Investigating the socioeconomic implications of the soybean production chain in Brazilian Northeast, Maranhão State

ABSTRACT

Agribusiness is considered an essential activity for the economic development of a country such as Brazil, which has significant natural fertility. Utilizing this resource to promote social and economic development is considerably challenging for productive regions, known as MATOPIBA. In this context, this study evaluated some socioeconomic impacts of the soybean production in Balsas municipality (Maranhão). A descriptive method was chosen to investigate the reality of the situation in situ, promoted by these commodities. Prevailing data was gathered via a quantitative questionnaire (Google forms), filled-in by collaborators during the soybean planting period. The results demonstrated a unanimous interest (100.0%) in updating agribusiness related information. The agents of the production chain considered the relationship period with suppliers (23.1%), proximity to the sellers (28.1%), and the best buying-price (28.08%) as important factor. The interaction with financial institutions (31.0%); availability of human capital (46.0%), physical (38.0%), financial support (46.0%), and social capital; the public sector investments were also considered critical. The soybean production chain in the Balsas (MA) presented positive and negative socioeconomic implications; greater intervention by the State would be necessary for scientific and technological contributions toward all municipalities involved. However, such implications not prevented the great extension of this important national agricultural culture.

Keywords: Agribusiness; Agricultural crops; Commodities; Supply chain; Sustainable.
RESUMO

O agronegócio é considerado uma atividade essencial para o desenvolvimento econômico de um país como o Brasil, que possui expressiva fertilidade natural. Utilizar esse recurso para promover o desenvolvimento social e econômico é um grande desafio para as regiões produtoras, conhecidas como MATOPIBA. Nesse contexto, este estudo avaliou alguns impactos socioeconômicos da produção de soja no município de Balsas (Maranhão). O método descritivo foi escolhido para investigar a realidade da situação in situ, promovida por essas mercadorias. Os dados predominantes foram coletados por meio de um questionário quantitativo (formulários do Google), preenchido pelos colaboradores durante o período de plantio da soja. Os resultados demonstraram interesse unânime (100,0%) em atualizar informações relacionadas ao agronegócio. Os agentes da cadeia produtiva consideraram o tempo de relacionamento com fornecedores (23,1%), proximidade com os vendedores (28,1%) e o melhor preço de compra (28,1%) como fator importante. A interação com instituições financeiras (31,0%); disponibilidade de capital humano (46,0%), físico (38,0%), suporte financeiro (46,0%) e capital social; os investimentos do setor público também foram considerados críticos. A cadeia produtiva da soja em Balsas (MA) apresentou implicações socioeconômicas positivas e negativas; seria necessária uma maior intervenção do Estado para aportes científicos e tecnológicos para todos os municípios envolvidos. No entanto, tais implicações não impediram a grande extensão desta importante cultura agrícola nacional.

Palavras-chave: Agronegócio; Culturas agrícolas; Commodities; Cadeia produtiva; Sustentável.

INTRODUÇÃO

The use of prevailing agricultural methods arose from historical conflicts between people, so as to increase possessions and wealth. The winning party dominated the others, thereby overlapping their cultivation techniques, taking advantage of only the best (Paula & Taschedo, 2019).

The exact origin of soybean cultivation techniques is unknown due to differences presented in historical reports. For example, Mandarino and Seibel (2017) stated that the soybean plant originated in the Manchuria region (Northeast China). Rabelo, Cruz, Silva and Gomes (2020) evaluated the environmental perspectives of soybean cultivation in the Maranhão State, presenting relevant information for research field. However, Bonato (1987) evidenced that such a culture originated in East Asia. Zanin and Bachas (2017) reported that with the arrival of soybean in the Southern region of Maranhão, influenced by southerners, some advantages were noted, e.g., temperature, rainfall volume and distribution, and conditioning of the biological cycle (Paludyszyn Filho, 1995), making it conducive for cultivation. In addition, the availability of distribution channels after the soybean harvest, such as the Carajás Railway, allowed access of this crop to the Itaqui Port, São Luís, MA (Amaral, Almeida & Marabito, 2012).

The demand for adaptation to local conditions, such as soil composition, climate, altitude, savannah temperature, and application of new techniques in an agribusiness scenario provided for an increasing usability of technological tools, granted through the Green Revolution, emphasizing
the use of machinery, fertilizers, pesticides, and genetically improved vegetables (Barreto Júnior, 2007; Fernandes, 2013; Carvalho, Oliveira & Cruz, 2019).

Therefore, replacing traditional/manual methods by mechanization enables enrichment by technological advantages, and has some positive implications, e.g., improved production, shortened plantation and harvesting periods, use of precision mapping; but also, negative implications, e.g., replacement of personnel and increased soil erosion (Rodrigues, 2005).

Due to this technological disposition, some key changes in social aspects include the efficiency of soybean production in terms of real gains, generation of annual surplus annual, and providing a greater return on invested capital depending on production costs (Leal, 2017). According to Dörner (2017), using the MGE (Employment Generation Model) of the BNDES (National Bank for Economic and Social Development), it was estimated that the Brazilian soybean industry generated approximately 4.5 million direct, indirect and effective-income.

Döner (2017) also stated that a simultaneous increase in productivity through the use of new technologies, implied in a direct increase in social income, i.e., a greater amount of goods and services available for the population. Conversely, the process of income inequality began, as large entrepreneurs began producing more, limiting small producers, forcing them to migrate to other agricultural crops (Repórter Brasil, 2010).

Comparing the relationship between Paraguay and Argentina, García-Lopez and Arizpe (2010), Azar and Araújo (2016) observed that prominent social impacts included the displacement of the peasant population, loss of livelihood, increased rural conflicts, and lack of support for food security by large entrepreneurs.

In Paraná State (Southern Brazil), also traditionally producing soy in this modality, i.e., without excessive use of machinery, it was observed that one of the social impacts concerned the training of small producers to obtain market knowledge, since the ties with the culture local and foreign markets forced them into this practice (Bazotti, Paula & Mielitz Netto, 2017).

It was proposed that, for Brazil to become the greatest producer of soybean, it was necessary that some challenges could have been previously overcome, e.g., the logistics sector was considered the biggest challenge (Bonfim, Ferreira & Caetano, 2013). In a country with geographical dimensions such as Brazil, markets of this sector could present a sustainability gap for the national soybean agribusiness (Carmello, 2018).

To better understanding the economic aspects, it is necessary to directly analyze economic science concepts, since the pioneering work of Adam Smith (1723–1790). The focus of this science has been directed in trying to understand making choices, using scarce resources in the production of goods and/or services to meet infinite human needs (Monteiro & Silva, 2014).

Meeting human needs has become a key priority to gain wealth, as greater the financial resources allocated, greater is the capacity to expand the production of goods and/or services (Chiavenato, 2013). Throughout history, this aspect has been considerably attractive in the context
of soybean production. According to Palhano (2016), soybean is the primary oilseed cultivated globally, being part of a set of agricultural activities with greater prominence in the international market.

The USDA (United States Department of Agriculture, 2018) projected a 5.3% growth in global soybean production (2018/2019 harvest), which has been expected to reach 354.54 mt (million tons); Brazil's has been projected to become the world’s largest producer, with an estimated production of 117.0 mt, surpassing the United States (116.5 mt). Argentina (56.0 mt) and Paraguay (9.8 mt) contribute relevant amounts, and together with Brazil contribute to 84.41% of global production (Costa & Santana, 2018).

The primary economic impacts (creation of direct and indirect jobs, implementation of modern infrastructure, and an increase in international trade), resulting from this profitable production, is observable via numerical representation through economic indexes such as GDP (Gross Domestic Product), trade balance, employment rate, etc. (Queiroz, 2009).

According to CEPEA (Center for Advanced Studies in Applied Economics, 2017), soybean is included in a special group of agricultural chains (Table 1), where in economic indices, such as GDP, are measured by the CNA (Confederation of Agriculture and Livestock of Brazil), which analyzes the production of cotton, sugarcane, soybean, livestock (beef cattle), and milk.

Table 1 - Agribusiness GDP of the primary productive chains, 2017.

<table>
<thead>
<tr>
<th>Productive chains</th>
<th>Cotton</th>
<th>Sugarcane</th>
<th>Soybean</th>
<th>Beef cattle</th>
<th>Milk</th>
</tr>
</thead>
<tbody>
<tr>
<td>January to June (%)</td>
<td>12.77</td>
<td>0.40</td>
<td>2.22</td>
<td>-4.50</td>
<td>4.36</td>
</tr>
<tr>
<td>Estimated value (million tons)</td>
<td>16.10</td>
<td>156.0</td>
<td>103.20</td>
<td>194.50</td>
<td>69.40</td>
</tr>
</tbody>
</table>


With regard to trade balance, the economic index measures the inflow and outflow of products and services between countries. A country that mostly exports will be conditioned to a deficit situation, and when the exports are greater than the imports, a surplus condition will persist (Table 2) (Monteiro & Silva, 2014).

Table 2 - Accumulated export (January, 2018) for select products of the soybean chain.

<table>
<thead>
<tr>
<th>Products</th>
<th>Tonnes (millions)</th>
<th>US$ (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybeans</td>
<td>83.6</td>
<td>33.2</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>16.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Crude soybean oil</td>
<td>1.4</td>
<td>1.0</td>
</tr>
</tbody>
</table>

If the employment rate in soybean production is considered, the scenario could be composed of various segments divided into inputs, primary services, primary agribusiness, agroservices, and total agribusiness. According to table 3, obtained by means of data from CEPEA, and ESALQ/USP9 (Superior School of Agriculture “Luiz de Queiroz”, University of São Paulo), it was possible to present a perception of this scenario.

**Table 3 - Variation of the employed population in the agribusiness and respective segments (January–September, 2017 versus January–September, 2016)**

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Primary</th>
<th>Agribusiness</th>
<th>Agroservices</th>
<th>Total agribusiness</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.50%</td>
<td>-6.40%</td>
<td>0.90%</td>
<td>2.30%</td>
<td>-2.20%</td>
</tr>
</tbody>
</table>


Correa and Ramos (2010) corroborated this interpretation, stating that Brazilian agribusiness is one of the most important sources of wealth sources for the country, being responsible for approximately 30% of the GDP, 35% of employed workers, and 40% of national exports.

Considering the relevance of the theme addressed, this study aims to understand the implications of the soybean production chain in the Balsas municipality, MA, in terms of the social and economic issues. Hence, we analyzed the socioeconomic impacts of soybean production in Maranhão State (Northeast Brazil), specifically in the Balsas municipality.

**MATERIALS AND METHODS**

The methodological procedure was initiated through a literature review, being essential to identify, know, and monitor the development of scientific research (Noronha & Ferreira, 2000). Hence, the method was characterized to be descriptive to describe the facts and phenomena of a given reality (Oliveira, 2011); and informative, providing a data summary (Cooper & Schindler, 2016).

The research scope was thematic, as discussions on production resulting from soybean cultivation in the Maranhão State is limited, emphasizing on the Balsas municipality, and analyzing the social and economic impact. In addition, this research is historical in nature, as it discusses retrospective literature, allowing a comparison of information from different sources (Cooper & Schindler, 2016).
Types of research

This study consists of an interdisciplinary approach. Cesco, Moreira e Lima (2014) demonstrated that interdisciplinary studies have gained considerable visibility in Brazil out of the need to establish new dialogues with civil society and to answer complex and hybrid problems being faced by modern society. Oliveira (2013) added that studies presenting various issues must be undertaken through multidisciplinary discussions.

By nature, this study is applied in origin as it is possible to apply the knowledge gained to obtain solutions to specific problems. In approaching the issue, this research was considered quantitative as it tries to quantify parameters with precision; and sometimes, normally assesses the behavior, knowledge, opinions, or attitudes of people (Cooper & Schindler, 2016).

This study aimed to incorporate descriptive research, describing the characteristics of a given population or phenomenon, or establishing relationships between specific variables (Silva, 2005). In terms of the procedures, other research techniques were utilized, e.g., bibliographics, documentary (secondary), observational, and the support of external participants.

Place of study

This study was conducted in the Balsas municipality, MA, which has a large agricultural area for cultivating soybean, with greater production potential in the State of Maranhão (member state of MATOPIBA), covering an area of 1 314 176 km², with an estimated population of 94 779 habitants, an MHDI (Municipal Human Development Index) of 0.687 and agricultural production of 108 100 hectares of planted area (IBGE, 2017).

Currently, the Balsas municipality is located 815 km from the state capital (Latitude: 07º 31'57" South, Longitude: 46º 02'08" West) and is considered to be the municipality of Maranhão with the highest occupancy rate (2.3 million tons per year, 2017), which contributed to 17.0% of the collection in the local soy complex (soy as grains, soy cake, and edible soy oil) and highlights the northeast region of the country (IBGE, 2017; IMESC, 2018).

Population/sampling

This research was driven and defined based on the population and sampling data obtained from literature; the samples were analyzed, considering the method proposed by Dörner (2017), where the value of “n” was maintained at 45 for the entire region analyzed in the municipally of Balsas, Maranhão State. However, this study is limited to the Balsas municipality, covering only those soybean producers included within this territory, and obeying the inclusion/exclusion
criteria. The sample number was defined based on convenience, since a sample test was not applied.

For the inclusion criterion, the introduction of the soybean farmer in soybean production, their location in the Balsas municipality, and their acceptance to participate in the research was considered. For the exclusion criterion, this was limited by the non-production of soybean and non-introduction in the municipality of study.

Data collection

This research considered a time horizon of eleven years (2007–2018), to obtain a wide range of published insights over a decade, especially those with a specific basis, to present secondary data that signaled the expansion of soybean cultivation in the State of Maranhão, as well as recent studies (first half of 2019). Some publications before the period 2007–2018 were also analyzed and used as a basis for the theoretical fundamentals and presentation of results in terms of socioeconomic aspects.

Primary data was obtained through an on-site visit in the Balsas municipality during the soybean planting period in order to observe and identify the socioeconomic impacts, resulting from this stage of the production process. It is noteworthy that the questionnaires were distributed to subjects/agents, e.g., collaborators, producers, and suppliers. The questionnaires involved closed questions and a language adapted to the place of study and the research objective and was based on methodology of Dörner (2017).

With the advent of technology, and in order to minimize geographical barriers, the Google forms platform (online) was also utilized to make the questionnaire available to participants in a virtual format through direct access on smartphones, desktops, and/or notebooks. Thus, participants answered questions directly, contributing to the study objective. According to Oliveira and Jacinski (2017), Google forms allow a user to “collect” and organize large and small amounts of information freely. The responses were stored in spreadsheets (Google sheets) and could be visualized through graphs or via spreadsheets generated by the system, helping obtain responses even from distant study sites.

Data analysis

Cooper and Schindler (2016) stated that as data begins flowing in, a researcher should focus on analyzing the data. This stage requires further attention and meticulousness by a researcher, so as to extract the maximum information possible from the raw data.

Several methods could be used to analyze the data, whether qualitative or quantitative, in an isolated or concomitant manner. In terms of choosing an analysis method, Chizzotti (2010)
reported that documents could be decoded using various procedures to achieve considerably meaningful information from encrypted data. The choice of the most appropriate procedure depends on the material to be analyzed, the research objectives, and the ideological and social position of the analyzer.

Content analysis was chosen for the study. According to Mozzato and Grzybovski (2011), this analysis consists of techniques to analyze information, which uses systematic and objective procedures to describe the content of the information and responses.

Referring to the various steps characteristic of content analysis, some authors used varying terminologies, but which were considerably similar (Oliveira, 2011). However, this was adopted as a parameter to define the stages of content analysis conducted by Bardin (2010), which consisted of three phases: 1) pre-analysis; 2) exploration of the materials; and 3) understanding of the results, inferences, and interpretation thereof.

New technologies are advantageous in terms of this stage of analysis of the collected data, as various softwares have emerged with a greater frequency to facilitate their organization and interpretation, regardless of their quality or quantity. Microsoft Office Excel 365 academic version software was used to organize the quantitative data, which helped prepare spreadsheets, graphs, and tables to record the frequency obtained by analyzing data. In addition, it is essential to regroup the economic data collected during the on-site visit for a comparative and interpretative analysis using available literature.

RESULTS AND DISCUSSION

The results represent the social and economic implications for the Balsas municipality (Maranhão State) in terms of the influence of the soybean production chain. It is noteworthy that the results are limited to the period described in section 2.4.

The first result reflects the importance of maintaining updated information on the market scenario in terms of the soy production chain, as new discussions arise constantly. Among all agents interviewed, i.e., 100%, wished to stay updated and participate in events such as AgroBalsas 2019 (occurring annually), which contributes to quality certification, sustainability in production, addressing challenges and opportunities for agribusiness and trade, quality of inputs, agricultural technologies, and others (FAPCEN, 2019), promoted by public and/or private entities.

Cornetta (2019) stated that organizations in the agribusiness must undertake self-assessments in order to organize and adapt to new technological trends. Only then could these organizations achieve profitability beyond expectations, remain competitive in the domestic and international markets, beside exhibit technical and scientific knowledges in terms of soybean
production. Therefore, it could be useful to be present and/or involved in scientific and academic events, congresses, forums, public hearings, and other knowledge promotion activities.

Almeida, Sodré and Mattos Júnior (2019) reported that for the globalized agribusiness to be most effective, it would be necessary on a global and local scale to involve some productive regions, e.g., MATOPIBA, demonstrating the relevance of being introduced in this environment, as Maranhão State in particular is connected to the primary centers of economic power and consumption worldwide.

Thus, to be updated in the soybean market, it is possible to enhance the expansion capacity of the network of contacts in the production chain, allowing access to suppliers of various inputs (Dörner, Oliveira & Schneider, 2019). Therefore, the frequent question on the buying of seeds was considered as this input represents one of the first stages of the soybean production process (Figure 1).

The results demonstrated that 23.08% considered the relationship period with the supplier, 23.08% for the best price, and 23.08% for proximity to the supplier. In addition, 15.38% of the interviewed responded that the required guarantees of supply, quality, and delivery time must be considered important; while 7.69% considered the relationship with the seller, and 7.69% considered other factors.

**Figure 1 -** Main factors considered by soybean producers while purchasing seeds.

Bandeiras and Medeiros (2019) demonstrated the relevance that the type of seed represented in agriculture, and that this approach is strategically linked to global markets. The authors also stated that the seeds sector demonstrated in previous periods that a strategic positioning could define the level of profitability and customer satisfaction.

Howard (2015) demonstrated that, with technological advances, transactions, involving GM11 (genetically modified) seeds enabled a greater expansion of suppliers, influencing companies that commercialize oil, pharmaceuticals, and grains to go through this market segment, offering greater options for farmers.
Regarding to fertilizer supply (Figure 2), the primary factors considered included the relationship period with the supplier (38.46%), a better price (23.08%), and proximity to the supplier (15.38%); while for the factors of required warranties, it can be mention the relationship with sellers, and other parameters (e.g., purchase policies, installments, deliveries, waiting time, and post-sales accompaniment), which were equally distributed (7.69%).

**Figure 2 -** Main factors considered while purchasing fertilizers in the soybean production chain.

According to Sari and Prajanti (2016), the use of better-quality fertilizers positively affects soybean production, minimizing costs. Quality exists not only in physical aspects, but also in the relationship with suppliers, facilitating the identification of problems, e.g., continuity of supply, receipt of acquired materials, correct quantities, and timeliness. In this sense, Cogo and Büttchenbender (2018) reported some logistical problems at Cooperative Tritícola Santa Rosa Ltda, in Rio Grande do Sul State. In Indonesia, Sari and Prajanti (2016) analyzed the need for the introduction of governmental policies, involving subsidies for purchasing fertilizers, thus helping farmers achieve optimum results.

The FAO (Food and Agriculture Organization of the United Nations, 2017) highlighted that a relationship with suppliers while seeking various inputs (including fertilizers) is established due to the reduction and/or elimination of import barriers. Thereafter, improvements in the establishment of commodity prices could be verified, providing domestic producers a significant reduction in production costs.

Some intrinsic aspects of the supply chain with regard to the buying/selling of machinery and equipments are presented (Figure 3). An equal prevalence was found in considering the relationship period with the supplier (23.08%), better price (23.08%), and proximity to the supplier (23.08%). In addition, 15.38% of the interviewees considered having a good personal relationship with the seller, 7.69% considered required guarantees, and 7.69% considered other factors.
Figure 3 - Main factors considered while purchasing machinery and equipments.

Iacono and Nagano (2010) observed that in the municipalities of Cascável and Toledo (Paraná State), there was a considerable change in the market scenario, promoting a growth in the number of companies that started offering agricultural equipment and parts in order to meet an increased production of soybean crops. The authors also perceived several advantages, e.g., relative proximity to customers, low cost of manpower, availability of specialized services, proximity to suppliers, existence of support and promotion programs, and proximity to large universities and research centers (Iacono & Nagano, 2010).

According to Rachelle (2015), soybean production was mainly responsible for the modernization and mechanization of Brazilian crops, in addition to contributing to the expansion of agricultural frontiers and boosting the agribusiness. In Brazil, Paraná State, for example, was considered to be a precursor of this product.

In the Balsas municipality (Maranhão State), for example, events such as AgroBalsas 2019 present favorable opportunities for farmers, suppliers, and intermediaries in the soybean agricultural chain, allowing them to negotiate new proposals for the supply of products and/or services. This event in 2019 generated revenues over R$ 700 million. In 2019, the Bank of Amazon granted R$ 50 million to farmers and rural producers as credit to purchase trucks, machinery and equipment. It is interesting to note that such financing allowed the inclusion of agricultural operating costs and working capital (Souza, 2018).

Bilobram, Antoniazzi and Novak (2018) reinforced that the diversity of technological evolution could be used in fields, focusing mainly on machines and equipment, through which it is possible to increase the planting area and harvest effectively with precision and online monitoring, reducing the time consumed and increasing operator comfort and productivity.

Other factors have also gained attention concerning an analysis of the internal environment (e.g., land availability, research centers, and diversified exports to several countries) and external ambience (increase in exports through free trade agreements between Mercosul and
the European Union) for the soybean production chain, including aspects that could be controlled by an organization itself (Pinazza, 2008).

Here, it was also possible to identify some aspects that were considered extremely important or unimportant (Figure 4). For example, the concentration or relationship with financial institutions (46.0%, important), availability of human capital (46.0%, extremely important), availability of physical capital: machineries, equipments, and lands (38.0%, important and extremely important), and availability of financial capital: private financial resources (46.0%, extremely important).

For the various types of social capital (Figure 4), the results were as follows: (a) social capital I: levels of confidence and cooperation between soybean producers (46.2%, important); (b) social capital II: levels of confidence and cooperation between soybean producers and input suppliers (38.0%, important and extremely important); (c) social capital III: levels of confidence and cooperation between soybean producers and trading companies (54.0%, important); (d) social capital IV: levels of confidence and cooperation between soybean producers and other economic agents (61.5%, important); and (e) social capital V: levels of confidence and cooperation between soybean producers and the public sector (61.5%, important).

Figure 4 - Identifying the degree of importance concerning the concentration of financial institutions, human capital, physical capital, financial capital, social capital (I, II, III, and IV), and the public sector.

Frederico (2015) reported that the location of corporate offices, whose activities could be listed under centers dealing with innovations, financial institutions, and judicial and human resource consulting companies are extremely important for strengthening negotiation dealings (exports, imports, and loans), and strategic decision-making (acquisitions, discussions with companies, and logistics).
Considering the availability of financial institutions, it was observed that the Balsas municipality (MA) is largely supported by several banks: Bank of Brazil, Bradesco Bank, Bank of Amazon, Itaú Bank, Northeast Bank, and BNDES. This is of significant value as these banks constantly finance or facilitate access to credit for purchases during events such as AgroBalsas 2019 (Souza, 2018).

Martins and Wander (2018) also reported the significance of proximity to educational and/or research institutions, e.g., the technological innovation centers in soybean crops at the IFGO (Federal Institute of Education, Science and Technology of Goiás). This institution provided access toward human resource development, new technologies and laboratories, enabling the realization of projects that can be submitted and approved by funding agencies of public and/or private institutions.

In the Balsas municipality (MA), several educational institutions contribute significantly to the local central market, which are public or private institutions offering specific qualifications (higher, technical, or professional courses). For instance, Environmental, Agricultural and Mechanical Engineering (UFMA, Federal University of Maranhão); Agronomic and Forest Engineering (UEMA, State University of Maranhão); Administration and Agribusiness (UniBalsas, Faculty of Balsas); Business Administration (FACAM, Faculty of Maranhão), and technical-professional courses offered by the National Service for Commercial Learning (SENAC), and National Service for Industrial Learning (UFMA, 2019; SENAI, 2019; UEMA, 2019; FACAM, 2019; SENAC, 2019).

These relationships with all the agents involved in the soybean production chain, facilitate access to financial and/or educational, which strongly assist in valorization of social capital. As defined by Willers, Lima and Staduto (2008), social capital comprises the ability to organize a society, which is associated to economic life, confidence, and cooperation among the agents involved. Such conditions have a potential for economic and social intervention and facilitating coordinated action, which could be the basis for local and regional economic development.

Social capital is employed to help understand how relationships and sociability are established in a territory. Its characterization helps understand better the relationship between citizens and their collective organization (Santos, Vieira & Santos, 2019).

Willers et al. (2008) highlighted that the establishment of social networks and productive groups (cooperatives and associations) provided better survival conditions in a competitive scenario. For example, the confidence level among entrepreneurs of baby fashion (Terra Roxa) was approximately 93%, representing an average to high degree of social capital.

Moreira Begnis, Arend and Alievi (2017) reaffirmed the need for confidence between agents in a transaction, and that commitments established by both are essential for a negotiation to occur place safely. Rossés, Tomazi, Stecca, Oliveira and Sccott (2015) proposed that
confidence, honesty, punctuality, and honoring deadlines for input payment, among others, are essential factors that encourage loyalty between members and suppliers.

As for the reliability and cooperation of trade companies, Wesz Junior (2015) pointed out the existence of a larger tendency for supplying necessary inputs for cultivation by means a coupled sales agreement. Thus, companies guarantee invested capital through resulting production. The authors also exemplified other activities such as lectures, socializing events, and fisheries, which follow this same practice.

In the context of the relationship between soybean producers and other economic agents, the presence of the State as a factor having significant influence on the production chain was strongly highlighted. The actions developed are directly linked to day-to-day activities of a producer, with the application of taxing measures and an absence of measures related to the infrastructure for production flow (logistics), by means of the predominance of a road modal (Carvalho, 2019).

Considering economic agents, it was noted that the family unit is commonly analyzed while assessing family agriculture conditions. According to Bazotti et al. (2017), the production process is also marked by externalization, i.e., transference to external agents the means and production agreements, which are previously under control of the property or community. Considering relatively autonomous production, this becomes a dependent production agreement, since it then onwards maintains a harmonious relationship between producers (family agriculture) and local consumers.

The public sector is centered on three governmental agencies: Federal, State, and Municipal. However, the contribution of these agencies was delimited through the interviews, demonstrating that the interaction between these agencies and producers is of fundamental importance; however, this interaction could be more dynamic, considering infrastructure availability, as the lack of good road infrastructure is a relevant and recurring issue. Miranda (2014) demonstrated that commodities account for approximately 9.15% of Brazilian exports, justifying the enormous attention and care they require, especially in the grain industry.

A significant number of jobs are generated by the soybean production chain, extending from the input, to production, and to the final consumer (Miranda, 2014). The interviewees unanimously (100.0%) considered the soybean production chain to generate significant employment, regardless of the stage of production. However, there are studies which report the conditions that the workers in this productive sector are subjected. Azar and Araújo (2016) noted that, in general, these undertakings offer unhealthy and precarious working conditions.

This reality is controversial to the results of this study. In this case, daily life is extreme, as there is an overvaluation of projects involving commodities (e.g., soybean). However, this is not practically considered to be productive, being concentrated across few workers, and
generating poverty through temporary jobs, without minimizing exploitative labor conditions (Botelho, 2017).

Santana (2018) also reaffirmed such a situation regarding an increase in soybean productivity, as production growth could be associated with analogous conditions involving slave labor. For example, in Luiz Eduardo Magalhães city (Bahia State), the Santo Antônio and Tabuleiro soybean farms were accused of subjecting workers to conditions similar to slavery in 2003.

The extent of employments generation presented in the responses of interviewees, demonstrated that this index is not only limited to those workers directly linked to soybean production, but to all those working in fields. With regard to purchase of inputs, 84.6%, 92.3%, and 84.6% of the interviewees considered purchasing seeds, fertilizers, and pesticides, respectively from the same supplier. It is noteworthy that there is a predominance in trying to always purchase inputs from the same supplier.

It is implied that employment generation is high, since input traders are considered essential agents of the production chain and need to necessarily obtain manpower to address customer requirements. Santos et al. (2019) confirmed the scope of formal jobs in the agricultural sector, taking as an example the city of Caraguatatuba (SP), where in the percentage of workers employed in commerce and service were 40.31% and 45.85%, respectively.

The need for qualified personnel to meet the demand of farmers' customers is increasing, based on the requirement of quality services, which is similar to other activity common to retail (Santana, 2018). Customers requirements are common regardless of the relationship developed through negotiations.

Finally, the study performed by Oliveira et al. (2016) assessed whether end consumers would be satisfied with the services provided by shopkeepers. From the responses provided, it was verified that the ability to resolve complaints, convey accurate information, and resolve doubts is a more frequent commercial challenge found in Balsas city (MA, Brazil).

CONCLUSIONS

This study suggests that the soybean production chain in the Balsas municipality (MA) presented numerous social and economic implications, due to a significant influence of the agents involved in this environment, e.g., rural producers, workers, consumers, suppliers, etc.

There is continued interest in such information concerning soybean production, as the technological age present several implications on human relationships; hence, agricultural activity cannot be excluded. Thus, using technologies, input suppliers are constantly interacting with their customers through public events.
Technological disposition is another determinant factor for the advancement of soybean production in the Balsas municipality (MA), as the introduction of agricultural machinery that facilitates precise mapping and automation enables rural farmers to undertake the planting process more effectively until harvest. However, it appears that other parameters such as working conditions require further attention, as only an increased technological disposition cannot guarantee quality and worker satisfaction.

The interaction between the several agents in the soybean production chain is significant; the degree of importance given to a good relationship between rural producers, financial institutions, input suppliers, trade companies, final consumers, economic agents, and the public sector are fundamental parts for the soybean production chain, providing good results and social capital for the entire municipality.

Finally, it is suggested that future research on such a socioeconomic analysis should focus on the relationship between the state and rural producers, because although there is a correlation between these members of the production chain, studies that emphasize this aspect are lacking. Therefore, the State could act as a collaborating agent in soybean production in the Balsas municipality (MA), focusing more attention on the use of high ways and roads, as this parameter presents a great opportunity in enhancing soybean flow to the world markets.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support of the Brazilian research funding agency FAPEMA (Maranhão Foundation for Scientific Research and Development) (Process no. 01661/21, 02659/21, and 06776/22). We also express our appreciation for the professional and technical support provided by the following universities: Federal University of Maranhão – UFMA and University of Campinas – UniCamp.

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