



Family Farmers' Perceptions of the Impact of Public Policies on the Food System: Findings From Brazil's Semi-Arid Region

Emily Aparecida Ferreira Brandão^{1*}, Thiago da Rocha Santos² and Stephan Rist³

¹ Faculty of Science and Natural Sciences, Institute of Geography, University of Bern, Bern, Switzerland, ² Cooperativa Sertão Forte de Casa Nova e Região (COOAF), Casa Nova, Bahia, Brazil, ³ Centre for Development and Environment (CDE) and UNESCO Chair on Cultural and Natural Heritage and Sustainable Mountain Development, University of Bern, Bern, Switzerland

OPEN ACCESS

Edited by:

Hans Rudolf Herren,
Independent researcher, United States

Reviewed by:

Gabriel da Silva Medina,
University of Brasília, Brazil
Imme Scholz,
Deutsches Institut für
Entwicklungspolitik (DIE), Germany

*Correspondence:

Emily Aparecida Ferreira Brandão
emilyfbrandao@gmail.com

Specialty section:

This article was submitted to
Land, Livelihoods and Food Security,
a section of the journal
Frontiers in Sustainable Food Systems

Received: 28 April 2020

Accepted: 20 August 2020

Published: 29 September 2020

Citation:

Brandão EAF, Santos TdR and Rist S
(2020) Family Farmers' Perceptions of
the Impact of Public Policies on the
Food System: Findings From Brazil's
Semi-Arid Region.
Front. Sustain. Food Syst. 4:556732.
doi: 10.3389/fsufs.2020.556732

The global narrative on food sustainability revolves around the need to improve food security, right to food, environmental performance, social-ecological resilience, reducing poverty, and inequality. Such principles were guiding a food policy shift for addressing the needs of family farmers, taking place in Brazil. However, how these policies were seen from the point of view of family farmers has not yet been investigated sufficiently. Consequently, this paper presents the results of an assessment of how food policies have impacted the food system in terms of production practices, market structure, land access, and food security, through the perception of family farmers. Our study concerns the semi-arid part of the state of Bahia (Brazil), in which rainfed food systems prevail. The perception of family farmers on the food policies related to credit, public procurement, technology, knowledge, and land access showed three main results: (1) concerning production practices, there was an increase in crop diversification (formerly collected wild plants are currently cultivated) and the dissemination of agro-ecological techniques (organic matter as a fertilizer and seed bank). However, credit is limited, not being translated into significant investments in the production process; (2) with regard to market structure, the public food procurement programs created a specific market for farmers assuring to provide reliable and stable income and trade through economies of scale. The negative factor regarding public food procurement programs is the dependence of farmers from institutional markets organized by the government; (3) food security was increased, due to the stable income, but the lack of policies directed at on-farm autonomy makes production for self-consumption difficult to be achieved. Also, the legal basis for land access does not meet the expectations and needs of farmers, placing them in a position of vulnerability to land grabbing. We conclude that the new food public policies had positive impacts, through a double strategy, consisting in first, the improvement of individual food system activities, and second, interconnecting single food system activities in such a way that they create synergies among them, in view of basic principles of sustainable food systems.

Keywords: food system, public policies, Fundo de Pasto communities, actors's perception, food sustainability

INTRODUCTION

The productivist paradigm emerged 60 years ago as a seemingly straightforward approach to tackling food insecurity by increasing food production (de Schutter, 2014). The so-called Green Revolution—based on mechanization and intensive use of agro-industrial inputs, natural resources, and chemical fertilizers—served as the main policy strategy for boosting agricultural productivity and solving the mismatch between supply and demand for food (Borlaug and Dowswell, 2003). After decades of such policy, however, a 2006 Food and Agriculture Organization report showed that, despite per capita increases in agricultural output, the percentage of hungry people only slightly declined from 1950 to the 1990s (FAO, 2006). And more recent data from 2018 showed that while more than enough food was produced to feed the global population in a year, as much as 34% of it never even reached the tables of consumers, leading to 821 million people being food insecure (FAO, 2019b). Indeed, achieving universal food security requires more complex mechanisms that consider political interventions, sustainability, holistic perspectives, and structural human development (FAO, 2019a).

In 1972, the Stockholm Conference and the Club of Rome unambiguously emphasized the importance of more socially and environmentally friendly development models. The Stockholm Conference was convened by the UN to define sustainable forms of development, and the Club of Rome authored the ground-breaking report “The Limits to Growth,” which for the first time denounced humanity’s plunder of non-renewable resources, concluding that we will have reached our natural limit of development by the year 2072 if unsustainable models of progress continue (Paul, 1993). Indeed, already decades ago, productivist agriculture and similar approaches caused crises that led to wider environmental and social movements around the world, beginning especially in the mid-1970s. In Brazil, the environmental movement was eventually further strengthened by ongoing struggles for restoration of democracy after years of military dictatorship (Abramovay, 1992; Paschoal, 1995). In the 1980s, measures toward re-democratization brought about important changes in Brazilian political–institutional and social arenas (Santos, 2011), including agriculture. The 1988 Brazilian Constitution set a milestone for recognition of family farming as a professional category, in particular by including family farmers in the country’s social security retirement programme (Grisa and Schneider, 2015). Overall, ending hunger and protecting family farmers’ rights became official public policy during the government of former President Luiz Inácio Lula da Silva (2003–2010), when various food policies were institutionalized at the federal level.

Against this background, there are many studies—mainly based on regional statistics and modeling—that highlight the socio-economic effects of Brazil’s recent food policies on living conditions among the country’s family farmers (Sabourin, 2007; Belik, 2010; Silva, 2011; Grisa and Schneider, 2015; Del Grossi, 2019). However, there are few empirical analyses of how farmers perceive the influence of these public policies on food systems at the local level. Thus, the present

study aims to fill this research gap by investigating family farmers’ perceptions of the socio-economic impacts of Brazil’s newer food policies on key food system features, including production practices, market structures, food security, and access to land.

The perceptions of individual actors are an important indicator for use in interpreting social transformation processes and assessing people’s subjective motivations and political involvement. Perception is also a relevant construct for evaluating the extent to which a state, in its diverse manifestations, is committed to incorporating historically neglected social groups. Further, social participation and inclusion contribute to proper monitoring of public policies, in addition to being fundamental to representation of collective interests (Soratto and Witt, 2013).

The main research questions that guided this study were: (1) What are farmers’ perceptions of impacts of new public policies on different socio-economic outcomes, including production practices, market structures, food security, and access to land? (2) How are these policies and outcomes related to specific features of the food system of family farmers?

CONCEPTUAL FRAMEWORK

The food system approach contributes to understanding the complexities of agricultural activities (input provision, producing food, processing, distributing, and consuming) and key actors by interconnecting inputs, flows, and outputs (FAO, 2018). The food system concept is ideally suited to address the links of food insecurity within wider socio-economic contexts, in contrast to narrowly defined productivist approaches that lead to limited technical solutions. It enables policymakers to view the agricultural system more fully, facilitating policy coordination and diverse actors’ participation in building more efficient instruments to tackle food insecurity, poverty, social inequality, environmental degradation, and unsustainable production practices (FAO, 2018).

Rastoin and Gherzi (2010) define a food system as interconnected but independent networks of stakeholders (NGOs, public and private organizations, citizens, financial institutions, and companies) coexisting in a geographic space (region, state, multinational region) that contribute directly or indirectly to generation of flows of goods and services oriented toward meeting the food needs of groups of consumers located in the same geographic space or elsewhere. Some experts define food systems as social-ecological systems (Berkes et al., 2002; Ericksen et al., 2010; Rist and Jacobi, 2016), emphasizing that they are sourced from biophysical and social elements along specific agri-food value chains and, through these, establish human relations around natural resources, information, services, and policy interests.

Public policies play a crucial role in shaping food systems by constructing legal frameworks to achieve food security, supporting investments in family farmers, increasing people’s access to markets, and mobilizing societal resources to push food

systems toward sustainability—based on resilience, adequate working conditions, environmental integrity, and provision of healthy food (Kay et al., 2018). However, the efficiency of public policies depends on a combination of factors, including the political context, social conventions, people's adaptability to specific production models, and monitoring via popular participation (Perrucci and Perrucci, 2014; Albers et al., 2018).

There is substantial literature debating what would constitute the most appropriate agricultural production practices to achieve sustainable food production (Huang et al., 2002; Phipps and Park, 2002; Tilman et al., 2002; Prasifka et al., 2009). Agricultural production practices range from highly technological models to more ecology-based techniques. Adoption of chemical fertilizers and pesticides and implementation of environmentally taxing production methods generally lead to unsustainable development (Piesse and Thirtle, 2010). However, various other food policies show promise of merging sustainability and productivity aims on behalf of family farmers, including provision of means of production, credit, and fairer conditions of market competition and movement of goods. Historically, production practices such as organic fertilization, seed selection, crop rotation, and biological control of pests have been successfully applied all over the world. More recently, these techniques have been referred to collectively as agroecological practices (Altieri, 1995; Wezel et al., 2009).

Synergies and trade-offs between sustainable agricultural practices and food security cannot be neglected, since food availability and access depend on the conditions under which it is grown, processed, distributed, and consumed (Colonna et al., 2013). Food security is determined by the arrangement and management of food systems, flows of goods, market configurations, diverse actors and their interconnected value-adding activities, and the different scales of production and demand for food that define where and how it is grown, processed, distributed, and consumed (FAO, 2018). The 1996 World Food Summit in Rome defined food security as the situation in which “all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996). In the literature, there has been an active debate regarding public procurement of food and school meal programmes as pathways for ensuring food security, since they contribute directly and indirectly to improving food distribution and access (de Schutter, 2010; Sidaner et al., 2013). Public procurement programmes are mediated market models, designed to transform trade into a more “socially efficient” process, guaranteeing basic social welfare needs in rural areas, especially where food-insecure households are prevalent (Rocha, 2007).

Equitable access to land is crucial to achieving food security and sustainable development in countries of the global South, where frequent instances of land grabbing are driven by worldwide demand for food commodities, biofuels, mining and other environmentally taxing and socio-economically demanding goods and activities. The concept of land governance aids understanding of the links between secure land rights and food security (Landesa, 2012). Land governance can be understood as sets of processes comprising access to and use

of land and natural resources, the related forms of organization and distribution of political power, and the manner in which conflicting land interests are reconciled (FAO, 2009). The International Land Coalition (ILC, 2010) argues that equitable access to land and sustainable management of natural resources would enable reduction of hunger and poverty while promoting dignified livelihood conditions.

According to the FAO, sustainable food systems are those in which the production, processing, distribution, and consumption of food effectively protect and respect natural resources, biodiversity, and ecosystems, while providing a sustainable diet that is “culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (FAO, 2010, p. 7). As conceptualized by Rist and Jacobi (2016), food sustainability comprises five pillars: food security, the right to food, reduction of poverty and inequality, environmental integrity, and social-ecological resilience. These can serve as normative foundations to transform the configuration of food systems, going beyond issues of production to incorporate and shape a wide range of aspects related to rural livelihoods.

Figure 1 summarizes how we used the food system approach to build our research questions. It provides a wider perspective on interactions between actors, public policies, and food system activities, the combination of which leads to multiple outcomes.

Our study hypothesis is that food-related public policies implemented to encourage the sustainability and resilience of family farming generate dynamics in the food system that influence value chains and livelihoods, triggering changes in production practices, market structured forms of commercializing family farmers' goods, food security, and land governance. Within the pillars of food sustainability described above (Rist and Jacobi, 2016), we prioritized the pillars of food security and reduction of poverty and inequality in the present research. Some aspects related to environmental sustainability were evaluated as observed impacts in regards to sustainability-related management practices. In the next section, the public policies selected for this study will be detailed, namely.

PUBLIC POLICIES TARGETED AT FAMILY FARMERS IN BRAZIL (STATE OF BAHIA)

Most of the policies were implemented at the federal, regional, and state levels. The majority of the programmes' financial resources were transferred from ministries to states, municipalities, NGOs, and private/public companies tasked with local operationalization of policies. The origin of the funds was centralized, but the policies' implementation, monitoring and operationalization were decentralized. In this section, we will present the main features of the key food policies that were implemented in the study area.

Rural Credit Programmes

The National Programme for Strengthening Family Farming (*Programa Nacional de Fortalecimento da Agricultura Familiar*,

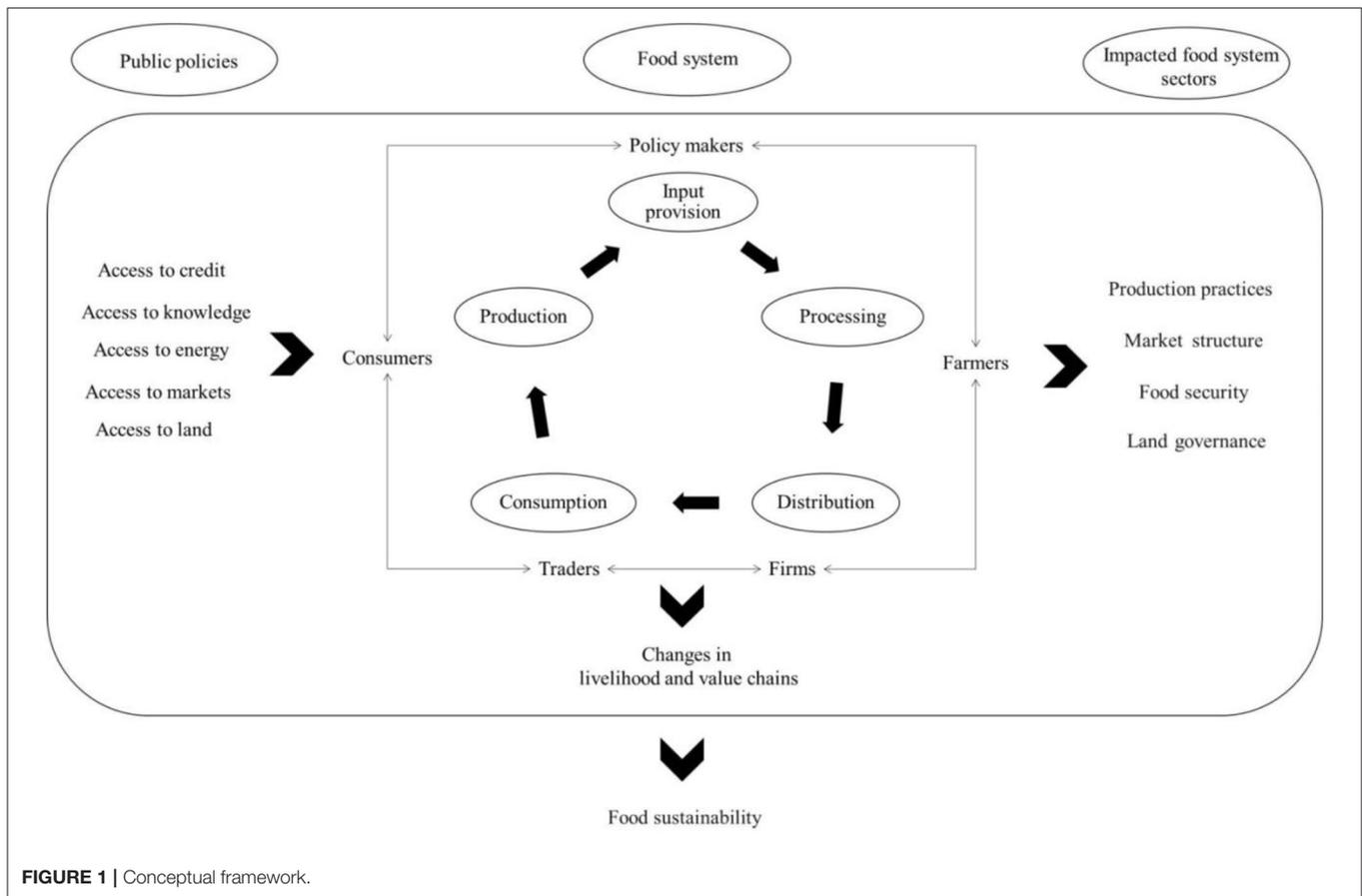


FIGURE 1 | Conceptual framework.

PRONAF) was launched in 1996 and provides credit for productive rural activities, targeted at family farmers (Aquino and Schneider, 2015). The family farmers must be enrolled in a national administrative register such as the Declaration of Aptitude to PRONAF (*Declaração de Aptidão ao PRONAF*, DAP), which is a tool used by Federal Government to identify the Family Units and give them legal recognition. This programme is financially supported by the Ministry of Agrarian Development (*Ministério do Desenvolvimento Agrário*, MDA), and the credit is provided by banks situated around the municipalities.

The *Garantia Safra* was launched in 2002 to grant financial compensation to family farmers who experience weather events (e.g., drought) that damage overall output (MDA, 2019). To become part of the programme, farmers must meet the following criteria: (1) monthly household income of maximum 1.5 times the Brazilian minimum wage; (2) holding between 0.6 and 5 hectares of land; (3) cultivating annual crops (e.g., onions, beans, cassava, maize); and (4) possessing the Declaration of Aptitude to PRONAF (DAP) (SEAD, 2018). The municipality reports to the Ministry of Agrarian Development a loss of 50% of the municipality's crops in the ongoing year. In the following year, the ministry transfers the amount to the municipality, which passes on the money to the family farmers.

Food Security and Mediated Markets

The National School Feeding Programme (*Programa Nacional de Alimentação Escolar*, PNAE) was first implemented in 1955, and was transformed over the years from a regional focus to a national programme. In 2003, it assumed its current form, with the objective of providing school meals to students in all stages of basic public education. The federal government transfers the financial resources to states and municipalities that must use at least 30% of their total budget to obtain food from the local family farm sector (Brasil, 2009a). To participate in this programme, family farmers must be connected to farmer associations or cooperatives.

The Food Procurement Programme (*Programa de Aquisição de Alimentos*, PAA) was launched in 2003 to provide access to food in sufficient quantity, quality, and regularity for populations in situations of food and nutritional insecurity (Brasil, 2012). The Ministries of Social Development (*Ministério do Desenvolvimento Social*, MDS) and Agrarian Development are responsible for managing and distributing the financial resources to the National Supply Company (*Companhia Nacional de Abastecimento*, CONAB¹), and state and municipal governments, as these are

¹CONAB supports the activities carried out by the other entities in the execution of the programme (state and municipal governments). Its main role is to build public food stocks for later transfer to programme beneficiaries CONAB, 2016.

the public bodies operating the programme at the local level. These agencies purchase family farmers' products (individually or via farmer associations or cooperatives) by means of public calls and channel them into public food stocks, which are directed to food insecure communities (Peraci and Bittencourt, 2011; Sambuichi et al., 2019). Further, the food produced and marketed through the PAA is incorporated into the municipal public nutrition programmes of schools, food banks, hospitals, etc. (Sambuichi et al., 2019).

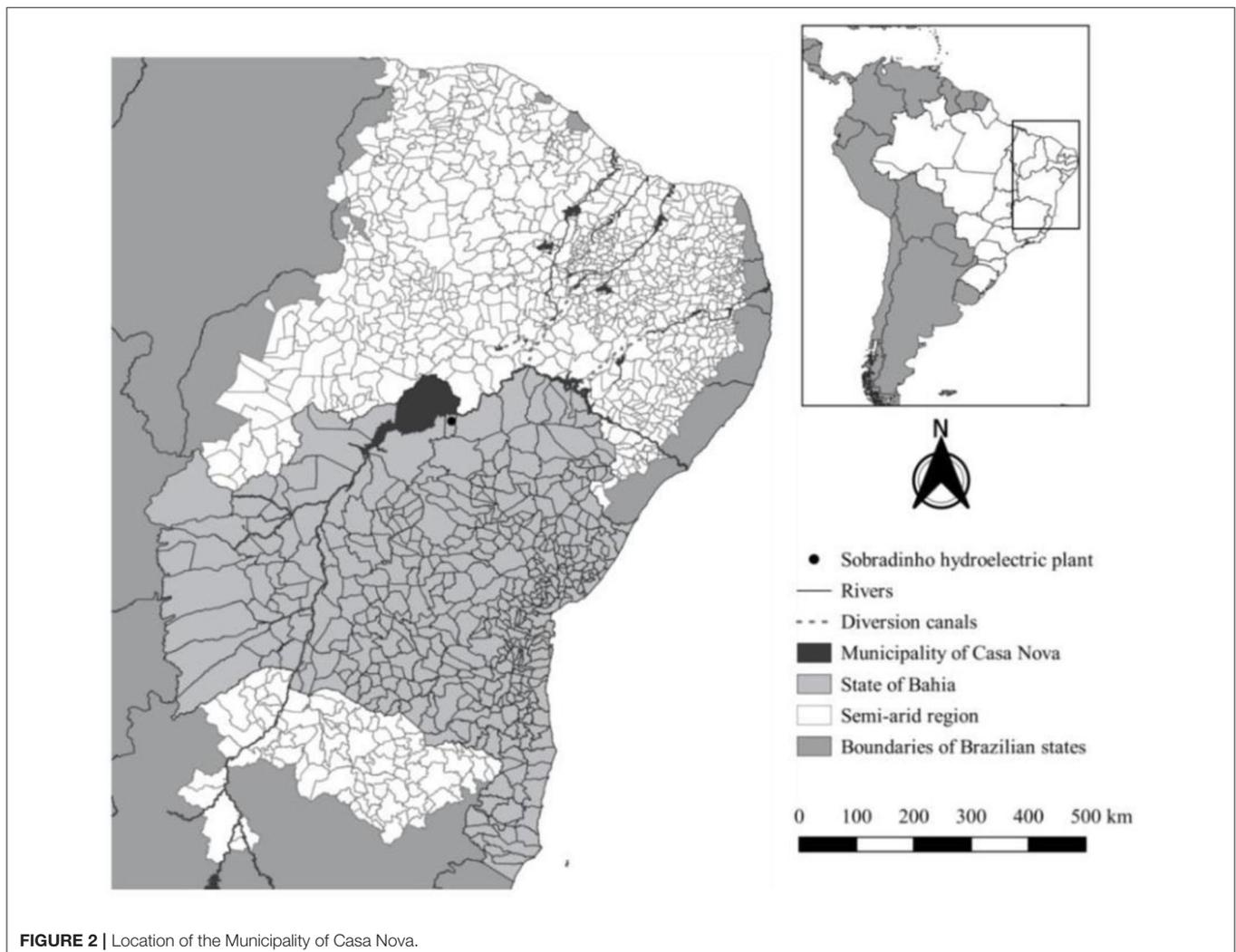
Technology and Knowledge

The programme One Million Cisterns for Drinking Water (*Um Milhão de Cisternas Rurais*, P1MC) was created in 2003 to provide cisterns to family farmers to store rainwater for domestic consumption (MDS, 2017). To benefit from the cistern programme, families must meet the following criteria: (1) live in a rural area; (2) have a per capita income of maximum R\$ 154.00 per month (15% of the Brazilian minimum wage); (3) lack access to water; (4) have a house with a roof to capture rainwater; (5) not have been assisted by another programme with the same

purpose (Brasil, 2011). The cisterns programme emerged from social mobilizations organized by civil society and the umbrella NGO Semi-arid Articulation (*Articulação Semiárido Brasileiro*, ASA), which operates in the semi-arid region and manages the programme. Though a federal policy, it has a regional focus—the cisterns are mainly distributed in the municipalities of the semi-arid region (MDS, 2017).

Another programme aimed at promoting technology in rural areas is “Light for All” (*Luz para todos*), created in 2003. In isolated rural communities not supplied by electricity-grid networks, the programme provides solar panels. It is a federal policy coordinated by the Ministry of Mines and Energy (*Ministério de Minas e Energia*, MME), operated by the public power company *Centrais Elétricas Brasileiras S. A. (Eletrobras)*, and implemented locally by concessionaires (Brasil, 2009b).

Concerning technical knowledge, the Technical Assistance and Rural Extension programme (*Assessoria Técnica e Extensão Rural*, ATER) became policy at the national level in 2010. Its main goal is to transfer technical knowledge to family-farm



food systems via environmental education, introduction of endogenous production techniques, and transition to agroecology (Brasil, 2018). The state governments in Brazil are in charge of its definition and implementation. In Bahia, policymakers opted for outsourcing this service to NGOs and other private entities, which are contracted through public calls.

Land Regularization

In Brazil, the land regularization is arranged at the state government's discretion. In 2013, the State of Bahia launched a plan (Law 12.910) aiming at regularization of public lands in rural areas that have been occupied by traditional communities. This law provides for a contract regarding the right of land usufruct for up to 90 years, with the possibility of renewal for an equal period.

THE STUDY AREA: RAINFED FOOD SYSTEM AND THE FUNDO DE PASTO COMMUNITIES

Our case study site is situated in the municipality of Casa Nova, belonging to the semi-arid region of the state of Bahia (Brazil). High temperatures and droughts are characteristic of the region, which features annual average rainfall and temperature of 800 mm and 25.4° C, respectively (Casa Nova, 2019). Its aridity relates to spatiotemporal precipitation concentration, with 71% of rainfall occurring between January and April (FUPEF, 2007). In addition, the rate of evaporation of 3,000 mm/year is three times higher than the precipitation (Malvezzi, 2007).

The Municipality of Casa Nova covers an area of 9,697 km² and is home to 64,940 inhabitants, 42% of whom reside in rural areas (IBGE, 2010). While the municipality is close to the São Francisco River (as seen in **Figure 2**), farmers do not use the water from the river for irrigation due to the lack of suitable infrastructure.

Local semi-arid agriculture is mainly rainfed, dominated by small traditional agriculture and livestock for family consumption and trade. The main activities consist of small animal husbandry (e.g., goats, sheep, free-range chickens, and pigs), annual crop cultivation (e.g., onions, beans, cassava, maize) and agro-extractivism (medicinal plants, native fruits, and vegetables). Common locally processed foods include cheese, juices, sweets, jams, cakes, cookies, tapioca, cassava pudding, etc. The sale of fresh, stored, or processed foods occurs in two different ways: (1) autonomously, via direct sale to middleman, or via local markets; or (2) collectively, via associations, or cooperatives whereby family-farm goods are pooled together and sold.

The *fundo de pasto* communities have adopted rainfed food system techniques to make a living. The main feature of the *fundo de pasto* communities is that of communal land, which is used for extensive animal rearing (Garcez, 1987), combined with individual areas for family crop growing (Cotrin, 1991). Three communities took part in the present study, Melancia, Riacho Grande, and Ladeira Grande. **Table 1** shows the key characteristics of each community.

TABLE 1 | Main features of the *fundo de pasto* communities participating in this study.

Community	Total number of families	Size of land occupied (hectares)
Melancia	42	600
Riacho grande	211	12,000
Ladeira grande	60	2,500

METHODOLOGY

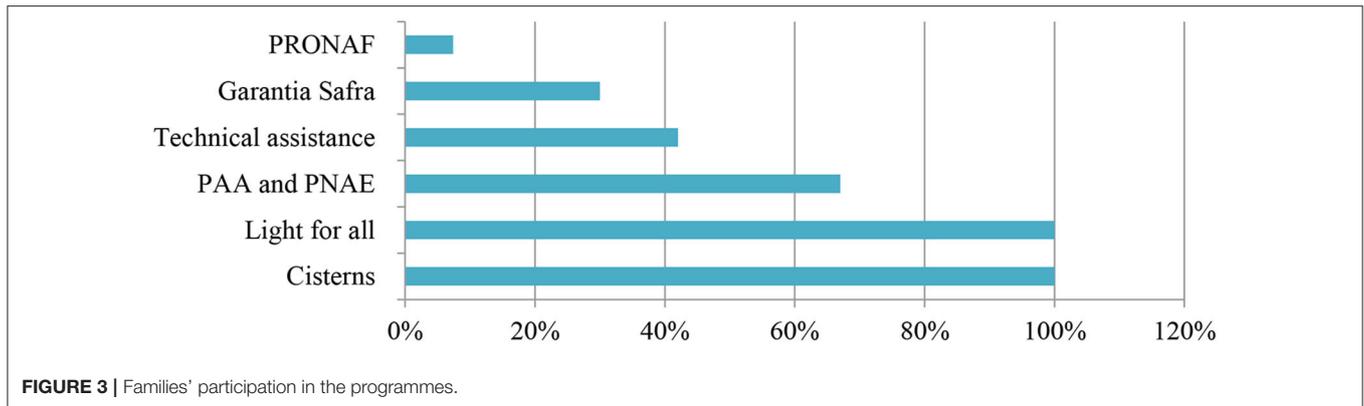
The present study employed a qualitative approach to generate knowledge on people's perceptions, behavior, experiences, and interactions (Pathak et al., 2013). This can provide detailed information and resources for researchers to challenge other dominant or naturalized socio-economic and political concepts and understandings (Patton, 2002). We used content analysis to examine and quantify our qualitative data, thereby identifying, coding, and classifying topics and patterns from our interviews and questionnaires (Downe-Wamboldt, 1992). Collected data also were interpreted using descriptive statistics (Woodrow, 2014).

Fieldwork was conducted in three municipalities of the semi-arid region: Casa Nova, Petrolina, and Juazeiro. The communities of *fundo de pasto* that took part in the study are located in the municipality of Casa Nova. Petrolina and Juazeiro, neighboring municipalities to Casa Nova, are home to urban centers that host NGOs, government institutions, universities, etc. Because we also interviewed people from these institutions, we included Petrolina and Juazeiro in the course of our fieldwork.

The *fundo de pasto* communities of Melancia, Riacho Grande, and Ladeira Grande were selected for the study based on the following criteria: (1) importance of the rainfed food system to the socio-economic development of the semi-arid region; (2) good access of communities to food public policies; (3) previous contacts with a community member who enabled us to link up to and interact with local families—traditional communities are often closed to outsiders.

During fieldwork, our data collection included participatory observation, focus groups, semi-structured interviews, and questionnaires. We took notes and made audio recordings. We organized six focus groups with community members, each involving 4–12 farmers. Additionally, 11 semi-structured interviews were conducted with academics and representatives from NGOs, social movements, and private and public institutions². Finally, questionnaires were conducted with 54

²The institutions that participated in this study break down as follows: Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária*, EMBRAPA), Food and Nutrition Security National Council (*Conselho Nacional de Segurança Alimentar e Nutricional*, CONSEA), Regional Institute for Appropriate Small Farming and Animal Husbandry (*Instituto Regional da Pequena Agropecuária Apropriada*, IRPAA), Advisory Service for Rural People's Organizations (*Serviço de Assessoria a Organizações Populares Rurais*, SASOP), *Pró-Semiárido*, Pastoral Land Commission (*Comissão Pastoral da Terra*, CPT), Agrarian Development Coordination (*Coordenação de Desenvolvimento Agrário*, CDA) and Secretariat for the Promotion of Racial Equality (*Secretaria de Promoção da Igualdade Racial do Governo do Estado da Bahia*, Sepromi). We also



families from the *fundo de pasto* communities located in the municipality of Casa Nova (18 families per community).

Concerning the sampling method for the questionnaire application, families were selected using the following criteria: (1) self-recognition as *fundo de pasto* members; (2) belonging to one of the communities selected for the study (Melancia, Ladeira Grande or Riacho Grande); and (3) presence of an adult (regardless of gender) identifying as the head of the family. We prioritized local leaders to answer the questionnaires because they were more involved in policy procedures and more aware of community needs. From the total respondents, 34% were community leaders and the remainder were regular family farmers. For the focus groups, participants also needed to belong to one of the three communities and be available to participate in our discussions and share experiences and information from a qualitative point of view with the researchers. For the focus groups, we invited community farmers, local leaders, and elderly people who were knowledgeable about historical community events and the dynamics of the rainfed food system. Data collection was oriented around the qualitative research methods, with the main goal that of capturing detailed information, regardless of the number of participants.

The focus groups, strategically, were carried out prior to implementation of the questionnaires. This enabled us to use the information gathered in these collective reflections to design consistent questions and obtain more precise information from families. The public policies considered in our study were selected by the focus group participants, as were the guiding topics we discussed in the six meetings. The topics participants chose for the focus groups' debates became indicators, as follows:

- Production practices
- Market structure
- Food security
- Land access.

interviewed two academics and accessed publicly available data on policies and programmes from government websites, statistical institute, Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE) and the government think tank Institute for Applied Economic Research (*Instituto de Pesquisa Econômica Aplicada*, IPEA).

RESULTS

In this section, we analyse—from stakeholders' perspectives—policy effects on food system activities (input provision, producing, processing, trading, and consuming), considering related impacts on production practices, market structures, food security, and land access. **Figure 3** shows the degree of families' participation in each programme, based on data from questionnaires.

Policy Impacts on Production Practices (Access to Credit, Technology, and Knowledge)

The *Garantia Safra* is a compensation mechanism granted by the federal government in times of proven harvest loss due to weather events (e.g., drought), serving as an emergency financial aid (SEAD, 2018). Only 16 families (30%) reported having received such compensation. They received an average of about R\$ 850 (currently US\$ 257) to compensate for harvest losses. These families used the money to buy food, make home repairs, and purchase inputs such as machinery and animal feed. While only 30% reported having received the grant, all families claimed to have lost part of their harvest. **Figure 4** shows the reasons why families did not access the *Garantia Safra* financial support.

Only four families managed to access the PRONAF credit, (~7.4%). The credit was invested in productive activities such as purchase of animals, purchase of inputs, or improvements to property infrastructure like small repairs (e.g., fixing fences, adjusting roof of the house). The remaining 50 families that never accessed the credit opportunity explained their non-participation in the programme by mentioning the reasons illustrated in **Figure 5**.

Access to credit and financial support for production was very limited among the families. However, when comparing the two programmes, we noted that PRONAF beneficiaries were fewer in number than *Garantia Safra* beneficiaries, as seen in **Figure 6**.

During the focus groups, participants indicated their perception of a geographical distinction in the distribution of the credit—one that strongly favors states in Brazil's southern region where there is a concentration of capitalized family farming. In terms of budget, the programme saw an increase from R\$ 38

billion in 1996 to R\$ 165 billion in 2016 (BCB, 2017). However, the uneven geographical distribution of credit is confirmed by the fact that, between 2013 and 2017, family farmers in the state of Bahia received 4% of the total programme budget while family farmers in the state of Rio Grande do Sul received 15% (IBGE, 2017). Despite receiving a smaller amount of credit, the state of Bahia accounts for 15% of the total rural properties in Brazil, while the state of Rio Grande do Sul accounts for only 7% of the total (IBGE, 2017).

Regarding technologies, the cisterns were indicated by participants as the most important technology-related policy in terms of mitigation of the effects of drought. Photovoltaics were also cited as a significant technological advance, but not one that significantly changed food system activities. All 54 families participating in the survey benefited from the cisterns (P1MC) and “Light for All.”

The cisterns enabled storage and consumption of rainwater. Previously, people collected unsuitable water from dams located

far from the communities. Farmers stated that the cisterns enabled them to diversify their production by facilitating cultivation of a variety of fruits and vegetables. All respondents agreed that the cisterns helped to increase their production; 73% of the interviewed families already grew vegetables and fruits before the cisterns; 82% of the families believed that the diversification of production led to improvements in family consumption and food security; 93% of the interviewed families stated that they increased their consumption of fruits and vegetables.

Most of the fruits previously consumed were collected from wild plants. However, after installation of the cisterns, families began cultivating some of these wild fruits on their farms. **Table 2** shows the diversity of fruits and vegetables before and after the cisterns.

The cisterns' efficiency depends on the availability of rainfall throughout the year. As reported by the participants in focus groups, due to recurrent droughts the water in the cistern runs out in certain periods of the year, forcing families to rely on government assistance for water supplies. To improve people's autonomy regarding water access, one academic interviewed recommended implementation of water adductor systems to connect the communities to the São Francisco River.

According to participants, access to energy has always been limited in the rural areas of the Casa Nova municipality. Despite

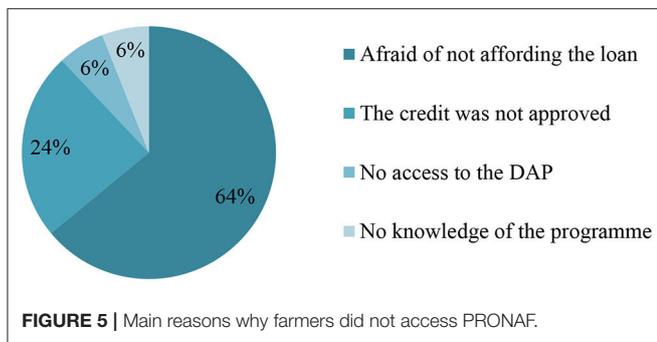
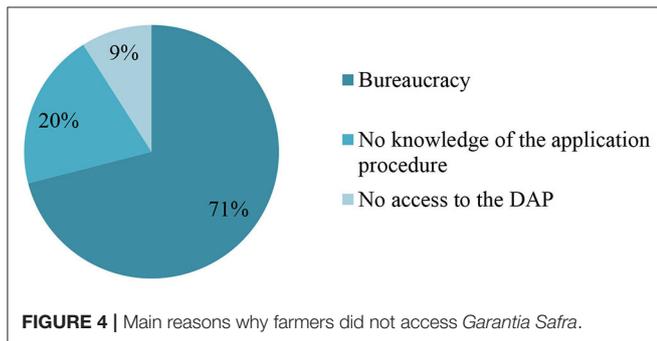
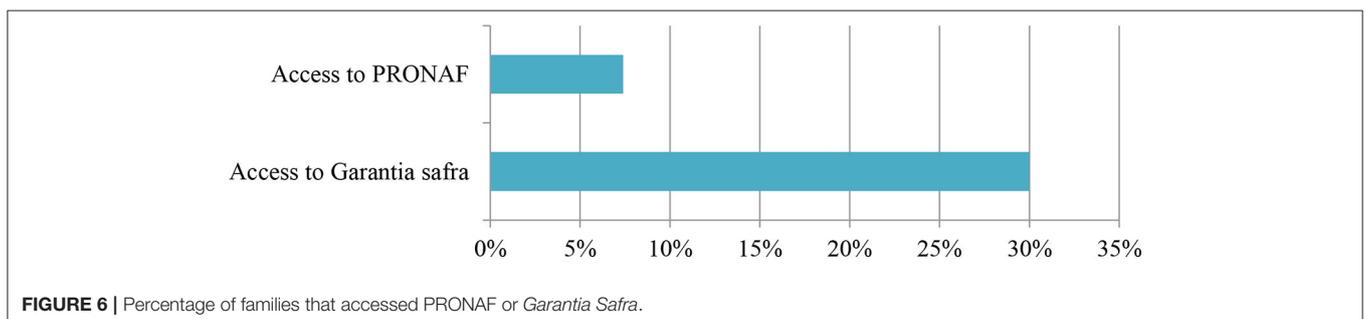


TABLE 2 | Crops cultivated before and after installation of cisterns.

Cultivated crops	
Before the cisterns	After the cisterns
<p>Vegetables</p> <p>Lettuce, onion, tomato, kale, corn, sweet potato, and cassava</p>	<p>Vegetables</p> <p>Lettuce, onion, tomato, kale, corn, sweet potato, cassava, chili, chives, parsley, okra, gherkin, pepper, cucumber, arugula, pumpkin, carrot, and beetroot</p>
<p>Fruits</p> <p><i>Umbu</i>, mango, <i>seriguela</i>, orange, tangerine, guava, passion fruit, banana starfruit, <i>cajá</i>, coconut, and cashew</p>	<p>Fruits</p> <p><i>Umbu</i>*, mango, <i>seriguela</i>*, orange, tangerine, guava*, passion fruit, banana, starfruit*, <i>cajá</i>*, cashew*, soursop, pineapple, coconut, <i>acerola</i>, papaya, and lemon</p>

*formerly collected as wild plants, now cultivated.



being located 50 km from the *Sobradinho* hydroelectric power plant (see **Figure 2**), the rural communities that participated in this study do not have access to electrical grid networks. Instead, photovoltaic technology became an alternative to enable access to electricity.

All families who answered the questionnaire had a domestic photovoltaic system featuring a solar panel but no energy storage. Solar panel capacities are 40–50 W, enabling use of low-voltage devices, such as portable radios, televisions, and cell phones. However, use of larger electronics, such as refrigerators, is not possible. The impossibility of refrigerating food was cited by 92% of the families as one of the biggest limitations to their photovoltaic systems. Due to such difficulties in storing food, farmers cannot trade goat milk and must make cheeses daily that keep longer in uncooled environments. The following statement, captured in a focus group, describes household use of photovoltaic systems:

“Solar energy has replaced the oil lamp and that was great, but the *umbu* processing unit and the pudding factory run on diesel-powered generators. We have machinery, but we have no energy. Equipment is not used due to a lack of energy. During the *umbu* season, we process the fruit to make the pulp, which needs to be taken immediately to the urban center to be frozen. The costs get very high this way. Sometimes it makes production almost impossible” (informant 1, a farmer of the Ladeira Grande community, who participates in PAA).

Finally, concerning access to knowledge, 42% of the participants benefited from NGOs' technical assistance, subcontracted by the State of Bahia. Local NGOs develop projects to improve environmental education, food security, and agricultural practices. Environmental education includes discussions of sustainable solutions to cope with the semi-arid climate. Regarding food security, the NGOs assist farmers and associations with applying for public calls to participate in the PNAE (National School Feeding Programme) and PAA (Food Procurement Programme). Concerning agricultural practices, the projects involve assistance with soil management, creation of a seed bank, and preservation of the region's characteristic biome (*Caatinga*). The NGOs also encourage the transition to agroecology through the use of organic matter as a natural fertilizer (thus avoiding use of chemical fertilizers).

The families domesticate seeds by selecting the most adapted and productive varieties. Participants spoke about the importance of the seed bank and its role in preserving local biodiversity and avoiding genetic erosion, especially in critical periods of drought. Regarding soil management, participants highlighted the importance of knowing techniques that enable coexistence of multiple crops, such as beans and corn cultivated on the same land. By diversifying production and maintaining soil productivity, they avoid exhausting soils.

Regarding the transition to agroecology, farmers reported that certain agroecological techniques have long been applied in the communities, for example fertilization of greens and vegetables with animal dung; chickens are fed part of the corn planted on farms and, where kept, pigs are fed part of the domestic food and crop waste. Nonetheless, they indicated that despite their good prior knowledge of certain techniques, outside technical

assistance helps to improve them based on scientific findings. Many participants reported that the technical assistance enabled them to understand the benefits of agroecological practices that they applied intuitively, providing insights into how they work to maintain a resilient environment.

One of the problems identified by the communities was that by outsourcing the technical assistance service, the number of family farmers receiving support had fallen. Participants stated that when the state government provided the service in the past, it covered more families. They said that the institutions that replaced the state in this function have a limited budget, which translates into less coverage. Participants pointed out that since some families were not informed and properly guided regarding the procedures and bureaucratic steps involved in applying for contracts, they had difficulties accessing public policies.

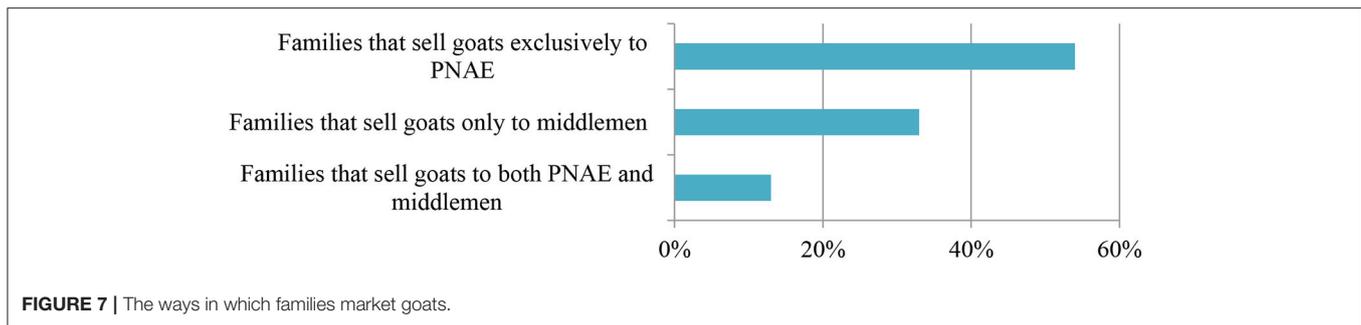
Policy Impacts on Market Structure

Accessing markets is one of the challenges faced by *fundo de pasto* families in Casa Nova, due to both geographical distance to urban centers and lack of economies of scale. Approximately 67% of the families ($N = 36$) sell their production through the PAA (Food Procurement Programme) and PNAE (National School Feeding Programme). The remaining 18 families that were not part of these programmes belong to the Riacho Grande community. This community is known for being resistant to dialogue with the government due to previous violence related to disputes over accessing land. Usually, they market their products directly to middlemen, and less frequently, trade via local markets.

Before the PAA and PNAE, trading involved middlemen or local markets. Both options fluctuated throughout the year, as sales depended above all on the purchasing power of locals. The main changes around the programmes were the creation of an alternative market for family farmers' products, at a fair price. According to one of the focus group participants, the agreement between the community association and the municipality/state regarding goat supplies set the price of live animals³ at R\$ 14.00 per kg (~US\$ 3.45 per kg for an adult animal weighing around 12 kg; the total price would be US\$ 41.4). By contrast, middlemen usually paid only half this price. All families that answered the questionnaire raised goats as their main economic activity and source of income. **Figure 7** shows how families market goats.

Our study found that the PAA and PNAE programmes strongly encouraged cooperativism and associativism among the members of the communities. Cooperatives and associations generally enable more efficient organization of family farmers, helping them cope with the difficulties imposed by highly competitive and challenging market structures. Strategically, these forms of work organization enable economies of scale by multiplying production to meet the demands of PAA and PNAE contracts, without increasing costs. Moreover, by participating in these collective organizations, farmers have more opportunities to obtain agricultural inputs that they cannot access individually. All families that answered the questionnaire participated in

³When the animal is sold to the government, through the institutional market, it is alive. The government is in charge of taking the animal to a slaughterhouse that follows the rules of municipal health surveillance.



associations of small rural producers and 66% were integrated in cooperatives.

In addition, the families that traded their products via the PAA and PNAE perceived more advantages in the institutional market for two main reasons: price stability and household income. Since prices are set in advance for the entire duration of the contract, farmers do not suffer the downsides of price fluctuations that are typical of agricultural markets. Also, with the guaranteed market, family farmers increased their opportunities for income generation, leading to household financial stability.

Similar to the cisterns, the PAA and PNAE also encouraged farmers to diversify their production. A remarkable example of this process was described by one of the participants who reported that the *umbu*, a very typical and abundant fruit of the semi-arid region, was not commercially exploited by the community before the programmes. However, thanks to the programmes, they were motivated to cultivate *umbu* to produce juice, pulp, and jelly. Another example is cassava pudding, a community-created recipe that was offered to the programmes for school meals.

PAA and PNAE became the main source of agricultural income for most of the participating families. On the one hand, it means that they have access to a stable source of income; on the other hand, it indicates a strong dependence of farmers on the programmes. To reduce this dependency on institutional markets, additional financial resources could be applied to diversify farmers' agro-processing activities, encouraging them to produce value-added goods from raw materials that are usually discarded, such as goat leather. Also, the communities could invest in logistics to diversify their market opportunities and sell products to new consumers.

Policy Impacts on Food Security

Income instability used to be one of the major concerns of farmers before the food procurement programmes (PAA and PNAE), especially due to the difficulty of marketing. Inconsistent monthly income was associated by participants with vulnerability to food insecurity. Income is important to food security because farmers need off-farm food to satisfy their dietary needs in quantity and variety (e.g., salt, couscous, sugar, cooking oil, rice, etc.), despite producing an important amount of food themselves.

Droughts were also cited as an aggravating factor contributing to food insecurity.

Farmers indicated that the PAA (Food Procurement Programme) played a decisive role in addressing food insecurity in times of drought, thanks to food provisioning. Information collected through questionnaires revealed that 33% of the interviewees received cassava and 25% received beans from the programme between 2005 and 2009, when there was a severe drought. Both products were produced by other communities that did not suffer significant consequences from the droughts.

One topic raised repeatedly by participants was the desire to become self-sufficient in terms of food production at the household level. Participants emphasized the lack of public policies that encourage on-farm food-production autonomy. Despite this, they expressed satisfaction knowing that kids from the communities—and also those enrolled in public schools in the municipality of Casa Nova—had access to good quality food through the PNAE. They indicated that before the PNAE children were fed canned and processed foods supplied by large industrial food companies. According to the participants, children now have access to fresh fruits, vegetables, and other healthy foods produced by local family farmers.

Finally, participants expressed concern about their further participation in policymaking processes following cessation of the Food and Nutrition Security National Council (*Conselho Nacional de Segurança Alimentar e Nutricional*, CONSEA) in January 2019. The purpose of the council was to link policymakers and society to enhance food security policies. According to a CONSEA representative, cessation of the council harms local democracy, as the body was created to encourage participatory public policy design.

Policy Impacts on Land Access

The members of the three communities under analysis expressed dissatisfaction with the Law 12.910 of the State of Bahia, launched in 2013, which granted land usufruct for a limited number of years. Participants reported that they have rights to this land and, for this reason, they claim deserve land titles, not simply an authorization to occupy the land for a certain period. They also stated that accepting the contract meant confirming the premise that the land does not belong to them, as dictated by the state government.

Importantly, people's connection to the land goes beyond productive needs related to their food system. Participants stated

that the notion of territoriality is essentially linked to people's identity, manifesting the interweaving of culture and nature. In this way, having access to and control over land enables these communities to reduce their food insecurity, to increase their income stability, and to maintain relationships with nature consistent with cultural identities built up over time.

As reported by interviewees, the communities' land struggles began in the 1970s when the federal government built the *Sobradinho* hydroelectric dam, flooding an area of 4,214 km² and displacing approximately 12,000 families, including some of the study participants. Currently, they occupy the land of the municipality of Casa Nova or "New Home." The dam construction set a precedent for land grabbing in the region. Land grabbing is an old practice in Brazil, typically beginning with irregular occupation of land, supported by fraud and falsification of property titles. In 1979, there was an intense and violent conflict between the communities and a company that illegally occupied their lands for cattle raising. Families were displaced, farmers were threatened with death, and a community leader was murdered. Nowadays, communities fear losing their lands to wind power companies, agribusinesses, and mining companies, which have been advancing in the region with the collusion of the government of Bahia⁴.

Links Between Food Policies and Rainfed Food System Activities

The public policies affected food system activities (input provision, production, processing, trading/selling, and consumption) and communities in different ways. In this section, we will summarize what was reported by the participants regarding public policies, highlighting which policies contributed most to food system activities and communities in terms of financial stability, food security, and cooperativism, as shown in **Figure 8**.

According to the perceptions of farmers, the *Garantia Safra* (financial support), cisterns (enabling access to water), and the technical assistance were the public policies that contributed the most to input provision. Farmers viewed these programmes as helping to diversify production, reduce water insecurity, and adopt agro-ecological production practices. By contrast, the rural credit programme—especially the PRONAF—was seen as structurally flawed, very restricted in scope, and overly bureaucratized.

According to participants, the cistern and public food procurement programmes (PAA and PNAE) contributed to the diversification and growth of production, especially of vegetables and fruits. Technical assistance also played an important role in production and processing, by providing knowledge support for more conscious and efficient use of resources. However, the food system would be more efficient if there were enough electricity to meet the demands of the communities concerning food processing and storage.

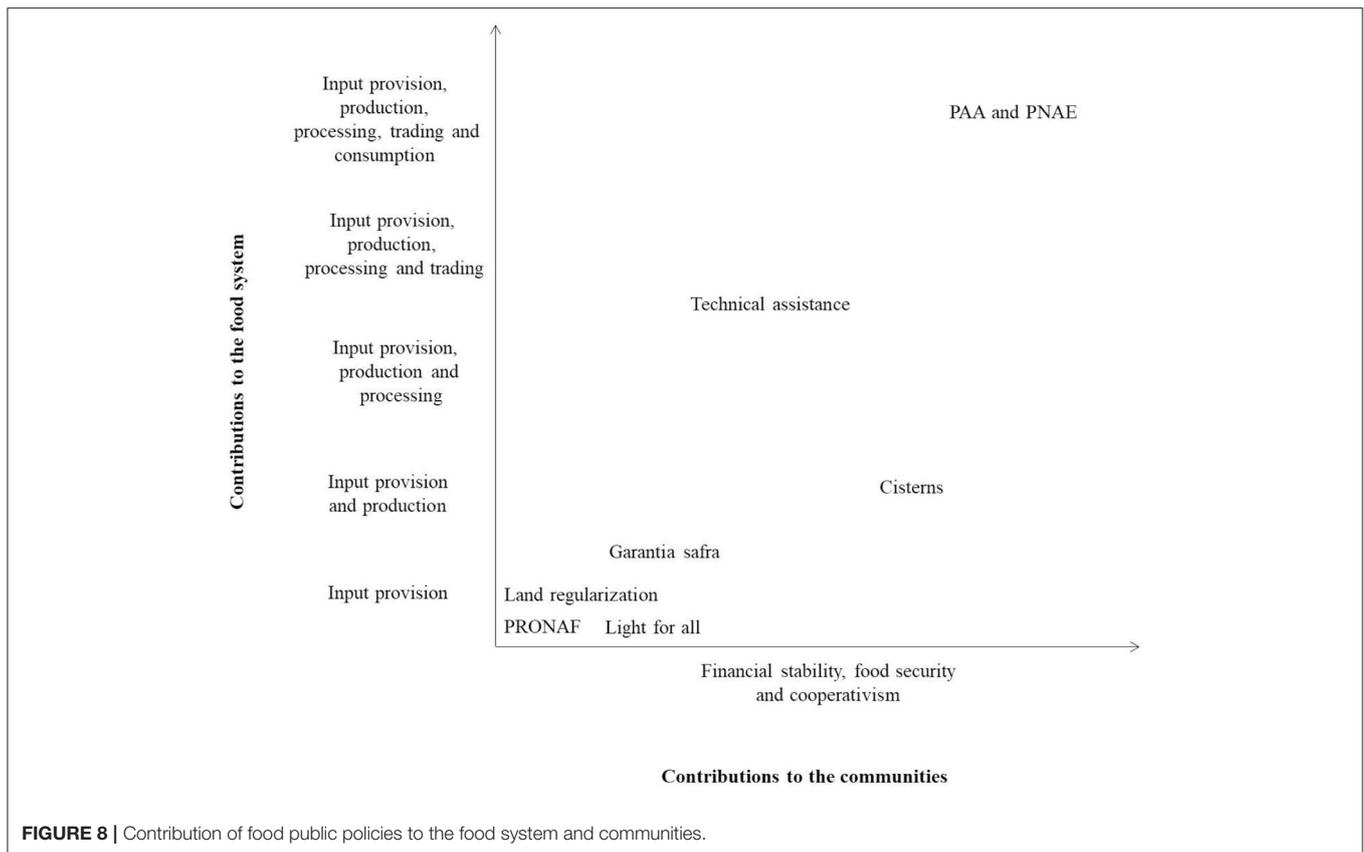
Both trading and consumption were driven by the PAA and PNAE programmes through increased marketing capacity for small-scale farmers. They were equally important for food security by creating food stocks for public nutrition programmes and by providing school meals. Thanks to the guaranteed market and long-term contracts, farmers finally achieved some income stability, which translated into food security. The main issue now is their economic dependence on the public institutional markets, with most of their household income coming from the public food procurement programmes.

The combination of public policies led to complementary outcomes in the food system. For instance, crop diversification related to cisterns and the public food procurement programme also led to improved quantity and quality of production on behalf of community families, schools, and groups. However, some public policies stood out more than others, exhibiting more contributions to the performance of the food system. According to the interviews, focus groups, and questionnaires, the most successful policies were those that affected not one, but several interrelated food system activities. In this sense, the PAA and PNAE played a fundamental role in linking input provision, production, processing, trading, and consuming.

The main community benefits from the food public policies relate to financial stability, food security and cooperativism. The institutional market opened up space for commercialization of goods produced by the communities. Further, the guaranteed market, fixed prices, and reliable long-term contract arrangements stabilized incomes for the families, aiding household financial planning. This new reality is completely different from the previous situation, in which families were caught—on uncertain terms—between middlemen, local markets, and supermarket contracts. Indeed, the PAA and PNAE represent possible solutions to the communities' historical trading difficulties, effectively improving household resilience and food security. Another great benefit of the food procurement programmes for the communities has been the encouragement they provide toward cooperativism and collective sales. Marketing organized through cooperatives and associations brought together a significant number of family farmers, enabling creation of economies of scale. Regardless of the institutional market, communities are now organized and prepared to market their production at local, regional, and national levels, with greater consistency.

However, land regularization remains an unsolved dilemma, as the proposal for the right of usufruct of the land for 90 years was rejected by the communities due to the conditional terms of access to land. Communal lands are fundamental to the communities' main economic activity and source of income (goat rearing), demanding large expanses of land. Further, the territory is interwoven with the culture and identity of the communities, whose connections with the land go beyond aims of capital reproduction. Above all, as long as the communities lack land titles they remain vulnerable to displacement, especially in light of the recent advance of capital in these areas and the frequency of land grabbing. According to Germani (2010), expansion of capital and increases in demand for land in

⁴The government of Bahia implemented a series of measures to attract investments, including offering concessions of state land for industrial and agricultural use and energy production; offering reductions and exemptions from state taxes, and offering low-interest financing (FIEB, 2019; SEI, 2019).



semi-arid areas has made the spaces occupied by traditional communities valuable to outsiders, attracting the attention of various companies. According to the author (*ibid.*), government measures to attract capital in rural areas—such as tax exemption, credit extension, and flexible labor laws—have contributed to the “territorialization” of capital and the “deterritorialization” of family farmers.

DISCUSSION

Our research emerges from a critical perspective on “productivist” agricultural development, highlighting the inconsistencies of this model that emphasizes technological intensification and expansionary production (Stiglitz, 2007). Productivist-oriented food systems reinforce inequalities and injustices in rural and urban areas (Dias, 2014). More comprehensive food public policies are needed to build sustainable food systems. They must apply holistic approaches to improve input provision, production, processing, trading/selling, and consumption, and aim at provision of year-round access to food that meets people’s nutritional needs (FAO, 2014). Further, public policies are fundamental to ensure respect for human rights, labor standards, and promote duties of preserving environmental integrity (Rist and Jacobi, 2016).

The present study examined family farmers’ perception of positive and negative impacts of food policies on their food system. Participants felt that the integrated set of public policies enabling family farmers’ participation in markets and those disseminating technology and knowledge had positive effects on the sustainable socio-economic development of the rural economy and food security. Farmers’ increased access to institutional markets enabled communities’ to sell their goods at fair prices, generating stable incomes and better family livelihoods. Public food procurement programmes (PAA and PNAE) made the greatest contribution to the performance of the food system, improving the areas of input provision, production, processing, trading, and consuming. The PAA and PNAE also enabled economies of scale, while reducing food insecurity at the household and community levels. The technical assistance programme was also highly relevant, serving to aid the dissemination of agroecological practices, promote techniques for soil management (less chemical fertilizer use), build a community-based bank of selected seeds for crop diversification, and promote the conservation of biodiversity and local ecosystems. Finally, the increased access to water enabled by cisterns helped communities achieve water security, while boosting diversification of production.

However, the food public policies also exhibited contradictions and flaws. One of the major problems is the

policies' broad approach, which fails to attend to the specific needs of the heterogeneous and socially diverse categories of family farmers in Brazil (Schneider and Nniederle, 2008). For instance, the credit offered by PRONAF for rural activities is unequal in its geographical distribution, appearing to favor capitalized family farmers located in the south of Brazil. Farmers also cited obstacles such as excessive bureaucratization and lack of orientation regarding application procedures, which harm the effectiveness of the credit and financial support policies (PRONAF and *Garantia Safra*). With respect to technical assistance programmes, the photovoltaic systems provided in the "Light for All" intervention do not support use of devices that demand high-voltage energy, such as refrigeration equipment that would benefit the food system. Finally, the failure to resolve land titling/tenure issues points to deep structural constraints that are hindering the medium- to long-term resilience of the communities in terms of food security, cultural identity, and preservation of the ecosystem. Ongoing territorial disputes (due especially to land grabbing) threaten the existence of the *fundo de pasto* communities who are strongly connected to the land.

CONCLUSION

In conclusion, our assessment of the perceived impacts of public food policies on rainfed farming in Bahia reveals opportunities as well as challenges. Several recommendations regarding public food policies emerge from our analyses, and could serve as starting points for further policy discussion and scientific study.

First, with respect to the rural credit granted via PRONAF, we recommend reformulating the programme's budget distribution based on the quantity of rural properties existing in each state. Second, the technical assistance programme should strive to better inform farmers about credit application, streamline its procedures, and reduce bureaucracy. Third, local access to energy could be improved by expanding the grid network to reach communities and supply them with reliable electricity. Fourth, to reduce their dependence on public food procurement programmes (PAA and PNAE), farmer associations and cooperatives could invest part of their financial resources in diversifying production and adding more value through processing activities, therewith expanding their marketing options.

In addition, the *fundo de pasto* communities expressed their concrete desire to produce enough food for self-consumption. This would require new policies that encourage and support on-farm food production and consumption. Finally and crucially, stable long-term access to land is fundamental to conserve the rainfed food system, enable maintenance of specific territorialities, protect the environment, ensure high quality nutrition, and protect the rights of traditional communities. In this sense, there is an urgent need for fair distribution and democratization of the land, enabling emancipatory development of the communities and sustainability.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR'S NOTE

Food security, access to market, land, knowledge, and means of production are challenges for traditional family farmers, located in the Brazilian semi-arid region. Historically traditional family farmers were neglected by the Brazilian State, however, from 1950/60s onwards the shift away from the "Green Revolution" and productivist model triggered a rural development paradigm change toward sustainability. The new comprehensive socio-economic and environmental food policies targeted at family farmers caused profound changes in the ways of how this group are integrated into Brazilian society. The lack of studies that interpret the farmers perspective of the impacts promoted by public policies on their food system motivated us to develop this study, aiming to fill this research gap. The stakeholder perspective on public policy is an indicator for interpreting social transformation processes and assessing the actor's subjective motivations and political involvement. Also, social participation and inclusion contribute to the monitoring of public policies, besides of being fundamental to the representation of collective interests. Through this paper the claims and the recommendations of the traditional family farmers were formally organized and analyzed, serving as a basis for the improvement of world wide public policies.

AUTHOR CONTRIBUTIONS

EB and SR: conceptualization and methodology. EB and TS: data collection. EB: formal analysis and writing—original draft preparation. SR: supervision. All authors have read and agreed to the published version of the manuscript.

FUNDING

EB received financial support from the Swiss Government Excellence Scholarships for Foreign Scholars and Artists: ESKAS 2017.0764. EB also was granted financial support from the Leading House for the Latin American Region for the fieldwork. TS and SR received support from the Swiss National Science Foundation (SNSF) through the Swiss r4d programme, Grant No. SNSF 400540-152033.

REFERENCES

- Abramovay, R. (1992). *Paradigmas do Capitalismo Agrário em Questão*. São Paulo: Hucitec/ANPOCS/Ed, Unicamp.
- Albers, H. J., Lee, K. D., and Sims, K. S. (2018). Economics of habitat fragmentation: A review and critique of the literature. *Int. Rev. Environ. Resour. Econ.* 11, 97–144. doi: 10.1561/101.00000092
- Altieri, M. A. (1995). *Agroecology: The Science of Sustainable Agriculture*. Boulder: Westview Press, Boulder.
- Aquino, J. R., and Schneider, S. (2015). “O Pronaf e o desenvolvimento rural brasileiro: avanços, contradições e desafios para o futuro,” in *Políticas Públicas de Desenvolvimento Rural No Brasil*, eds C. Schneider, and S. Grisa Porto Alegre (Brasil: UFRGS), 53–81.
- BCB (2017). *Rural Credit Data Matrix (MDCR). Banco Central do Brasil*. Available online at: <https://dadosabertos.bcb.gov.br/dataset/matrizdadoscreditorural> (accessed November 04, 2019).
- Belik, W. (2010). *Desenvolvimento Rural e Segurança Alimentar: Contribuições Teóricas Para o Desenho e Avaliação de Políticas Públicas*. Institute of economics, UNICAMP.
- Berkes, F., Colding, J., and Folke, C. (2002). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.
- Borlaug, N. E., and Dowswell, C. R. (2003). “Feeding a world of 10 billion people: a 21st century challenge,” in *Paper Presented at the International Congress in the Wake of the Double Helix: From the Green Revolution to the Gene Revolution* (Bologna), 27–31.
- Brasil (2009a). *Lei no 11.947, de 16 de junho de 2009*. Brasília: Congresso Nacional.
- Brasil (2009b). *Ministério de Minas e Energia. Manual de Operacionalização do Programa Nacional de Universalização do Acesso e Uso da Energia Elétrica. Anexo à Portaria n. 85, de 20 de Fevereiro de 2009*. Brasília: Programa Luz Para Todos.
- Brasil (2011). *Decreto No 7.535, de 26 de julho de 2011. Institui o Programa Nacional de Universalização do Acesso e Uso da Água - “ÁGUA PARA TODOS”*. Brasília: Congresso Nacional.
- Brasil (2012). *Decreto No 7.775, de 4 de Julho de 2012. Regulamenta o Art. 19 da Lei No 10.696, de 2 de Julho de 2003, Que Institui o Programa de Aquisição de Alimentos, e o Capítulo III da Lei no 12.512, de 14 de Outubro de 2011, e dá Outras Providências*. Brasília: Congresso Nacional.
- Brasil (2018). *Assistência Técnica e Extensão Rural*. Available online at: <http://www.agricultura.gov.br/assuntos/ater> (accessed January 08, 2020).
- Casa Nova (2019). *O Município. Prefeitura de Casa Nova*. Available online at: <http://www.casanova.ba.gov.br/detalhe-da-materia/info/a-cidade/6501> (accessed October 15, 2019).
- Colonna, P., Fournier, S., and Touzard, J. M. (2013). “Food systems,” in *Food System Sustainability: Insights From DuALIne*, eds R. E. Esnouf, M. B. Russel, and N. Bricas (Cambridge: Cambridge University Press), 69–100.
- CONAB (2016). *Companhia Nacional de Abastecimento*. Available online at: <http://www.conab.gov.br/> (accessed November 12, 2019).
- Cotrin, D. V. N. (1991). *O Pastoreio Comunitário em Uauá: Uma Expressão da Subordinação do Trabalho Ao Capital*. (Master thesis), Salvador: Ciências Sociais, UFBA.
- de Schutter, O. (2010). *Countries Tackling Hunger with a Right to Food Approach: Significant Progress in Implementing the Right to Food at National Scale in Africa, Latin America and South Asia*. Geneva: United Nations.
- de Schutter, O. (2014). The specter of productivism and food democracy. *Wisconsin Law Rev.* 2014, 199–233. Available online at: <https://wlr.law.wisc.edu/volume-2014-no-2/>
- Del Grossi, M. E. (2019). *Políticas Públicas Diferenciadas Para A Agricultura Familiar No Mercosul Ampliado: O Caso do Brasil*. Brasília: COPROFAM/CONTAG.
- Dias, J. (2014). *A Possível Transição Para Agricultura Ecológica*. Outras palavras. Available online at: <https://outraspalavras.net/sem-categoria/a-possivel-transicao-para-uma-agricultura-ecologica/> (accessed December 21, 2019).
- Downe-Wamboldt, B. (1992). Content analysis: method, applications, and issues. *Health Care Women Int.* 13, 313–321. doi: 10.1080/07399339209516006
- Ericksen, P., Bohle, H., and Steward, B. (2010). “Vulnerability and resilience of food systems,” in *Food Security and Global Environmental Change*, eds J. S. I. Ingram, P. J. Ericksen and D. M. Liverman (London: Earthscan), 67–77. Available online at: <https://cgspace.cgiar.org/handle/10568/3593>
- FAO (1996). *Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November 1996*. Rome: FAO
- FAO (2006). *The State of Food Insecurity in the World, 2006: Eradicating World Hunger, Taking Stock 10 Years after the World Food Summit*. Rome: FAO.
- FAO (2009). *Towards Improved Land Governance*. Rome: FAO Land Tenure Working Paper, 11.
- FAO (2010). “Sustainable diets and biodiversity. Directions and solutions for policy, research and action,” in *Proceedings of the International Scientific Symposium: Biodiversity and Sustainable Diets United Against Hunger*. Rome: FAO Headquarters. Available online at: <http://www.fao.org/docrep/016/i3004e/i3004e.pdf>
- FAO (2014). “Rome declaration on nutrition,” in *Second International Conference on Nutrition* (Rome: FAO).
- FAO (2018). *Sustainable Food Systems: Concept and Framework*. Rome: FAO.
- FAO (2019a). *Global Sustainable Development Report 2019: The Future is Now—Science for Achieving Sustainable Development*. New York, NY: FAO.
- FAO (2019b). *The State of Food Security and Nutrition in the World*. Rome: FAO.
- FIEB (2019). *Serviço de Apoio ao Investidor Estudo Setorial—Energias Renováveis na Bahia*. Available online at: <http://www.fieb.org.br/midia/2017/6/ESTUDOSSETORIALCINENERGIASRENOVAVEIS.PDF> (accessed February 14, 2020).
- FUPEF (2007). *Apoio Técnico e Institucional Para o Desenvolvimento do Programa Florestal da Chapada do Araripe em Pernambuco. Produto 2 – Diagnóstico*. Curitiba: Governo do Estado de Pernambuco/CODEVASF/MMA.
- Garcez, A. N. R. (1987). *Fundo de Pasto: Um Projeto de Vida Sertanejo*. Salvador: INTERBA/SEPLANTEC/CAR.
- Germani, G. I. (2010). “Questão agrária e movimentos sociais: a territorialização da luta pela terra na Bahia,” in *(GEO) Grafias Dos Movimentos Sociais. Feira de Santana (BA)*, eds A. S. Coelho Neto, E. M. C. Santos, and O. A. Silva (Feira de Santana: UEFS Editora), 269–304.
- Grisa, C., and Schneider, S. (2015). “Três gerações de políticas públicas para a agricultura familiar e formas de interação entre sociedade e Estado no Brasil,” in *Políticas Públicas de Desenvolvimento Rural No Brasil*, eds C. Schneider and Grisa, S. Porto Alegre (Brasil: UFRGS), 19–50.
- Huang, J., Pray, C., and Rozelle, S. (2002). Enhancing the crops to feed the poor. *Nature* 418, 678–684. doi: 10.1038/nature01015
- IBGE (2010). *Censo Demográfico 2010*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística.
- IBGE (2017). *Censo Agropecuário 2017*. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística.
- ILC (2010). *Links Between Land Tenure Security and Food Security*. Rome: International Land Coalition.
- Kay, S., Mattheisen, E., McKeon, N., De Meo, P., and Moragues Faus, A. (2018). *Public policies for food sovereignty. Think piece series Food for Thought No.1*. Amsterdam, Rome, and Heidelberg: Hands on the Land/FIAN/Terra Nuova/TNI
- Landesa (2012). *Land Rights and Food Security. The Linkages Between Secure Land Rights, Women, and Improved Household Food Security and Nutrition*. Seattle: Issue brief: Land rights and food security.
- Malvezzi, R. (2007). *Semi-Árido - Uma Visão Holística*. Brasília: CONSEA.
- MDA (2019). *Base de Dados do Crédito Pronaf*. Brasília: Ministério do Desenvolvimento Agrário.
- MDS (2017). *Programa Cisternas: Boletim Informativo No 005*. Brasília: Ministério do Desenvolvimento Social.
- Paschoal, A. D. (1995). Modelos sustentáveis de agricultura. *Agric. Sustentável* 1, 11–16.
- Pathak, V., Jena, B., and Kalra, S. (2013). Qualitative research. *Perspect. Clin. Res.* 4:192. doi: 10.4103/2229-3485.115389
- Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods, 3 Edn*. London: Sage.
- Paul, E. (1993). ‘Limits to growth’ and ‘sustainable development’: grappling with ecological realities. *Ecol. Econ.* 8, 269–288. doi: 10.1016/0921-8009(93)90062-B
- Peraci, A. S., and Bittencourt, G. A. (2011). “Family farming and price guarantee programs in Brazil: the food acquisition program (PAA),” in *Fome Zero: The*

- Brazilian Experience, eds J. G. Silva, C. G. França, and M. E. Del Grossi (Brasília: MDA/FAO), 193–224.
- Perrucci, R., and Perrucci, C. (2014). The good society: core social values, social norms, and public policy. *Soc. Forum.* 29, 245–258. doi: 10.1111/socf.12078
- Phipps, R. H., and Park, J. R. (2002). Environmental benefits of genetically modified crops: global and European perspectives on their ability to reduce pesticide use. *J. Anim. Feed Sci.* 11, 1–18. doi: 10.22358/jafs/67788/2002
- Piessse, J., and Thirtle, C. (2010). Agricultural R&D, technology and productivity. *Philos. Trans. R Soc. London Series B Biol. Sci.* 365, 3035–3047. doi: 10.1098/rstb.2010.0140
- Prasifka, J. R., Hellmich, R. L., and Weiss, M. J. (2009). “Role of biotechnology in sustainable agriculture,” in: *Integrated Pest Management. Concepts, Tactics, Strategies and Case Studies*, eds E. B. Radcliffe, W. D. Hutchison, and R. E. Cancelado (Cambridge: Cambridge University Press), 260–272.
- Rastoin, J. L., and Ghersi, G. (2010). *Le Système Alimentaire Mondial. Concepts et Méthodes, Analyses Et Dynamiques*. Versailles: Editions Quæ.
- Rist, S., and Jacobi, J. (2016). *Selection of Food Systems in Bolivia and Kenya and Methods of Analysis*. Bern: Centre for Development and Environment (CDE), University of Bern
- Rocha, C. (2007). Food insecurity as market failure: a contribution from economics. *J. Hunger Environ. Nutr.* 1, 5–22. doi: 10.1300/J477v01n04_02
- Sabourin, E. (2007). Que política pública para a agricultura familiar no segundo governo Lula? *Sociedade e Estado* 22, 715–751. doi: 10.1590/S0102-69922007000300009
- Sambuichi, R. H. R., Kaminsk, R., Perin, G., Moura, I. F., Januário, E. S., Mendonça, D. B., et al. (2019). *Programa de aquisição de alimentos e segurança alimentar: modelo lógico, resultados e desafios de uma política pública voltada ao fortalecimento da agricultura familiar*. Discussion paper. Brasília: Ipea.
- Santos, F. P. (2011). *Coalizões de Interesses e A Configuração Política Da Agricultura Familiar No Brasil. Escola de Administração de Empresas de São Paulo*. Rio de Janeiro: Fundação Getúlio Vargas.
- Schneider, S., and Niederle, P. A. (2008). “Agricultura familiar e teoria social: a diversidade das formas familiares de produção na agricultura,” in *Savanas: Desafios E Estratégias Para O Equilíbrio Entre Sociedade, Agronegócio E Recursos Naturais*, eds F. G. Faleiro, A. L. Farias Neto (Planaltina: Embrapa Cerrados), 989–1014.
- SEAD (2018). *Plano Safra da Agricultura Familiar 2017-2020*. Brasília: Secretária Especial de Agricultura Familiar e Desenvolvimento Agrário.
- SEI (2019). *Análise & Dados*. Available online at: <http://www.sei.ba.gov.br/phl8/download/p024190.pdf> (accessed February 14, 2020).
- Sidaner, E., Balaban, D., and Burlandy, L. (2013). The Brazilian school feeding programme: an example of an integrated programme in support of food and nutrition security. *Public Health Nutr.* 16, 89–94. doi: 10.1017/S1368980012005101
- Silva, S. P. (2011). *Políticas públicas, Agricultura Familiar e Desenvolvimento Territorial*. São Paulo, 16, 126–144.
- Soratto, J., and Witt, R. R. (2013). Participação e controle social: percepção dos trabalhadores da saúde da família. *Texto Contexto Enferm.* 22, 89–96. doi: 10.1590/S0104-07072013000100011
- Stiglitz, J. E. (2007). *Globalização: Como Dar Certo*. São Paulo: Companhia das Letras.
- Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., and Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature* 418, 671–677. doi: 10.1038/nature01014
- Wezel, A., Bellon, S., Doré, T., Francis, C., Vallo, D., and David, C. (2009). Agroecology as a science, a movement or a practice: a review. *Agron Sustain. Dev.* 29, 503–515. doi: 10.1051/agro/2009004
- Woodrow, L. (2014). “Presenting descriptive statistics,” in *Writing about Quantitative Research in Applied Linguistics*, eds L. Woodrow (London: Palgrave Macmillan).

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Brandão, Santos and Rist. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.