TITLE: A Closer Look at the Brazilian Social Fuel Seal: Uptake, Operation and Dysfunctions

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ABSTRACT: Due to the increasing concerns about the social effects of biofuel production in developing countries, the Brazilian government created the Social Fuel Seal (SFS) within the framework of the National Program of Production and Use of Biodiesel (PNPB) launched in 2004. The SFS is a voluntary certification scheme aimed at upgrading small farmers in the biodiesel value chain. In this article we discuss the institutional settings and explore the uptake, achievements and shortcomings of this political instrument in the light of the official data and the academic literature. Specific aspects of the practical implementation of SFS are examined upon the base of interviews conducted with different stakeholders in the state of São Paulo. Important dysfunctions in the overall operation of the SFS put under question the accomplishment of the social inclusion objective and awaken concerns about the sustainability of the role of family farmers in it.

KEYWORDS: Brazil; Social Fuel Seal; family farmers; biodiesel value chain.

1. INTRODUCTION

There has been an increasing concern over the last decade, both in the scientific and political spheres, about the effects of biofuel production in developing countries [1,2]. Emphasis has been made on the social implications of large-scale production of

commodity feedstock crops such as soy, palm oil, jatropha and sugarcane. Changes in land tenure patterns ‑ particularly the processes of land ownership concentration and 'landless' displacement, competition with land for food production, smallholders' exclusion and poor labour conditions - have centred many of these studies [2-5].

Within this context, new governance mechanisms have been implemented in many countries to integrate social justice considerations into global biofuel markets. Voluntary standards represent an outstanding example of these initiatives. Certification systems may be devised either by governments, inter-governmental organizations or private standardization bodies - although hybrid models of public-private partnerships are increasingly common [6,7]. Contrary to the mandatory regulations, actors are free to choose whether they adhere to these programs or not. Governments act as "facilitators" to foster institutional arrangements that effectively encourage the upgrading to small farmers in the value chain or the improvement of labour conditions.

The Brazilian case has occupied a prominent position in these debates on biofuel production governance, as the second largest producer in the world. Brazil had a pioneering role in the promotion of biofuel production and use, and represents the most successful attempt of oil substitution in transport [8]. Bioethanol is a core part of Brazilian energy strategy since 1975 - when the National Alcohol Program (PROALCOOL) was launched as a response to the petroleum crisis and the falling sugar prices [9]. The incentives originally included in the program have experienced changes over time, but high fuel taxes on gasoline, tax credits for ethanol and mandates to blend anhydrous ethanol in gasoline still exist [10].

In the case of biodiesel, the regulatory framework of this industry was not envisaged until the Brazilian Biofuel Program (PROBIODIESEL) was launched in 2002. Two years later, the National Program of Production and Use of Biodiesel (PNPB) introduced biodiesel in the Brazilian energy matrix, to be mainly used in truck and buses [4,11]. Mandatory blends were promulgated by the Law no. 11.097/2005 and would gradually increase thereafter, from a 2% addition of biodiesel to the oil diesel (denoted by B2) in January 2008 to 7% (B7) in November 2014[1]. A system of incentives and subsidies was devised to promote biodiesel production from vegetable oils, as these products have higher prices in the food market [12]. Following the PNPB implementation, the production of biodiesel grew from 70 Mm^3 to 3,800 Mm^3 between 2005 and 2015 according to the Ministry of Mines and Energy (MME) [29]; nowadays Brazil is the world's third biggest producer of biodiesel, behind the United States and Germany.

The process of biofuel expansion has by no means been without detractors. In the early years of 2000s, Brazilian bioethanol industry received massive international criticism as labour conditions on sugarcane farms and ethanol companies were branded as "slave-like" [3]. Financial incentives were also reported to support better-off sugarcane farmers

[1] Blends had been authorised on a voluntary basis in 2005. The recent Law no. 13.033/2016 sets a B8 the biodiesel mandate from March 2017 that will rise up to B10 in 2019.

and industries settled in rich regions; meanwhile labour-intensive production of cassava or sweet potato, in which small farmers of the impoverished northeast would have integrated, was abandoned [13,14]. In the case of biodiesel, the prevalence of a productive model based on large-scale soybean plantations (mainly located in the Central-West region, where this agroindustry was already established [12,15]), has also been strongly contested [5,16].

The Brazilian government has prompted several political initiatives over the last decades to confront these problems - thus becoming one of the first countries to include social concerns in the biofuel policy [4]. The multi-stakeholder National Commitment to Labour Conditions in Sugarcane Activity, reached in 2009, is an outstanding result of such efforts. In the case of biodiesel, the PNPB acknowledged social inclusion as one of its main objectives from the start - together with biodiesel blending promotion. With this aim, the program created the Social Fuel Seal (SFS, *Selo Combustível Social*) as an instrument to enable a better integration of small farmers into the biodiesel value chain, particularly in the poorest regions of the country. The original arrangements of the Seal underwent significant changes in subsequent years, as an effort to deal with the problems that arose in the beginning. However, there still are lights and shadows in the implementation of the program.

This article is aimed at taking a closer look at the operational functioning of the SFS. More specifically, the objective is threefold: (i) to display the institutional settings of this instrument and the role that different stakeholders (processors, agricultural cooperatives and farmers) play in it; (ii) to explore the uptake, achievements and shortcomings of this program in the light of the most recent official data and the academic literature, and (iii) to illustrate specific aspects of the practical implementation of SFS upon the base of interviews conducted with SFS stakeholders in the state of São Paulo (Southeast region).

The remainder of this paper is structured around these three points, after the methodological approach is explained in section 2. In the last section we present some conclusions of the analysis.

2. METHODOLOGY

This research was initially based on secondary sources. First, a textual analysis of national legislation on this matter was conducted. The scientific literature review provided further information and elements for discussion. Data on the practical application of the SFS were compiled from a wide array of sources, notably reports and official databases by government agencies such as the Ministry of Mines and Energy (MME), the National Agency of Petroleum, Natural Gas and Biofuels (ANP) –responsible for the regulation and supervision of the Brazilian oil and biofuel market, and dependent on the former Ministry- and the extinct Ministry of Agricultural Development (MDA)[2]. Specialized informative journals (eg. Biodieselbr [17]) provided useful updated material.

Secondary sources were later verified and complemented with primary information. The empirical analysis was focused on the Southeast region, concretely in the state of São Paulo, the most industrialized state and the first biodiesel consumer in the country [11]. Telephone/email enquiries to power plants (made from May to July 2015) were necessary to check their current situation with respect to the SFS. Remarkably, the information provided by the official website of the MDA regarding the agricultural cooperatives participating in the SFS was found to be outdated and primary information thereon was also necessary [18].

Later, in-depth and semi-structured interviews were conducted (in August 2015) with several agents of the biodiesel chain involved in the SFS functioning. The Figure 1 displays the State of São Paulo and the different locations were fieldwork was conducted.

[Figure 1]

First, technical visits were made to one of the two biodiesel industries currently operating with the SFS in the state of São Paulo, headquartered in the city of Orlândia. Experts responsible for different stages of the productive process, together with the technician in charge of the SFS in the industry, were interviewed. Another visit was made to an agricultural cooperative settled in the municipality of Motuca that worked with SFS for two years in recent times, as the only cooperative that have ever operated within this scheme in São Paulo. Finally, we also interviewed two of the family farmers associated to this cooperative that used to provide soybean for biodiesel processing. Their farms were located in the settlement of Bela Vista do Chibarro, municipality of Araraquara.

Finally, both primary and secondary information was analised and discussed in the light of the academic literature.

[2] This Ministry was eliminated in May 2016 by the interim President Michel Temer, and its competences were transferred to the Ministry of Social and Agricultural Development.

3. THE SOCIAL FUEL SEAL: STAKEHOLDERS AND INSTITUTIONAL ARRANGEMENTS

The SFS is awarded by MDA to biodiesel processing plants that buy a minimum percentage of biodiesel feedstock from family farmers. The share of feedstock obtained from family farmers required to qualify for SFS ranks from 15% to 40%, depending on the region (15% in the North and Central West, 30% in Southeast, Northeast and Semi-arid regions and 40% in the South).

The MDA determines which producers are eligible as family farmers, according to a number of criteria established within the framework of the National Program for Strengthening of Family Farming (PRONAF). A cooperative may also be awarded with SFS, as long as at least 60% of the members are qualified as family farmers. Therefore, an industry may obtain the SFS by purchasing the required percentage of raw materials either from individual family farmers or from accredited cooperatives [4].

The PNPB provides credit lines with favourable rates to power plants with the SFS and also to family farmers participating in the scheme [19]. The SFS is also connected with a special tax system that establishes federal exemptions and incentives for biodiesel producers that differ per supply region and type of raw material (Table 1).[Table 1]

Diversification of biodiesel raw materials is a central objective for the SFS, provided that soybean-based oil still largely prevails in the country (it generated 76% of the total biodiesel production in 2015, according to ANP [22]). In spite of the low oil content of the soybean (18%) compared to other oilseeds cultivated in Brazil[3], the by-products obtained in the industrial process generate important revenues for these plants, notably glycerine (consumed by domestic chemical industries) and bran (used and exported as animal feedstock together with the beans) [1,23]. In addition, soy production is based on large, specialized and highly mechanized farms. The cost reduction achieved through economies of scale is of particular importance considering that the raw material represents 80% of the total cost of biodiesel production [21].

The second-most used feedstock is beef tallow (from which 20% of biodiesel is produced), a residue of another massive agrifood industry - Brazil has the second world's largest beef herd in the world [12]. This low-cost fat used to be mainly destined to the soap industry by early 2000s, but power plants have increasingly used it as feedstock for biodiesel production. At present, this is largely the main destination of beef tallow in Brazil [24].

Other vegetable oleaginous feedstock different from soybean, such as cotton, canola, castor oil, babassu, sunflower, palm oil and peanuts only generate around 5% of Brazilian biodiesel production altogether – and cotton accounts for an important part of this

[3] Babassu has 66% of oil content; palm 30-45%, sunflower 35-52%, peanut 44-56%, and jatropha 38% [23].

percentage. The PNPB aimed at enhancing the integration of alternative crops into the biodiesel chain, considering that some of them are better adapted to the production conditions of small farmers and/or disadvantaged areas. Thus, castor oil is a labour intensive production suitable to be obtained in the Northeast on a low-input basis, and plays a role as a cash crop for small farmers [16,19, 34], and palm oil also requires little capital investments, uses intensively manpower and adapts well to the Amazonian conditions [25][4].

In addition to the tax exemptions, industries awarded with the SFS are allowed to participate in the bimonthly biodiesel auctions organized by ANP on very favourable terms [22]. These auctions are the only way to trade biodiesel in Brazil; by means of them, the biodiesel necessary to comply with the blending mandates is bought by Petrobras to the power plants. The latter are the bidders, they offer a mix of price and quantity and those with the lowest prices win. The amount of biodiesel to be traded at these auctions is set by ANP; as the blending mandates have increased from 2008, so has this amount. PNPB establishes that the first auction day is restricted to bids from processors certified with the SFS, and 80% of the biodiesel purchase is reserved for them. The remaining 20% is bought in the second day auction, open to any industry.

The SFS requires the awarded industries to sign legally binding contracts with either farmers or cooperatives. Contracts have necessarily to include a technical collaboration agreement embracing the provision of technical assistance, training and other backing to farmers (e.g. in logistics, transport or access to credit). The ultimate objective of this help is to improve the agricultural practices and increase farm productivity, not only for biodiesel raw materials but also for food crops[5]. Extension services may be assumed either by the company itself or by an outsourced enterprise or institution. A reference to prices formation criterion and the amount of feedstock to be obtained by family farmers is also made in the contract -the industry guaranteeing the purchase of such amount. The contracts have no legal value if they are not consented and signed by collective actors such as agricultural labour unions, organizations of farmers' cooperatives, and associations of the biodiesel industry – a representative of one smallholder association is required. The contract compliance by the power plants is yearly evaluated by external agencies led by MDA.

The technical settings of the SFS adapt to the objectives of the program. Thus, each time a certified industry buys raw material alternative to soy from family farmers, the value of this feedstock is multiplied by 4 in the accounting presented to MDA to comply with the minimum percentage that should be obtained from family farms. A multiplying factor of

[4] Babassu fruits are obtained from indigenous forests and peasant families retain an important share of the income they generate [23], but this crop does not receive any tax reduction. In the case of peanuts, the production is concentrated in the industrialized state of São Paulo.

[5] "*The biodiesel producer will ensure technical and training assistance permanently throughout the year for all other crops and activities produced in family farms contracted to deliver* [biodiesel] *feedstock*". Art. 15 of the Ordinance 337/2015 of the MDA, that regulates the criteria and procedures for the granting, maintenance and use of the SFS.

3 is applied to feedstock obtained in the most disadvantaged areas (i.e. Northeast and semi-arid regions), a factor 1.2 to transactions with family farmers' cooperatives (the factor raises up to 1.7 if more than 80% of the associates are family farmers). Finally, as a novelty in 2014, a multiplying factor of 1.5 was applied to industries operating in Southeast and Central West that buy raw materials from their own regions [31,32].

The institutional arrangements we have just exposed are those that are currently in place, after an important amendment of PNPB was introduced in January 2009. This reform was aimed at reinforcing the participation of the lagging-behind regions and improving the overall performance of the program. First, the participation of cooperatives was institutionalised and encouraged by announcing new privileges and incentives for them. Cooperatives were thus given a more active role in biodiesel transactions and, importantly, in farmers' capacity building.

Second, Petrobras created PBio, a subsidiary company specifically aimed at promoting biodiesel feedstock cultivation by family farmers in the North and Northeast regions of Brazil. PBio became the sole buyer of all the feedstock ‑ above the market price - and also organised the provision of technical assistance and inputs to farmers [4]. Third, other technical thresholds of the program were fine-tuned. For instance, the minimum share of feedstock obtained from small farmers was notably reduced for the Northeast and Semi-arid regions, considering the difficulties that industries had had to fulfil the original requirement of 50%. As specified above, the minimum is now set at 30%.

4. THE SFS IMPLEMENTATION: STAKEHOLDERS' UPTAKE AT REGIONAL LEVEL

A discussion of the results of the SFS should necessarily start with an analysis of the program uptake by the main stakeholders: family farmers, agricultural cooperatives and biodiesel processing industries. The number of family farmers involved in the scheme has been continuously far below the Brazilian government target of 200,000 producers (Figure 2). In the early years of implementation of the SFS, the poor results of the program were attributed to the inexperience of both power plants and family farmers with technical assistance projects, the limited role given to cooperatives by the program and the scarce agricultural area available on family farms for biodiesel feedstock crops – partly due to farmers' preference for food production [4].

The program reached half of the target in 2011, and the number of participants has dropped ever since. Moreover – in spite of the emphasis made by policymakers in the promotion of the most disadvantaged areas of Brazil - farmers abandoning the scheme belonged almost exclusively to the Northeast. Only 5.4% of the participants in 2015 lived in such region, a strikingly low percentage considering that half of the family farmers of the country live there [26]. Meanwhile, the northern farmers are virtually absent from the

program: there were only 304 of them in 2015 according to MDA. There are several reasons for this situation, i.e. structural problems in the access to land, scarce labour availability due to rural exodus, exhausted soils and poor infrastructure [27].

Focusing on castor and palm oil production, some of the obstacles in these areas are the scarce investment made by biodiesel plants, the 'chaotic' land tenure system [12], the lack of qualified agronomists for technical assistance and the difficulties in knowledge assimilation by farmers [34]. In the specific case of castor oil, the high prices of this product due to the lack of competitiveness compared with other feedstock hinders castor-based biodiesel production [34].

[Figure 2]

The fact that the volume of biodiesel feedstock traded with the SFS has systematically increased (Figure 3) makes it evident that the less productive farmers have been more likely to abandon the program.

Similarly, the program has failed in diversifying the biodiesel feedstock, as big soybean farmers remain being the main suppliers of biodiesel processing industries [3, 5]. Along with the above mentioned advantages of soy production, the alternative uses of jatropha, castor oil and indigenous palm varieties for cosmetics industry make them too expensive to be used for biodiesel [16]. The prevalence of soy explains the prominent role of the South and Central-West regions in the volume of biodiesel feedstock traded with SFS depicted in Figure 3 – as 85% of soy production in Brazil concentrates there [28].

[Figure 3]

The consideration of the cooperatives' role in SFS sheds more light (and somehow provides a more positive view) upon the evolvement portrayed by the above figures. As a result of the amendment of the PNPB undertaken in 2009, the participation of cooperatives in the certification scheme underwent a four-fold increase between 2008 and 2014 – in fact it doubled the first year after the policy revision (Figure 4). It is worth noting that 85% of the biodiesel feedstock obtained from family farmers is sold to power plants through cooperatives at present [26].

The promotion of these entities has facilitated the uptake by small farmers especially in regions with a long collective action experience, remarkably the South - hence the concentration of the accredited cooperatives there [23,26]. This region is, in fact, the principal contributor to the program also in terms of volume of feedstock traded and number of farm households involved.

[Figure 4]

Contrarily, farmers from the North and Northeast have scarce cooperative tradition [25]. This fact can be ascribed to, first, the 'protest' political profile of the collective initiatives in these areas (which have not been recognized by the Brazilian Cooperative

Organization), linked to the disputes around the unequal land access, and second, the distrust in formal cooperatives as they are seen as instruments of governmental control [4, 34]. Thus, apart from the logistic limitations due to the poor infrastructures existing in these regions, the scarce organizational capacity of cooperatives may have acted as a hindrance for their effective integration in the SFS.

Since PNPB was redesigned in 2009, the number of participating cooperatives has increased in the North and Northeast with a strong support from PBio, but these areas still lag behind other regions in terms of uptake and biodiesel outcome. Moreover, some of the cooperatives created in 2009 and 2010 failed shortly after (Figure 4). Besides, the PNPB has succeeded in promoting the integration of medium-sized farmers, but has not properly reached the smallest ones [4]. Many times these farmers are located in remote areas; they are ill-educated and more reluctant to changes or to engage in collective action initiatives. In other words, the least productive producers of the poorest regions of Brazil have remained largely marginalised from the program.

Opposite to the limited uptake by farm families, the appeal of the SFS for biodiesel processing plants becomes evident if one considers their engagement in the scheme (Figure 5). From the 51 industries authorized in participate in biodiesel auctions in 2015, 19 were located in Central-West (the most productive region), 11 in the South and 6 in Southeast. The 'target' North and Northeast regions only have 3 industries each awarded with the SFS.

There is some instability in the number of accredited industries, that varies from year to year due to the difficulty of reaching the required minimum percentage of feedstock collected from family farmers (Figure 5). In fact, the biodiesel obtained and delivered from family farmers' raw material is regularly below the contracted amount [12]. In the Northeast, the power plants reach the compulsory 30% of feedstock from family farming through contracts with cooperatives located in the other regions [26], thus failing to effectively involve smallholders from their own territories. This is the reason why in 2014 a multiplying factor was introduced by the PNPB for the raw material obtained in the same region where the industry operates (see section 3).

[Figure 5]

5. THE SFS IMPLEMENTATION: EXPERIENCES IN THE STATE OF SÃO PAULO

The industry where interviews were conducted operates in the city of Orlândia (São Paulo, see Figure 1), employs some 600 workers and participates in the SFS since 2012. It is authorized a nominal capacity of 11,000 m^3 of biodiesel per month by the ANP, but the monthly production greatly varies according to the demand at auctions. In 2014, the

overall production was about 36,000 m³ of biodiesel[6]. The biodiesel is 100% obtained from soy, which is collected from three different states: São Paulo (20% of the raw material), Minas Gerais (10%) and Goiás (70%).

The strong competition with industries from other regions (namely Central-West and South), able to offer lower prices at biodiesel auctions, is remarked by the interviewed technicians as a problem. The crop yields obtained in the states of Mato Grosso and Paraná are indeed notably higher [23]. In this line, the most important incentive for the plant to operate with the SFS is the guarantee of participation in the first day of biodiesel auction, as tax reductions are not relevant in this case.

Importantly, the industry do not always use the soybean obtained from family farmers for biodiesel production. The company also produces other outputs such as soybean oil, bran and protein, vegetable fat, lecithin and soybean seeds. Because the soybean oil produced from improved seeds has a higher quality, it is re-routed for food production to obtain higher profits – meanwhile soybean oil is purchased from third parties as biodiesel raw material. This recalls another dysfunction in the SFS operation that other studies [4, 26,29] found in the Northern regions: biodiesel industries sell to third processors the castor and palm oil produced by family farmers and, with the profits so obtained, they acquire the soybean for biodiesel production.

The studied power plant obtains the feedstock mainly from individual, non-associated family farmers. Only one cooperative, which is located in the state of Goiás (out of the geographical scope of this study, São Paulo) supplies raw material to them at present. Both farm inputs (remarkably improved soybean seeds) and technical assistance are directly provided by the power plant to those family farmers that are not associated in cooperatives, either by their own technicians or by outsourced enterprises. However, farmers who are associated receive this support by way of the cooperative. The technicians of the industry pointed out as a drawback that farmers sometimes ignored the contracts and sold the feedstock to local traders who offered a higher price for it; for this reason they only gave the improved soybean seeds to “trustful members”.

There has only been one cooperative in the state of São Paulo that has ever worked within the SFS scheme, which is settled in the municipality of Motuca. It supplied soybeans to the other power plant in this state, set in Bebedouro, but this commercial relationship broke off in 2013/2014. We interviewed a technician and farmers associated to this cooperative to better understand the functioning of the SFS scheme in that period.

The cooperative had 175 members, from which 151 were family farmers. They were mainly maize producers, but in the 2010/2011 crop year, 20 farmers started producing soybean for biodiesel processing as a strategy of farm diversification. The cooperative obtained the SFS certification the following year, after completing the required

[6] All biodiesel plants in Brazil are assigned a maximum capacity, but they produce well below that level. In overall terms, the biodiesel production in Brazil rounds a half of the installed capacity of the industry (which was 7.3 Mm^3/year in 2015).

administrative procedure, and the number of farmers producing soybean doubled in 2011/12.

The soybean production entailed some uncertainties for farmers, mainly related with the incidence of plagues in case of adverse weather. For instance, an excess of rain and heat made it necessary to increase the number of farm operations to avoid fungus plagues and diseases. Considering the costs of soybean production, farmers of this area were close to the financial limit of profitability. The soy producers associated to the cooperative were settled in two different locations: Monte Alegre (municipality of Motuca) and Fazenda Bela Vista do Chibarro, in Araraquara (see Figure 1). The formers struggled to cover the production costs because their soils were sandy and impoverished, whereas those living in Bela Vista cultivated clayey, more productive soils and were able to make profits on soybean production. By 2012/13, only a few farmers of Monte Alegre remained producing soybean, whereas the number in Bela Vista had increased to 44 (see Table 2).

[Table 2]

All the SFS arrangements were detailed in the contract signed between the power plant and the cooperative. The contract specified the economic compensation that the cooperative should receive from the industry, which in 2012 amounted to 2 *reais* per 60kg soybean bag (around 0.6 USD at the moment of this research). This imbursement, to be paid at the moment of delivery of the raw material, was in theory expected to cover the transport costs, the extension services and the inputs provided by the cooperative to farmers. The contract also included the minimum volume of feedstock to be delivered, which is calculated upon the base of the cultivated area and technical coefficients of crop productivity provided by official agencies[7]. In this particular area, the amount was 36 bags of 60kg of soybean per hectare.

The interviewed technician reported that farmers' yields significantly improved thanks to the technical assistance (that covers all farm operations from pre-planting to harvest, safety issues, etc.), not only focused on soy cultivation but also on other crops as SFS regulations indicate. However, the distance among farms and the bad communications (through unpaved roads) made the displacements of the technician from one farm to another long and expensive. In addition, the cooperative was 140 km away from the biodiesel industry, well further the 60-70km that the interviewee pointed as the maximum distance that could be compensated by the plant[8]. Transport costs were hence recognized as a core problem for the functioning of the scheme.

[7] Such as the National Food Supply Agency (CONAB) or the Brazilian Institute of Geography and Statistics (IBGE).

[8] According to the contract the transport costs are financed by the industry, but only up to a limit f 2% of the total value of the acquired feedstock.

In 2012/13, a severe drought caused a crop loss and the cooperative was unable to supply the industry with the minimum volume of output required by the contract. The little amount paid by the plant for the delivered raw material left the cooperative in a difficult financial position, and farmers had not enough financial resources to plant soy the following year. The cooperative stopped commercializing soybean ever since and has specialized in maize again[9]. Only 20 of the associates still produce soybean at present, and they sell it to a large food industry in Bebedouro, 88km away, outside the cooperative and the SFS.

In the interviews conducted to two of these farmers, they identify the loss of technical assistance for soybean production as the most important drawback from the breakup of the commercial relationship with the biodiesel industry within SFS. Given that the drought was a generalized problem for family farmers in Brazil that year, by September 2012 a revision was introduced to the SFS whereby, in case of a harvest loss, the minimum percentage of feedstock to be delivered by family farmers was to be calculated on the *expected* production (art. 6 of the Ordinance 60/2012 of MDA [33]; after replaced by the Ordinance n° 337, 18/09/2015 [31]).

As a final remark, the administrative burden is mentioned by technicians from both the cooperative and the biodiesel plant as a problem for SFS implementation. The procedure to certify the Seal is reported to be long and time-consuming for the industry, and the transaction costs of the programs' functioning are also considered relatively high. For instance, the biodiesel company claim that they are penalised if MDA inspections detect producers registered as family farmers that do not meet the necessary conditions to fall in this category – what forces the company to increase their surveillance effort by way of fieldwork visits. The interviewee from this industry estimates that around 10% of the farmers actually do not fulfil those legal criteria, because they have split the farm and registered as several separate (family) producers. When this kind of fraud is discovered, the DAP of the farmer (i.e. the declaration of eligibility for PRONAF) is cancelled and subsequently the producer no longer has access to any kind of public support as family farmer.

The industry also reports (exceptional) cases of farmers that lose the DAP due to a genuine improvement in their income. Extensive documentation (contracts, photographs and attendance lists of training days, follow-up reports on technical assistance, field measurements, etc.) needs to be collected and presented by the biodiesel industry in the yearly MDA evaluation.

6. CONCLUSIONS

In this article we aimed to shed light on the institutional arrangements, the application and the main outcomes of the Social Fuel Seal in Brazil. Available data show that the

[9] According to the strict contract terms, the power plant could have charged a penalty to the cooperative because the stipulated amount of raw material was not reached. Our informants reported that it was not charged, but the parties decided not to renew the contract by mutual agreement.

program uptake by small farmers has remained well below the government expectations, although the cooperatives' involvement has rapidly increased and catalyzed family farmers' participation after the revision of the policy in 2009.

Interviews in the state of São Paulo have revealed that the technical assistance to family farmers, be it provided by the biodiesel processing plant or the cooperative, is regarded as an effective way to improve agricultural practices and yields. However, the logistic problems due to the high transport costs, the arrangements of the contract (that did not protect farmers in case of harvest loss at that moment), the administrative burden of the scheme, the lack of compliance of some farmers with the agreements and the withdrawal of the less productive farmers have been identified as weaknesses of the SFS implementation.

Moreover, the soybean oil transacted within the SFS is diverted to food processing by the studied industry - a widespread practice in Brazil that adds to other dysfunctions in the SFS practical operation. Biodiesel companies located in the North and Northeast only meet the minimum share feedstock obtained form family farmers by means of contracts with cooperatives settled in other regions; in addition, much of the castor and palm oil produced by the few participating farmers in poor regions is resold by the power plants to buy soybean as biodiesel feedstock [30].

The overall operation of the program awakens concerns about the sustainability of the role of family farmers in it. The accomplishment of the social inclusion objective is also put under question. In the most critical line, the SFS has been considered more of an industry subsidy than as a program to benefit family farmers [14] - in short, a similar accusation to that voice against the bioethanol policy. Hunsberger *et al*. [13] make a crucial point in this regard when they declare that "*Social Fuel Seal's incentives to encourage smallholder production in Brazil appear to be overpowered by counter-incentives favouring economies of scale that are built into biofuel markets beyond the national level*" (p. 255). In a similar vein, other observers [4] claimed that "*family farmers are* […] *hardly relevant as raw material producers for biodiesel production but rather are only an entry ticket into the biodiesel auction*" (p. 291), and indeed this preferential access to auctions was also found to be the most important motivation for the power plant in our case study.

However, the positive outcomes of the SFS for family farmers should not be underestimated. As occurs in our study area, the technical assistance was indeed recognized to have benefited farm productivity. Further, the institutionalization of the role of the cooperatives in SFS has encouraged farmers' capacity building and collective action since 2009, which are undoubtedly positive side effects of PNPB. Fairly positive experiences in the Northern regions have been reported in this regard. As some authors remark [4], the role of cooperatives is particularly important considering that, when small farmers become members, they indirectly gain access to an array of resources from other agricultural, social and rural programs.

Finally, the fact that both industries and farmers divert biodiesel raw material to food purposes leads to two substantive issues for further debate: first, whether the improvements that smallholders may have achieved from PNPB are really due to their upgrading in the biodiesel value chain, and second, whether biodiesel policy is a cost-effective way to promote family farmers compared to alternative policies specifically targeted at them.

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Table 1. Tax exemptions and incentives for biodiesel (R$/m^3)

Type of farmer	Family farmer (PRONAF)		All other producers	All others
Region	North, Northeast & Semi-Arid regions	All other regions	North, Northeast & Semi-Arid regions	
Biodiesel feedstock	Any	Any	Palm oil or Castor oil	
Reduction coefficient	1	0.896	0.775	0.6763
PIS/PASEP*	0.00	10.39	22.48	26.41
COFINS**	0.00	47.85	103.51	121.59

*PIS/PASEP (Program of Social Integration/Program of Patrimony Formation of Public Servants) are social contributions payable by legal entities.

**COFINS (Contribution to the Social Security Funding) is the federal tax levied on gross revenues of businesses.

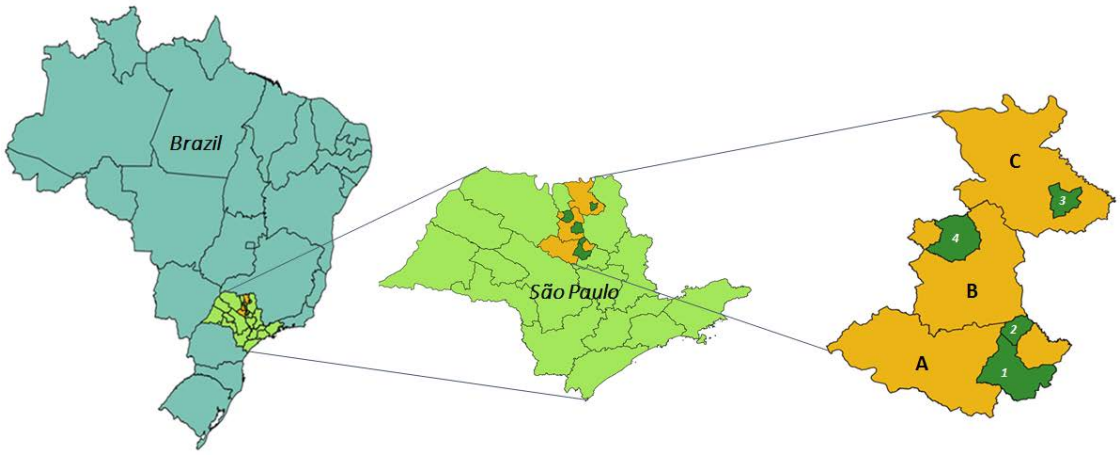
Source: Authors' elaboration from [20].

Table 2. Farmers producing soybean for biodiesel production in the studied cooperative

Soy producers	Fazenda Bela Vista do Chibarro (Araraquara)	Monte Alegre (Motuca)	SFS status
2010/11	3	17	In process of obtaining SFS
2011/12	26	26	With SFS
2012/13	44	7	With SFS
2013/14	15	5	No SFS

Source: Authors' elaboration.

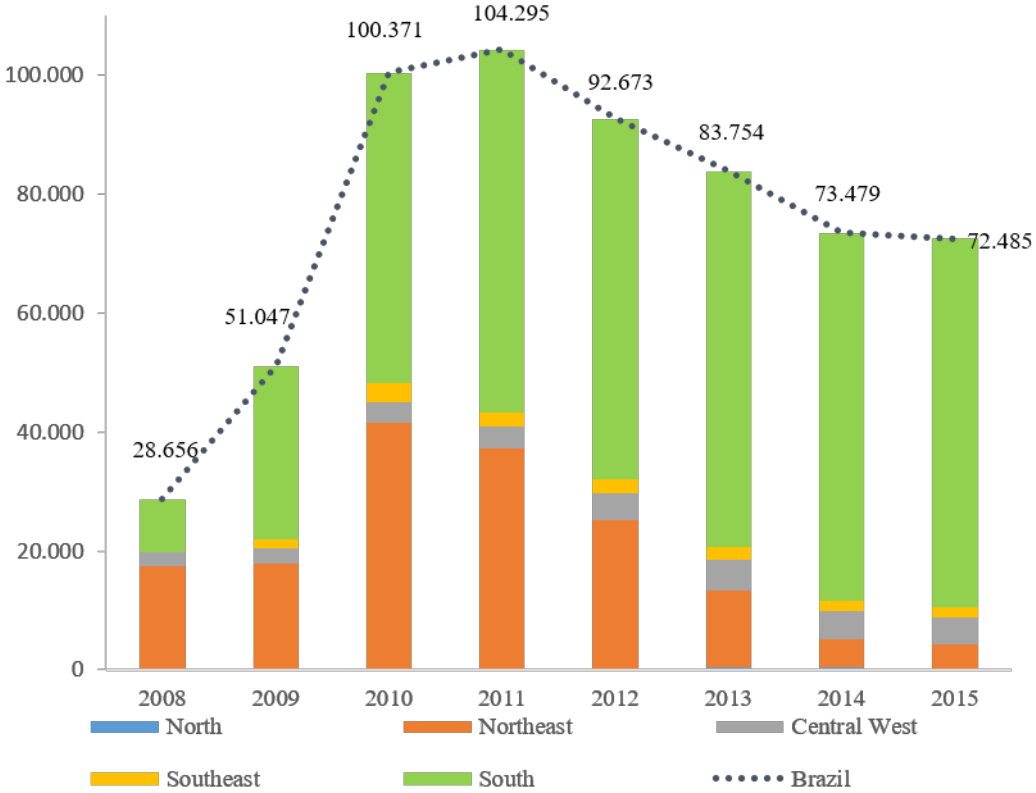
Figure 1: State of São Paulo, micro-regions and cities* where fieldwork was conducted



Micro-regions: A - Araraquara; B - Jaboticabal; C- São Joaquim da Barra. Cities: 1- Araraquara; 2 - Motuca; 3- Orlândia; 4 - Bebedouro.

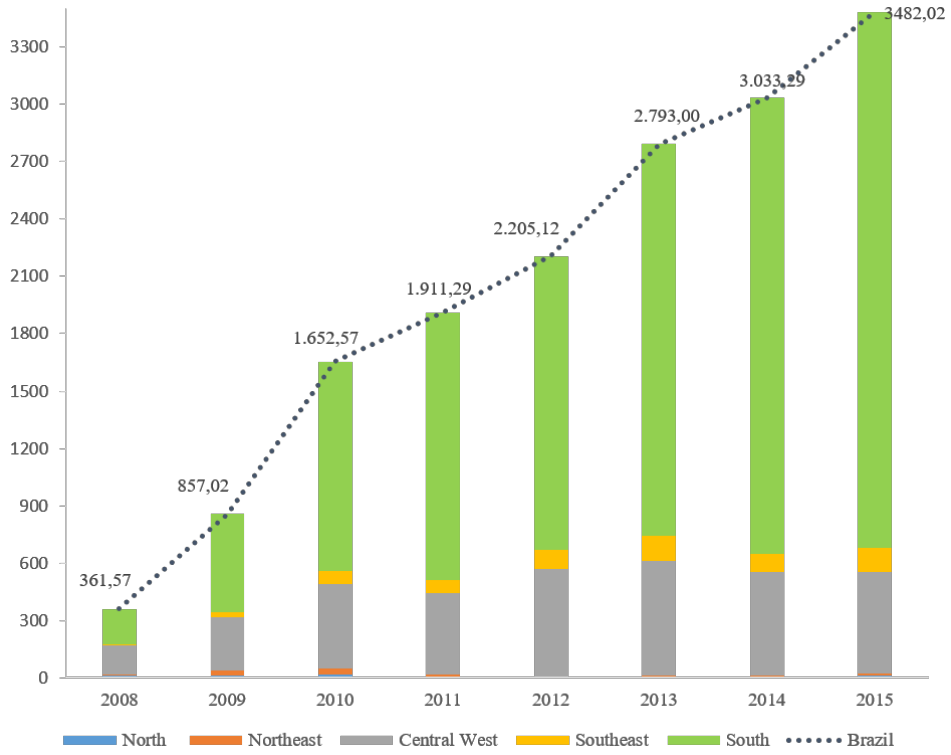
Source: Authors' elaboration.

Figure 2: Number of farm families participating in SFS



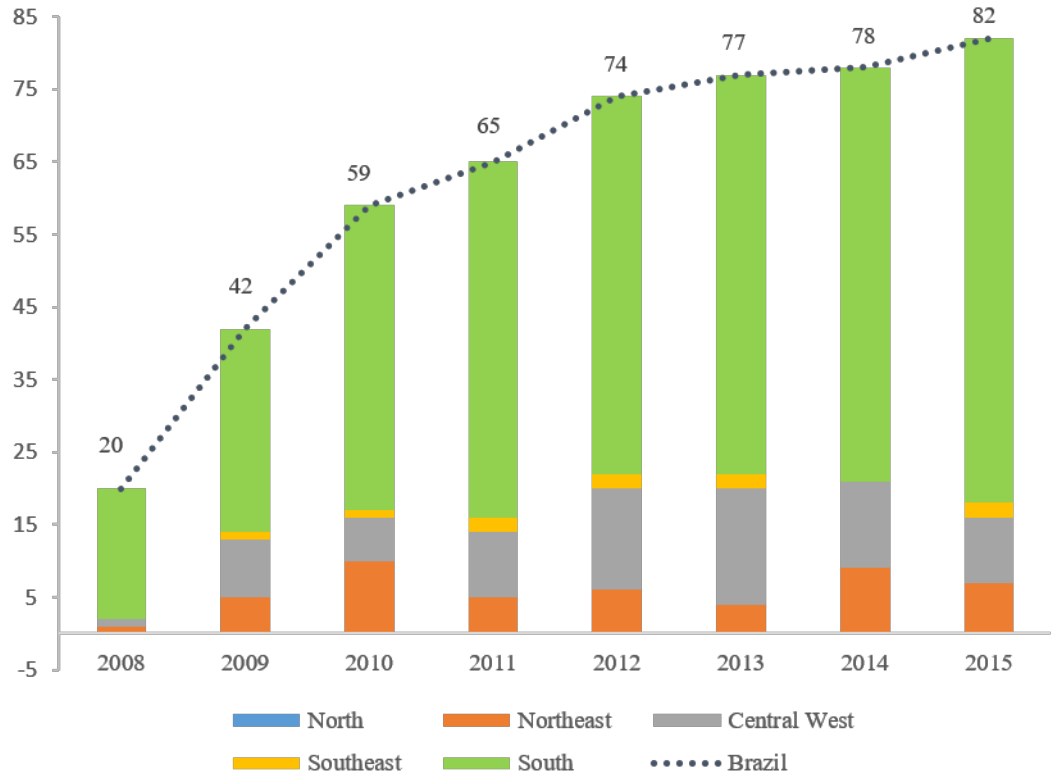
Source: Authors' elaboration based on MDA [18]

Figure 3: Volume of biodiesel feedstock obtained from family farmers within the SFS (1,000 tons)



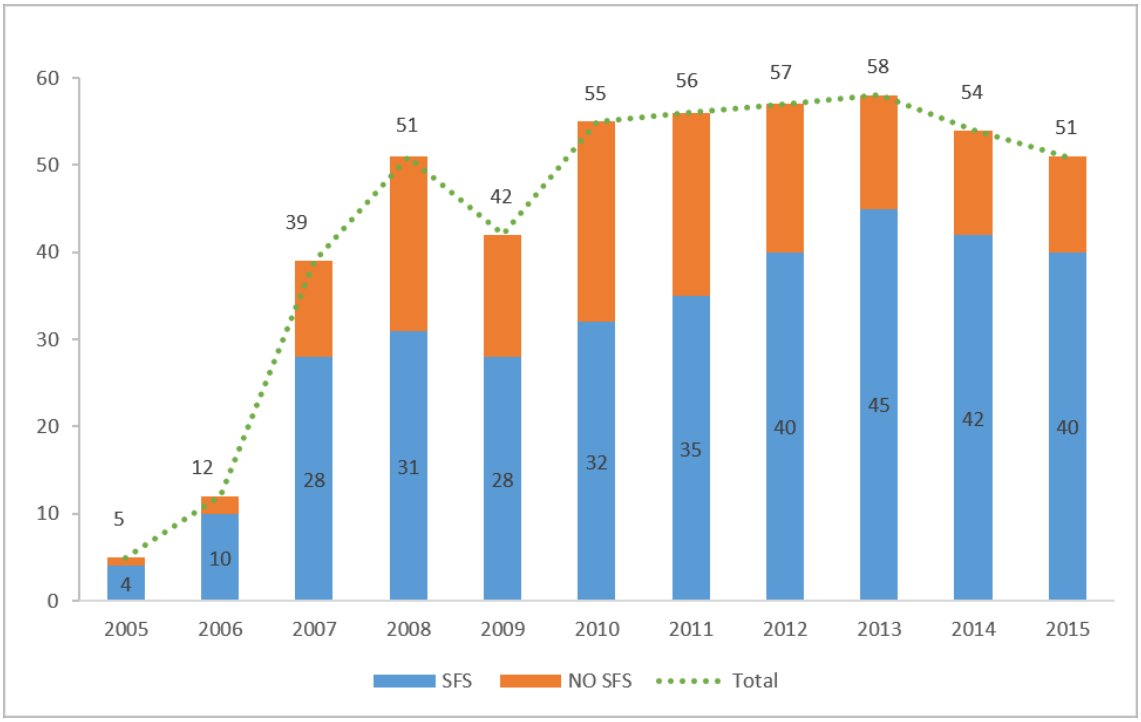
Source: Authors' elaboration based on MDA [18]

Figure 4: Number of cooperatives qualified in SFS.



Source: Authors' elaboration based on MDA [18]

Figure 5: Participation of biodiesel processing industries in Brazilian SFS.



Source: Authors' elaboration based on MME [29].