



Biodiesel in Brazil: analysis of the first decade of production

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Introduction

At the end of the 20th and early 21st century, agricultural systems incorporate a new mission: to generate energy for a world population that continues to grow and whose way of life demands not only food, but also energy with low environmental impact. In this sense, biofuel policies emerge in various countries originated from the deals made in the agenda 21 during the Rio Summit in 1992 (Silveira, 2013).

In March 2005, Brazil produced its first 49 barrels of pure biodiesel (B100) and began its addition to mineral diesel. From January 2008 the blending of B100 to diesel oil at a 2% level became mandatory, being increased to 3% in July 2008. Between July and December 2009 the level was increased to 4%, going up again in January 2010 to 5% and maintaining this level up to June 2014. Between July and October 2014 the blend was leveled at 6% and is currently of 7% (ANP, 2015).

Soybean oil continued to be in 2013 the main raw material for the production of B100 being responsible for 76.4% of total production. When considered the period between 2006 and 2013, it was responsible for 82.4% of the production of B100. The goal of this paper is to analyze the impacts of the first decade of biodiesel production in Brazil.

Materials and Methods

The number of hectares used for the cultivation of rice, bean, corn and soybean, main crops that compete for land use during spring/summer periods were obtained from the historical series database from the Companhia Nacional de Abastecimento (CONAB, 2015). The use of data regarding area planted serves as an indicator of the farmer's decision on "what to produce", so factors that lead to higher or lower production each year, such as climate, sanitary and economic conditions have been removed from the analysis, which focuses on farmer decision.

The data that refers to biodiesel production was obtained from the Boletim Mensal do Biodiesel, which is made available by the Agência Nacional do Petróleo (ANP, 2015). The monthly production of biodiesel is presented in number of barrels, which is equivalent to 159 liters, being that one hectare of soybean produces an average of 400 liters of biodiesel.

Results and discussion

One of the main goals of the Biodiesel program, which was to develop the production of oily seeds by small farmers in order to create jobs and income in poor regions of the country, particularly in the northeast, was not achieved. Despite of tax incentives conceded by the federal and state governments such as Bahia, Ceará and Piauí to set biodiesel refineries in the region, only 15% of the units in the country are located in the region (Rathmann et al., 2012). Thus, in 2013 the Central-West region was still the largest biodiesel producer, followed by the South, being that both achieved the 82.29% mark of total produced in the country (ANP, 2015). This participation is a reflection of the fact that Biodiesel has as its main production source soybean and animal fat, being these regions the largest producers of these raw materials.

In Table 1 an increase in the area cultivated with soybean can be observed, as well as the direct relation between the increase in the production of B100 in Brazil and the increase in the area cultivated with soybean destined for the production of energy.

Table 1. Biodiesel production and its relation to the area for the production of soybean in Brazil.

Year	Biodiesel Barrel	Percentage soybean source in Biodiesel	Soybean Hectares Total	Soybean Hectares to Biodiesel	Percentage Hectares to Biodiesel
2005	4,670	30.71	23,301,666	570	0.00
2006	437,749	95.29	22,749,666	165,816	0.73
2007	2,565,064	86.58	20,686,393	882,737	4.27
2008	7,404,263	82.14	21,174,721	2,417,575	11.42
Brazil 2009	10,203,997	77.44	21,761,782	3,141,192	14.43
2010	15,139,312	82.94	23,467,094	4,991,323	21.27
2011	16,955,989	81.23	24,181,410	5,474,960	22.64
2012	17,239,715	77.43	25,042,559	5,305,812	21.19
2013	18,508,546	76.39	27,736,100	5,620,395	20.26
2014	21,658,989	74.68	30,173,100	6,429,536	21.80

On figure 1 apart from second harvest corn all other crops suffered a reduction in this period, indicating a direct effect of the farmer's decision on "what to produce". First harvest corn was reduced in an area equivalent to 3.474.400 ha, which clearly shows the prioritization of soybean crop adopted by farmers. However, second harvest corn increased its area in 5.871.600 ha due to the fact that during this period soil use does not compete with soybean, thus emerges the soybean-corn binomial, especially in the Central-West region. The impact on rice and bean crops, considered essential to the Brazilian diet, was clearly negative with a reduction of 663.926 ha (22%) and 1.026.500 ha (24.3%) respectively.

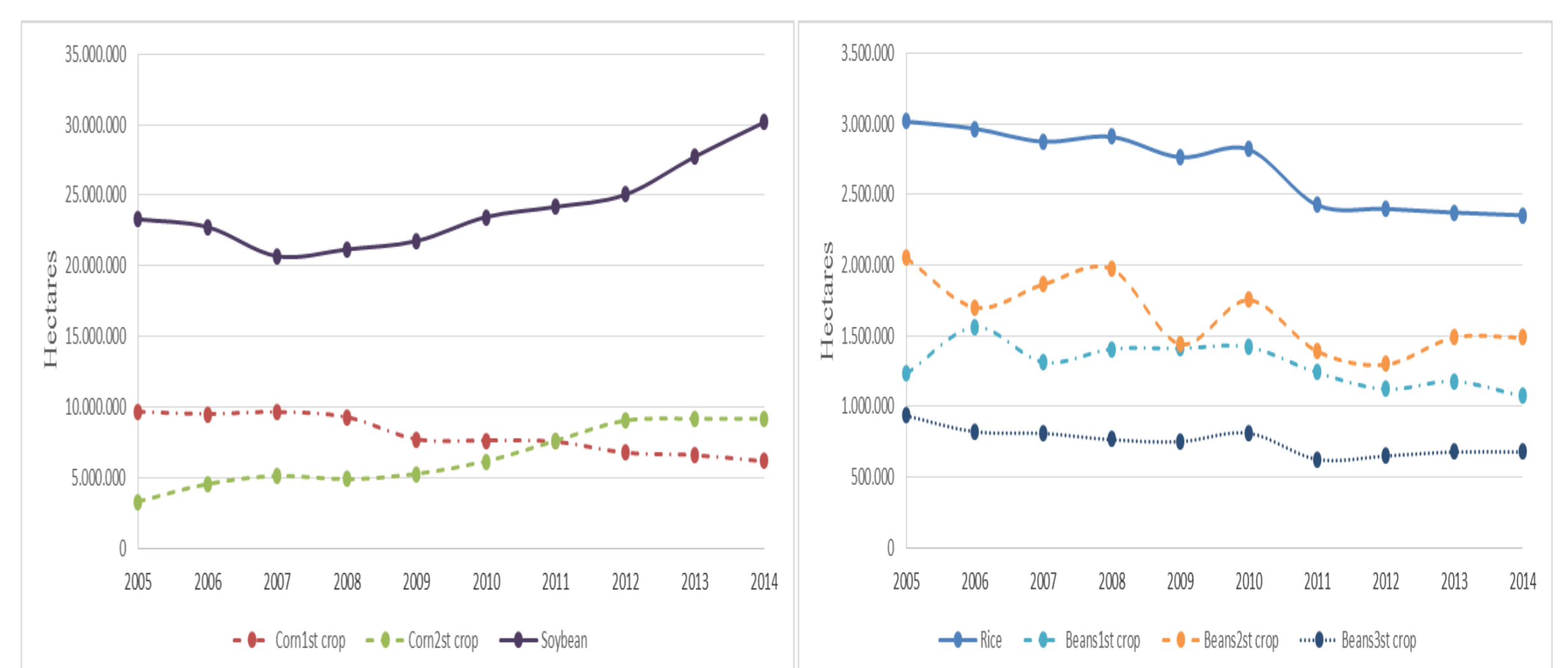


Figure 1. Areas cultivated with rice, bean, corn and soybean in Brazil between 2005 and 2014.

Conclusions and Outlook

Biodiesel policy in Brazil has led to an enlargement of the area used with soybean crop over rice and bean crop. It should also be considered that the impact regarding biomes and different states should be studied, as is the case of the state of Rio Grande do Sul for example, which has become the largest B100 producer in Brazil. In this state the soybean advance happens over natural pasture of the Pampa Biome where social and environmental impacts have scarcely been studied.

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