



Biodiesel and social inclusion: An analysis of institutional pressures between biodiesel plants and family farmers in southern Brazil

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ABSTRACT

The objective of this study is to identify, through motivating, inhibiting and facilitating factors, responses to institutional pressures on the relationship between biodiesel plants and family farming cooperatives via the Social Fuel Seal (SFS) in the South region of Brazil. This region is characterized by well-endowed family farming cooperatives. This paper adopts as theoretical lens the institutional theory. It is based on case studies involving qualitative research drawing results from four biodiesel plants with SFS certification and eight family farming cooperatives. The results indicate that the institutional biodiesel framework influenced the SFS-based relationships. This coercion mechanism led the plants to comply with the promotion of family farming via cooperatives. The plants seek legal legitimacy and opt to accept institutional pressures, primarily due to the guaranteed sale of all biodiesel produced via government sponsored auctions. Cooperatives are attracted by the receipt of the social bonus, seen as a prime motivating factor, which can be interpreted as an informal coercive pressure. Considering the context in which the plants and cooperatives are inserted, the SFS promoted changes in the sale of raw materials. It was also found that cooperatives facilitating factors are inversely related with plants inhibiting factors.

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1. Introduction

Biofuel production and consumption have expanded in recent decades, as a result of public policies to encourage diversification of the energy matrix, within the green economy paradigm (Alves et al., 2017). The challenge of the Green Energy Economy (GEE) is to reconcile environmental and socioeconomic aspects, in the search for energy matrices with a larger content of renewable energy. Efforts have been made to produce and use biofuels such as ethanol and biodiesel to either replace or supplement gasoline and diesel fuel (Khanna et al., 2016).

With respect to biodiesel in Brazil, the federal government launched the National Program for Production and Use of Biodiesel

(PNPB) in 2005, which established rules, tax incentives and subsidies for its production and consumption on a commercial scale to favor socioeconomic aspects, such as inclusion of family farming and diversification of oily raw materials (Brasil, 2005).

Brazil is one of first countries to include social sustainability in its national biodiesel promotion policy, through a certification system called the Social Fuel Seal (SFS) including family farming into the biodiesel supply chain. Through contracts, biodiesel plants purchase oily raw materials from family farmers and provide technical support. The benefits to the plants are lower federal taxes and the legal right to commercialize all the biodiesel produced, via ANP biodiesel auctions. The establishment of family farming cooperatives is encouraged within the institutional rules of the SFS, to foster the interorganizational relationship between plants and family farmers (Brasil, 2014).

The potential role of family farming cooperatives within the institutional sphere of the SFS is very important, since it enables a diversity of agreements in the relationships between large buyers and small suppliers, who adjust to each other in terms of prices,

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technology sharing, capital, products and services (Cardoso et al., 2017). In Brazil, agricultural cooperatives receive special attention from the government, to encourage the development of small farmers, boost production, promote technological development and improve economies of scale (Stattman and Mol, 2014).

Most studies on the SFS focus on regions with de-capitalized family farming and little or no technological structure, in addition to low-scale production, such as the Northeast and North regions of Brazil (Alves et al., 2017). The geographic focus of this study is the South region of Brazil, since besides having the largest number of family farmers operating within the SFS compared to Brazil's other regions, its farmers are also leaders in technology, cooperative organization and large-scale production (Goulart and Zilber, 2016).

The aim of the present article is to identify, through examining the motivating, inhibiting and facilitating factors, responses to institutional pressures on the relationship between biodiesel plants and family farming cooperatives via the SFS in southern Brazil, which is characterized by a large number of family farming technologically well-endowed cooperatives.

Understanding these institutional pressures and how these relationships occur allows inferences about how the relationships are structured (Raucci et al., 2015; Vega and Keenan, 2016). As an institutional agent, the government creates institutional pressures that impact organizations, via legislation, regulations, temporary measures and programs, using sanctions or incentives to ensure company adherence. Organizations do not voluntarily accept becoming subordinate to government policies; they do so with the purpose of gaining the attention and approval of authorized agents to ensure that they achieve their objectives (Chen et al., 2014).

Biodiesel plants and cooperatives adhere to the SFS to fit into their environment, through institutional isomorphism, seeking social adequacy and institutional legitimacy. Social pressures can explain many of the reasons why organizations are not proactive agents of institutionalization; however, those pressures do not inhibit inter-organizational relationships (Alam, 2016).

The institutional framework provides a level of analysis that enables an understanding of the structural formation of the environment and ways to solve specific problems. Organizations respond to institutional pressures according to: their internal capacities; reasons for those pressures; who exerts the pressures; the types of pressures; and how pressures are exerted (Oliver, 1990; DiMaggio and Powell, 1983).

This paper is divided into six sections, including this one. The second section contains the theoretical framework in relation to the pressures of the institutional approach, an institutional and marketing panorama of the Brazilian biodiesel program, as well as the institutional dynamics of the SFS. The third section features the methodological aspects. The fourth section outlines the research results, with an analysis of the motivating, inhibiting and facilitating factors of the relationships, through the institutional pressures of the SFS in the region studied. Last, the fifth section presents the final considerations of this paper and the sixth section presents its conclusions.

2. Literature review

2.1. Institutional pressures

The central idea of Institutional Theory provides explanations for a large number of phenomena, especially those affected by the environment-organization relationship. The institutional environment generates sources of pressure that influence the structure and behavior of organizations, through norms, legal pressures and regulatory forces of the state and market (DiMaggio and Powell, 1983). Therefore, organizations need to adapt to their

environment, through isomorphism (Liu et al., 2010). Isomorphism is related to the set of actions and behaviors that help modify organizational characteristics, to make them compatible with the characteristics of the environment, and it may be competitive or institutional (Wong and Boon-itt, 2008).

Competitive isomorphism is generally observed in freely competitive environments, where organizations experience pressure from the market and relationships of exchange, and must alter their niches or adapt to this environment, to stay competitive. In institutional isomorphism, influences and pressures are exerted by the institutions that compose the environment. This causes organizations to pursue social adaptation and institutional legitimacy, becoming similar to one another (DiMaggio and Powell, 1983; Hemmert et al., 2016). The present paper focuses on institutional isomorphism, since it entails a social program with rules imposed by the government, where companies seek to adapt socioeconomically to institutional norms.

Regarding socioeconomic adaptation to institutional isomorphism, the question is whether it is more feasible for organizations to adjust to what is institutionalized or to resist institutional pressures and act according to their individual interests. This research seeks to understand the responses of organizations and the synchrony or reaction in the responses of agents from the supply chain in relation to the institutional environment. Social pressures may explain many of the conditions under which organizations do not conform as proactive agents of institutionalization, but which do not intend to abandon the relationship (Alam et al., 2016).

DiMaggio and Powell (1983) mention three types of mechanisms in relation to institutional isomorphism: coercive, mimetic and normative. Coercive isomorphism involves formal and informal pressures exerted on organizations by other organizations on which they are dependent, and by the expectations of society. These pressures can be felt as force, persuasion or invitations to join together in collusion (Meyer and Rowan, 1977).

Wong and Boon-itt (2008) note the profound impact of a complex and rationalized system of contractual laws that require the necessary organizational controls for honoring legal commitments, such as fiscal years, and annual and financial reports, that ensure the eligibility of contracts. This paper shows through empirical data how organizations seek through the social system via government rules to remain in the market by way of various institutional pressures, particularly coercive isomorphism.

Mimetic isomorphism occurs within industry groups to maintain legitimacy, by imitating successful strategies and minimizing the risk of being the first in a new market. The more uncertain the relationship between means and ends, the greater the extent to which an organization will change after organizations are perceived as successful (Liu et al., 2010).

The third form of pressure is normative isomorphism, in which normative forces arise from the professionalization of organizations, characterized as a movement to define the conditions and methods of their work, establishing greater legitimacy for their occupation. Professionalism is interpreted as the collective struggle of members of an occupation to define the conditions of their work, control production and establish a cognitive basis and legitimacy for occupational autonomy (DiMaggio and Powell, 1983).

Normative and coercive pressures promote better environmental performance in organizations, whereas the existence of mimetic pressure improves economic performance (Castka and Balzarova, 2008). Moreover, they argue that organizations adopt a social responsibility agenda for strategic, altruistic and coercive reasons, but only if implementation costs can be offset by perceived benefits.

To understand the different institutional pressures and their

impacts, it is necessary to know the parties that exert coercive pressures – governments and regulatory agencies – as well as how these pressures are exerted; in addition to the parties that receive the pressures – companies that are purchasers and suppliers. Five factors define the nature of institutional pressure (Oliver, 1990): cause of the pressure; the institution that exerts the pressure; content of the pressure; form of control of the pressure; and context of the pressure. Cause is related to the rational expectations or desires that support the pressure, which may be social or economic in nature (Meehan et al., 2016).

Constituent refers to the institutional agents that exert pressures, and may be represented by the state, professional associations, interest groups or society in general (Scott and Meyer, 1994). Content refers to the necessary requirements for the organization to be legitimized in the organizational field in the definition of its response to pressures. Therefore, harmony between organizational and institutional issues is important so that the resistance of the organization is mitigated (Meehan et al., 2016).

The control exerted on organizations directs actions in two ways: via legal coercion or voluntary dissemination. Government laws impose legal coercion to impose their interests. Organizations tend to lower their resistance the stronger the power of the institutional agent and the more dispersed and supported the pressures are, as occurs when the government is the constituent (Scott and Meyer, 1994). Norms adopted voluntarily tend to be easily accepted and disseminated among organizations.

The context shapes the responses of organizations that are subjected to pressures. Organizations seek to make decisions within more secure and predictable contexts, whereas in environments with a high degree of uncertainty, the tendency for actions to be aligned with institutions is greater (Hemmert et al., 2016).

Governments can exert institutional pressure on organizations via regulations and provisional measures, and can use sanctions or incentives to ensure the adherence of companies. The submission of organizations subordinated to the government does not occur voluntarily but is based on the intention of obtaining the attention and approval of agents authorized to ensure the achievement of their objectives (Alam et al., 2016). By investigating institutional pressures from this point of view, important information can be obtained about how companies are influenced, decisions are made and the strategies and tools for adjusting to institutional pressures are laid down.

2.2. Institutional overview of the PNPB

The regulations of the PNPB are based on Law No. 11097/05 which established commercial production and the required percentage of biodiesel to be added to diesel (Brasil, 2005). It progressed from the B2 option (2% biodiesel mixed with diesel) in 2005, to B8 in 2017 (Brasil, 2014). The government is also proposing a gradual increase in the mixture, implementing B20 in 2030 (APROBIO, 2017).

The number of biodiesel production plants raised from 10 in 2008 to 51 in 2017 (ANP, 2016). Of these plants, 37 (74%) have SFS certification (MDA, 2017) and are primarily set up in the South and Center-West regions. Together, they produce 86% of domestic biodiesel production (ANP, 2016).

The reason for the predominance of the South and Center-West regions in Brazilian biodiesel production is the result of concentrating production close to the supply of raw materials, in this case soybeans, taking advantage of the structure which existed even before the PNPB (Cremonez et al., 2015). It is important to point out that soybean family farming is concentrated in the South region of Brazil, which makes the soybeans from these farmers highly sought after by plants with SFS (César et al., 2015).

Since 2010, the main raw material used in biodiesel production in Brazil has been soybean oil, followed by beef tallow and cottonseed oil (ABIOVE, 2018). In 2017, the use of soybeans accounted for 70% (Table 1).

Production scale, product convertibility options and how the soybean industry is structured make soybean biodiesel the most economically feasible options for Brazil (Zonin et al., 2014).

The particularity of the present study stems from setting the relationship between biodiesel plants and family farming cooperatives within the social inclusion program of the PNPB, through the SFS.

2.2.1. Institutional dynamics of the Social Fuel Seal in relation to the regional inclusion of family farming

The SFS represents the certification of biodiesel plants that fulfill the criteria for social inclusion of family farmers, and gives the plants benefits and responsibilities. The professionalization of family farming and cooperatives as important mediators in the supply of raw materials are aspects that mark the relational environment in oily raw material sales via the SFS (Schaffel et al., 2012).

In Brazil, family farming is a flexible category that ranges from subsistence farming to highly technical monoculture. However, in this paper is related to the eligibility criteria for gaining access to the National Program for Strengthening Family Farming (Central Bank of Brazil, 2015), with the following characteristics: i) the family must live on a family farm; ii) 30%–70% of household income must come from the farm; iii) family members must be the main workforce on the farm; iv) annual household income cannot exceed USD 55,000.

The SFS allows plants to sell all the biodiesel they produce via government auctions, receive federal tax exemptions/reductions and obtain better financing conditions from public banks. To obtain the SFS, plants must purchase raw materials from family farms, according to the regions in which they are located, in the following proportions (MDA, 2017): South (40%); Northeast and Southeast (30%); and, Center-West and North (15%). In this sense, one of the priorities of biodiesel plants is to promote integration with family farmers through cooperatives, signing contracts for raw material purchases and providing technical support (Castanheira et al., 2015).

In the approximately 10 years that the SFS has been in operation, the number of family farmers increased from 2008 to 2016; however, the number of family farmers only grew until 2011 (Table 2). Even though the program focused on farmers from less economically and socially favored regions, such as the Northeast and the North, the farmers who withdrew from the program were exclusively from these regions. Among the various reasons for this, emphasis goes to structural and technological issues, in addition to lack of competitiveness of raw materials that are not soybeans.

The largest number of family farmers who have benefited from the inclusion policy in recent years, the largest number of cooperatives, and the highest volume of raw material purchased from family farmers were concentrated in the South, as shown in Table 3 (MDA, 2018).

Table 1
Main raw materials (in %) used for biodiesel production in Brazil.

Raw materials	2010	2011	2012	2013	2014	2015	2016	2017
Soybean oil	82	81	75	73	75	77	77	70
Beef tallow	14	14	18	21	21	19	17	17
Cottonseed oil	3	3	4	3	2	2	1	0
Used frying oil	0	0	1	1	1	0	1	1
Other fatty materials	1	2	2	3	2	2	4	12

Source: ABIOVE (2018).

Table 2
Evolution in the number of family farmers who supply raw materials to the SFS.

Region	2008	2009	2010	2011	2012	2013	2014	2015	2016
North	215	177	246	56	60	327	313	304	260
Northeast	17,187	17,711	41,253	37,226	25,210	12,949	4757	3926	1923
Center-West	2400	2550	3388	3533	4513	5133	4757	4548	4109
Southeast	87	1457	3297	2486	2378	2287	1837	1818	1040
South	8767	29,152	52,187	60,994	60,512	63,058	61,815	61,889	62,923
Brazil	28,656	51,047	100,371	104,295	92,673	83,754	73,479	72,485	70,255

Source: MDA (2018).

Table 3
Regional SFS data in 2016.

Variables	South	Northeast	Center-West	Southeast	North	Total
Family farmers who supply raw materials	62,923 (89.6%)	1923 (2.73%)	4109 (5.85%)	1040 (1.48%)	260 (0.37%)	70,225 (100%)
Cooperatives that supply raw materials	59 (74.6%)	9 (11.39%)	7 (8.86%)	4 (5.06%)	–	79 (100%)
Volume of raw materials purchased from family farmers (thousand tons)	2717.40 (81.9%)	31.88 (0.96%)	480.16 (14.47%)	85.09 (2.56%)	3.25 (0.09%)	3317.79 (100%)
Value of raw materials purchased from family farmers (millions of Brazilian reais)	3576.69 (83.69%)	49.01 (1.14%)	545.61 (12.76%)	98.38 (2.30%)	3.86 (0.09%)	4,273.56 (100%)

Source: MDA (2018).

The prevalence of soybeans explains the prominent role of the South and Center-West regions in the volume of biodiesel raw materials traded in the SFS, since 85% of Brazil's soybean production is concentrated in these two regions (Cardoso et al., 2017).

The long history of soybean production in the South region through family farming, the large number of plants and the concentration of cooperatives in this region have contributed to competition for soybeans produced by family farms. Therefore, as plants are more vulnerable to opportunistic actions by cooperatives, risk of breach of contract and the need to comply with the quotas purchased from family farming cooperatives have made biodiesel plants willing to pay a premium for soybean biodiesel, called a social bonus (Alves et al., 2017).

The amount of the social bonus to be paid to the cooperatives is discussed in a meeting with legal representatives of the family farmers and with the biodiesel plant trade union. Although not part of the institutional norms of the SFS, the social bonus was incorporated into negotiations, as an incentive to join the SFS and attract more family farmers to work cooperatively (Alam et al., 2016).

The reality of biodiesel production and the relationships between plants and family farmers are permeated with a series of elements that involve costs, prices, supply and demand. Since the South region is predominantly a biodiesel producer though family farming, it was noted that the SFS in this region achieved better results in the insertion of family farming, which leads to questioning the inhibiting and facilitating factors of this relationship.

3. Methodological aspects

This is a qualitative multi-case study featuring the largest biodiesel plants in the South region of Brazil and family farming cooperatives that supply oily raw materials via SFS. It is assumed that organizations adapt to the environment and institutional pressures and are driven by the rational pursuit of profit (Turkulainen et al., 2017). Therefore, the use of a theoretical perspective based on institutional theory is one of the contributions of this paper, since it can provide a more complete understanding of the phenomena.

The South region was chosen since it has: (i) the most developed supply structure in Brazil for oily raw materials via family farming; (ii) the second largest biodiesel production in Brazil; (iii) the largest number of family farming cooperatives qualified to provide oily raw

materials via SFS. The four largest biodiesel plants in the region were selected representing 38.3% of Brazilian biodiesel production and 52.8% of the production in the South region (ANP, 2016).

Each biodiesel plant recommended two family farming cooperatives that were soybean suppliers, based on the following criteria: (i) regular deliveries in the last six years (2010–2016); (ii) large number of family farming cooperative members; (iii) supply of a high volume of fresh soybeans. There were eight cooperatives, which together corresponded to approximately 28,000 family farmers, who produced 58% of the soybeans via SFS in the region.

The agents interviewed were: (i) four supply managers and eight agricultural technicians from the plants, responsible for SFS-based relationships with the family farming cooperatives; and (ii) eight managers from the cooperatives responsible for the sale of raw material via SFS and 16 agricultural technicians responsible for technical support via SFS. A total of 36 agents directly linked to raw material trading via SFS were interviewed.

The interviews were conducted between June 2016 and January 2017, using a semi-structured script. The interviews were taped, transcribed and codified.

The interviews were combined with data from secondary sources, in order to identify the factors that motivate, inhibit and facilitate relationships through the institutional pressures of the SFS. Questions were used to operationalize the variables that describe the institutional pressures, as shown in Table 4.

4. Results

4.1. Overview of the factors that motivate, facilitate or inhibit SFS-based relationships

4.1.1. Motivating factors that lead to the establishment of SFS-based relationships

SFS-based relationships between plants and cooperatives are shaped by coercive isomorphism, driven by legal commitments through contracts, assured by government rules. The guarantee of biodiesel sales in ANP auctions was cited by the biodiesel plants as the preponderant coercive factor for adhering to the SFS, followed by reduced federal taxes.

It was stated that the entire tax return obtained by the plants via SFS is passed on to the cooperatives in the form of social bonuses.

Table 4
Variables for analysis of institutional pressures and their operationalization.

Variables	Concepts	Operationalization of the variables
Cause	These are the rational expectations that support the pressure, which may be social or economic in nature.	Why did biodiesel plants and individual/cooperative family farmers choose to interact with each other via SFS, subjecting themselves to institutional pressures?
Constituent	This refers to the institutional agents that exert pressures, and may be represented by the state, professional associations, interest groups or society in general.	Who is exerting institutional pressures on biodiesel plants and family farmers via SFS?
Content	This refers to the necessary requirements for the organization to legitimize itself in the organizational field in the definition of its response to pressures.	Which norms are biodiesel plants and family farmers/cooperatives being pressured to conform to?
Control	Organizations will tend to lower their resistance the stronger the power of the institutional agent and the more dispersed and supported the pressures are, as is the case when the government is the constituent.	How or by what means are institutional pressures exerted?
Context of the institutional pressure	It shapes the responses of organizations that are subjected to pressures and have two significant variables: uncertainty and the degree of interconnectivity in the relationships between organizations.	In what environmental context is institutional pressure being exerted on relationships via SFS?

Source: Created by the author based on [Oliver \(1990\)](#).

According to a supply manager from one of the plants, *“the tax incentive doesn't make any difference as an incentive, since the social bonus consumes it all. The greatest benefit is the auction which is divided into two batches of 20% without the seal and 80% with the seal. Whoever has the seal can sell 100% of the biodiesel produced.”*

In terms of informal coercive pressure, receipt of the social bonus was the primary motivating factor reported by the cooperatives for signing SFS-based contracts, since there was strong interest on the part of family farmers to deliver soybeans to cooperatives and this also attracted a large number of farmers to join them. It was mentioned that SFS-based relationships helped strengthen regional networks since through the bonus received the cooperatives started increasing investments aimed at the regional market, further strengthening the soybean and biodiesel agro-industrial sector in the South region. According to an agricultural technician from a cooperative, *“family farmers receive a higher price for soybeans via SFS than the price paid in the conventional market. This has attracted farmers who seek to deliver their soybeans to cooperatives entitled to sell via SFS.”*

The social bonus has been used for attracting and motivating cooperatives to work with the biodiesel market, since cooperatives prioritize soybean exports, which are considered attractive due to the price factor. Therefore, the contracting of the cooperatives by the plants for provision of technical support via SFS was cited as a motivating aspect by both parties.

4.1.2. Factors that inhibit SFS-based relationships

A common inhibiting factor for biodiesel plants and cooperatives, also shaped by coercive isomorphism, in order to honor legal commitments, is related to the technical support reports required by the MDA, which involves five visits to each family farmer per season. A specific report for each farm is issued every visit, using the model proposed by the MDA.

The failure of the cooperatives to deliver (time wise and content wise) the technical support reports stipulated by the MDA has created problems, as additional reports justifying the non-compatibility of the reports sent by the cooperatives. This behavior can result in plants and cooperatives not obtaining SFS renewal.

It is important to note that the plants must send the MDA a report with the number of family farmers involved in the SFS, as well as the number of families that received technical support. The MDA uses this information for audits, technical visits and SFS renewal.

In addition to these factors, cooperatives fail to deliver the volume of soybeans negotiated in the contract, due to allocating part of the soybeans financed by the SFS to exports, not fulfilling the

contracts affecting the planning of raw material purchases and the production planning of the plants.

One agricultural technician from a cooperative reported that the higher the volume of soybeans produced, the lower the commitment of farmers to the cooperative, who choose to sell part of their production to whoever offers the best prices, which is a consequence of the difficulty of cooperatives to ensure soybean deliveries from family farmers.

The contracts between plants and individual family farmers are an inhibitory factor of relationships, as they create competition with the cooperatives. Although some of the family farmers supplying the plants were not part of any cooperative, some supply cooperatives that are not eligible to commercialize via the SFS. Considered a market distortion by cooperative managers, this process hinders many family farmers from becoming part of the program.

In contrast, the plants emphasized a lack of willingness of cooperatives to increase the negotiated value of soybeans as the main inhibitory factor, which leads plants to establish individual contracts with family farmers.

The demands of some cooperatives to receive a social bonus above the already referenced market value was seen by the plants as an inhibiting factor for building business relationships. As the size of the bonus established for the region is defined by the amount of government tax incentives obtained by the plants via the SFS, if cooperatives demand gains above what the plants can afford, the chain yields benefits for only one agent, causing destabilization in gains.

It was reported that some biodiesel plants in the Center-West region purchase soybeans from family farmers in the South and pay a higher bonus than that agreed by SINDIBIO. According to the plant's supply manager *“these plants only purchase the right of family-grown soybeans, which is the invoice, and sell the soybeans to crushers here in the region. The Center-West region is a major soybean producer, but family farming is weak and there are few social organisms like the cooperatives here in the South.”* According to the interviewees, this practice is common due to the unavailability of raw material from family farmers in the Center-West region.

Plants and cooperatives acknowledge there are unaligned strategies and view the social bonus as an informal coercive pressure and one of the main impediments to the relationship. Despite these barriers, they view each other as important partners, resulting in economic, technological and social interactions. Contracts should be designed so that the sector can operate with less opportunism, mainly on the part of cooperatives, which present greater power in this relationship in the South region.

4.1.3. Factors that facilitate SFS-based relationships

Among the formal coercive pressures, the plants noted that SFS-based contracts with cooperatives were the main facilitating factor, since they contribute to cost savings by not having to manage thousands of contracts with individual family farmers. Other facilitating factors highlighted by the plants were: the productivity of cooperative family farmers even before the SFS; the history of the cooperatives in providing technical support; the cooperatives production scale to supply the demand of the plants; and better possibilities for family farmers to obtain bank loans via the SFS.

Regarding informal coercive pressure, the cooperatives pointed out that the social bonus has been the primary facilitating factor, due to the financial gains for cooperatives and family farmers. According to the cooperatives managers, without the financial incentives of the social bonus, it would not be worth entering into SFS-based relationships, due to the bureaucracy of technical support and the reports that need to be sent to the MDA. A manager from one of the cooperatives reported that “*the sales of the cooperatives used to target foreign markets, but with the advent of biodiesel we became very interested in the regional market because of the price received for soybeans and the volume of this commodity required by this sector.*”

As plants never failed to fulfill the contracts with the cooperatives and there were never any delays in payments, trust and the desire to maintain the relationship over the long term was always present. The interest of the plants in increasing the volume of soybeans traded is causing the cooperatives to adjust to increased production. Motivated by the continuity of the relationship, the cooperatives are establishing grain collection and processing points in regions close to the plants, which leads to a new service configuration in the biodiesel market.

4.1.4. Summary of the factors that motivate, hinder and facilitate relationships

Table 5 summarizes the motivating, inhibiting and facilitating factors between plants and cooperatives via the SFS.

5. Discussion

The presence of the government as an inducer, regulator and controller of the relationship between biodiesel plants and family farming cooperatives in the South region of Brazil underscores the mechanism of control through coercive pressure.

It was possible to identify certain characteristics of coercive pressure mentioned by DiMaggio and Powell (1983), such as the: (i)

existence of contracts imposed by the government, which control the relationship between plants and cooperatives; (ii) emergence of the social bonus as an informal rule to encourage the supply of raw material via cooperatives due to strong competition for soybeans grown by family farmers in the region; (iii) use of government authority, where coercive power is legitimized by a normative framework; and (iv) presence of the government imposing its will through sanctions.

It was noted that the relational structure of the plants was strongly influenced by the regulatory framework of the SFS and, even with well-defined legal norms, the social bonus made transactions more attractive in the eyes of the cooperatives. According to Scott and Meyer (1994), the tactic of creating specific government programs or incentives in order to direct the actions of organizations is a way for governments to induce the obedience of organizations according to its intentions.

The SFS partially contributed to limiting the competitiveness of the plants, since there are transaction costs that do not exist in trade relationships outside the SFS, such as: the social bonus on the commercial value of the soybeans; greater complexity in the negotiations, provision of technical support; and costs inherent to the contracts. The plants are dependent on the SFS since it guarantees the sale in government auctions of all the biodiesel they produce.

This behavior primarily occurs in chains in a recent stage of institutionalization, where companies tend to pursue their objectives rather than conform to the institutional environment (Scott and Meyer, 1994). As recognized and legitimized as institutional agents, the plants receive strong coercive pressure from the government which reinforces and strengthens the sanctions and coercion established, leading to congruence in the responses of the plants and causing the pressures to prevail.

5.1. Cause

The SFS was considered a coercive mechanism for the plants to adhere to its main cause: promotion of family farming in the biodiesel supply chain. Thus, the plants sought legal legitimacy, opting to accept government pressures so that they would have a lower share in the ANP auctions.

Therefore, the legal mechanisms of the SFS arose from recognition of the usefulness of submitting to the rules in order to gain access to benefits that the plants would otherwise not receive. According to DiMaggio and Powell (1983), since this is a social program with rules imposed by the government, companies tend to seek socioeconomic adaptation to institutional norms.

Table 5
Factors that motivate, inhibit and facilitate SFS-based relationships.

Factors	Plants	Cooperatives
Motivating factors for signing SFS-based contracts	Guaranteed sale of biodiesel in ANP auctions; Lower federal taxes; Cooperatives with a longstanding history and commercial scale in soybean production; High productivity family farmers.	Receipt of social bonus; Diversification of the customer portfolio; Establishment of soybean purchase contracts and provision of technical support, with greater financial gains for cooperatives.
Inhibiting factors	Priority given by cooperatives to exports and failure to deliver the soybean volume agreed in contracts; Immediate unavailability for increasing soybean volume via SFS; Failure to deliver technical support reports to the MDA on the set dates using the established models.	Bureaucracy in reports to be submitted to the MDA; Five visits per season to each farmer; Plants sign separate contracts with family farmers, generating competition with cooperatives.
Facilitating factors	Appropriate technical support which increases the production and productivity of family farmers; Quality of soybeans received within the specifications required by the plants; Cooperatives seek more farmers to increase the production of soybeans grown by family farmers.	Fulfillment of contracts by the plants; Obtaining financial resources subsidized by the plants; Interest of new family farmers in joining cooperatives to receive the social bonus.

The study revealed that the SFS, as an institutionalized force, has a major influence on how raw materials are purchased from family farmers, in that it guides and regulates the transactions between biodiesel plants and cooperatives.

5.2. Constituent

The government is the institutional agent that intervenes in the relationships between biodiesel plants and family farmers and operates through its ministries, which exert control over the operation of the sector. The entire commercialization structure, such as the price of the raw material, type of technical support and amount of the social bonus, is discussed at a negotiating table, with the consent of the government agencies, in order to be valid before the MDA.

The regulations of the SFS create safeguards for signed contracts, as they establish clear, well-defined, standardized contracts, with little difference among the Brazilian regions. The interviews suggest that SFS-based relationships would probably not exist had not the government intervened. According to Meehan et al. (2016), rational expectations of a social or economic nature promote the compliance of companies with institutional pressures.

5.3. Content

During the interviews, it was clear that the plants only purchase raw materials from family farmers in order to sell their entire biodiesel production in ANP auctions, which is a result of government coercive pressures.

It is worth mentioning that the plants have managed to meet the negotiation requirements for purchasing raw materials from family farmers. Compared to raw material purchases from non-family farmers, the plants and cooperatives have managed to embrace SFS-based relationships. The presence of organizations representing family farmers during the negotiation and conclusion stages harmonized institutional issues mitigating resistance to institutionalized pressures (Meehan et al., 2016).

5.4. Control

Institutional pressures are exerted through legal coercion, given the force of government impositions on biodiesel plants and cooperatives, leading them to operate within institutional standards. It was noted that the SFS regulations mainly affect the plants in the following ways: requirement to purchase 40% of their raw materials from family farmers; obligatory consent to contracts by family farming legal representatives; and specifications set by the MDA regarding the criteria for the commercial relationship contracts between plants and family farmers.

By establishing relationships with cooperatives, plants are restricted in their choice of suppliers by the institutional norms of the SFS. However, as Scott and Meyer (1994) claim, organizations will tend to lower their resistance the stronger the power of the institutional agent, as is the case when the government is the constituent.

The factors with the greatest impact on cooperatives were the bureaucracy involved in filling out the reports for the MDA and advance purchases, where the price of the raw material to be delivered at the next harvest is already stipulated. It can be said that advance purchases are one of the main differences between purchasing raw material from family farmers and non-family farmers, which has an impact on production planning and signing of contracts.

5.5. Context

Institutional pressures are based on coercive sanctions, as proposed by DiMaggio and Powell (1983), to impose government interests. Plants that are not SFS-certified would be practically prevented from operating in the market, due to the reduced volume of biodiesel they would be able to sell in government auctions. This determines not only the type of relationship that plants will have with their raw material suppliers, but also who their suppliers will be and which distribution channels will be used.

According to Hemmert et al. (2016), establishing specific incentives to steer the actions of organizations is a tactic used by the government to induce organizations to comply with its objectives. In the case of the plants, this is clearly manifested by the government's use of policies, laws and regulations, which constitute benefits such as tax incentives and access to biodiesel purchasing auctions, to lead plants to acquiesce with their goals. Consequently, biodiesel plants have tailored themselves to government strategies for producing and selling biodiesel, just as cooperatives, through informal coercive pressures, as DiMaggio and Powell (1983) suggest, adapt themselves to this new market.

6. Conclusions

The objective of the present study was to identify, through motivating, inhibiting and facilitating factors, the responses to institutional pressures on the relationship between biodiesel plants and family farming cooperatives via the Social Fuel Seal (SFS) in southern Brazil, characterized by a large technologically well-endowed number of family farming cooperatives, which are also.

The marked presence of the government as an inducer and regulator of the biodiesel supply chain through the SFS demonstrates its relevance in the SFS-based market relationships between plants and cooperatives. The presence of isomorphism can be clearly seen by the presence of well-defined norms that led plants and cooperatives to adapt to the biodiesel market government's requirements, which is incited by coercive pressures that involve incentives for plants and cooperatives to enter into SFS-based relationships for raw material sales. However, the plants, representing the purchasing agents, were more strongly influenced by institutional pressures.

The results indicate that SFS-based institutional interventions curb market dynamics and to a certain extent the competitiveness of plants as far as selecting their suppliers. At the same time, it also gives greater power to suppliers in the relationship. The upper hand of the cooperatives is clear in the negotiation of the social bonus, considered an informal coercive pressure. However, the guaranteed sale in government auctions of all the biodiesel they produce is the main motivating factor for plants to adhere to the SFS.

The impact of the SFS on biodiesel plants is manifested by: (i) the amount paid to the cooperatives for soybeans, which is higher than the market price, due to the social bonus; (ii) the complexity of the negotiations, which requires legal representatives from the plants and cooperatives; (iii) the provision of technical support to family farmers; and (iv) the costs inherent to the contract that have become more formal and complex. It was noted that the cooperatives were impacted less by the institutional rules of the SFS, as they started partaking of the benefits, such as receipt of the social bonus, i.e., a better price received for soybeans.

The results of this study show that in environments controlled by coercive pressures, where the government is the main actor, private companies adapt through specific incentives, resulting in commercial relationships conforming to institutional norms. Considering the context in which plants and cooperatives operate,

it can be seen that the SFS introduces bureaucratic changes in the way raw materials are sold. However, for the plants, the impacts of the inhibiting factors are well assimilated, with good possibilities for progress in the relationship with cooperatives.

The effects of institutional pressures on the relationship between plants and cooperatives were demonstrated through responses to legal elements, which expressed willingness, especially among plants, to accept and comply with what has been defined within the scope of the SFS. The guaranteed sale of all the biodiesel produced by plants that are part of the SFS in government auctions and the receipt of the social bonus by cooperatives were the main factors that motivated both to continue with the program.

Of the contradictions considered in this study, such as SFS distortions, two deserve special attention: the establishment of the social bonus; and transactions carried out by biodiesel plants in the Center-West to purchase soybeans produced by family farmers in the South. According to the plants in the South, the mandatory purchase of raw material from family farmers brought negative externality to the market, causing increased competitiveness due to soybeans supplied by family farmers, resulting in inflation of the social bonus. It is worth emphasizing that this practice occurs because the South presents the largest number of family farmer cooperatives, which are also technologically well-endowed.

Even though it displeases the plants, the purchase of soybeans by Center-West plants from cooperatives in the South does not violate SFS regulations and is a commonly employed strategy to comply with norms and to continue in the program. Even though selling soybeans purchased from family farmers is not an illegal practice, it does not fit into the SFS guidelines in the Center-West, because it does not contribute to development of the region, nor does it improve the conditions of family farmers, which is one of the goals of the SFS.

The biodiesel supply chain via the SFS is still being consolidated, which makes the institutional pressures developed by the government important, especially in order to reach social insertion goals. One of the necessary adjustments is to promote family farmer cooperatives in the Center-West, since it is the largest region producing soybean in Brazil, which would help reach the goals of the SFS regarding true development and strengthening of family farming. These institutional policies need be rethought to enable SFS members to continue to develop and become nationally and internationally competitive, thus contributing to the program's social objectives.

This paper contributes to the understanding of the influence of government policies on the relationship between plants and cooperatives through the SFS. The research also highlights the importance of understanding how buyers and suppliers behave through government social programs in order to keep abreast of knowledge regarding the fit between the program and the needs and interests of the various stakeholders.

One limitation of this study regards the lack of a more in-depth analysis of raw material purchase relations involving grain companies, rather than families, which can be explained by the attention given to family farming in the guidelines of the SFS. Another limitation is the fact that the interviews involved only plants and cooperatives of family farmers. The authors recommend that further studies apply this methodology in other Brazilian regions, also considering the possible consequences for the biodiesel supply chain in case government intervention via the SFS ends.

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References

- ABIOVE, 2018. Associação Brasileira das Indústrias de Óleos Vegetais. Produção de biodiesel por matéria-prima. Retrieved in July 2018 from: www.abiove.org.br/site/.../11072017-123158-2017.07.07_-_matéria-prima.xlsx.
- Alam, G.M.M., 2016. An Assessment of the Livelihood Vulnerability of the Riverbank Erosion Hazard and its Impact on Food Security for Rural Households in Bangladesh. PhD Thesis. School of Commerce, University of Southern Queensland, Australia.
- Alam, M.G.M., Alam, K., Mushtaq, S., 2016. Influence of institutional access and social capital on adaptation decision: empirical evidence from hazard-prone rural households in Bangladesh. *Ecol. Econ.* 130, 243–251.
- Alves, C.E.S., Belarmini, L.C., Padula, A.D., 2017. Feedstock diversification for biodiesel production in Brazil: using the Policy Analysis Matrix (PAM) to evaluate the impact of the PNPB and the economic competitiveness of alternative oilseeds. *Energy Pol.* 109, 297–309.
- ANP, 2016. Agência Nacional de Petróleo, Gás Natural e Biocombustíveis. Boletim mensal março de 2016. Retrieved in April 2016 from: <http://www.anp.gov.br/?pg=80665&m=&t1=&t2=&t3=&t4=&ar=&ps=&1463578227304>.
- APROBIO, 2017. Associação de Produtores de Biodiesel do Brasil. Setor do biodiesel apresenta ao governo proposta para mercado de energia. Retrieved from the in March 2017 from: <http://aprobio.com.br/2016/10/06/setor-do-biodiesel-apresenta-ao-governo-propostas-para-mercado-de-energia/>.
- Brasil, 2005. Programa Nacional de Produção de Uso de Biodiesel. Brasília-DF: Imprensa oficial. Retrieved in June 2014 from: http://www.biodiesel.gov.br/docs/lei11097_13jan2005.pdf.
- Brasil, 2014. Portaria Selo Combustível Social. Retrieved in October 2015 from: http://www.lex.com.br/legis/26224832_PORTARIA_N_81_DE_26_DE_NOVEMBRO_DE_2014.aspx.
- Cardoso, B.F., Shikida, P.F.A., Finco, A., 2017. Development of Brazilian biodiesel sector from the perspective of stakeholders. *Energies* 10, 399. <https://doi.org/10.3390/en10030399>.
- Castanheira, E.G., Grisoli, R., Coelho, C., Silva, G.A., Freire, F., 2015. Life-cycle assessment of soybean-based biodiesel in Europe: comparing grain, oil and biodiesel import from Brazil. *J. Clean. Prod.* 102, 188–201.
- Castka, P., Balzarova, M., 2008. ISO 26000 and supply chains – on the diffusion of the social responsibility standard. *Int. J. Prod. Econ.* 111 (2), 274–286.
- Central Bank of Brazil, 2015. Programa Nacional de Fortalecimento da Agricultura Familiar. Retrieved in July 2015 from: https://www.bcb.gov.br/pre/bc_atende/port/PRONAF.asp#1.
- César, A.S., Almeida, F.A., Souza, R.P., Silva, G.C., Atabani, A.E., 2015. The prospects of using Acrocomia aculeate (macaúba) a non-edible biodiesel feedstock in Brazil. *Renew. Sustain. Energy Rev.* 49, 1213–1220.
- Chen, H., Wang, J., Huang, J., 2014. Policy support, social capital, and farmers' adaptation to drought in China. *Global Environ. Change* 24, 193–202.
- Cremonez, P.A., Feroldi, M., Nadaleti, W.C., Rossi, E., Feiden, A., Camargo, M.P., Klajn, F.F., 2015. Biodiesel production in Brazil: current scenario and perspectives. *Renew. Sustain. Energy Rev.* 42, 415–428.
- DiMaggio, P.J., Powell, W.W., 1983. The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *Am. Socio. Rev.* 48 (2), 147–160.
- Goulart, D.F., Zilber, M.A., 2016. Industry leadership in the biodiesel chain: an analysis under the concept of competitive advantage. *Organizações Rurais & Agroindustrias, Lavras* 18 (4), 332–341.
- Hemmert, M., Kim, D., Kim, J., Cho, B., 2016. Building the supplier's trust: role of institutional forces and buyer firm practices. *Int. J. Prod. Econ.* 180, 25–37.
- Khannaa, M., Nunez, H.M., Zilberman, D., 2016. Who pays and who gains from fuel policies in Brazil? *Energy Econ.* 54, 133–143.
- Liu, H., Ke, W., Wei, K., Gu, J., Chen, H., 2010. The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. *J. Oper. Manag.* 28 (5), 372–384.
- MDA, 2017. Ministério de Desenvolvimento Agrário. Evolução do número de famílias nos arranjos do Selo Combustível Social no período de 2008/2015. Retrieved in March 2017 from: http://www.mda.gov.br/sitemda/sites/sitemda/files/user_img_1755/SCS_BALANCO_2015_PARA_PUBLICACAO_02022017_.pdf.
- MDA, 2018. Ministério de Desenvolvimento Agrário. Balanço do Selo Combustível Social. Retrieved in July 2018 from: http://www.mda.gov.br/sitemda/sites/sitemda/files/user_img_1754/SCS%20-%20Balan%C3%A7o_2016_Para%20Publica%C3%A7%C3%A3o.pdf.
- Meehan, J., Ludbrook, M.N., Mason, C.J., 2016. Collaborative public procurement: institutional explanations of legitimised resistance. *J. Purch. Supply Manag.* 22 (3), 160–170.
- Meyer, J.W., Rowan, B., 1977. Institutionalized organizations: formal structure as myth and ceremony. *Am. J. Sociol.* 83, 340–363.
- Oliver, C., 1990. Determinants of interorganizational relationships: integration and future directions. *Acad. Manag. Rev.* 15 (2), 241–265.
- Raucci, G.S., Moreira, C.S., Alves, P.A., Mello, F.F.C., Frazão, L.A., Cerri, C.E.P., Cerri, C.C., 2015. Greenhouse gas assessment of Brazilian soybean production: a case study of Mato Grosso State. *J. Clean. Prod.* 96, 418–425.
- Schaffel, S., Herrera, S., Obermaier, M., Lebre La Rovere, E., 2012. Can family farmers benefit from biofuel sustainability standards? Evidence from the Brazilian social fuel certificate. *Biofuels* 3 (6), 725–736.
- Scott, W.R., Meyer, J.W., 1994. *Institutional Environments and Organizations: Structural Complexity and Individualism*. Sage Publications, Thousand Oaks.

- Stattman, S.L., Mol, A.P.J., 2014. Social sustainability of Brazilian biodiesel: the role of agricultural cooperatives. *Geoforum* 54, 282–294.
- Turkulainen, V., Kauppi, K., Nermes, E., 2017. Institutional explanations Missing link in operations management? Insights on supplier integration. *Int. J. Oper. Prod. Manag.* 37 (8), 1117–1140.
- Vega, D.E.C., Keenan, R.J., 2016. Situating community forestry enterprises within New Institutional Economic Theory: what are the implications for their organization? *J. For. Econ.* 25, 1–13.
- Wong, C.Y., Boon-itt, S., 2008. The influence of institutional norms and environmental uncertainty on supply chain integration in the Thai automotive industry. *Int. J. Prod. Econ.* 115 (2), 400–410.
- Zonin, V.J., Antunes Jr., J.A.V., Leis, R.P., 2014. Multicriteria analysis of agricultural raw materials: a case study of BSBIOS and Petrobras Biofuels in Brazil. *Energy Pol.* 67, 255–263.