

# Can family farmers benefit from biofuel sustainability standards? Evidence from the Brazilian Social Fuel Certificate

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Biofuels have come under increasing scrutiny due to adverse environmental and social impacts. In this context, the potential benefits of biofuel development for small family farmers is frequently overlooked. We analyze how sustainability standards and regulatory safeguards try to integrate family farmers' concerns in complex biofuels commodity chains. The study is based on castor feedstock production in the semi-arid northeast of Brazil, where family farmers participate in the National Program on Biodiesel Production and Use through the Social Fuel Certificate mechanism. Our findings indicate that strong regulatory frameworks such as the Social Fuel Certificate are necessary to incentivize family farmer participation and guarantee their benefits. However, they may still be insufficient for sustainable rural development given existing livelihood diversification and limited impact of feedstock production on family income. Sustainable development in less-developed regions such as the semi-arid northeast will thus likely depend on broader development strategies rather than process-oriented sustainability standards.

In the past few years biofuels have received increased criticism. Originally seen as a panacea for climate change mitigation, energy independence and strengthening of rural development [1–3], recent research now links the expansion of biofuels to biodiversity losses, depletion of water resources, food insecurity and, contrary to earlier studies, increases in GHG emissions due to issues related to direct deforestation and releases of natural carbon stocks [4–7]. In addition, violations of labor rights on biofuel raw material plantations and the expulsion of small **family farmers** due to the expansion of energy crops place new doubts on the sustainability of biofuels [8–10].

In this context, Brazilian biofuels are often viewed as a positive exception, implying that large-scale development of biofuels could also be a potential way forward for other countries, particularly in the developing world [11,12]. However, most evidence in Brazil comes from mature sugarcane ethanol (largely through the 1975 Proálcool program that provided incentives to substitute road transport gasoline with ethanol from sugarcane),

which has shown a weak track record in integrating small family farmers into a biofuels commodity chain, with sugarcane workers frequently being contracted laborers that have to endure extreme physical working conditions [9,13,14]. The 2004 Brazilian **National Program on Biodiesel Production and Use** (PNPB) has therefore been interpreted largely as a counterproposal to capital-intensive sugarcane ethanol that would specifically focus on the social inclusion of poor family farmers in the country's most disadvantaged regions, particularly **semi-arid northeast Brazil** [8,15]. Social inclusion is thereby understood as a shift in the understanding of poverty, as social exclusion defined poverty in relative rather than absolute terms, intricately linked poverty and inequality and, perhaps most importantly, placed emphasis on 'power' and 'participation' [1].

The PNPB set up the Social Fuel Certificate (SFC) to articulate these issues by establishing long-term contractual agreements between family farmers and biodiesel producers [15,16]. These agreements include, among others, guaranteed prices, provision of technical

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## Key terms

**Family farmers:** Defined by Brazilian law as a small landholding, with a predominant reliance on family labor, a household income originating mainly from family farm activities, with the farm being operated by the family.

**National Program on Biodiesel Production and Use:** An innovative arrangement to integrate family farmers into biofuel commodity chains. It includes long-term contracts between biodiesel producers and family farmers, participation of social movements, provision of technical assistance and guaranteed prices for family producers.

**Semi-arid northeast Brazil:** One of Brazil's poorest regions. Small family farmers suffer from hydrological deficits, land degradation, limited access to technology and poverty.

**Sustainable biofuels:** There is no generally accepted definition, but sustainable biofuels should contribute to climate change mitigation and rural development while simultaneously maintaining food security and preventing local or regional environmental damages.

**Castor:** Drought-resistant oilseed with high oil content (43–49%) and existing R&D base that has become the flagship for the National Program on Biodiesel Production and Use's family farmer inclusion strategy.

**Biofuel sustainability standards:** Aim to characterize and implement sustainable processes for biofuels in order to reduce adverse socioecological impacts during their production and create market opportunities.

assistance and supply of quality seeds for farmers. However, despite considerable efforts since 2004, the PNPB has shown only limited progress with regards to family farmer integration and benefit generation [17,18], as feedstock produced by family farmers remains expensive and cost-efficient alternatives for biodiesel production – especially agribusiness-led soybean feedstock – are widely available [19,20]. Still, from the perspective of developing-country governments, as well as sustainability standards such as the Roundtable on Sustainable Biofuels (RSB) [21], the Global Bioenergy Partnership [101] or the Cramer Commission [22], integrating biofuel supply-side concerns with sustainable rural development targets is of considerable interest.

In this context, the Brazilian experiences with the SFC can provide important lessons learned on how farmers benefit from their integration in biofuels commodity chains and what must be done on the institutional level to guarantee their integration and benefits. This article presents the case of **castor** (*Ricinus communis* L.) production by family farmers in the semi-arid northeast of Brazil. Castor has been planted and commercialized for decades in the wider Irecê, Senhor

sustainability initiatives have been implemented in the past few years. Environmental impacts are consistently addressed in all initiatives and are mostly related to water, soil and air management, and to conservation/biodiversity issues. **Table 1** gives an overview on the most relevant initiatives.

Two of the most well-known initiatives are the RSB and the Roundtable on Sustainable Palm Oil (RSPO). The RSB Principles and Criteria for Sustainable Biofuels document provides guidelines on best practices in production and processing of biofuel feedstock and raw material, and for the production, use and transport of liquid biofuels [21]. The principles and criteria identify four types of operators subject to different sustainability requirements, including feedstock producers, feedstock processors, biofuel producers and biofuel blenders, where family farmers fit into the first category (feedstock producers). The RSPO's Guidance on Scheme Smallholders document defines family farmers as those “*growing oil palm, sometimes along with subsistence production of other crops, where the family provides the majority of labor and the farm provides the principal source of income and where the planted area of oil palm is usually below 50 ha in size*” [25].

Therefore, small family farmers are typically seen as raw-material producers in a supply chain (and not, for example, decentralized biofuel producers). A question, however, remains as to how fragile stakeholders such as family farmers can be effectively integrated in the certification process, and whether they can benefit from participating in biofuel commodity chains. This observation takes into account that family farmers are often not central stakeholders within sustainability standards for biofuels production [26,27]. For instance, RSB mentions the problems for small producers to receive certifications given that they “*may have difficulty meeting some criteria,*” making it “*necessary to balance requirements of the standard with these practical challenges*” [21]. However, the potential role that small family farmers can play in guaranteeing the proper sustainability of biofuels production is not recognized. Small producers often intercrop biofuel feedstock with subsistence crops and use little chemical fertilizers or pesticides, which may reduce adverse environmental impacts and guarantee food security.

While initiatives such as the RSB and the RSPO raise important issues regarding family farmer integration into biofuel commodity chains – including the contribution to the social and economic development of local, rural and indigenous people and dealing fairly and transparently with the small producers – their acknowledgment of family farmers as potential partners in these chains is limited. In Brazil, the PNPB has integrated a comprehensive approach to include

do Bonfim and Jacobina (ISJ) region. As such, it has become the flagship for the PNPB's social inclusion strategy [10,23,24].

Following this short introduction, the remainder of this article is organized as follows: the PNPB framework is presented and a short overview on **biofuel sustainability standards** is given; the castor case study in the ISJ region is analyzed; the principal weaknesses and opportunities for family farmer integration in biofuel commodity chains are discussed; and final remarks are given.

## Contextualization

### ■ Biofuel sustainability standards & family farmer integration

In order to mitigate adverse social and environmental impacts in biofuel commodity chains while maintaining market access to main consumer markets, various

**Table 1. Key schemes/standards/initiatives to support sustainable biofuel production.**

| Scheme                                     | Year | Description  | Ref.  |
|--|------|--|-------|
| Roundtable on Sustainable Palm Oil         | 2002 | Multistakeholder initiative that joins oil palm producers, NGOs and other relevant stakeholders to develop global standards for sustainable palm oil production  | [21]  |
| The Global Bioenergy Partnership           | 2005 | International initiative to promote bioenergy development in three strategic areas: sustainable development, food and energy security, and climate change  | [101] |
| Cramer Commission                          | 2006 | Commission established in The Netherlands to set generally applicable criteria for bioenergy production and processing in order to incorporate sustainable biofuels production into government policies  | [22]  |
| Round Table on Responsible Soy Association | 2006 | Multistakeholder initiative specific for soy production; aims to monitor global soy production and promote a sustainability standard for its supply chain  | [102] |
| Roundtable on Sustainable Biofuels         | 2007 | Multistakeholder initiative coordinated by the Energy Center at the École Polytechnique Fédérale de Lausanne; development of a sustainability standard and a third-party certification system for biofuel sustainability standards   | [103] |
| Better Sugarcane Initiative (Bonsucro)     | 2008 | Global multistakeholder nonprofit organization dedicated to reducing the environmental and social impacts of sugarcane production; a standard has been developed for products, processes or services that have been certified by an independent certification body as being in compliance with the Bonsucro criteria | [104] |

Data taken from [55].

small family farmers into biodiesel production using innovative regulatory instruments. This mechanism is discussed in the following section.

#### ▪ National Program on Biodiesel Production & Use

Brazilian experiences with biodiesel date back to the first half of the last century [28]; however, only with the implementation of the PNPB was family farmer integration effectively addressed in the country's biofuel strategy. The PNPB's legal, regulatory and tax model framework for biodiesel production and use in Brazil was established in 2004. Due to the large diversity of available feedstock for biodiesel production and varying regional comparative advantages, various productive systems were integrated in the program, including small-scale family farmer-based production in the semi-arid northeast, as well as complex soybean (*Glycine max*) agribusiness-led production. Given the limited success in integrating small family farmers in the earlier sugarcane ethanol program (Proálcool), as well as fears that the family farmer would not be able to compete with already established commodity chains such as soybean, specific safeguards and institutional arrangements were implemented in the PNPB program [8].

The integration of family farmers in the PNPB is ensured by the SFC of 2005. The SFC is a scheme issued by the Ministry for Agrarian Development (MDA) to biodiesel producers that promote social inclusion for family farmers within the PNPB. The SFC requires the biodiesel producer to provide technical assistance and training to farmers, supply quality raw material such as certified seeds, as well as to set contractual definitions (including minimum prices) with family farmer representatives, including the National Confederation of Agricultural Workers and the Federation of Family Farmer Workers. In return, the SFC provides biodiesel producers with access to the first and largest (80%) of the two lots in the national biodiesel auctions (organized by the National Agency of Petroleum, Natural Gas and Biofuels) that are reserved exclusively to producers holding the SFC. Furthermore, detention of the SFC is linked to tax exemptions and the right to obtain preferential interest rates for biodiesel investments; for example, at the National Development Bank. As such, obtaining the SFC is a vital strategy for biodiesel producers that, at the same time, can guarantee family farmer participation. To obtain the SFC, a company must demonstrate a minimum percentage of the purchase of oilseeds from family farmers. This was originally set at 50% for the

semi-arid northeast region, but at significantly lower values for other geographical regions (e.g., only 10% in the major soybean production centers in the midwest). Petrobrás, Brazil's major oil company, supports the logistics and distribution of biodiesel but has also invested in biodiesel plants in the semi-arid northeast through its subsidiary Petrobrás Biocombustíveis. The innovative institutional set-up is summarized in **Figure 1**.

The SFC has undergone considerable changes since 2005. These were justified by the predominance of cheap agribusiness soybean as biodiesel feedstock, as well as concerns to turn family farmer production, such as castor, more competitive. Following the global economic crisis of 2008, vegetable oils such as castor, cotton, sunflower or rapeseed (all potential PNPB feedstocks) began to show much higher prices than soybean (premiums of 20–50%) on international markets, making their sale via the PNPB auctions economically unviable [29]. SFC changes included reduced minimum percentages for raw materials purchased from family farmers in the semi-arid northeast (from 50 to 30%) and laxer rules for biodiesel producer acquisitions from family farmers (**Box 1**). Further incentives aimed to increase expenditures with technical assistance, technology and quality inputs that would benefit participating family farmers and promote social inclusion.

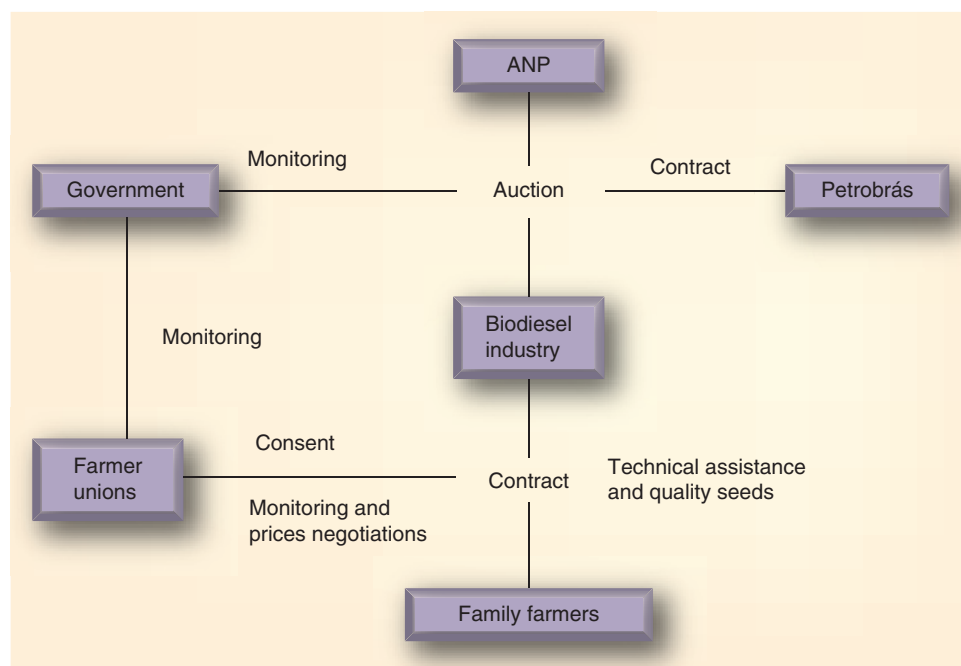
In the past, the Brazilian biodiesel market has seen considerable growth in capacity through the establishment

of gradually increasing mandatory biodiesel blends (from B2 to B5). The installed capacity for the production of biodiesel in Brazil has increased to 6.13 million m<sup>3</sup> year<sup>-1</sup>, distributed among 55 plants. Of this total capacity, 5.19 million m<sup>3</sup> have been awarded the SFC [30]. However, this has yet not translated into integration of predominantly poor family farmers from regions such as the semi-arid northeast. The main feedstocks currently used in biodiesel production in Brazil are soybean (71.1%), animal fat (18.7%) and cotton (4.7%); that is, agricultural products that are mainly produced by large-scale agribusiness or modern family farms in the country's southern region [30]. In fact, despite the considerable market growth, family farmer integration remains fairly limited: by 2009, only 51,047 family farmers participated in the PNPB (17,711 farmers in northeast Brazil), whereas initial government objectives had aimed at a total of 225,000 contracts (85,000 contracts in the northeast) [18,31]. Small farmers planting castor thus do not yet play a relevant role in biodiesel production in Brazil.

The next section explains the underlying factors for this development based on a case study in the regions of ISJ, state of Bahia.

#### PNPB & family farmer integration: the case of castor in semi-arid Brazil

Bahia is the largest state in the semi-arid northeast (567 million km<sup>2</sup>). Farmers in the sparsely populated region have coped with hydrological deficits and recurrent droughts since the earliest days of its colonization. Examples include, among others, extensive cattle raising based on forage and salt ponds for animal feed, climate-adapted sugarcane and cotton for export markets, and resistant subsistence crops for human consumption, including cassava, corn or beans [31,32]. In this context, high demand for meat in the country's coastal centers, and cotton and sugar cultivation as agricultural commodities, caused subsistence farming to develop merely as an appendix to commercial agriculture rather than on its own. This has been evidenced by widespread use of soils of inferior quality or degraded lands for own consumption, rudimentary agricultural methods, inconsideration of organic fertilizers or pesticides, and lack of irrigation, drainage or other water regulation techniques [31,32]. Furthermore, extensive cattle



**Figure 1. Institutional framework of the National Program on Biodiesel Production and Use.** ANP: Brazilian National Agency of Petroleum, Natural Gas and Biofuels. Reproduced with permission from [15].

**Box 1. Key changes in Social Fuel Certificate rules for northeast Brazil (2009).**

- Reduced minimum percentage required for raw materials purchased from family farmers.
- Laxer rules to calculate family farmer feedstock minimum percentages – costs for soil analysis, provision of production inputs (including quality seeds, fertilizers, soil correctives, machine hours and fuel) and expenses related to technical assistance and training – can be partly offset against overall expenses with family farmers. In practice, providing these services within the National Program on Biodiesel Production and Use thus requires biodiesel producers to buy from a lower number of family farmers in order to obtain the Social Fuel Certificate.
- Several new reporting obligations on feedstock acquisition and provision of technical assistance in order to reduce irregularities and fraud.

Data taken from [30].

production, slash-and-burn agriculture and uncontrolled use of woodfuel (especially for sugar production) has led to widespread degradation of the caatinga – one of the country's largest biomes (735 million km<sup>2</sup>) – including soil erosion, desertification, fragmentation and losses in biodiversity [31–33]. Today, only approximately 40% of the original vegetation of the caatinga remains, but very few areas are not yet economically used [33]. Only 1% of its area is currently protected [34].

Castor, in global terms, is a small commodity with clearly defined markets [35,36]. Its oil corresponds for only 0.15% of globally traded vegetable oils [37], showing a considerably higher price than competing oils [38]. Brazil, the world's leading producer during the 1970s, lost its place in the following two decades to India and China, experiencing a considerable drop in overall production as well as in productivity [39]. Castor has been planted by family farmers in rural Bahia for decades given its resilience to the region's adverse climatic conditions and the crop's commercialization potential [40,41]. Bahia contains approximately 80–90% of the domestic production, particularly in the regions of the ISJ (Figure 2). It plays a considerable role as a cash crop, which farmers intercrop together with subsistence crops (mainly corn and beans) and then sell to the oleochemical industry that requires castor oil for the production of cosmetics, polymers, lubricants or other derivatives [35].

Castor farmers have long suffered from dependence on middlemen for commercialization and fluctuating prices, reducing their margins and adding considerable uncertainty on future returns. Furthermore, due to continuous environmental degradation in the main producer region, as well as lacking dissemination of good agricultural practices, agricultural yields remain considerably below their potential [19,42,43]. In this context, the industrialization of castor production in the northeast was discussed as early as in the 1940s [44]. Given its high oil content (43–49%), existing R&D base and an existing basis in smallholder agriculture, castor became early on the flagship for PNPB's northeast social inclusion strategy. In a newly integrated commodity chain, existing economic and agronomic deficiencies would be removed and income and jobs could be created for

family farmers. Its integration into the PNPB was consequently endorsed by many stakeholders, including the scientific community and government [23,24,28]. Early estimates foresaw that castor would play a significant part in the provision of biodiesel feedstock; according to scenarios presented by the Brazilian Agricultural Research Cooperation (Embrapa), 5400 million l or 15% for B5 blends (2005) could be based on castor oil [45].

Table 2 shows that positive experiences with castor as a feedstock for biodiesel production within the PNPB have been limited. Despite considerable efforts to turn castor into a commercially competitive alternative to agribusiness oleaginous crops, castor production and productivity have not significantly improved since the PNPB implementation, in spite of renewed efforts to provide technical assistance to farmers. Furthermore, castor cultivation has remained strongly concentrated in the three microregions of the ISJ (currently accounting for 66% of domestic production). This has pushed castor prices upward, which benefits farmers but makes castor less competitive than other biodiesel feedstocks. While castor continues to be bought by biodiesel producers in order to fulfill their SFC obligations (minimum purchase of oilseeds from family farmers), castor is not turned into biodiesel but sold in vegetable oil form on the world market. Although this is consistent with current SFC rules, the lacking competitiveness of castor makes farmers vulnerable to policy changes, under which castor might be cut from the program's objectives (castor biodiesel has only been sold in the national biodiesel auctions before the biodiesel mandate became mandatory in 2005).

It is clear that family farmer participation has significantly increased between 2009 and 2010 (from 17,711 to 55,000), implying that positive impacts now accrue to a larger number of participating families. This positive development can be linked to the restructuration efforts within the PNPB [42]. However, continuing problems regarding lack of scale of production and prohibitively high prices will likely impede castor-based biodiesel production in the future. The reasons for this are manifold.



**Figure 2. Case study location: Irecê, Jacobina and Senhor do Bonfim.** The Irecê, Senhor do Bonfim and Jacobina microregions are underlined.

Reproduced with permission from [105].

**Table 2. Castor production and family farmer participation following the National Program on Biodiesel Production and Use implementation, 2003–2010.**

| Castor  | 2003   | 2004    | 2005    | 2006   | 2007   | 2008    | 2009   | 2010   |
|---|--------|---------|---------|--------|--------|---------|--------|--------|
| Production in Brazil (kt)   | 83,682 | 138,745 | 168,802 | 95,000 | 98,142 | 122,140 | 91,076 | 95,183 |
| Production in the ISJ region (%)  | 77.5   | 72.8    | 65.5    | 55.5   | 58.2   | 64.1    | 52.6   | 66.3   |
| Productivity (kg/ha)  | 622    | 787     | 679     | 592    | 589    | 746     | 548    | 605    |
| Northeast (of Brazil) family farmers participating in PNPB <sup>†</sup> | NA     | NA      | 15,000  | 30,226 | 6850   | 17,187  | 17,711 | 55,000 |
| Prices received by producers <sup>‡</sup>                               | NA     | NA      | 33.11   | 32.17  | 54.71  | 70.48   | 60.75  | 70.98  |

<sup>†</sup>Includes mainly castor farmers.

<sup>‡</sup>R\$/60kg, annual average. Data does not include December 2010.

ISJ: Irecê, Senhor do Bonfim and Jacobina regions; NA: Not available; PNPB: National Program on Biodiesel Production and Use.

Adapted with permission from [42].

Most farmers only plant castor in addition to subsistence crops (beans or corn), a tradition that has not changed since PNPB effectively entered into operation [10]. A cooperative leader interviewed stated that “*Bahia is the main castor producer of Brazil, but we don’t have any castor farmers. What we have is beans or corn farmers.*” Other difficulties that continue to hamper castor production include, among others, contractual misunderstandings between biodiesel producers and farmers (including breach of contracts), lack of qualified agronomists for technical assistance, delayed delivery of certified seeds for production, difficult assimilation of new agricultural practices by farmers and disastrous management by early biodiesel producers working with family farmers in the semi-arid northeast region [10,17,42]. In 2008, additional problems arose based on comments that castor oil would be inadequate for biodiesel production given its high viscosity. While this information caused a considerable stir in national discussions, it was later clarified that this situation would only be relevant for very high-grade biodiesel blends (e.g., B100) but not low-grade blends (up to B10) [46].

Recent numbers published by MDA/Deutsche Gesellschaft für Technische Zusammenarbeit see farmers gaining an average annual R\$345 per ha planted, to which income from intercropped cultivars, other agricultural activities, nonfarm jobs and especially government transfer programs would have to be added [18]. In the survey, most farmers (54%) stated to have experienced modest income gains [18]. Another recent study corroborates these results in finding that farmers may have experienced income gains in the order of up to 20% [47]. Due to the low income level in rural northeast Brazil these increases can be considerable for families. However, in most cases, castor rent will be only an additional component of family income. The MDA/Deutsche Gesellschaft für Technische Zusammenarbeit study found that farmers, on average, plant only 1.5 ha with castor [18] (small landholdings are common in northeast Brazil: 60% of family

farmers possess an average of only 1.7 ha [48]). As such, the biggest impact of PNPB for family farmers may not lie in providing (yet) limited financial gains for castor production, but in the provision of technical assistance and consolidation of the castor commodity chain (and thus market access). Before, PNPB castor farmers were mostly price takers who sold their production to local middlemen, who in turn sold the produce to the processing industry. While these relationships provided several benefits (e.g., access to credit and trust they nevertheless left farmers vulnerable when informal contracts were not kept [49]). Furthermore, the market chain was left completely unstructured, where in some cases as much as seven middlemen were involved before castor eventually reached industry. As of today, the number of farmers in cooperatives selling to biodiesel producers has increased significantly in Bahia (interestingly, in other northeast states, biodiesel feedstock is bought directly from farmers as they mistrust cooperatives due to failed experiences in the past, particularly due to corruption). This may strengthen local governance but also provide new economic opportunities, as cooperatives move into other business opportunities; for example, milk production. A recent government program focuses on self-organization of actors at local level, including bank representatives, municipal secretariats or agronomists, which aims to strengthen strategic planning and problem-solving capacities. While the quality of technical assistance within the PNPB has been criticized, ongoing programs for technicians may provide positive returns in the long term.

### Discussion & final remarks

Development policies are typically developed to compensate inequalities related to the allocation or access to resources, attempting to create or to restore a type of level playing field. Therefore, public intervention in markets typically aims to compensate identified biases, which may be of a regional, social and/or environmental nature. When circumstances alter, requiring significant

#### Key term

**Sustainable development:** According to the Brundtland Commission (1987), development that “meets the needs of the present without compromising the ability of future generations to meet their own needs.” This implies that economic, social and environmental concerns should be equally considered for development.

and long-term strategic direction to change, the driving force of innovation, to a certain extent and in some parts of the economy, shifts location from the market to the state [50]. In this sense, the PNPB, through seeking to expand the production of oilseeds in the semi-arid northeast of the Brazil, aims to promote a section of the country’s agricultural sector

that is under considerable stress; that is, poor family farmers in the semi-arid northeast region. In its original proposal, the PNPB would be a counterproposal to the Brazilian sugarcane ethanol program, which is dominated by large agribusiness companies, strongly concentrated around the São Paulo region and based on extensive monoculture plantations [8]. As such, the PNPB sought the decentralization of production, the diversification and prioritization of raw materials production according to the region’s potential, and the use of economic incentives in order to convince biodiesel producers to integrate small family farmers into their supply chain.

The Bahia case study shows that, despite these efforts, several problems continue; in particular related to low family farmer participation, productivity and incomes. Lack of technical assistance and quality thereof, lack of access to resources, difficulties in knowledge assimilation and bad performance of the PNPB in its initial stages are part of the underlying factors leading to this development. In line with our argumentation, it can be stated that many problems are of structural nature rather than exclusively linked to the PNPB [WILKINSON J, UNPUBLISHED DATA]. These observations are particularly interesting when comparing them to the evolution of family farmers in the developed south region. The great triumph of the PNPB has been the building of network companies, trade unions and social movements to cooperate in the promotion of contractual relationships between family farming and biodiesel companies. However, insofar as soybeans have become the almost exclusive raw material of the PNPB (>80% of auctioned biodiesel), most benefits are also accrued in the soybean producer regions in the Brazilian south, southeast and midwest regions. These producers historically have benefited the most from the state’s microfinance program (O Programa Nacional de Fortalecimento da Agricultura Familiar), are well organized and provide the social bases of unions, associations, social movements and parties that directly influence public policies. Along the incorporation of transgenic soybean that contributed to decrease of soybean production costs, the biodiesel supply chain has given these farmers considerable opportunities in the soybean supply (in which

only approximately 20% of feedstock can be used for biodiesel production due to its low oil content, the main product being high-protein animal feed). Family farmers that plant soybean become valued given the necessity for biodiesel producers to fulfill the SFC obligations in order to participate in all biodiesel auctions (not only the 20% available for producers without SFC), and this important role will certainly increase with the growth of domestic biodiesel demand (~11% in 2011) and the prospect of further future increases in biodiesel blends [51]. Furthermore, the expansion of biodiesel production and its link with the SFC are transmitting a greater bargaining power to soybean farmers, something already seen in the special conditions already required for the biodiesel companies, such as an additional fee per bag bought from these farmers. At the same time, many biodiesel producers in the semi-arid northeast have been disappointed with the limited results in castor productivity and production, and a concentration of biodiesel plants outside this region has been clearly visible for several years; the exception being state-controlled Petrobrás Biocombustíveis, which has entered the northeast market only due to significant pressures from federal government [52].

The contrast between the difficulties regarding social inclusion in the Brazilian northeast region (in fact, also in other less developed regions such as the north Amazon region) and the considerable growth of the family farming sector in other regions, shows that the structural problems of family farming in the semi-arid regions takes precedence over a public energy policy aimed at **sustainable development**. The agroecological, land-owning, technological and organizational conditions in small-producer agriculture in the semi-arid northeast are weaknesses that require considerable action and time to resolve. This is especially true where production and logistics require considerable economies of scale, such as in biofuel feedstock production (requiring quantity, not quality of feedstock).

The results achieved with the PNPB suggest that the absence of instruments to drive the market in a sustainable way would be detrimental to disadvantaged agricultural sectors. In this context, the development of castor production by family farmers as a market niche for supplying the oleaginous industry (instead of as its feedstock function for biodiesel) may be interesting given the potentially higher prices (castor feedstock not having to compete with agribusiness soybean oil). However, such a market would also require safeguards in order to allow farmers to benefit from this development – it would be counterproductive to apply mechanisms such as the SFC only for biofuels production, but not alternative uses that are based on the same raw materials produced in the same region by similar farmers.

These findings have considerable consequences for the design of sustainability certification standards. However, defined sustainable biofuels, as an objective of process-oriented certification standards or sustainability initiatives, do not necessarily translate into sustainable development (as an overall objective of government), particularly where family farmers suffer from structural poverty and other problems. Therefore, initiatives such as the RSB [21] or the SFC will likely generate the largest benefits for poor family farmers where broader rural development strategies are implemented simultaneously, including (and not limited to) investments in health, schooling, microfinance, market development, cash transfers for extremely poor families or rural electrification [42,46]. In the absence of these conditions, it is unclear whether sustainability initiatives can have tangible impacts on these farmers.

Social inclusion through biofuel production only via income and job generation in the semi-arid northeast is likely insufficient to guarantee sustainable development along its three pillars, as it will focus primarily on economic, but not social or environmental concerns. In this context, [Figure 3](#) presents the links between the structural problems studied in the case study in Bahia and the social criteria considered in the RSB: institutional development (e.g., cooperatives, farmer associations), market development (e.g., elimination of middlemen), facilitating access to technological inputs or microcredit, greater security due to contracts, improving technical assistance (both quality and quantity) and facilitating access to new markets [42]. As can be seen in [Figure 3](#), sustainability initiatives such as the RSB set criteria and principles that overlap with these issues, but do not provide operable rules for action.

In line with this thought, it is interesting to see that both the SFC and restricted biodiesel auctions are subject to an elimination campaign by large Brazilian biodiesel companies in favor of free negotiations for biodiesel sales. Several changes have already happened, such as the relaxation of eligibility criteria for the SFC concession and the more relaxed consideration of costs for family farmer acquisitions. However, the most anticipated change would be a free market-oriented biodiesel framework, which could increase sales volumes considerably but likely exclude castor from the biodiesel program. The message launched by the Interministerial Biodiesel Executive Committee in March 2012 is that plans exist for an expansion of the domestic market, in accordance with the automotive industry, which should promote sustainability objectives and seek the inclusion of other renewable alternatives that could replace diesel derived from petroleum.

This would happen primarily by further relaxing the regulatory framework of the PNPB and the creation of a fund to finance the technological development and innovation, and insertion of family agriculture actions in the biodiesel industry [53].

The metaphor of ‘the market as a policy’ draws the construction of markets as a political project directed by actors with power [54]. Despite the difficulties encountered, keeping the SFC as a control mechanism of social sustainability of the Brazilian biodiesel program in this context remains an essential strategy for future sectorial development, particularly the integration of poor family farmers [50,53]. Such mechanisms would not need to be limited to biofuels production, but could also be implemented in other promising markets.

Accordingly, sustainability will likely not be guaranteed or achieved from compliance with certification requirements previously established, or framed within a management system. It is a dynamic and multidimensional concept, related to a transition, a work in progress and a long-term objective. Principles and criteria related to sustainability will likely not be exhaustive enough to encompass all issues and stakeholders that may arise in the future or that currently exist. Broad sustainable rural development in underdeveloped regions thus depends fundamentally on strong sectorial policies rather than process-oriented criteria and standards.

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### Future perspective

Current pressures aim to end Brazil’s unique approach for market integration of poor family farmers in the semi-arid northeast and in other less developed regions. If the current trends continue it is likely that the PNPB will lead to a similar concentration of feedstocks as the Brazilian sugarcane ethanol program. Under this scenario, better-developed soybean family farmers will continue to participate in the PNPB, although under a less favorable institutional arrangement with a focus on free markets development. Unorganized and poor family farmers such as in the semi-arid northeast will likely be dropped from the PNPB. The focus on soybean production could increase indirect land use pressures on the Amazon agricultural frontier and, thus, renew deforestation of the Brazilian Amazon or the lesser known but biodiversity-rich cerrado biome (savannah). In the semi-arid northeast, these consequences may be less relevant given already high land degradation indexes and integration of castor in small-scale intercropping arrangements rather than extensive monoculture. Continuing to invest in social benefits to poor family farmers thus gains considerable support from a broad sustainability perspective.

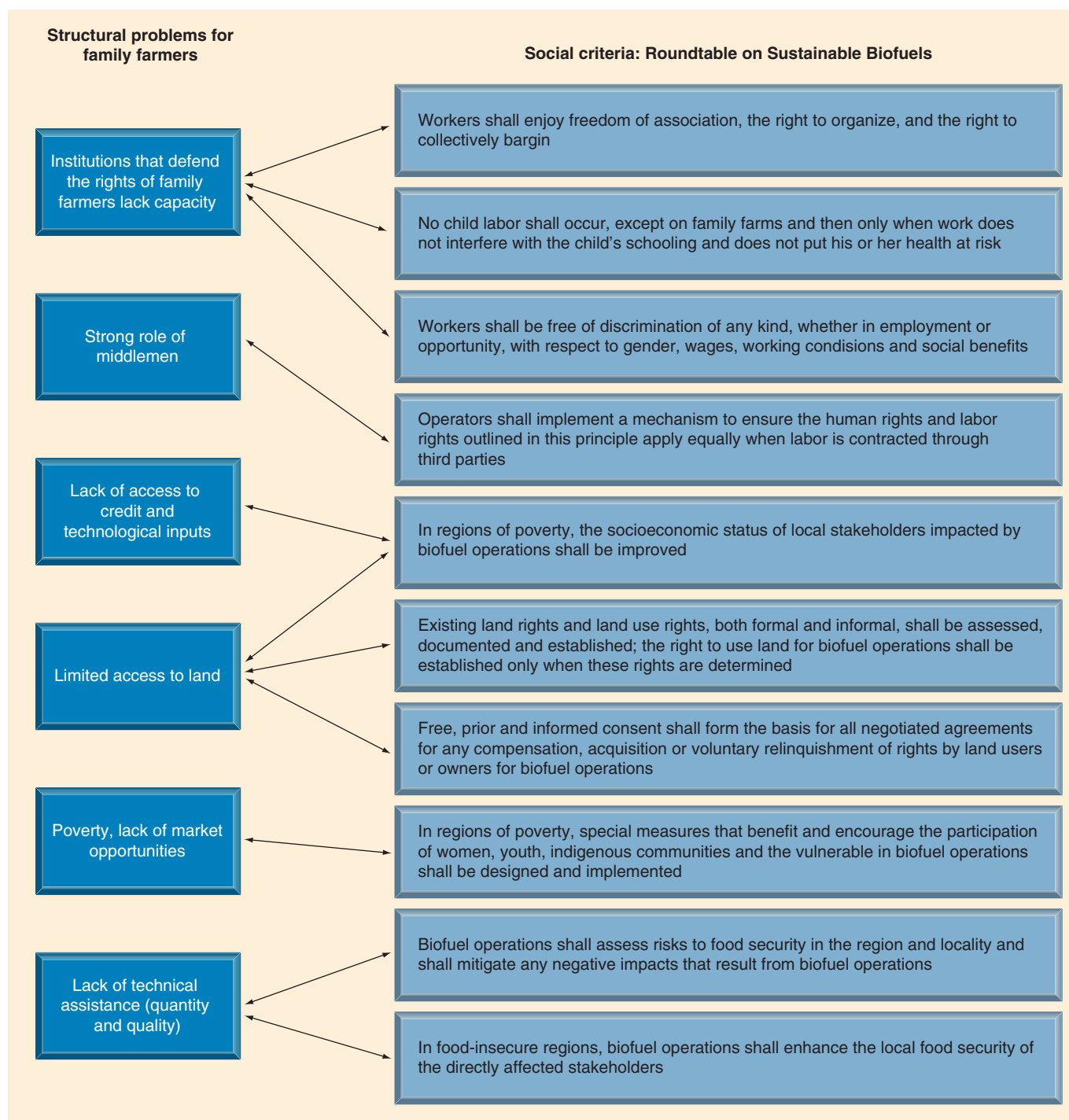


Figure 3. Shared values in biofuels production versus social criteria of the Roundtable on Sustainable Biofuels.

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**Executive summary****Background**

- Biofuels are now frequently criticized for adverse socioenvironmental impacts. This is contrasted with the ongoing Brazilian experiences that aim to strengthen family farmer integration and guarantee their benefits in the poor semi-arid northeast of the country, despite initial problems.

**Contextualization**

- There are several mechanisms and instruments through which sustainability standards worldwide and the National Program on Biodiesel Production and Use in Brazil aim to provide social benefits for family farmers participating in biofuel commodity chains.

**National Program on Biodiesel Production & Use & family farmer integration: the case of castor in semi-arid Brazil**

- Family farmers in the semi-arid northeast participate in a biodiesel commodity chain, which has benefits and challenges.

**Discussion & final remarks**

- Sustainable development in less developed regions such as the semi-arid northeast will depend on broader development strategies rather than process-oriented sustainability standards.

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