucratic cost* obtained an index of 1.5 with a coefficient of variation of 91.4% for the entire sample, a wide variation. For sugarcane producers, the average was 2.1 and for cattle farmers the average was lower (1.0).

*Amount of time spent* indicated an average of 1.4 with a coefficient of variation of 69.2%. With respect to the *difficulty of adapting the previous practices to the current practices*, the average of the sample was 2.6, with a coefficient of variation of 57.2%. Statistically, in the two items above there was no evidence that the average of sugarcane producers may be different from the average of cattle farmers. As for the *intensity of inspection* the average was 1.3 with coefficient of variation of 71.6%. With regard to the *difficulty for the inspection body do conduct its work* in the opinion of producers, the average was 1.6, with coefficient of variation 67.7%. Statistically, there was also no evidence that the average of sugarcane producers may be different from the average of cattle farmers in the last two items. Finally, when the rural producers were asked about the benefits

<sup>16</sup> This, too, was a spontaneous response.

<sup>17</sup> Statistical calculations of differences in the average values were all made considering 90% confidence.

<sup>18</sup> SPSS Statistics Software version 19 was used.

<sup>19</sup> Significant correlation: at the 0.01 or 0.05 level.

Chart 03

Presentation of the incentive indexes for the three rules.

		Erosion	Storage	Return of containers
Monetary cost	Average	2.8	1.7	1.4
	C. variation*	42.2%	62.5%	81.8%
Bureaucratic cost	Average	1.8	1.5	1.5
	C. variation*	82.4%	92.3%	91.4%
Time spent	Average	2.6	1.1	1.4
	C. variation*	39.4%	63.2%	69.2%
Difficulty in adapting the method used previously	Average	2.5	2.2	2.6
	C. variation*	57.5%	67.2%	57.2%
Intensity of inspection	Average	1.6	1.3	1.3
	C. variation*	69.3%	71.7%	71.6%
Difficulty in conducting the inspection	Average	2.0	1.8	1.6
	C. variation*	71%	72.3%	67.7%

\* Coefficient of variation.

Source: Authors.

of performing the storage and disposal of pesticide containers, only two of the 32 producers answered access to credit facilities, in addition to preserving the environment. In addition, it was noted that the issue of risk to health was not mentioned in any of the answers.

With regard to the analysis correlation of this rule a significant correlation of the variable associated with compliance with the norm and the variables “*time spent*” with a value  $-0.376$  at level 0.05, and “*difficulty of adaptation*” with a value  $-0.433$  at level 0.01. From these results a logistic regression was performed between the variable associated with compliance with the norm (dependent) and the explanatory variables.<sup>20</sup> However, none of the coefficients presented statistical significance, considering 95% confidence.

## Analysis

Based on the theory, we present three types of incentives: one from the design of the rule (proposition 01); another related to the interests of the various actors in the rules (propositions 02 and 03); and the last one related to the costs of these actors to fulfill the rules (propositions 04 and 05). From the perspective of the first type of incentive, it was noted that the three rules were in conflict with the practices of farmers (social norms) which, according to the theory, increases the cost of adoption. However, there was a change in the behavior of producers in relation to the three rules of study, as it can be seen by the rate indexes in [Chart 03](#) (all above 2.0). These results present evidence that supports the proposition in question. Society began to pay greater attention to the issue of environment preservation, causing producers to reflect on their practices. Thus these are corrective norms, as categorized by [Arida \(2005\)](#). They are norms that have the objective of modifying or adjusting a pattern of behavior that entails negative externalities, the so-called social costs.

By analyzing the design of the rules, it can be seen that the land conservation rule indicates the resource of adjustment of

conduct. It generates a positive incentive for the compliance with the practice, exempting the irregular farmer from punitive resources. Although there are initial costs to adjust the conduct, the farmer will soon see benefits in terms of crop productivity. As for the storage rule, we have not identified clear incentives for changing the habits in the design of the rule. The farmers do not see benefits in incurring costs to adapt the storage facility, in addition to the fact that there is no penalty fine for violations of the agrochemicals law. This coupled with the scarce inspection contributes to the maintenance of irregularities, at their various degrees. In the latter case, the index that refers to the change of habit was 2.2. It is an important index, in the sense that there was a change of habits toward the principles of the formal rule. However, its high index of non-compliance, considering all degrees (compliance with three basic requirements of the rule) indicates that it is necessary to outline other incentives, or that there should be more effective incentives, contemplating the various profiles of rural producers.

Finally, the rule for the return of containers determines that the manufacturers are the agents responsible for the final disposal. This configuration allows for the costs of adopting this rule to be distributed between all members of the chain. It is the manufacturer who has greater power of coordination, due to, among other factors, the fact that they are more concentrated, in addition to being the segment that has more information about the product in question. Thus, the State is able to “optimize” its inspection efforts and the manufacturers are encouraged to coordinate the change presenting practical mechanisms to the farmers so that the reverse flow occurs.

This configuration of the rule for the return of containers leads to *proposition 02* (private interest in formal rules) of this study, which also indicated evidence for its acceptance. The main information that provided basis for the analysis of this proposition was obtained through the interviews conducted at the CDA units (at headquarters and in the regional ones). It is only in the agrochemicals law that there is the presence of private entities representing the sector, in particular the industry, which coordinates the reverse logistics, also bringing to the farmers information to raise awareness about the need and importance of the disposal. This is the rule with the highest degree of compliance. In contrast, the rule for storage indicated the highest rate of non-compliance. This particular rule depends and is of interest only to farmers. We have not identified actions carried out by private representation organizations. As for the law for land use and conservation, it was found that the involvement of the private sector is also absent. However, in the case of sugarcane, the mills showed interest in their suppliers maintaining high levels of productivity. Therefore, the mills provide technical assistance and finance inputs to suppliers. In this sense, the degree of adoption of technology among sugarcane producers is higher in comparison with cattle farmers, who have no support from other agents of this agribusiness system or representation entities, as evidenced by the interviews in regional offices. Thus, it can be seen that private interest is a relevant factor to the understanding of incentives for the compliance with the rules.

<sup>20</sup> The method adopted was the Forward Stepwise (Likelihood Ratio).

As for the *third proposition*, with regard to the State's interest in the rule, we noted indicative elements which confirm the proposition in question. The main information that provided basis for the analysis of this proposition was obtained through the interviews conducted at the CDA units (at headquarters and in the regional ones). Regarding the agrochemicals law, on the part of federal agencies, there is a structured program called PNCRC (National Plan for the Control of Residues and Contaminants), which includes the CDA with a sanitary education program. In addition, as it can be seen, the inspection of the agrochemicals law is a routine activity in most regional offices interviewed. A situation that does not occur with the land use and conservation law, which is inspected by the offices interviewed mainly through complaints, although the degree of importance of the erosion problem in all surveyed regions is deemed high, ranged from seven to eight on a scale of zero to ten. The only exception was the Ribeirão Preto region (two on the scale), in which the interviewee stated that there are specific and localized problems. It is worth noting that most offices (four of the five interviewed) pointed out that one of the main sources of problems related to erosion does not lie in agriculture, but in the construction and maintenance of the road system (highways and rural roads). Those responsible for monitoring the conditions of the roads are the public agencies (DER – Department of Highways) and, when it involves rural roads, it is the responsibility of the municipalities.

Another information, though in the opposite direction, was the issuance, by the CDA, of an ordinance in 2012 requiring that sugarcane plants request a certificate attesting the compliance with the legislation adopted in São Paulo for the use, conservation and preservation of soil. This ordinance was issued considering that CETESB (Environmental Company of the State of São Paulo) started requiring from the plants the regularity of their own agricultural properties and of their suppliers with regard to the provisions set out in this law. Thus, the ordinance of CDA demonstrates an attempt by the government agencies to promote the coordination of sugarcane agribusiness system agents so that the law is enforced. Therefore, in this case (land law), there is a misalignment of efforts between the public agencies. Resuming the agrochemicals law, there is a contrast between the rules studied (the most and the least enforced). What may explain this disparity, although this law is of interest to three Ministries (Agriculture, Environment and Health), is the active participation of private agents in one of them (return of containers), with the creation of reverse logistics mechanisms, and the lack of interest of these agents in the rule for the storage at a farm. In this context, it can be seen that the State's interest is a factor to be considered in the understanding of incentives although it is clear that its efforts are often scattered and therefore see interference from many actors. This fact often gets in the way of the interest manifested by its actions, and they fail to reach the desired extent.

With regard to analysis of costs, from both State and rural producers, we have the last two propositions. For *proposition 04*, regarding the cost incurred to monitor the formal rule, there is evidence for the non-rejection. The main information that integrates the analysis of this proposition was obtained through the

interviews done in the units of the CDA. With respect to the two laws (and the three rules), it is possible to note that these rules for the State to conduct the monitoring (measurement) of irregularities are expensive. Enforcing them demands a considerable number of personnel, in addition to the training they must undergo to properly identify the irregularities. We noticed that, in most regionals, for both laws, the respondents stated that they require more inspectors (usually double the current number) for a better inspection. The only exception was for the land law in the Ribeirão Preto region, in which the respondent stated that the degree of importance of the problem of erosion is low.

Also, it can be seen that between the two laws, the land law indicates higher information costs. For the agrochemicals law through the inspection of retailers it is possible to obtain evidence of producers who consume more pesticides, therefore the relevant producers for the inspection of the law. With regard to the land use and conservation law there is no "source" that provides evidence of places with major problems, thus hindering the access to relevant information. Therefore, if the incentive to comply with the rules relied solely on the State's monitoring capacity, all three rules would indicate a high rate of non-compliance. The low figures (all below 2.0, as shown in [Chart 03](#)) for the three rules regarding the perception of rural producers on the intensity of inspection reinforces that idea.

Regarding the proposition related to the costs incurred by producers – *proposition 05*, there is evidence of its rejection. As shown in [Chart 03](#), the rule with the highest degree of non-compliance, the storage rule, was not the one with the highest average regarding the monetary cost and amount of time spent. Regarding the bureaucratic cost,<sup>21</sup> statistically there was no evidence that the average of the three rules is different. With respect to the two first-mentioned costs, the rule with the highest average was land law in both cases. The high degree of compliance despite its high costs can be explained by the fact that the producer sees benefits that outweigh the costs incurred with its compliance (example: improvement in land quality) – benefits that the producers are unable to notice if they invest in an adequate facility for the storage of pesticides. Although the rates for *proposition 05* have indicated its rejection, it is necessary to highlight its relevance in addressing incentives for the compliance with rules that seek to reduce externalities, but not in isolation, considering the other types of incentives.

## Conclusion

As noted above, the three rules can be considered corrective rules (Arida, 2005). By permitting adjustment of conduct (in the agrochemicals law only in less severe cases) before punitive action is taken they promote the option of correcting the problem. When considering again the producers' responses to the three rules on the "difficulty of adapting the previous practices to the current practices," it is noted that these are average indices, indicating that the laws have achieved some success in

<sup>21</sup> "Bureaucratic cost" and "amount of time spent" sought to raise the transaction costs.

their intention to correct habits that generated social costs. However, it was observed that one of the rules, regarding storage, has a very high index of non-compliance by the farmers. The explanation is in the fact that farmers do not see benefits in improving their facility, only costs. Considering this fact together with the high costs of monitoring the law, by the inspection body, which result in a low level of inspection intensity, besides the lack of interest on the part of organizational (private) agents, makes the non-conformity index high in this case. The other rule of agrochemicals law, the return of empty containers, conversely, is followed by the majority of the farmers interviewed. One explanation for the high adherence may be the fact that the law imposes a need for coordination among the agents of agribusiness system and assigns the final destination of the packaging to the manufacturer. Thus, there is “pressure” among the members of the chain for the law to be enforced. Combining this with the fact that it is not a costly rule to the producer encourages compliance with it.

With respect to the last rule, in order to avoid erosion, nine of the 38 interviewees stated that they have erosion points in the areas that they work with. For this norm, it should be noted that there is no clear rule, but many that contribute to prevent erosion and vary from context to context (soil type, climatic conditions, among others). It is a law which, for farmers, is often difficult to understand. This is justified by analyzing the responses in the regional offices about the bad habits to the law that still persist. The answer in all the interviews was the superficial view that the farmers have about what is land conservation, as well as the insistence of many of them not to resort to technical assistance routinely. However, this rule was in the middle position. One explanation is that farmers believe that they are doing what is necessary for land conservation, although they may often not be doing their best.

Given the results and the analysis, it can be seen that norms that aim at the public good and/or the reduction of externalities are rules that have a more complex “mechanism” of enforcement, since they involve heterogeneous actors, besides the fact that they are of interest to every citizen who makes up society, are rules of diffuse interest. This is not a purely economic issue, that is, costs are not the main factor, although they are rather relevant. A more accurate look at the problem and its possible solutions is necessary, taking into account the characteristics of the actors involved (Libecap, 2005). According to the author, it is necessary to impose some limits on individual behavior that best translate the expanded notion of the common good, benefits and social costs. If this does not happen, only private calculations of net benefits will govern resource use decisions. In addition, Libecap (2005) notes the need for clear legal definitions of property rights with the increasing number and heterogeneity of the parties involved.

Thus, it is noted that it is necessary that rules that seek to legislate the environmental theme promote educational actions and knowledge to the agents of interest consistently. Practices, old habits do not change rapidly, so this is a phase of great importance for the rule to be understood and voluntarily complied with by the target agents. The corrective logic (and not punitive, at first) of the rules studied is a signaling in this sense. In addition,

norms that deal with environmental issues must contemplate the entire production chain (agribusiness system) so that each link has its attributions and rights. Particularly in agribusiness systems there is great dependence among the actors, therefore, actions that contemplate this logic of dependence between the segments are necessary.

Finally, with regard to the conception of this work, it is necessary to point out that no studies were found that address the incentives to comply with formal rules related to the theme of “unenforceable” laws. The importance of this study lies in the fact that it has searched for evidence that better explain the phenomenon on which it has focused.

## Conflicts of interest

The authors declare no conflicts of interest.

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