

THE SOYBEAN PRODUCTION IN MATOPIBA: CONTRADICTIONS OF THE DEVELOPMENT MODEL, RISKS AND PROSPECTS FOR THE BRAZILIAN CERRADO CONSERVATION

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EXECUTIVE SUMMARY

Matopiba

The territory of MATOPIBA (acronym that uses the first two letters of the Brazilian states of Maranhão, Tocantins, Piauí and Bahia) stretches approximately 73 million ha across 337 municipalities grouped in 31 micro-regions. It sits at the intersection of four Brazilian states: western Bahia, southern Piauí, southern Maranhão, and Tocantins. The territory was established with strong participation of the private sector linked to commercial agriculture, in the context of a centralized planning process whose development model sought to enhance the production and processing of commodities. According to the Cerrado Manifesto published by a group of 40 non-governmental organizations (available at https://www.wwf.org.br/natureza_brasileira/areas_prioritarias/cerrado/manifestodocerrado) agricultural expansion is the main cause of deforestation in the Cerrado, and in MATOPIBA 62 percent of the agricultural expansion took place over native vegetation.

Focus of the study

- To further investigate the effects of the introduction of soybeans into the MATOPIBA region through a socioeconomic analysis of the dynamics of territorial development.

Specific objectives

- To study the main contradictions of the development process in progress;
- To identify the risks to conservation of the Cerrado biome and the prospects for a more equitable economic growth for municipalities and local stakeholders.

Main results: the expansion of soybean in Matopiba and the contradictions of the development process

Two regions (western Bahia and southern Piauí) and four sub-regions have been identified and classified in MATOPIBA, namely:

- i) "Consolidated soybean": Located in the western part of the State of Bahia, this sub-region is characterized by intensive soybean farming, which has spread over large areas of land since the 1980s;
- ii) "Soybean expansion": Located in the southern part of the State of Piauí and the southeastern part of the State of Maranhão, this sub-region, which is characterized by the introduction of soybeans in the 1990s, experienced a rapid expansion from the first decade of the 2000s to 2015;



iii) “Soybean periphery (I)”: Located in western Bahia; and

iv) “Soybean periphery (II)”: Located in southern Piauí/Maranhão. Both sub-regions are characterized by small-scale soybean production.

The crop was initially introduced into the soybean peripheral sub-region in the western part of the state of Bahia in the late 1990s, and more recently in southern Piauí. Soybean expansion is likely to occur in both sub-regions, especially in western Bahia. However, cattle farming and large areas covered by Cerrado vegetation prevail in both sub-regions.

The analysis of key socioeconomic development indicators in four dimensions (demographic, land use, economic, and well-being) enabled comparing the performance of the four sub-regions. The set of indicators surveyed and verified were: i) population and population density; ii) total soybean-growing area; iii) percentage of areas occupied by family farming; iv) per capita GDP; (v) employment rate; vi) diversity of economic activities; (vii) income, poverty and inequality; (viii) mortality rate; and ix) illiteracy.

The review and analysis of economic and social indicators show that there are contradictions in the development process, which have been aggravated by the more intense introduction of soybeans into some sub-regions. On the one hand, factors such as economic growth (higher per capita GDP, higher per capita household income and greater poverty reduction) can be observed, alongside a decrease in illiteracy in the soybean expansion sub-region. On the other hand, the two soybean-growing sub-regions (consolidated sub-region of western Bahia and Piauí/Maranhão sub-region) showed a decrease in the performance of health indicators (increase in child mortality rates and decrease in the number of physicians per 10,000 population).

Another contradiction was observed from the analysis of land use: the sub-regions into which soybean has been introduced have a lower percentage of areas occupied by family farming. The data suggest that the introduction of soybean leads to a decrease in the presence of family farming, which in turn can be a vector of the migration of family farmers from rural areas to cities, with impacts on their way of life and consequences related to the quality of the services provided in urban areas. The migration of family farmers from rural areas to cities was reported by respondents in the field stage.

Inclusive development or reproduction of an old model?

From the identification and analysis of the performance of a set of municipalities in the four sub-regions, the authors chose to focus more closely on the soybean expansion sub-region and, more specifically, on a municipality that is very representative of the dynamics of territorial development: Bom Jesus, located in the southern part of the state of Piauí.

A literature review and an empirical study enabled verifying how the development process of Bom Jesus matches the hypothesis of Berdegue et al (2014) and Favareto et al. (2015) that economic growth with social inclusion is more likely to occur in territories where:

- i) Local stakeholders have greater access to land and natural resources.
- ii) The production structure is more diverse and decentralized.
- iii) There are medium-sized cities that offer markets and services;
- iv) There is greater access to dynamic markets.
- v) There are public policies in place aimed at either reducing asymmetries and strengthening the aforementioned factors or reversing the conditions that prevent them from occurring.

In the case of the “soybean expansion” sub-region and, specifically, of the municipality of Bom Jesus, the analysis of these empirical factors shows that the hypothesis of Berdegué et al. (2014) and Favareto et al. (2015) does not hold in the scenario of the soybean expansion region in southern Piauí. The characteristics of existing empirical factors exacerbate the contradiction inherent in the development model implemented. Thus, despite the existence of an economic dynamism associated with the introduction of soybean, which promotes the development of municipalities that concentrate soybean-related infrastructure, services and products and ensures continuous investment in structures of access to dynamic markets (roads, railways and ports, among others), the following factors are observed:

- a) Land concentration, which precludes different stakeholders from participating in this process; reduced availability of family farming areas in soybean-growing municipalities.
- b) Emergence of land conflicts due to increased land value.
- c) Concentration of economic dynamism in few municipalities, thus preventing a more equitable reinvestment of the agricultural surplus in the territory itself.
- d) accelerated population growth, which is not always accompanied by the corresponding evolution in the provision of public services; and
- e) deforestation of large areas of Cerrado vegetation cover.

Risks and prospects

The advance of deforestation in the Cerrado is a risk due to the potential expansion of soybean and other agricultural activities into areas available in the highlands and especially in the so-called “baixões” (lowlands). The respondents recognize that the occupation has promoted the loss of Cerrado vegetation and that the use of all areas with potential for the expansion of soybean production would require the additional legal deforestation of about 10 percent of these areas. Add to that the risks associated with both the emergence of conflicts with local communities and expropriation, which would arise from the increase in land value associated with the introduction of soybean farming.

Agriculture and cattle farming prevail in municipalities where soybean is not produced. Different from commercial agriculture, these activities have not been the target of investments and structuring public policies aimed at their development. Because these municipalities have no revenue of their own, the absence of structured economic activities causes them to depend on public policies from other government spheres, such as the Bolsa Família program.

The prospect exists that the inclusive and equitable development of the municipalities in the regions studied will require strong action by local stakeholders and public and private institutions in the search for alternatives that ensure both economic growth and the conservation of Cerrado natural resources. In this regard, the adhesion of large global buyers to the Cerrado Manifesto and the emergence of spaces for dialogue and political concertation, such as the newly created Cerrado Working Group, may become venues where solutions are discussed and implemented with a view to eliminating contradictions and effectively protecting the remnants of Cerrado vegetation, which are vital for environmental conservation and balance. Finally, more in-depth studies are necessary to outline social, economic and environmental measures capable of reconciling expansion with sustainable and inclusive socio-economic development.

INTRODUCTION

MATOPIBA was established as a territory on November 12, 2015, from an initiative of the Federal Government of Brazil through Ordinance 244. It sits at the intersection of four Brazilian states - western Bahia, southern Piauí, southern Maranhão, and Tocantins and stretches approximately 730 million ha across 337 municipalities grouped into 31 micro-regions. The territory was established with strong participation of the private sector linked to commercial agriculture, in the context of a centralized planning process whose development model sought to enhance the production and processing of commodities (COUTINHO, 2013; SANTOS, 2016).

Historically, this planning modality disregards issues related to the economy and social needs of existing local populations, as well as environmental issues related to the development process. Thus, two factors are essential for understanding the territorial configuration of MATOPIBA. On the one hand, we have public policies on agricultural production as well as financing, research and development, the creation of infrastructure and the presence of large producers, especially of soybeans (BACHA & CARVALHO, 2012). And on the other hand, we have the understanding of natural heritage as a mere source of economic resources, or even as an obstacle to development. In addition, from the standpoint of both the State and the private sector, there is the idea of a population "vacuum" in Central Brazil, which reinforces the invisibility of local and regional social stakeholders and processes.

This study aimed essentially at further understanding the effects of the introduction of soybean in the MATOPIBA region, through a socioeconomic analysis of the dynamics of territorial development. The specific objectives included examining the main contradictions of the process and identifying prospects and future risks for a more equitable economic growth for both the municipalities and local stakeholders.

The report is organized into three sections, in addition to this Introduction. The first section describes the methodological procedures that were developed and followed in the course of the analyzes. The two following sections present the surveys and analyzes of secondary data on 23 municipalities distributed in four sub-regions and an in-depth historical and analytical review of the "soybean expansion" sub-region and the municipality of Bom Jesus, which are representative of the territorial dynamics. Finally, conclusions and recommendations are drawn from the results.

METHODOLOGY

Although MATOPIBA is formed by municipalities belonging to four states of the Federation, this study prioritized those specific spaces related to the dynamics of the introduction of soybean into the territory, namely western Bahia and southern Piauí and Maranhão. The survey and analysis were conducted between June 2017 and April 2018. The study procedure included two stages: i) survey and analysis of secondary data on a group of soybean-producing and non-producing municipalities; and (ii) literature review of the historical evolution of soybean expansion within a predefined geographical area complemented by a survey and analysis of primary data, and investigation of the case of a representative municipality of the soybean expansion region through semi-structured interviews.

The first stage of the survey consisted in the survey and analysis of secondary data, whose sources of information were mainly land use, agricultural suitability and land structure maps produced by IMAFLORA (PIATTO and INAKAKE, 2016). Through this analysis, four sub-regions, which are described below, were identified and classified according to the presence or absence of soybeans (*Figure 1*). The so-called “consolidated soybean” region, located in western Bahia, is characterized by intensive soybean farming, which has spread over large areas of land since the 1980s.

To the north of these areas, in the southern part of the States of Piauí and Maranhão, lies a second sub-region known as “soybean expansion”, which is characterized by the introduction of soybean in the 1990s and experienced rapid expansion from the first decade of the 2000s to 2015.

Finally, a third and fourth sub-regions known as “soybean peripheries” were identified: in western Bahia and southern Piauí/Maranhão. Both sub-regions are characterized by low-scale soybean production. The crop was initially introduced in the soybean periphery sub-region in western Bahia (late 1990s) and more recently in southern Piauí. Soybean expansion is likely to occur in both sub-regions, especially in western Bahia. However, land use for cattle farming and large areas covered by Cerrado vegetation prevail in both sub-regions.

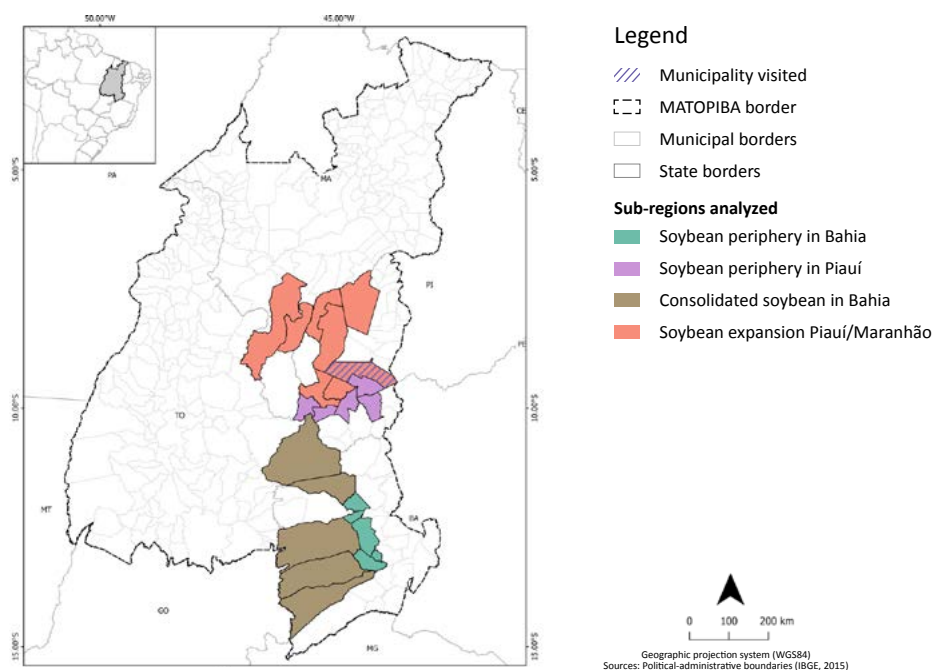
From this characterization, 23 municipalities representative of the development process implemented in each sub-region (*Table 1*) were selected. A comparative analysis of the four sub-regions identified was then conducted, using indicators in four dimensions of the development process (*Table 2*).

REGION	SUB-REGION	MUNICIPALITIES
Western Bahia	Consolidated soybean	Correntina, Formosa do Rio Preto, Jaborandi, Riachão das Neves, and São Desidério*
	Soybean periphery (I)	Angical, Baianópolis, Canápolis, Catolândia, and Santa Maria da Vitória.
Southern Piauí/ Maranhão	Soybean expansion	Baixa Grande do Ribeiro, Bom Jesus, Gilbués, Monte Alegre do Piauí, Ribeiro Gonçalves, and Uruçuí, in Piauí; Balsas and Tasso Fragoso, in Maranhão.
	Soybean periphery (II)	Barreiras do Piauí, Curimatá, Redenção do Gurguéia, Riacho Frio e São Gonçalo do Gurguéia, no Piauí.

Prepared by the authors

Table 1 - Municipalities selected for analysis in each sub-region.

* The municipalities of Barreiras and Luís Eduardo Magalhães were not selected due to the dismemberment, in the year 2000, of the then Luís Eduardo Magalhães District located in the Municipality of Barreiras. For this reason, the municipalities were surveyed together in the 2000 Census, which made it difficult to compare secondary data between the 2000 and 2010 Censuses.



Source: IMAFLORA, geoprocessing sector.

Figure 1 - Sub-regions analyzed and municipalities visited.

DIMENSION	INDICATORS	SOURCE
Demography	Population	IBGE Census (2000 and 2010)
Land use	% of family farming properties and areas	IBGE Agricultural Census (2006)
	Soybean farming areas	PAM – Municipal Agricultural Production (1990, 2000, 2010 and 2015)
Well-being	Child mortality and illiteracy rate among 15-year-olds or older.	IBGE Census (2000 and 2010)
	Number of physicians per 10,000 people	National Register of Health Establishments – CNES (2005 and 2010)
Economic dynamism: employment, income, poverty, and inequality	Per capita GDP	IBGE report (2000) corrected by INPC (and 2010)
	Unemployment rate and Herfindahl-Hirschman sectoral employment diversification index, per capita household income and people living in poverty.	IBGE Census (2000 and 2010)

Prepared by the authors.

Table 2 - Development dimensions and indicators.

The second stage, i.e., literature review of the evolution of soybean in the defined geographic area was conducted based on the theoretical-methodological approach developed in the studies of Berdegúe et al (2014) and Favareto et al. (2015). These studies point to a greater possibility of economic growth with social inclusion in territories with: i) greater access to land and natural resources by local stakeholders; ii) greater diversity and decentralization of the production structure; iii) existence of medium-sized cities that offer markets and services; iv) greater access to dynamic markets; and v) public policies aimed at either reducing asymmetries and strengthening the aforementioned empirical factors or reversing the conditions that prevent them from occurring. In the presence of these five factors, the necessary conditions for economic growth with social inclusion are more likely to occur. On the other hand, the absence of these factors may cause the territorial dynamics to follow a path contrary to that of economic growth and expansion of social well-being.

This stage included collecting additional information in the municipality of Bom Jesus (Piauí) located in the “soybean expansion” region, as this municipality is representative of the dynamics of the introduction of soybean into the territory. Interviews conducted through semi-structured questionnaires included questions related to the empirical factors that make up the territorial dynamics, to development indicators and to the existence of land conflicts. Key informants were interviewed among representatives of trade unions, social movements, the production sector and public management. The results were analyzed qualitatively.

1. COMPARATIVE ANALYSIS OF INDICATORS BETWEEN SOYBEAN- PRODUCING AND NON-PRODUCING SUB-REGIONS

The first analysis of the information compared secondary data on the 23 municipalities that make up the four sub-regions. The main objective was to assess the performance of key indicators in four dimensions of the development process, namely:

1.1. Demographic dimension

The indicator analyzed in this dimension was population growth, using IBGE data (2000; 2010).

Sub-regions with intensive soybean production experienced a large population growth between 2000 and 2010, which was above the Northeast and Brazil average (*Table 3*). This fact can be attributed to the population attractiveness of these areas, associated with the increase in economic activity promoted by soybean expansion.

TOTAL POPULATION	2000	2010	%
Consolidated soybean (western Bahia)	100.082	112,346	12.25
Soybean periphery (I) (western Bahia)	80.976	80.254	-0.89
Soybean expansion (Piauí/Maranhão)	133.451	172.210	29.04
Soybean periphery (II) (Piauí)	27.040	29,461	8.95
Northeast	47.741.711	53.081.950	11.18
Brazil	169.799.170	190.755.799	12.34

Prepared by the authors. Source: IBGE (2000; 2010).

Table 3 - Population growth between 2000 and 2010.

1.2. Land use dimension

The first indicator analyzed in this dimension was the number of soybean-growing areas. Soybean was introduced into the “consolidated soybean” sub-region in western Bahia in the 1980s. In the 1990s, the crop occupied significant areas in this sub-region and was already emerging in the “soybean expansion” sub-region in southern Piauí (Table 4).

In both cases an acceleration in growth has been observed since 2000, which coincides with the information taken from the literature and interviews with local stakeholders, that the arrival of large companies and international investors in these sub-regions began during that period (IBGE/PAM, 1990; 2000; 2010; and 2015).

EXPANSION OF THE SOYBEAN-GROWING AREA (HECTARES)

REGION	SUB-REGION	1990	2000	2010	2015
Western Bahia	Sub-region	277.987	380.071	747.530	1.100.000
	Consolidated soybean	2.752	11.700	7.000	7.200
Southern Piauí/Maranhão	Soybean periphery (I)	8.495	139.434	492.774	829.470
Southern Piauí	Soybean expansion	0,00	550	982	3.800

Prepared by the authors. Source: IBGE –Municipal Agricultural Production (PAM), 1990; 2000; 2010; and 2015.

Table 4 - Expansion of soybean-growing areas in the sub-regions studied.

The second indicator analyzed in the land use dimension was the percentage of areas occupied by family farming (Table 5). The land use map (Figure 2) shows that the introduction of soybean implies a downward trend in family farming and land concentration. Data from the 2006 Agricultural Census show that the area occupied by family farming is clearly larger in the sub-regions where soybean production is low (Table 5).

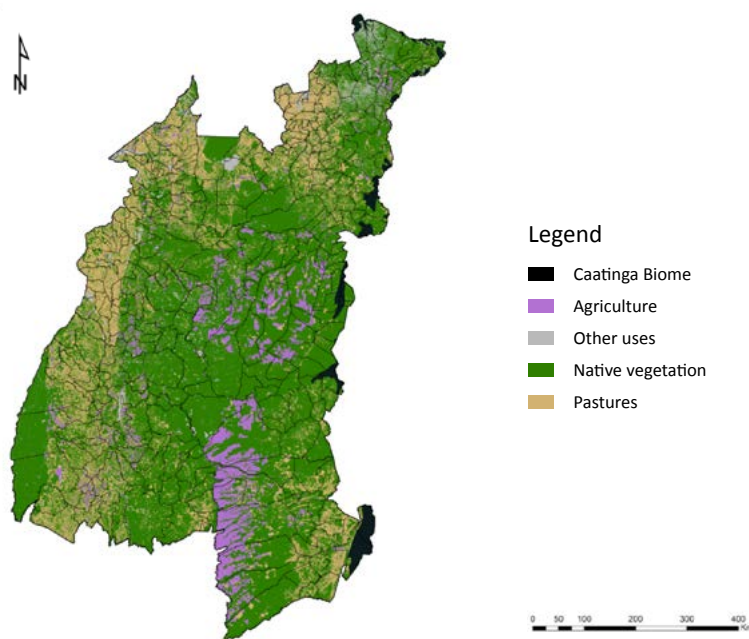
% NUMBER OF FAMILY FARMING PROPERTIES AND AREAS

REGION	SUB-REGION	% PROPRIEDADES FAMILIARES	% ÁREA FAMILIAR
Western Bahia	Consolidated soybean	86,41	7,13
	Soybean periphery (I)	89,54	42,32
Southern Piauí/Maranhão	Soybean expansion	82,64	12,62
Southern Piauí	Soybean periphery (II)	90,12	39,66

Prepared by the authors. Source: IBGE, 2006.

Table 5 - Number of family farming properties and areas.

The analysis of the information on land structure (*Figure 3*) shows that large and medium-sized properties prevail in the sub-regions with large-scale soybean production, while the peripheral sub-regions are characterized by a greater presence of family farms.



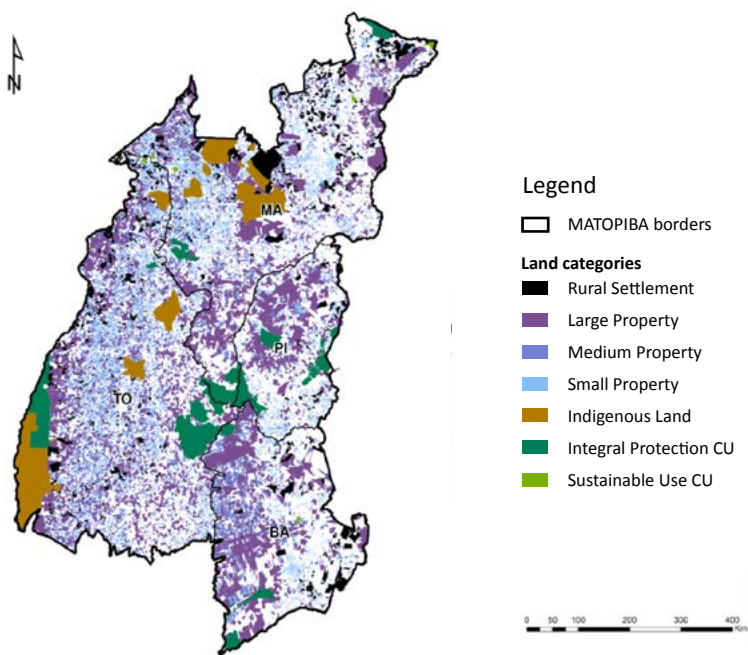
Source: Piatto and Inakake, 2016

Figure 2 - Land use map in MATOPIBA.

1.3. Dimension of the economic dynamics: employment, income, poverty, and inequality

In the economic dimension, one of the indicators observed was per capita GDP. In the “consolidated soybean” and “soybean expansion” sub-regions there is an increase in per capita GDP. This is expected due to the economic growth promoted by the crop.

Increase percentages and absolute values in the year of 2010 are higher in these sub-regions in relation to the others (Table 6). Per capita GDP increased in all sub-regions between 2000 and 2010. This performance can be explained by cash transfer policies introduced especially in the first decade of the 2000s (FAVARETO et al, 2015).



Source: Piatto and Inakake, 2016.

Figure 3 - Land configuration and Conservation Units in MATOPIBA¹.

¹ The land classification of rural properties follows the definition provided in the **Native Vegetation Protection Law** - Law nº 12,651 of May 25, 2012 (New Forest Code) by stating that: small properties are those with up to 4 fiscal modules; medium properties are those with more than 4 and up to 15 fiscal modules; and large properties are those with more than 15 fiscal modules. The fiscal module varies according to the municipality and region of Brazil.

PER CAPITA GDP	2000*	2010	%
Consolidated soybean (western Bahia)	10.784,30	21.236,33	96,92
Soybean periphery (I) (western Bahia)	3.272,92	5.295,83	61,81
Soybean expansion (Piauí/Maranhão)	3.843,99	12.922,60	236,18
Soybean periphery (II) (Piauí)	2.291,14	3.952,46	72,51
Northeast	5.944,31	9.561,41	60,85
Brazil	12.749,00	19.766,33	55,04

Prepared by the authors. *Source: IBGE report 2000 corrected by INPC and IBGE 2010.

Table 6 - Per capita GDP.

It was observed that the decrease in unemployment rates between 2000 and 2010 in the soybean consolidation (-2.94%) and expansion (-3.84%) regions was smaller than the decrease in unemployment rates in the Northeast (-6.13%) and in Brazil (-7.63%). This suggests the following contradiction: the presence of soybean, while generating economic growth has not contributed decisively to employment generation in the territories where the crop was introduced.

A second indicator analyzed was the Herfindahl-Hirschman index, which estimates the diversity of economic activities in a region. The analysis of this indicator did not reveal significant differences between the sub-regions. The analysis of data by municipality, however, shows that despite the dependence of the economy on a single production chain, the presence of soybean generates a greater diversity of jobs, especially in the hub cities of Bom Jesus (Piauí), Balsas (Maranhão) and Uruçuí (Piauí) as compared to the other municipalities, thus confirming the findings of the historical survey presented in the next section of this study.

Finally, the study sought to investigate the behavior of income, poverty and inequality. From 2000 to 2010, all sub-regions studied experienced a significant increase in per capita household income. The soybean "consolidation" and "expansion" sub-regions boasted the highest average per capita incomes in 2010, when compared to non-producing sub-regions. Between 2000 and 2010, the poverty index fell in all regions, with the best performances recorded in the "soybean expansion" sub-region (IBGE, 2000; 2010).

1.4. Well-being dimension

Finally, child mortality rates, number of physicians per 10,000 population and illiteracy rates were addressed in the well-being dimension.

In issues related to health and education, it is observed that child mortality rates are higher in soybean-producing sub-regions (Table 7) and that the number of physicians per 10,000 population decreased between 2000 and 2010 (Table 8).

These data show that economic growth is not necessarily related to improved health conditions. One possible explanation for these data would be that these municipalities experience a population growth which, however, is not always accompanied by an improvement in the provision of public services.

CHILD MORTALITY RATE	2000	2010	%
Consolidated soybean (western Bahia)	12,42	16,44	32,36
Soybean periphery (I) (western Bahia)	11,57	10,79	-6,79
Soybean expansion (Piauí/Maranhão)	12,26	20,61	68,12
Soybean periphery (II) (Piauí)	15,24	11,26	-26,13
Northeast	26,38	15,57	-40,98
Brazil	21,16	13,88	-34,39

Prepared by the authors. Source: IBGE, 2000; 2010.

Table 7 - Child mortality rates (per 1,000 live births).

PHYSICIANS PER 10,000 POPULATION	2005	2010	%
Consolidated soybean (western Bahia)	3,2	2,9	-8,13
Soybean periphery (I) (western Bahia)	2,5	3,9	56,39
Soybean expansion (Piauí/Maranhão)	4,7	4,6	-1,60
Soybean periphery (II) (Piauí)	2,2	3,7	68,27
Northeast	8,5	9,8	22,18
Brazil	12,7	15,1	18,26

Source: National Register of Health Establishments (CNES), 2005 e 2010.

Table 8 - Total number of physicians (public and private health care) per 10,000 population.

The lowest illiteracy rate is found in the “soybean expansion” sub-region (*Table 9*). This could be explained by two possibilities to be tested and further investigated: there may have been an increase in investment in education due to economic growth; or the population attracted by soybean production has a higher educational level.

ILLITERACY RATE	2000	2010	%
Consolidated soybean (western Bahia)	35,71	25,23	-10,48
Soybean periphery (I) (western Bahia)	32,50	26,10	-6,40
Soybean expansion (Piauí/Maranhão)	25,91	16,61	-9,30
Soybean periphery (II) (Piauí)	26,86	20,55	-6,31
Northeast	26,20	19,60	-7,13
Brazil	13,63	9,62	-4,01

Source: IBGE Census (2000 and 2010).

Table 9 - Illiteracy rates (15-year-olds or older).

2. HISTORICAL EVOLUTION OF THE INTRODUCTION OF SOYBEAN AND THE DIFFERENT VISIONS OF STAKEHOLDERS: INCLUSIVE DEVELOPMENT OR REPRODUCTION OF AN OLD DEVELOPMENT MODEL?

The second stage of this study sought to carry out a literature review of the historical process, starting from the introduction of soybean into southern Piauí. The conditions under which the development of this region occurred are recorded and were retrieved mainly in the works of Araújo (2013), Bolfe et al. (2016), Bacha & Carvalho (2014), Buainain & Garcia (2015), Coutinho et al (2013), and Santos (2015, 2016). This configuration of territorial development was then confronted with the hypothesis proposed by Berdegué et al (2014) and Favareto et al (2015), namely:

Economic growth with social inclusion is more likely to occur in territories where:

- i) Local stakeholders have greater access to land and natural resources.
- ii) The production structure is more diverse and decentralized.
- iii) There are medium-sized cities that offer markets and services.
- iv) There is greater access to dynamic markets.
- v) There are public policies aimed at either reducing asymmetries and strengthening the aforementioned empirical factors or reversing the conditions that prevent them from occurring.

The review of the historical path of a representative municipality (Bom Jesus-PI) included in the “soybean expansion” sub-region contributes to the empirical understanding by comparing the information collected with the five empirical factors listed above. This analysis is complemented by the stakeholders’ perspectives on local development.

2.1. Analysis of the historical and behavioral evolution of empirical factors in the soybean expansion sub-region - the exemplary case of Bom Jesus (Piauí)

The expansion of the agricultural frontier into the Cerrado of Piauí occurred in the 1990s, mainly in the municipalities of Bom Jesus, Uruçuí, Ribeiro Gonçalves and Baixa Grande do Ribeiro, as alternatives of lower land prices vis-à-vis the regions already occupied in western Bahia, in the region of Barreiras, and in Maranhão, in the region of Balsas (SANTOS, 2015).

According to Santos (2015), the initiative spearheaded by large landowners and agricultural companies led to a rapid process of changes in the demographic structure and urbanization profile, with greater intensity in the municipalities of Bom Jesus and Uruçuí, and changes in the production structure of the municipalities of Alvorada do Gurguéia, Baixa Grande do Ribeiro, Bom Jesus, Brejo do Piauí, Corrente, Gilbués, Ribeiro Gonçalves, Santa Filomena, and Uruçuí, all of them in southern Piauí.

The author highlights the changes in the agricultural and urban dynamics of Bom Jesus and Uruçuí, which are the largest agricultural producers in Piauí. In southern Piauí, the municipality of Bom Jesus is classified as a hub municipality and, therefore, its development dynamics is quite representative of the region under study. For this reason, most of the historical analyses provide examples from Bom Jesus, thus justifying the emphasis given to aspects of this municipality also in this section.

2.1.1. Access to land and natural resources

The first group of crop growers in southern Piauí in the 1990s was made up of farmers from the South of Brazil (Paraná, Santa Catarina and northwestern Rio Grande do Sul), followed by groups from other Brazilian states and the so-called “Braziguayans” (Brazilians coming from Paraguay). These first farmers acquired plots of about 300 hectares² in high and flat areas, such as the Quilombo Mountain Chain in Bom Jesus (SANTOS, 2015).

The second wave of soybean expansion in the region occurred in 2000, based on a business structure made up of international investment funds and large companies from the sector, which are characterized by the acquisition of large areas of land. These developments were attracted by the availability and suitability of the land for soybean farming. IBGE data confirm this information, indicating an increase from approximately 1,500 hectares of soybean plantations in the year 2000 to around 55,000 hectares in 2015 (IBGE, 2000, 2015).

This shows that local stakeholders were not the main protagonists as regards access to the natural resources necessary for soybean farming in Bom Jesus. The largest and most suitable areas were occupied by out-of-town stakeholders (COUTINHO, 2013).

³ References to property sizes in the region classify holders of areas of up to 500 ha as small producers; of up to 4,000 ha as medium producers; and above 4,000 ha as large producers. There are currently producers with more than 15,000 hectares.

2.1.2. The production structure: diversity and decentralization?

The dynamics of the production structure (credit, technical assistance and infrastructure, among others) that sustains the recent economic growth of the Cerrado areas of Piauí and Maranhão is similar to that of Bahia, supported by agrarian sectors with increased grain and fiber production, where soybean, corn and cotton are the main crops.

The Federal Government played a central role in the territorial reconfiguration of southern Piauí, including through some initiatives with direct implications in the configuration of MATOPIBA. For example, cultivation experiments with soybeans have been conducted since the 1970s by the Apolônio Sales Experimental Station (Ministry of Agriculture), with the support of the State Agriculture Secretariat, the Cotton Society of Northeastern Brazil (SANBRA) and the Northeastern Association of Credit and Rural Assistance of Piauí (ANCAR/PI).

The Northeast Constitutional Financing Fund (FNE) was established in the late 1980s as a mechanism to encourage land occupation and production modernization. The Fund provides for the allocation of 1.8 percent of revenues from Income Tax (IR) and Tax on Industrialized Products (IPI) to finance agricultural and agroindustrial activities, with half of the funds earmarked for the semi-arid region. In the 1990s, the creation of the State Level Research Unit (UEPAE/EMBRAPA) in Teresina, in cooperation with the National Center for Soybean Research (now EMBRAPA-Soybean), ensured the continuity of investments. However, Santos (2015) points out that the “productive occupation of the Piauí Cerrado became a reality and was put into effect only in the years after 1990” (SANTOS, 2015).

Gradually, new modern agricultural activities took the place of traditional activities such as rice production, while the soybean area increased by 398 percent (from 400,000 ha to 2 million ha), the herbaceous cotton area by 114 percent (from 208,000 ha to 446,000 ha), the corn area by only 15 percent (from 690,000 ha to 790,000 ha) and the area occupied by rice, which was an important temporary crop in the region, experienced a sharp decrease of 37 percent (BUAINAIN & GARCIA 2015; BOLFE et al. al, 2016). As a result of the lack of concern for the economic demands of the population, the weakest farmers were left out and benefits were generated for very few producers (GRAZIANO DA SILVA, 1994, pp. 138, 139, apud SANTOS, 2016).

Thus, the production structure developed is entirely focused on the mechanized production of grains, with emphasis on soybeans. The structuring of the chain promoted economic growth concentrated only in hub municipalities in the territory, such as Bom Jesus. The southern region of Piauí absorbed slightly more than 20 percent of PAC2 investments in energy and logistics, which were invested in production outlets, with 9 pivots and 96 warehouses installed (EMBRAPA, 2015).

2.1.3. Configuration of cities, markets and services

When analyzing the presence of medium-sized cities in the territory of MATOPIBA, the general emphasis confirms the concentrated profile found in the other dimensions analyzed. In each of the parts that make up the territory there are few medium-sized cities that concentrate the supply of services and trade activities as well as the confluence of infrastructure from storage to production outlets. As seen, the introduction of soybean led to a rapid process of changes in both the demographic structure and urbanization profile, especially in the municipalities of Bom Jesus and Uruçuí.

The literature review shows that, in fact, intermediary cities, called hub cities, emerged within the territory. This was a positive factor in the dynamization of relations between these cities and their surroundings, with the provision of a variety of services. However, the centralized growth of the hub cities was insufficient to boost economic and social development in the other municipalities, so as to reach a greater number of social stakeholders (SANTOS, 2015).

2.1.4. Access to dynamic markets

The soybean market consists of three distinct products: grains, oil and soybean foods, of which some are intended for domestic markets, especially the Northeastern capitals, with an emphasis on Fortaleza, in the State of Ceará. However, a large part of the amount produced goes to European markets and to China. Access to either regional or large international markets is strictly related to the development model implemented, with investments in logistics infrastructure (roads and ports) that connect the territory to these markets and enable generating revenues that could be invested in the dynamization of the territory (FEARNSIDE, 2001).

This model implies an overlapping of centralized government planning and development trends and private interests related to the production of commodities for export. Nevertheless, this process has promoted increasing access by the territory to dynamic markets, a factor that is considered favorable in the light of the proposed hypothesis. This income, however, ends up not being distributed in different local social and economic circuits, due precisely to the land concentration and production structure that hinder access by the poorest populations to markets and the generation of greater development opportunities.

2.1.5. Public policies

The public policies that supported the intensification and diversification of agricultural exports in Brazil, which were implemented especially from the 1960s and sustained the historical trajectory of agricultural development in Central Brazil, are mostly market oriented (BACHA & CARVALHO, 2012) and aligned with the two editions of the National Development Plan (PND). The set of policies and programs that guide Brazilian development is expanded over time with some subtle differences, especially as regards the greater or lesser participation of family farming - but always with the strong participation of commercial agriculture - in the distribution of available resources.

Among the programs supporting production, the literature highlights the relevance of PRODECER (Japan-Brazil Cooperation Program for the Development of the Cerrado) started in 1974. Santos (2016) evaluated the three phases (PRODECER I, II and III), in which US\$553 million were invested and 20,000 direct jobs and 40,000 indirect jobs were created. With incentives from PRODECERC, 350,000 hectares of Cerrado were occupied in the seven states where the program was implemented (Minas Gerais, Mato Grosso, Mato Grosso do Sul, Goiás, Piauí, Maranhão, and Tocantins). A total of 717 producers settled in those states, virtually reaching the total planned number of 760. The experience served as a “demonstration and multiplier program of a new agricultural model of Cerrado occupation” and established large farms, organized farmers into cooperatives and offered business support and training for the use of capital-intensive technologies, all with a view to increasing soybean production (SANTOS, 2016).

The National Program for the Strengthening of Family Farming (PRONAF) was created in 1995, with lines of credit for small farmers. At the same time, the Product Outflow Prize (PEP), the Agricultural Product Option Contract (COVPA) and the Rural Product Certificate emerged as policies aimed at both limiting the number of small farmers who could access PRONAF and improving private sector access to the marketing system.

Between 2000 and 2013, incentives for family farming were increased, the Ministry of Agrarian Development (MDA) was created with planning and budget separate from those of the Ministry of Agriculture, Livestock and Food Supply (MAPA). Marketing policies such as the Food Acquisition Program (PAA), rural credit programs³ and new minimum price programs managed by the private sector were also implemented. The Family Farming Law (Law 11,326) establishing guidelines for the formulation of a National Policy for family farmers was enacted in 2006.

The set of public policies conducive to the growth of commercial agriculture was a major factor for the introduction of soybean into the territory and the reason for its expansion. However, it was not inclusive of all stakeholders. Not even the cycle of social policies of the last decade, which benefited low-income populations and family farmers was enough to ensure their inclusion in the dynamics of local economic growth.

2.2. The view of local stakeholders from Bom Jesus

With an area of 5,469.2 km² and a population of 24,711, Bom Jesus is a hub municipality located in the “soybean expansion” sub-region in southern Piauí (IBGE Cidades, 2017).

Data from the literature review vis-à-vis the empirical factors that indicate a more inclusive development show that the dynamics of development in the soybean expansion sub-region in southern Piauí does not present favorable conditions for inclusive economic development, since it is characterized by land and production concentration factors and pressure on natural resources.

However, a second layer of analysis must be applied to help understand the current dynamics from the stakeholders' point of view. In this sense, the municipality of Bom Jesus was chosen as a representative case of this territorial dynamics.

Using targeted questions, the surveyors interviewed a diverse range of stakeholders, seeking to help understand the converging and diverging views of development paths in this territory.

³ Such as the Agricultural Certificate of Deposit (CDA), the Agricultural Warrant (WA), the Agribusiness Credit Rights Certificate (CDCA), the Agribusiness Letter of Credit (LCA) and the Agribusiness Receivables Certificate (CRA).

What are the priority soybean production areas?

It is a fact empirically observed and generally confirmed by respondents that soybean is grown in both the high and flat regions of Bom Jesus, while extensive cattle-raising and subsistence farming prevail in the so-called “baixões” (lowlands), as an ancillary activity to cattle-raising.

As reported by representatives of the production sector, high and flat regions, despite presenting favorable characteristics for the introduction of the crop are places with low water availability. Soybean in these regions is produced using dry farming methods, which do not require irrigation, and is a highly technified crop in all its production stages.

Still according to representatives of the production sector, the expansion of the crop has stabilized since 2014 due to several factors, especially the increase in production costs and the Brazilian and international economic crisis.

Does soybean promote inclusive economic growth?

Despite this stabilization scenario, respondents from the production sector estimate that the companies in the soybean production chain in southern Piauí generate approximately 3 billion reais of GDP and about 45,000 direct and indirect jobs, with a wage floor above the country's average. In the period 2000 to 2010, the data show that the unemployment rate in the soybean expansion region fell by 3.84 percent and stood at 7.72 percent (IBGE, 2000 and 2010).

However, this positive view on development generated by the introduction of soybean is not shared by representatives of family farmers and social movements, since the benefits translate into temporary jobs for some farmers during the harvest season. Because it is difficult for them to earn sufficient income from agricultural production, farmers migrate from their lands in search of work and end up living in precarious conditions in the outskirts of the cities during that period.

According to public authorities, the municipality of Bom Jesus benefited from the introduction and consolidation of soybean, precisely because it was the first municipality occupied by migrant farmers who settled there with their families and contributed to intense development and the retention of resources, which is not the case in neighboring municipalities. For example, in Baixa Grande do Ribeiro soybean production started directly with the arrival of large companies, whose generated capital is ultimately invested outside the municipality, based on a model that brings less benefits to regional development.

In the view and evaluation of the government representative, Bom Jesus provides good health and education services, including a state regional hospital, satisfactory private health care, and six health clinics in the rural area. Public and private education is provided in the urban area and nucleated schools are available in the rural area, integrated with school transportation.

Despite the existence of a campus of the Federal University of Piauí, which attracts young people from different regions of the state thus enhancing local businesses and services, the public sector representative pointed out that the municipality does not create qualified jobs capable of absorbing the skills of many young graduates, who end up migrating to Brasília, Teresina and São Paulo. According to the representatives of workers and social movements, there is a lack of jobs in the municipality, which also forces less skilled young people to migrate in search of work.

What are the consequences and trends of soybean expansion?

Respondents recognize that the introduction of soybean promoted the loss of Cerrado vegetation and that, based on sectoral estimates for the region, the expansion of the crop in all areas with farming potential would require the additional legal deforestation of about 10 percent of these areas.

According to the production sector, the possible expansion of soybeans would not yet put direct pressure on family farming in the lowlands. The opinions of other stakeholders, however, reveal the existence of a potential pressure resulting from the search for lowlands to be used as legal reserves, since the expansion of soybean into uncultivated plateaus requires finding new areas for environmental adequacy.

Local public administration cites the introduction of new crops such as passion fruit and recent initiatives to develop integrated soybean and livestock systems, which would give rise to a new source of land pressure on lowlands. It is known that the expansion of agriculture into the lowlands in several cases is preceded by the land grabbing process that seeks to legalize public lands and tenurial areas, in order to sell them to commercial farmers. In the opinion of some respondents, the land issue in the municipality and in the region can potentially lead to conflicts between land grabbers and local communities, with repercussions on commercial agriculture. This situation is compounded by the existence of different levels of overlapping of land titles on the legal base of the land structure.

A Land Court was established in the municipality in 2012 for the purpose of regularizing land, ensuring greater safety to landowners and reducing or avoiding conflicts over land. Family farmers are supported by organizations such as the Pastoral Land Commission (CPT) and Caritas as regards both regularization and land conflicts.

The production sector states that, in general, farmers, soybean producers, pension funds, and large companies try to avoid legal problems involving labor, land and other issues. In the view of social movements, this promotes a race for legalized lands, thus stimulating previous action by land grabbers, who manage to have these lands legalized through official channels.

CONCLUSION AND RECOMMENDATIONS

The analysis of the above mentioned economic and social indicators shows that there are contradictions in the process of soybean introduction into the sub-regions studied.

On the one hand, economic growth is observed alongside a decrease in illiteracy in the “soybean expansion” sub-region. On the other hand, there was a deterioration in the performance of health indicators.


Another contradiction observed from the analysis of land use indicators reveals that in the sub-regions where soybean was introduced, the percentage of areas occupied by family farming is lower. The data suggest that the introduction of soybean causes a decrease in the presence of family farming and may be a vector of migration of family farmers from rural areas to cities, with impacts on the way of life of these farmers and consequences related to the quality of the services provided in urban areas. The migration of family farmers from rural areas to cities was reported by respondents during the field stage.

The historical analysis complemented by the more empirical investigation of a representative case of the territorial dynamics showed that the economic growth generated by soybean was unable to promote the inclusion of local stakeholders. Therefore, the factors that make up the hypothesis of Berdegué et al (2014) and Favareto et al (2015) cannot be confirmed in the analyzed scenario. Despite the existence of an economic dynamism related to the introduction of soybean, which promotes the development of municipalities that concentrate soybean-related infrastructure, services and products and ensures continuous investments in structures of access to dynamic markets (roads, railways and ports, among others), the contradictions inherent in this development model are exacerbated, including:

- a) Land concentration, which precludes different stakeholders from participating in this process; reduced availability of family farming areas in soybean-growing municipalities.
- b) Emergence of land conflicts due to increased land value.
- c) Concentration of economic dynamism in few municipalities, thus preventing a more equitable reinvestment of the agricultural surplus in the territory itself.
- d) Accelerated population growth, which is not always accompanied by the corresponding evolution in the provision of public services.
- e) Deforestation of large areas of Cerrado vegetation cover.

Risks, perspectives and recommendations

The increase in Cerrado deforestation is a risk due to the potential for the expansion of soybean and other agricultural activities into areas available in high regions and especially in the so-called “baixões” (lowlands). Respondents recognize that the occupation has promoted the loss of Cerrado vegetation, but that there is still room for expanding the crop within the legal frameworks, which would lead to an increase in Cerrado deforestation. In addition, the study identified social risks such as: exclusion of family farming; increased social conflicts over land ownership; increased social and economic inequality in the municipalities; and deterioration in the provision of public services due to accelerated population growth.



Agriculture and cattle-raising prevail in municipalities where soybean is not produced. Different from commercial agriculture, these activities have not been the target of investments and structuring public policies aimed at their development. Because these municipalities have no revenue of their own, the absence of structured economic activities causes them to depend on public policies from other government spheres, such as the Bolsa Família program. The socioeconomic development of these municipalities should be based on investments and public policies and on coordination with local populations for the definition of sustainable and inclusive economic activities.

The inclusive and equitable development of municipalities in the regions studied requires strong action by local stakeholders and public and private institutions in the search for alternatives that ensure economic growth with inclusion and conservation of the natural resources of the Cerrado. In this regard, the adhesion of large global buyers to the Cerrado Manifesto and the emergence of spaces for dialogue and political concertation, such as the newly created Cerrado Working Group, may become new social venues where solutions are discussed and implemented, with a view to eliminating contradictions and effectively protecting the remnants of Cerrado vegetation, which are vital for environmental conservation and balance, thus reducing the social risks arising from the deforestation process.

The introduction of soybean through large companies and investment funds is established in the territory, thus generating a development dynamic that heavily concentrates infrastructure investments in a hub municipality and soybean farming in surrounding municipalities. These municipalities have large soybean-growing areas but do not retain the taxes collected in the hub municipalities, thus remaining in precarious economic conditions, as is the case of Baixa Grande do Ribeiro. This dynamic is not the subject of this study and requires further investigation to facilitate the understanding of the impacts generated.

Finally, more in-depth studies are necessary to outline social, economic and environmental measures that can reconcile expansion with sustainable and inclusive socio-economic development.

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ANEXO

ACRONYMS

COVPA	Agricultural Trade Option Contract
CPT	Pastoral Land Commission
EMBRAPA	Brazilian Agricultural Research Corporation
ESALQ	“Luiz de Queiroz” College of Agriculture
IBGE	Gross Domestic Product
IN CRA	Brazilian Institute of Geography and Statistics
Matopiba	National Institute for Colonization and Agrarian Reform
MDA	Maranhão, Tocantins, Piauí and Bahia
PAA	Ministry of Agrarian Development
PAC	Food Acquisition Program
PDA	Growth Acceleration Program
PEP	Agricultural Development Program
PIB	Production Flow Prize
PRODECER	Japan-Brazil Cooperation Program for the Development of the Cerrado
PRONAF	National Program for the Strengthening of Family Farming

EXPEDIENTE

Execution:

INSTITUTO DE MANEJO E CERTIFICAÇÃO FLORESTAL E AGRÍCOLA (Institute for Forest and Agricultural Management and Certification).

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ISBN : 978-85-5333-010-2.

1. Cerrado 2. Matopiba 3. Soybean expansion 4. Territorial development dynamics 5. Social and economic inequality.

This work is part of an agricultural markets collaboration among National Wildlife Federation, The Nature Conservancy, World Wildlife Fund and the Gordon and Betty Moore Foundation. For more information see www.moore.org.

Financial support:



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