Biodiversity & Bio-fuels in Brazilian Agricultural Areas

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Abstract

Transparency and targeting of public policies as well as the questionning about what has been and will be done for achieving energy sustainability have been a problem for the Brazilian sugar-ethanol sector. It regards the negative impacts, such as loss of habitats, fragmentation and disturbance of natural areas, among others which the large-scale production and its expansion could generate. At the state level, Sao Paulo is the biggest sugar cane producer in Brazil and the first State which has developed the Agro-environmental Zoning for sugar-ethanol Sector defining appropriate areas to sugar cane expansion. This study shows the incorporation of the biodiversity analysis into the Agro-environmental zoning in order to discuss the future of conservation and land use planning. Although the inclusion of important areas (not protected by law) is a positive aspect of the zoning, the most part of Sao Paulo State may become a sugarcane monoculture; despite the restrictions areas indicated on the resulting maps. This can result in adverse impacts on natural resources, especially in biodiversity conservation. Therefore, the results about the analysis are capable of being used to support public policies in terms of dealing with the impacts on biodiversity.

Introduction

The changes in the use and occupation of land driven by the human being are key aspects to the conservation or biodiversity loss (Haines-Young, 2009). Among these changes, the conversion of natural habitats to agricultural areas has been the biggest threat to the global biodiversity (Gemmil, 2001). Therefore planners and decision makers must pay attention to the balance between agricultural and protected areas. The OECD Environmental Outlook 2030[1] estimates that the expected (10%) increase in the world agricultural areas by 2030 will be responsible for 32 % of global biodiversity loss. Moreover this increase bas been and will be the main cause of biodiversity loss in the group of the so-called BRIC countries (Brazil, Russia, India and China) (OECD, 2008). Part of that farmland demand is due to the necessity to increase the energy generation by means of bio-fuels.

Biofuels are seen as a potential renewable alternative and less polluting energy sources compared to the fossil fuel. In addition, they are considered the basis of the energy-agricultural economy in many countries. According to Goldemberg (2007) it does not only support local agriculture, but also developing economies. However, the increased of the sugar cane production sites and the ethanol consumption can bring many negative environmental consequences, such as soil degradation, impacts on climate and biodiversity damage (Worldwatch Institute, 2006).

Brazil is the largest world producer of sugar cane at present – more than 569 million tons in 2008/09 years (UNICA (2010a) – and Sao Paulo State has contributed to 63,3 % of this production (UNICA , 2010b). Sao Paulo is located in southeastern region of Brazil and has an area of 24,820,942 ha (IBGE, 2002), of which 5,400,823 ha are currently used for the sugarcane production (INPE, 2012). According to the data from CanaSat, a monitoring program, between

[1] The OECD Environmental Outlook to 2030 provides analyses of economic and environmental trends to 2030. It shows the natural resource risks based on the needing to support economic growth including biodiversity loss, climate change, water scarcity and health impacts of pollution. This edition focuses in both OECD countries and Brazil, Russia, India, Indonesia, China, South Africa (BRIICS).

2003/04 and 2011/12 the sugarcane harvests have increased approximately 2,398,147 ha (80 %) in this state. The crops expansion has occurred in the northwest direction, as shown in Figure 1.

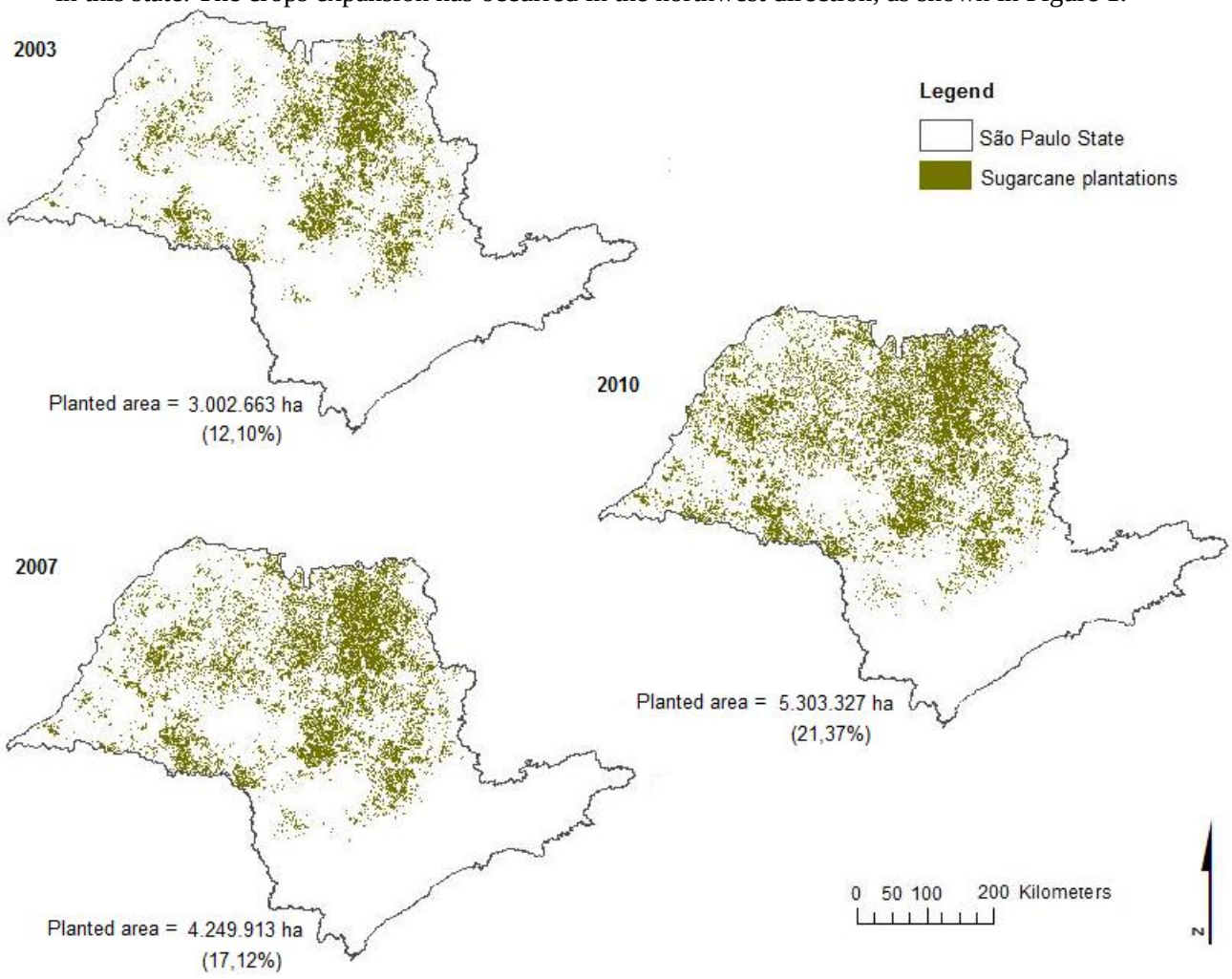

Figure 1. Areas of Sao Paulo State occupied by sugar cane.
Source: Rudorff et al. (2010).

Agro-environmental Zoning for Sugar - Energy Sector

As an initiative to plan the sugarcane expansion in Sao Paulo, the Environmental Departament of the State in partnership with the Agriculture and Food Supply Department developed the Agro-environmental zoning for the Sugar and Alcohol Sector, which was regulated in 2008 and changed in 2009. Based on this zoning some technical guidelines have been established for the licensing of enterprises of this sector in Sao Paulo State (Resolution SMA 088 since December, 19th, 2008).

The zoning provides areas more or less suitable for sugarcane growing considering the following criteria: a) agricultural suitability: climate and soil suitability and land slope b) Water: watersheds deemed critical and groundwater vulnerability as published by IG-CETESB-DAEE-1997, and c) biodiversity and protected areas: priority for increased connectivity and areas classified as extremely important for biological conservation indicated by the BIOTA-FAPESP program; conservation Units of Integral Protection and Federal and State Environmental Protection Areas (APA) and their Wildlife Areas ; a buffer of 10 Km of the protected areas with full protection and areas classified as extremely important for biological conservation (Sao Paulo, 2008a) (Figure 2).

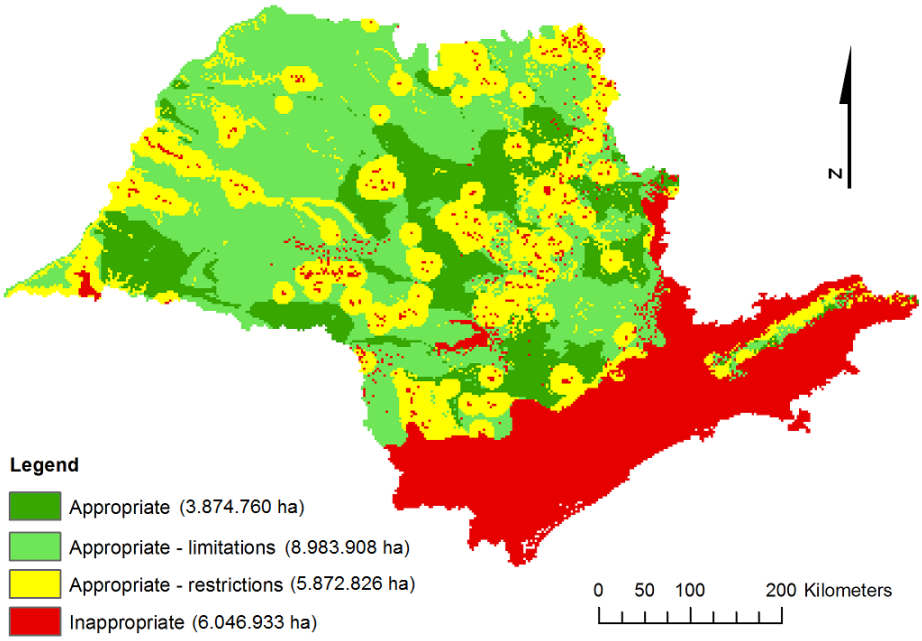

Figure 2. Agro-environmental zoning for Sao Paulo Sugarcane Industry.
Source: Sao Paulo (2008a).

The Agro-environmental Zoning is expected to direct the expansion of agro-energy crop in São Paulo State. Considering this context, the public policies must be formulated to guide this activity focusing not only on the power generation by biofuels expansion, but also on the environmental sphere with congruent sustainable standards (GROOM et al. 2008). The Agro-environmental Zoning for the sugar cane energy sector in Sao Paulo State, established in 2008, should be able to support the planning of the new areas occupation in the state and the public policies management in relation to the sector growth.

Objective

The purpose of this paper is to provide an insight into the sugar cane expansion based on the analysis of the Agro-environmental Zoning for Sao Paulo Sugarcane Industry and the possible impacts on natural areas (legally protected or not), hence biodiversity. The analysis considered the original zoning maps (Sao Paulo, 2008a) and the monitoring carried out by the CanaSat project (Rudorff, 2010) by overlaying maps using ArcGis 10 software.

Overlaying sugar-cane area and zoning maps

The overlaying maps indicated that in 2010 there were plantations in both legally protected areas and their buffer zones (Figure 3), and in important areas for landscape connectivity (Figure 4), pressing biodiversity on local and regional scales what shows conflicts between conservation areas and agriculture.

The land use planning particularly in priority areas for conservation and protected areas and their surroundings should prioritize the fulfillment of environmental legislation. According to WWF Brazil (2008), the sugarcane activities have shown a history of noncompliance with the environmental legislation. Moreover, Pivello (2005) reports that protected areas surrounding large sugar cane farms offer suffer from habitat loss due to erosion, siltation and water contamination, and even death of animals caused by agrochemicals poisoning. In relation to connectivity, Carvalho et al. (2009) argue that even if there is no loss of natural areas, the degree of landscape fragmentation may increase with the change in pasture areas.

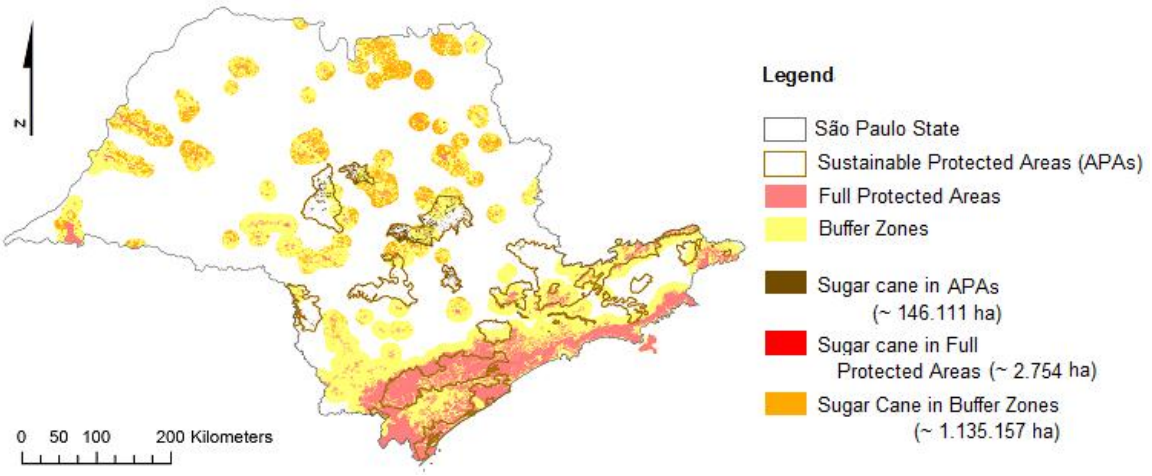

Figure 3. Sugar cane crops in protected areas and buffer zones in Sao Paulo State.

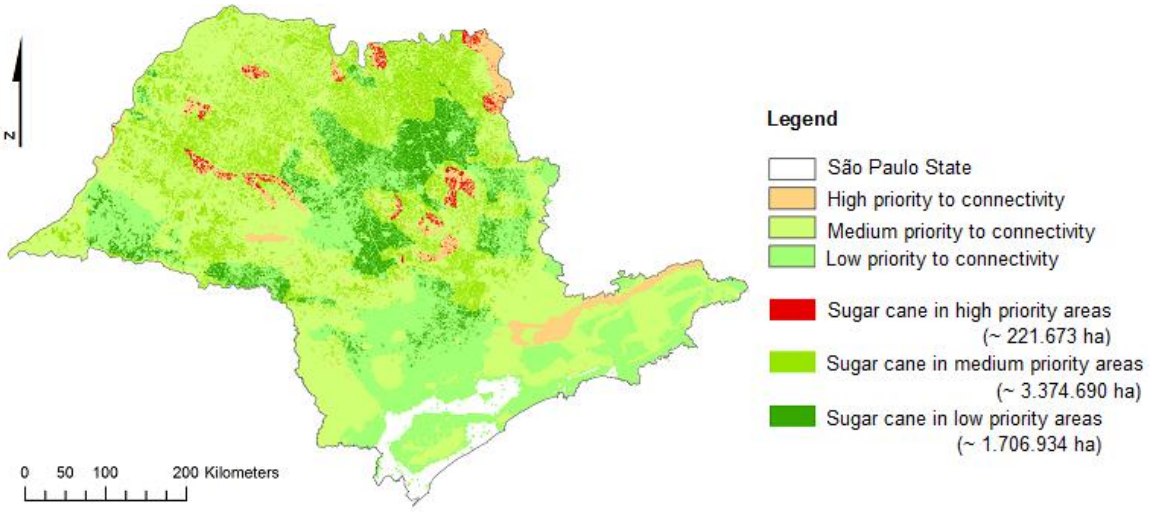

Figure 4. Sugar cane crops in priority areas for landscape connectivity in Sao Paulo State.

In 2008, the zoning included these considerations and indicated priority areas for sugar-cane expansion. Figure 5 shows that the expansion of the agricultural activity took place between 2007 and 2010 (after the proposed zoning implementation).

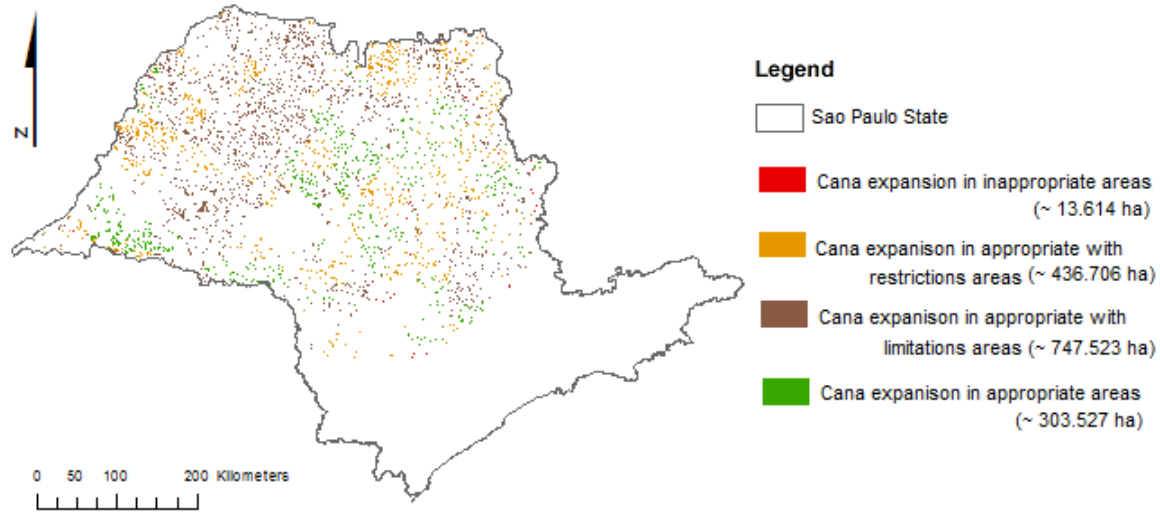

Figure 5. Sugar cane expansion from 2007 to 2010.

The expansion of sugar cane as a result of the zoning implementation occurred in appropriate areas, with limitations and restrictions, as well as in inadequate areas. Most expansion was occurred in areas with limitations and restrictions what shows that the zoning has not directed the expansion to the most appropriate areas.

Conclusions

The expansion of agro-energy crop production without an adequate policy and regulatory guide may enhance the many social and environmental negative impacts from the sector. Besides, the Zonning implementation in 2008 has not been sufficient to drive the sugar cane expansion. According to the way the zoning is presented, most of Sao Paulo State may become a sugarcane monoculture, resulting in adverse impacts on the availability of natural resources and biodiversity conservation.

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