



GOIÁS AND ITS SUGARCANE SUBREGIONS: ANALYSIS OF RECENT AND CURRENT PERIODS (1975-2019)

GOIÁS E SUAS SUB-REGIÕES CANAVIEIRAS: ANÁLISE DOS PERÍODOS RECENTES E ATUAL (1975-2019)

GOIÁS Y SUS SUBREGIONES DE CAÑA DE AZÚCAR: ANÁLISIS DE LOS PERÍODOS RECIENTES Y ACTUAL (1975-2019)

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Abstract

The article analyses the process of expansion of the sugarcane cultivation in Goiás, Center-West of Brazil. The recent history is presented in a periodic manner, indicating the main phases of the large-scale implantation of this plantation in Goiás: 1975-1990, 1991-2002 and 2003-2019. The research methodology included theoretical and specific bibliographic review, data collection and analysis, thematic mapping, as well as fieldwork. It can be concluded that this sugar-energy production is mainly focused to supply the domestic market of ethanol, sugar and electricity.

Keywords: Goiás. Sugarcane. Regional Geography. Periodization. Thematic Cartography.

Resumo

O artigo analisa o processo de expansão da canavieira em Goiás, Centro-Oeste do Brasil. É feito um resgate do histórico recente, de modo periodizado, indicando-se as principais fases da implantação em grande escala desta lavoura em solos goianos: 1975-1990, 1991-2002 e 2003-2019. A metodologia de pesquisa abrangeu revisão bibliográfica teórica e específica, coleta e análise de dados, elaboração de cartografia temática, além da realização de trabalhos de campo. Conclui-se que a produção sucroenergética goiana volta-se, sobretudo, para o mercado doméstico de etanol, açúcar e eletricidade.

Palavras-chave: Goiás. Cana-de-açúcar. Geografia Regional. Periodização. Cartografia Temática.

Resumen

El artículo analiza el proceso de expansión de la caña de azúcar en Goiás, Centro-Oeste de Brasil. Se hace una revisión del histórico reciente, de forma periodizada, indicando las principales fases de la implantación a gran escala de este cultivo en suelos goianos: 1975-1990, 1991-2002 y 2003-2019. La metodología de investigación abarcó una revisión bibliográfica teórica y específica, recolección y análisis de datos, elaboración de cartografía temática y realización de trabajos de campo. Se concluye que la producción sucroenergética goiana se vuelve, sobre todo, para el mercado doméstico de etanol, azúcar y electricidad.

Palabras clave: Goiás. Caña de azúcar. Geografía Regional. Periodización. Cartografía Temática.

Introduction

The following article intends to contribute to studies and researches related to the sugarcane production in the State of Goiás, as it synthesizes



the recent period (1975-2002) and represents the current perspective (2003-2019) of Goiás' sugar-energy industry activity. It seeks to interrelate local or micro regional events and impacts to wider, national or even global, happenings. The text is divided into three sections: 1) Sugarcane and energy crises and the emergence of Goiás as a modest alcohol distiller (1975-1990); 2) Neoliberal turn and Goiás advent as a low sugar producer (1991-2002) and; 3) Environmental crisis and Goiás rapid rise to the position of second power of the national sugar-energy industry (2003-2019). This analytical effort aims to present the recent time-space evolution that raised Goiás to the second position in terms of sugarcane production in Brazil. It also offers, with great detail level, aspects about how this activity articulates in national and international economic overview. An approach based on official statistics was chosen, aiming to put this production into context in broad lines, with the intention to provide a better understanding of Goiás participation according to a mesorregional scale analysis of the national sugar-energy industry.

Sugarcane and energy crises and the emergence of Goiás as a modest alcohol distiller (1975-1990)

The state planning conceived by the Sugar and Alcohol Institute (Instituto do Açúcar e do Álcool - IAA) on behalf of the national sugar harvest increase of production and productivity succeeded in the transition from the 1960s to the 1970s. The international market seemed favorable to countries that were able to provide sugar to the capitalist bloc, while the two largest producers of the world belonged to the socialist bloc (USSR and Cuba). In the first half of the 1970s, Brazil became known for providing "raw cane sugar" to other countries, being the USA the main importer. In 1972, Brazil was the world major sugar single importer, and the average price per ton in the market was exponentially going up. Between 1969 and 1974, the volume of Brazilian exports tripled (Thomaz Júnior, 2002, p. 91; Szmrecsányi, 1979, p. 303). "In 1974 sugar became the leader of the exportations guideline, even passing the coffee. [...] Prices rise on an unprecedented scale, reaching its peak in November." (Castro Santos, 1993, p. 18 – our translation, original in Portuguese). However, by the end of 1974 and the beginning of 1975, there was a turnaround. The United States and the European Economic Community radically



changed their sugar market management mechanisms. Americans ended the Sugar Act of 1948, adopting liberal measures in a way never attempted before, (temporarily) ending its traditional and interventionist production and import quota scheme. In the case of European countries, after the accession of the United Kingdom to the European Economic Community (EEC), they signed the Sugar Protocol, which fixed a list of 19 member countries from the African, Caribbean and Pacific (ACP) Group of States that received guaranteed and privileged access to the European market. The result of those economic and geopolitical operations was dramatic to Brazilian sugarcane mill owners, who were heavily dependent on sugar exports. In addition, the creation of the Organization of Arab Petroleum Exporting Countries (OAPEC, in 1968) and the Yom Kippur war (in 1973) caused globally the Oil Crisis, enormously increasing the costs of goods international freight and leading to deep budget deficits in many countries. Beyond those unfavorable international circumstances, the sugar commodity price fell a lot: “[...] fell around 70% already in the first semester of 1975, which was confirmed to the rest of the year, when the ton price stabilized in US\$ 300 [...and] reached, in the second semester of 1974, US\$ 1,389” (Andrade Neto, 1990, p. 322 - our translation - original in Portuguese).

The second half of the 1970s was tense to the Brazilian sugarcane sector. The 1976/1977 harvest culminated in an “unprecedented [sugar] stock accumulation” (p. ?); and the 1977/1978 harvest was “an absolute record [...] even globally” (p. ?). Between 1976 and 1978 the sugar overproduction phenomenon in Brazil radicalized again “with still very low prices and stocks accumulating to alarming levels” (Castro Santos, 1993, p. 19, 62 and 67). It was finally perceived that the low sugar price noticed in the international market since 1975 wouldn’t be as transitional as they had imagined. At this moment, in other words, with a certain gap, sugarcane mill owners deeply noticed that the National Fuel Alcohol Program (Programa Nacional do Álcool - PNA or Proálcool), created by the Decree no. 76593, in November 14, 1975, surrounded by disagreements and internal misgivings, would really be the “farming salvation” to sugar producers (Sampaio, 2015, p. 215, 331 and 659). And it is only from this moment on, after great official incentive to alcohol production, that Goiás gains some more relevance in the national sugar-ethanol scenery. There appears to be consensus among researchers that



the PNA had three different phases throughout its existence: the first between 1975 and 1979, when it was conceived and debated; the second, between 1980 and 1985, when it reached its peak; and the third between 1985 and 1990, when it declined and was discontinued. Castro Santos (1993) considers the first phase as the one with “great indecisions”; Shikida (1998) named the second phase as the “rapid expansion” and Baccarin (2005) described the last phase as the “Proálcool in slow motion”. Between 1975 and 1985, the Federal Government approved 401 projects to build distilleries annexed to sugarcane plants and independent distilleries, 298 of which were in the Center South Brazil (74.3% of all), 27 in Goiás (6.7%). At this juncture, the approval of the State Law no. 9489, in July 19, 1984 was very important because it instituted the Program FOMENTAR (Fundo de Participação e Fomento à Industrialização do Estado de Goiás). Its purpose was to encourage agricultural products industrialization and consequently add value to local production, being the alcohol sector one of the main beneficiaries. In 1975, the year of PNA’s approval, there were only two sugarcane processing agro-industrial units: the staggering plants Santa Helena (new name of the old Central Sul-Goiana, in Santa Helena) and Goianésia (new name of the old Açucareira Monteiro de Barros, in Goianésia). Provided of annexed distilleries, besides sugar, the first one started to produce hydrated alcohol and the second one anhydrous alcohol. Until the 1980/81 harvest, these were the only two active companies in the state, when the first Goiás independent distillery was installed: the Destilaria Brasil Central, located in the municipality of Formosa, close to the Federal District. In the 1982/83 harvest, the second independent distillery, Destilaria Pite, came into operation in Itapuranga, totalling four agro-industrial units in operation. The 1983/84 harvest was characterized by an openings boom, totalling 13 new ongoing companies in the state: Alcoolverde (in Acreúna), Alto Paraíso (in Alto Paraíso de Goiás), Anicuns (in Anicuns), Dalur (in Uruaçu), Goálcool (in Serranópolis), Jalles Machado (in Goianésia), Delasa (in Ipameri), Denusa (in Jandaia) and Vale do Verdão (in Turvelândia) – this last one, in its first year of activity, received the greatest IAA’s single quota of authorized alcohol production, 27 thousand m³, equivalent to 21% of the state total. In 1984/85, three other independent distilleries started operations: Cenasa (in Inhumas), Coave (in Carmo do Rio Verde) and Devale (in Itapaci). In the 1985/86 harvest, Coasf started operating (in São Francisco de Goiás); in



1986/87, Cooperativa Rubiataba (in Rubiataba) started the milling process and in 1991/92 Goiasa (in Goiatuba) the last distillery was inaugurated in Goiás in the context of the PNA.

Goiás began the 1980s with two sugarcane agro-industrial units installed and the 1990s with 24 – it's true that not all of them were duly regularized before the government bureaucracy neither counted with full conditions to operate. Thus, in relative terms, throughout the 1980s, Goiás increased in 940% its participation in the national alcohol production, from 0.24% to 2.53% of Brazil's total production. Regarding to sugar, it increased its participation in 124%, from 0.25% to the still modest 0.57%. In absolute terms, these numbers are not so expressive, but show the primacy of the biofuel, when compared to sugar, in the process of Goiás sugarcane production expansion and spreading. In Goiás, contrary to what happened in traditional producer states as São Paulo and Pernambuco, it wasn't sugar what introduced the sugarcane large-scale production, but alcohol. Despite the Federal Government unsuccessful official efforts to implement the first modern plants of Goiás in the 1940s (see the cases of Usina da Colônia Agrícola Nacional de Goiás, located in Ceres, and Usina Central Sul-Goiana, owned by Fundação Brasil Central), it was only after the second half of the 1980s, with the establishment of state and national public policies for biofuel production, that sugarcane farming spread in the state. The 1980s encompass the PNA start, peak and end in Goiás, ensuring a greater production of alcohol in the middle than in the end. In 1990 the hydrated alcohol, directed to vehicles direct supply, was the main product of Goiás sugarcane agroindustry and totaled 224.8 thousand m³, while the anhydrous alcohol, used mixed with gasoline, reached 43 thousand m³. The sugar production was 26,3 tons. All 14 active distilleries/mills produced hydrated alcohol. In its turn, the anhydrous alcohol production happened only in two authorized companies, the greatest PNA highlights in Goiás: Jalles Machado (53% of total) and Vale do Verdão (47%). Sugar production was little and even more concentrated, monopolized by the old plant Santa Helena (87% of total) and Goianésia (13%). As a result of PNA, public, cheap and abundant credit offer, tax incentive state policies (FOMENTAR) and the existence of lands free of intense intrasectoral competition between mills for the access to raw materials and intersectoral with other crops, Goiás appeared, in the early 1990s, as a sugarcane emerging and essentially alcoholic center (Table 1).



Table 1 - Goiás: authorized alcohol production in the 1980/81, 1985/86 and 1990/91 harvests

Plant/Distillery	Municipality (2019)	Total 1980-81 (m ³)	Anhydrous 1980-81 (m ³)	Hydrated 1980-81 (m ³)	Total 1985-86 (m ³)	Anhydrous 1985-86 (m ³)	Hydrated 1985-86 (m ³)	Total 1990-91 (m ³)	Anhydrous 1990-91 (m ³)	Hydrated 1990-91 (m ³)
Alcoolverde	Acreúna	-	-	-	10.300	-	10.300	-	-	-
Alto Paraíso	Alto Paraíso de Goiás	-	-	-	15.000	-	15.000	-	-	-
Anicuns	Anicuns	-	-	-	12.000	-	12.000	4.200	-	4.200
Brasil Central	Formosa	7.500	7.500	-	25.700	-	25.700	17.000	-	17.000
Cenasa (Centralcool)	Inhumas	-	-	-	21.000	-	21.000	15.500	-	15.500
Coasf (coop.)	São Francisco de Goiás	-	-	-	5.000	-	5.000	9.000	-	9.000
Coave (coop.)	Carmo do Rio Verde	-	-	-	10.000	-	10.000	1.400	-	1.400
Coop. Rubiataba	Rubiataba	-	-	-	0	-	-	24.500	-	24.500
Dalur (Dest. de Álcool de Uruaçu)	Uruaçu	-	-	-	2.800	-	2.800	-	-	-
Delasa (Dest. Lago Azul)	Ipameri	-	-	-	13.500	-	13.500	9.000	-	9.000
Denusa (Nova União)	Jandaia	-	-	-	35.000	-	35.000	2.500	-	2.500
Devale (Dest. Vale do São Patrício)	Itapaci	-	-	-	10.000	0	10.000	12.200	-	12.200
Goálcool	Serranópolis	-	-	-	22.750	-	22.750	13.500	-	13.500
Goianésia	Goianésia	21.600	20.200	1.400	15.750	-	15.750	8.000	-	8.000
Jalles Machado	Goianésia	-	-	-	43.000	10.000	33.000	63.000	23.000	40.000
Pite	Itapuranga	-	-	-	17.850	-	17.850	-	-	-
Santa Helena	Santa Helena	3.600	-	3.600	42.000	18.000	24.000	28.000	-	28.000
Vale do Verdão	Turvelândia	-	-	-	52.000	27.000	25.000	60.000	20.000	40.000
TOTAL	GOIÁS	32.700	27.700	5.000	353.650	55.000	298.650	267.800	43.000	224.800

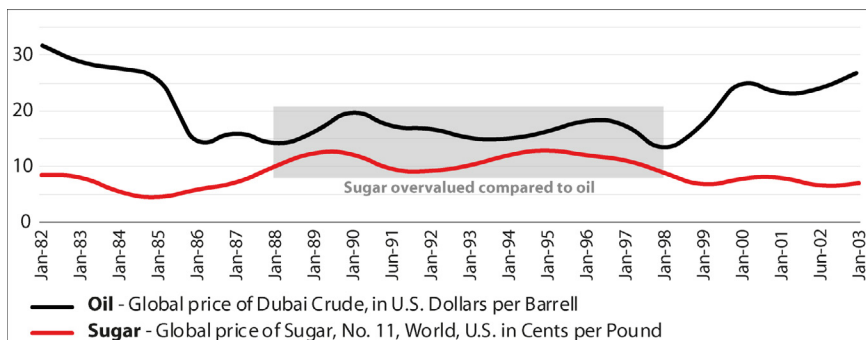
Source: Diário Oficial da União (1980, p. 91; 1985 p. 67; 1990 p. 8). Elaboration: SAMPAIO, M.A.P., 2019.

Neoliberal turn and Goiás advent as a low sugar producer (1991-2002)

On an economic level, the period of time between 1982 and 2003 was characterized, notably after 1985, by the fall in the international prices of oil and, after 1986, by the increase in the price of sugar. As a result, between 1988 and 1998, there was a period of great increase in value of sugar prices when compared to oil prices, stimulating Brazilian sugarcane agroindustries, including those in Goiás, to confine alcohol to secondary importance and turn their production, as far as possible, to sugar (Chart 1).



Chart 1 – Oil and sugar international prices, 1982-2002



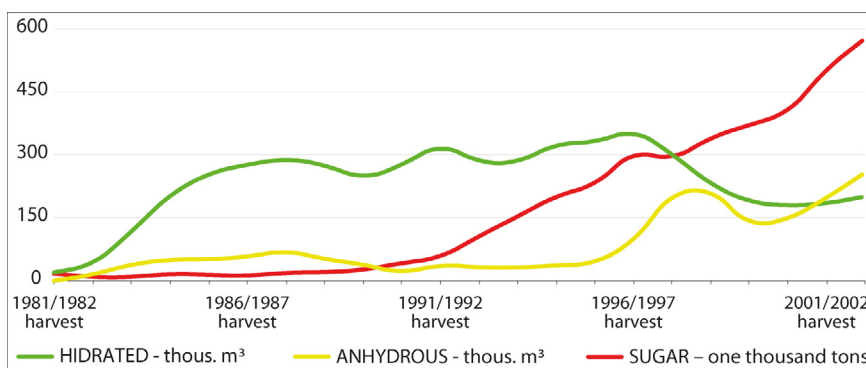
Source: International Monetary Fund. Elaboration: SAMPAIO, M.A.P., 2019.

Thus, if 1986 can be considered the PNA's peak in Goiás and in the whole country, soon after the alcohol production was strongly discouraged by market forces, as economically it didn't make sense to produce alcohol to replace gasoline (now cheapened) and, thereby, stop using sugarcane raw material to produce more sugar, better quoted to external trade. Throughout the 1990s, there was the installation of sugar plants in many of the independent distilleries installed in Brazil with PNA's resources in the previous decade, which converted themselves to a mixed industry of food (sugar, preferentially destined for export) and energy (alcohol, for domestic market). As oil import costs decreased and sugar export profits rose, the national sugar-energy industry reduced its ethanol (C_2H_5OH) production and expanded the sucrose's ($C_{12}H_{22}O_{11}$) one. In the agro-industrial sector, companies that were not only alcohol producers, also diversifying their production to sugar, were able to keep themselves active in most cases and even thrive after the IAA's termination and PNA's discontinuation. In turn, distilleries that didn't make these adaptations tended to end the sugarcane milling. National alcohol production declined. Even the motor vehicle assemblers, that in 1979 had started to market cars fueled (exclusively) with ethanol, in 1990 had already returned their production line to cars fueled (exclusively) with gasoline. Facing the fuel shortage crisis that struck the country from the 1980s to the 1990s, there were two options remaining to owners of cars powered exclusively by ethanol: "go on foot" or "be left in the lurch". Therefore, the PNA, perceived as an energy strategic alternative by the Military Government (1964-1985), didn't



take long to become useless to solve problems, not being an energy policy able to deal with oscillations of oil and sugar markets. However, it was the start of expansion and internalization of export sugar production of Brazil and also Goiás. In this state, the alcohol agro-industrial complex, installed to produce biofuel and, thus, supply the country's internal demand, already stopped expanding in 1986. It began to gradually, and especially from 1989 onwards, be used as a support, giving way to a growing sugar harvest. Hence, the vehicular fuels energy crisis that began in the 1970s and actions taken to overcome it in the following years were the catalyst for later implementation of sugar modern production in Goiás (Chart 2).

Chart 2 - Sugar, hydrated and anhydrous alcohol Goiás production, 1981/82-2001/02 harvests



Source: UNICADATA. Elaboration: SAMPAIO, M.A.P., 2019.

It is possible to understand the 1990s as a transition phase to national sugar-energy sector, whose central benchmark was IAA's termination. Thereby, the segment was no longer under State control, being oriented and managed (mainly) by companies' (geo)political strategies of occupation and use of the national agricultural territory, often based on the fierce of economic globalization with neoliberal bias. However, the role of the State remained important to the sugarcane sector. It changed, but it was still there, being decisive to the development of activity at the national and the state level. The Military Government began to erode in Brazil and, when it ended, the Federal Constitution of 1988 was promulgated. Political changes soon involved the sugar-energy issue. At the beginning of his troubled government, Fernando Collor signed Provisional Measure 151,



of March 15, 1990, terminating the IAA and thus ending an almost six decades cycle of strict state intervention over the national sugar-energy activity. Regarding to the PNA, it was never officially terminated, but in practice it was weakened during the second half of the 1980s and gradually discontinued throughout the 1990s. Because of the progressive end of alcohol cars manufacturing, the Federal Government, through the Decree of October 27, 1993 signed by Itamar Franco, created the Comissão Interministerial do Álcool (CINAL), linked to the Ministry of Mines and Energy, to “help formulate the sector development policies” and to “propose the mechanisms required to stabilize the sugar-energy sector activities and to seek its economic self-sufficiency”. In the following day, the Law no. 8723, about reducing motor vehicles emissions of pollutants, fixed “in twenty two percent the mandatory percentage of anhydrous ethyl alcohol added to gasoline throughout the national territory”. Effective until today, this law was changed by FHC, Lula and Dilma, until its current wording. The first thing to be noticed is the unprecedented event that an environmental measure started stimulating the sugarcane sector. The second point to be highlighted is that this law was important for alcohol distilleries to resist the market downturn caused by the interruption of biofuel models manufacturing. Also, it mainly benefited sugar producers when it guaranteed captive market to their byproduct, strengthening the whole sugarcane production chain. Alcohol, mixed to gasoline with contents that vary from 18 to 27%, has become a kind of escape valve to circumvent any excesses of sugar supply (Sampaio, 2014).

At state level, based on the Federative Pact brought by the Federal Constitution of 1988, which gave more autonomy to federated entities, Goiás government adopted a series of aggressive policies to attract investments, especially resting on complex tax incentives mechanisms. In a context often mentioned as “Fiscal War”, in order to promote the economic development and to mitigate regional imbalances, the state government relieved taxes on production to increase its competitiveness. Among the promoted benefits in favor of the sugarcane activity development, notably those attached to finance and tributary sphere, it’s interesting to highlight the tax substitution process derived of the ICMS Agreement no. 03/99, settled in 1999, by which the responsibility for collecting tax obligation on Anhydrous Ethyl Alcohol Fuel (AEAC) was transferred from cane mills and distilleries to fuel distributors. With the



economic stabilization phenomenon that happened in the 1990s, which decreased inflation rates in Brazil, the model set up by FOMENTAR in 1984 became less attractive to agro-industries, leading the state of Goiás to totally redesign the program through the edition of the Law no. 13591, of January 18, 2000. A new tool emerged to implement Goiás industrial policy, effective until today, known as Programa de Desenvolvimento Industrial de Goiás (PRODUZIR). Its purpose is to contribute to the “expansion, modernization and diversification of Goiás industrial sector, stimulating investments, productive structures technological renovation and increase of the state competitiveness, focusing on job and income generation and on social and regional inequalities reduction”. Such legal measures allowed, with greater or minor difficulties, Goiás cane agro-industries to overcome the 1990s, maintaining some alcohol and also sugar production. The state started and ended the 1990s with 12 mills and distilleries in operation, not being considered, till then, as a relevant cane, sugar, ethanol or bioelectricity relevant producer. However this reality would be rapidly transformed.

The environmental crisis and the rapid rise of Goiás to the post of second national sugar-energy sector (2003-2019)

The current millenium began with a rise in sugar prices, but mainly in oil prices. The large high gain in the international price of black oil, as well as a ratification of the Kyoto Protocol (1999), and the concerns related to environmental crisis and global warming were a strong stimulus to the resumption of the insertion of biofuels in the energy matrix, now not only in Brazil but in several other nations.

Lula’s Government (from 2003 to 2011) was marked by the arrival of the flex-fuel vehicles (2003) and by profound changes in the Brazilian sugar-energy sector. After 20 years (1985-2005), without the installation of new plants in the country, a new expansionary phase was inaugurated for the sector, emerging larger technologically renewed agricultural industries closely related to international capital (Sampaio, 2015). The great driver of this expansion was the ethanol (new name of the fuel alcohol), now presented as a mitigating element for climate change. According Department of Agriculture and Cattle Raising Defense (MAPA)¹³, between the harvests of 2002/2003 and 2010/2011, the sector



doubled size. National production of sugarcane increased 97% (from 316 to 624 million tons); sugar 70% (from 22.4 to 38.1 million tons) and ethanol 121% (from 12.5 to 27.6 billion liters). Global oil crisis legitimated public contributions to the Brazilian sugarcane sector in the 1980s. In the year 2000, the global environmental crisis validated the new wave of financing for fuel promotion now called “green”, “renewable” and “environmentally friendly”.

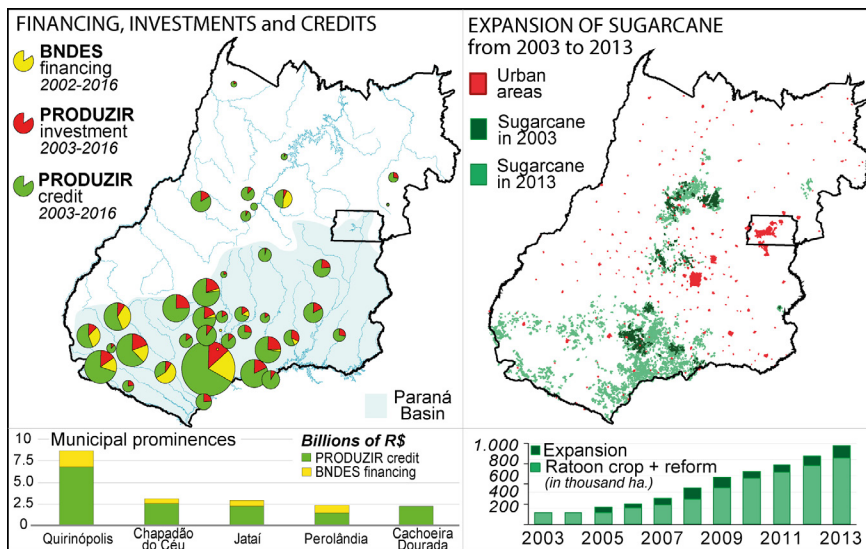
Ten years ago, sugarcane owners were considered agribusiness bandits in this country. But now they are national and global heroes, because everyone is keeping an eye on alcohol. And why? Because it has serious policies. And they have serious policies because when we want to earn the external market, we have to be more serious, because we have to guarantee for them the supply fulfillment.¹⁴

In an effort to earn the global ethanol market and becoming the “Saudi Arabia of ethanol” we understand the role played by the National Bank for Economic and Social Development (BNDES) in favor of national sugarcane activity. The amounts invested each year by the bank in the sugar-energy sector increased between 2004 and 2008, declining in 2009, reaching its peak in 2010, declining abruptly from 2011. It must be observed that in 2007, the BNDE created a specific unit, the Biofuels Department (DEBIO). Since this year, financial incentives to the sector increased substantially. In 2010, the BNDE “was the largest financing agent for investment projects in Brazilian ethanol expansion”.¹⁵ Detailed data of their credit financing for the period 2002-2016 shows that the state of São Paulo concentrated most of the offered volume (49% of the total). In the ranking, Goiás (18%) occupied second position, and Mato Grosso do Sul (14%) the third position. For the entire country, its financing to the sugar-energy sector raised R\$ 35.7 billion (of which R\$ 6.6 destined to Goiás).¹⁶

As regards the State Plan, data from the Planning and Management Secretary (SEGPLAN) obtained between 2003 and 2016 state that the sugarcane and biofuels segments were those that benefit the most from PRODUZIR. Approved projects for these segments involved investments of around R\$ 8.3 billion and tax exemption benefits converted into granted credits amounted to R\$ 37.3 billion (Map 1).



Map 1 - Goiás: public investments (2002-2016) and expansion of sugarcane (2003-2013)



Source: IBGE; BNDES; Goiás Fomento and INPE. Elaboration: SAMPAIO, M.A.P., 2019.

Between 2005 and 2010, an average of four mills were inaugurated each year in the state, and in 2008 alone, 11 new agroindustrial plants began to mill sugarcane in Goiás soil. In 2008, 37 mills and distilleries were registered with the System for Monitoring Sugarcane Activity (SAPCANA/MAPA).¹⁷ Twenty of these produced exclusively ethanol and 17 were mixed (that is, they also produced sugar). In 1995, Goiás represented 2.3% of the sugarcane hectares cultivated in Brazil. Also according to the data from the Municipal Agricultural Production of the Brazilian Institute of Geography and Statistics (PAM/IBGE), in 2000, increased to 2.9% in 2005, to 3.4% in 2010, to 6.1%, and in 2015, to 9%.¹⁸ It's the main front of sugarcane activity expansion in the country after 2003, with almost 1 million hectares planted in 2018. However, the policy focused on fostering ethanol exports did not achieve exponential success as it was intended, having reached its peak in 2008. Such public and private investments appear to have been, in the case of Goiás, undeniably important to leverage sugar exports – which happened after 2008. This phenomenon is considered something new. Since sugar is produced at distances ranging from 775 km (Itumbiara) to 1,200 km (Goianésia) of the port of Santos, it finds it difficult to participate in international trade, once along its journey



abroad it encounters others local producers in more favorable competitive situation. See the recent cases of the cities in the state of São Paulo, such as Sertãozinho (410 km from Santos), Araraquara (350 km), Araras (250 km) and Piracicaba (230 km). For Goiás to be able to sell its sugar to the global market, it must have some differential and be considered more qualified, for example through international certification seals that give credibility to the product and attest to its suitability to certain quality standards.¹⁹ This is underscored by the data available on the COMEX STAT portal of the Ministry of Industry, Foreign Trade and Services (MDIC)²⁰, which attest that in 2018 Goiás exported 3.9% of the total volume of Brazilian sugar, but obtained 5.1% of sales revenues (Table 2).

Table 2 - Brasil (BR) and Goiás (GO): exports of sugar and ethanol, 2003-2018

Year	SUGAR export BR (US\$ mi)	SUGAR export GO (US\$ mi)	SUGAR export GO on BR (%)	ETHANOL export BR (US\$ mi)	ETHANOL export GO (US\$ mi)	ETHANOL export GO on BR (%)
2003	2.136	9	0,4	147	0	0,0
2004	2.634	15	0,6	461	0	0,0
2005	3.917	29	0,8	743	0	0,0
2006	6.166	62	1,0	1.437	0	0,0
2007	5.096	36	0,7	1.439	5	0,3
2008	5.481	32	0,6	2.366	0	0,0
2009	8.372	106	1,3	1.338	0	0,0
2010	12.761	195	1,5	1.013	6	0,6
2011	14.940	343	2,3	1.492	0	0,0
2012	12.845	511	4,0	2.186	27	1,2
2013	11.842	328	2,8	1.865	30	1,6
2014	9.459	318	3,4	897	1	0,1
2015	7.641	280	3,7	845	5	0,6
2016	10.435	382	3,7	885	2	0,2
2017	11.412	364	3,2	805	3	0,4
2018	6.526	334	5,1	891	16	1,8

Source: COMEX STAT/MDIC. Elaboration: SAMPAIO, M.A.P., 2019.

Definitely, it is not (yet) for the external market that sugar-energy production in Goiás turns, but for domestic trade. Data from National Supply Company (CONAB)²¹, referring to the 2015/16 harvest, indicate that only 17% of the sugarcane harvested in Goiás was destined to sugar



production, and the remaining 83% was directed to distillation of ethanol, mainly hydrated. Goiás State production of sugarcane correspond to 6% of total production in Brazil, the Anhydrous Ethanol (EAC), 9%, and the most significant of them, the Hydrous Ethanol (AEHC), represent 19% of the national total. These data clearly reflect the fact that the domestic fuel market is the principal destination of the products of the mills and distilleries of Goiás. Goiás is characterized as an important “exporter inside” of the country of hydrated ethanol, that is, it strongly participates in the interstate commerce.²² It is this characteristic that gives the state a greater peculiarity in the national sugar-energy industry.

Let us remember that this type of fuel is the substitute for gasoline where it is not present or is too expensive – especially in the outermost reaches of the major importing centers and crude oil refineries, which are located near the coastal portion of the national territory. Thus, it is mainly in the domestic market, at the interstate and macroregional level, that sugar and, especially, Goian ethanol, notably hydrated, find their space for realization and consumption. Data from the National Agency for Petroleum, Natural Gas and Biofuels (ANP) for 2015²³ point to Goiás as the second largest hydrous ethanol distiller in the country (3.7 million m³) and the fourth largest consumer (1, 2 million m³). This gives the Goiás the post of main biofuel surplus state (+2.5 million m³). This excess volume is directed to federation entities unable to produce their own fuels. Thus, 100% of the hydrous ethanol consumed in the Distrito Federal is produced in Goiás; which still supplies 32% of Pará’s demand; 25% of Maranhão and Piauí; 20% of Ceará’s; 17% from Minas Gerais and 15% from Bahia.

I concluded that in a vast area of the Brazilian inner (hinterland), especially in the “north-central” portion of the country, the Goiás fuel is fundamental to supply the regional market. Suffice it to say that almost 70% of the biofuel produced in the state of Goiás is sold to other states, whether border or not.²⁴ Regarding anhydrous ethanol and sugar produced in Goiás, these are consumed mainly within the territory of Goiás, but also in neighboring states and in Distrito Federal.

Final considerations

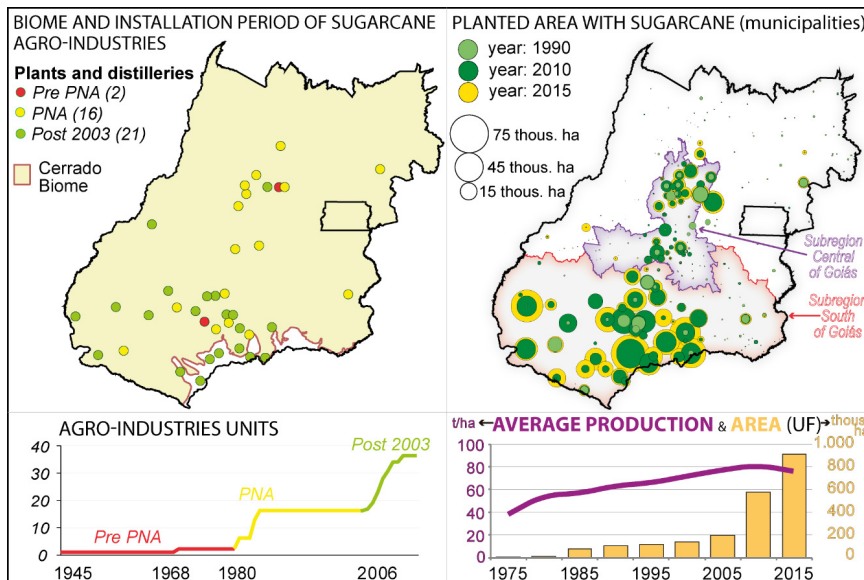
After 2006, the last wave of expansion of sugarcane in Goiás was composed by plants essentially characterized as agro-energy plants. In this sense, plants has the main products in the biofuel production



and energy cogeneration from the burning of sugarcane bagasse: that is why we now talk about the sugar-energy sector, and no more sugar-alcohol. Ranked as the second largest producer of sugarcane and ethanol in Brazil, Goiás also occupies the second position in the generation of bioelectricity from sugarcane, according to the Generation Information Bank of the National Electric Energy Agency (BIG/ANEEL).²⁵ Plants of Goiás are well above the national average for electric cogeneration, since the 30 companies registered in the state have an average installed power of 44,000 kW, compared to a national average of 28,000 kW.²⁶ Goiás, as an emerging agroenergy power, has today two sugarcane subregions: Central and South. Each one of them had a modest and unique plant in operation in the period immediately prior to our analysis. With the PNA, the Central subregion of Goiás became hegemonic, where small distilleries annex were producing hydrated alcohol. This area currently occupies a secondary position and in relative stagnation with regard to the expansion of sugarcane. Companies established in this region in the 1980s subsequently had to become in mixed unit of sugar and alcohol production to keep active in the business. After 2006, the Central subregion of Goiás, in the Paraná River basin, which already had some units established in the PNA, gained added importance and now has some of the largest and most modern agroenergetic plants in Brazil. This area, where the sugarcane plantation are in plain expansion, was responsible for inserting the state of Goiás in the high-level of national sugarcane. Both subregions have started at times of international crisis – be it the oil energy of the 1970s or the environment of the 2000s. Both settled in the Cerrado biome with policies related to the production of alternative fuels. Central subregion of Goiás has already the opportunity to become a sugar area and, the South subregion, when it really becomes a sugar producing zone, it will be able to impact the global price of this *commodity*. A new period of overvaluation of the sugar quotation in relation to the oil is the enough for this to happen.²⁷



Map 2 - Goiás: installation period of sugarcane agro-industries (1945-2019), variation in sugarcane cultivated area (1975-2015) and sugarcane subregions (1990-2015)



Source: CONAB, IBGE. Elaboration: SAMPAIO, M.A.P., 2019.

Notes

1 Available at: <https://www2.camara.leg.br/legin/fed/decret/1970-1979/decreto-76593-14-novembro-1975-425253-publicacaooriginal-1-pe.html> . Accessed on: 13 Aug. 2019.

2 Available at: http://www.gabinetcivil.go.gov.br/pagina_leis.php?id=6425 . Accessed on: 13 Aug. 2019.

3 “Financing consisted in a loan of an amount that corresponded to 70% of the ICMS to be generated by the industrial unit, for an initial period of five years, that later was extended for up to 30 years, counted from the start of production [...] During this deadline the company disburses every month only 30% of the ICMS due, the other 70% are internalized as a loan from the government to the company, as a working capital. Loans to fixed investments had interest of 2,4% per year and without monetary adjustment, which in a period of accelerated inflation depreciated the debt, becoming effective tax waiver in practice [...] allowing companies that used more than one benefit to stay up to 120 years without collecting credit to the State” (Borges, 2014, p. 169-171). (Our translation; original language – Portuguese).

4 This analysis will not consider companies that nowadays belong to the State of Tocantins territory.



5 The complex dependency between cane, sugar, alcohol and oil in Brazil was examined by the article “After all, alternative to what? Driving force agent, motor alcohol, national fuel, anhydrous alcohol, hydrated alcohol or ethanol: the ‘green’ (-‘yellow’) fuel”, by Sampaio (2014). Available at: <http://www.revistas.usp.br/ceru/article/view/98763>. Accessed on: 13 Aug. 2019.

6 Available at: <http://www2.camara.leg.br/legin/fed/medpro/1990/medidaprovisoria-151-15-marco-1990-370446-publicacaooriginal-1-pe.html>. Accessed on: 13 Aug. 2019.

7 Available at: http://www.planalto.gov.br/ccivil_03/DNN/Anterior%20a%202000/1993/Dnn1804.htm. Accessed on: 13 Aug. 2019.

8 Similarly, the Decree of August 21, 1997, signed by the president at the time Fernando Henrique Cardoso, created the Sugar and Alcohol Interministerial Council (Conselho Interministerial do Açúcar e do Alcool – CIMA), attached to the Ministry of Agriculture and Supply, directed to promote the “adequate participation of sugarcane products in the National Energy Matrix” and to guarantee the “economic mechanisms required to the sector self-sufficiency”. (Our translation; original language – Portuguese).

9 Available at: http://www.planalto.gov.br/ccivil_03/LEIS/L8723.htm. Accessed on: 13 Aug. 2019.

10 Available at: http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2014/Lei/L13033.htm#art4. Accessed on: 13 Aug. 2019.

11 See https://www.confaz.fazenda.gov.br/legislacao/convenios/1999/cv003_99, CAPÍTULO IV - DAS OPERAÇÕES COM ÁLCOOL ETÍLICO ANIDRO COMBUSTÍVEL - AEAC. Cláusula décima segunda. Accessed on: 13 Aug. 2019.

12 See http://www.gabinetecivil.goias.gov.br/leis_ordinarias/2000/lei_13591.htm. Accessed on: 13 Aug. 2019. To Silva ([200?], p. 5-6), the advantages of PRODUCING compared to FOMENTING are: 1) Granting discounts from 30% to 100% to the anticipated payment of the financing debit balance, depending on the project’s priority, as investment support; 2) Financing of up to 73% of the ICMS generated and collected to each State Treasury; 3) Non-occurrence of monetary restatement in the financed amount, but with up to 0,2% per month, non-capitalizable interest. Borges (2014, p. 174) understands that the financing modality adopted by the Program is, in practice, as a “disguised tax waiver”.

13 Available at: <http://www.agricultura.gov.br/assuntos/sustentabilidade/agroenergia/producao>. Accessed on: 13 Ago. 2019.

14 Speech given in Mineiros, Speech given in Mineiros, Goiás State, on March 20. 2007. Available at: <http://www1.folha.uol.com.br/folha/brasil/ult96u90477.shtml>. Accessed on: 13 Ago. 2019. (Our translation; original language – Portuguese).

15 BNDES disseminates information on consolidation in the ethanol sector. Available at: http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Institucional/Sala_de_Imprensa/Noticias/2010/institucional/20100219_BrencoETH.html. Accessed on: 13 Ago. 2019. (Our translation; original language – Portuguese).

16 Available at: <https://www.bndes.gov.br/wps/portal/site/home/transparencia/centraldedownloads>. Acesso em: 13 ago. 2019. Accessed on: 13 Ago. 2019.



17 The data contradict each other, because according to CONAB and UDOP there are 36 plants, and according to SIFAEG are 39. Available at: <http://sistemasweb.agricultura.gov.br/sapcana/downloadBaseCompletaInstituicao.action>. Accessed on: 13 Ago. 2019.

18 Available at: <https://sidra.ibge.gov.br/pesquisa/pam/tabelas>. Accessed on: 13 Ago. 2019.

19 One example is the Usina Jalles Machado, in Goianésia (GO), which invested in adapting its production to obtain internationally recognized stamps, such as USDA Organic (their organic sugar can be marketed in the US and Canada); AB/Agriculture Biologique (manufactured product made from sustainable agricultural practices in accordance with the rules of the European Single Market); Cibal Halal (It meets the Islamic Community requirements); Kosher B.K.A. Parve (referring to the specific rules of Jewish food standards); IMO Fair for Life (ensures that the company practices fair trade and has socially responsible projects); NON GMO Project (production from non-GMO raw materials and genetically unmodified organisms); ISO 14001 - Environmental Management (the company adopts good practices to minimize impacts that pose risks to the preservation of biodiversity, contributing to the environmental balance and quality of life of the population); and FSSC 22000 (ensures food safety management and food defense against bioterrorism), and others.

20 Available at: <http://comexstat.mdic.gov.br/pt/home>. Accessed on: 13 Ago. 2019.

21 Available at: <https://www.conab.gov.br/info-agro/safras/cana>. Accessed on: 13 ago. 2019.

22 In 2008, under the terms of the ICMS 50/08, Goiás was assigned one of the lowest taxes on the marketing of hydrous ethanol for both intra-state trade (14%, compared to a national average of 38%) and interstate (39 %, compared to an average of 65%), conferring undeniable competitiveness to the Goiás fuel inside and outside the state border. Generally,

the different taxation between hydrous ethanol (ICMS 22%) and type C gasoline (28%) also encourages the consumption of sugarcane biofuel. According to ANP, in 2015, the average disbursement paid per liter of hydrated alcohol in the supply pumps in Goiás was R\$ 2.29, while in the rest of the country it was R\$ 2.62 (-12.5% difference). Type C gasoline was sold, on average, at R\$ 3.41 in Goiás and R\$ 3.42 in the rest of Brazil (-0.3% difference). These differences come from the state's differentiated taxation policy and result in a clear stimulus for ethanol consumption.

23 Available at: <http://www.anp.gov.br/dados-estatisticos>. Accessed on: 13 ago. 2019.

24 The Usina Boa Vista Nova Fronteira is a partnership signed between the São Paulo group São Martinho and state-owned Petrobrás Biofuel. Inaugurated in 2008, in the city of Quirinópolis, the plant represents the predominant enterprise profile in this last expansionary phase of sugarcane cultivation in Goiás. This was projected to be the largest sugarcane single unit unit in the world producing ethanol. The Usina Boa Vista Nova Fronteira does not produce sugar and is exclusively dedicated (for the time being) to ethanol production and cogeneration of electricity from sugarcane bagasse. The same applies to Raízen Centro-Oeste (de Jataí), Rio Claro (Caçu), Morro Vermelho (Mineiros), and Água Emendada (Perolândia). These last three of the Atvos group (ex-ETH and ex-Odebrecht Agroindustrial) are endowed with huge idle capacity.



25 São Paulo ranks first (annual production of 5.7 million kW, or 51% of the national total) and Goiás follows (1.3 million kW, or 12% of the total). Available at: <http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/UsinaListaSelecao.asp>. Accessed on: 13 ago. 2019.

26 The CerradinhoBio plant (ex-Porto das Águas), located in Chapadão do Sul, in the south of Goiás, with a grant to generate 160,000 kW per year is, currently, the most powerful agroindustrial unit in Brazil in this aspect. This plant combines sugarcane, soybean, corn and sorghum production, having obtained in 2017 the first place in sugarcane productivity among all plants in the state for the fifth consecutive harvest.

27 This research was endorsed by the FAPESP (DO/2011-2014), under the orientation of Prof^a Dr^a. Rosa Ester Rossini/USP), and by the CAPES (PNPD/2019), under the orientation of Prof. Dr. Eduardo Paulon Girardi/UNESP).

References

ANDRADE NETO, J. C. X. de. *O Estado e a agroindústria canavieira do Nordeste Oriental: modernização e proletarização*. 1990. 394 f. Tese (Doutorado em Geografia Humana) – Universidade de São Paulo, São Paulo, 1990.

ANP. Agência Nacional do Petróleo, Gás Natural e Biocombustíveis. *Dados estatísticos: produção de biocombustíveis; produção de etanol*. Available at: <http://www.anp.gov.br/dados-estatisticos>. Accessed on: 13 Ago. 2019.

BACCARIN, J. G. *A desregulamentação e o desempenho do complexo sucroalcooleiro no Brasil*. 2005. 291 f. Tese (Doutorado em Ciências Exatas e da Terra) - Universidade Federal de São Carlos, São Carlos, 2005. [Available at: https://repositorio.ufscar.br/handle/ufscar/3466](https://repositorio.ufscar.br/handle/ufscar/3466). Accessed on: 13 Ago. 2019.

BIG/ANEEL. Banco de Informações de Geração da Agência Nacional de Energia Elétrica. Capacidade de geração do Brasil: usinas e centrais geradoras. [Available at: <http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/UsinaListaSelecao.asp>](http://www2.aneel.gov.br/aplicacoes/capacidadebrasil/UsinaListaSelecao.asp). Accessed on: 13 Ago. 2019.

BNDES. Banco Nacional de Desenvolvimento Econômico e Social. Dados sobre operações de Financiamentos. [Available at: https://www.bndes.gov.br/wps/portal/site/home/transparencia/centraldedownloads](https://www.bndes.gov.br/wps/portal/site/home/transparencia/centraldedownloads). Accessed on: 13 Ago. 2019.

BORGES, E. B. *Incentivos fiscais e desenvolvimento socioeconômico de goiás: análise de impactos dos programas Fomentar e Produzir (1995-2011)*. 2014. 99 f. Tese (Doutorado em Políticas Públicas, Estratégias e Desenvolvimento) – Universidade Federal do Rio de Janeiro, Rio de Janeiro, 2014.

CASTRO SANTOS, M. H. *Política e políticas de uma energia alternativa: o caso do Proálcool*. Rio de Janeiro: Editora Notrya/ANPOCS, 1993.

CONAB. Companhia Nacional de Abastecimento. *Informações agropecuárias: perfil do setor do açúcar e do etanol no Brasil Edição para a safra 2015/16*. [Available at: https://www.conab.gov.br/info-agro/safras/cana](https://www.conab.gov.br/info-agro/safras/cana). Accessed on: 13 Ago. 2019.



MAPA. Ministério da Agricultura, Pecuária e Abastecimento. Sustentabilidade - Agroenergia – Produção e Sistema de Acompanhamento da Produção Canavieira. Available at: <http://www.agricultura.gov.br/assuntos/sustentabilidade/agroenergia/producao>. Accessed on: 13 Ago. 2019.

MDIC. Ministério do Desenvolvimento, Indústria e Comércio Exterior. *Estatísticas de comércio exterior do Brasil*. Available at: <http://comexstat.mdic.gov.br/pt/home>. Accessed on: 13 Ago. 2019.

PAM/IBGE. Produção Agrícola Municipal do Instituto Brasileiro de Geografia e Estatística. *Sidra*. Available at: <https://sidra.ibge.gov.br/pesquisa/pam/tabelas>. Accessed on: 13 Ago. 2019.

SAMPAIO, M. A. P. Afinal, alternativo a que? Agente motriz, álcool-motor, carburante nacional, álcool anidro, álcool hidratado ou etanol: o combustível “verde” (-“amarelo”). *Cadernos CERU*, v. 25, n. 2, p. 39-66, 2014. Available at: <http://www.revistas.usp.br/ceru/article/view/98763>. Accessed on: 16 May 2018.

SAMPAIO, M. A. P. *360°: o périplo do açúcar em direção à Macrorregião Canavieira do Centro-Sul do Brasil*. 2015. 881 f. Tese (Doutorado em Geografia Humana) - Universidade de São Paulo, São Paulo, 2015.

SHIKIDA, P. F. A. *A evolução diferenciada da agroindústria canavieira no Brasil de 1975 a 1995*. Cascavel: Edunioeste, 1998.

SILVA, M. B. M. da. *A regulação do estado e a indústria canavieira: aspectos tributários em Goiás*. Goiânia: Ministério Público/CAOMA. [200?]. Available at: http://www.mp.go.gov.br/nat_sucroalcooleiro/Documentos/documentos_art/08.pdf. Accessed on: 16 May 2018.

SZMRECSÁNYI, T. *O planejamento da agroindústria canavieira do Brasil (1930-1975)*. São Paulo: Hucitec, 1979.

THOMAZ JÚNIOR, A. *Por trás dos canaviais, os “nós” da cana: a relação capital x trabalho e o movimento sindical dos trabalhadores da agroindústria canavieira paulista*. São Paulo: Annablume/Fapesp, 2002.

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