

# SIMULATING LAND USE AND AGRICULTURE EXPANSION IN BRAZIL: FOOD, ENERGY, AGRO-INDUSTRIAL AND ENVIRONMENTAL IMPACTS

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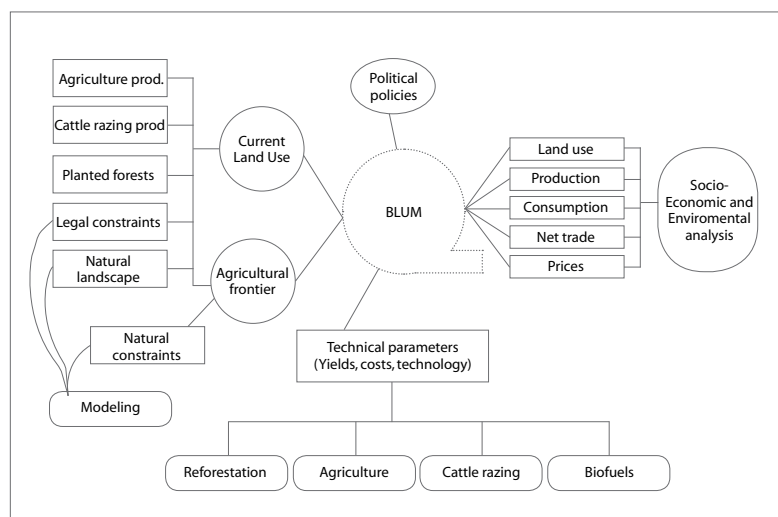
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Brazilian agro-industrial output has experienced a cycle of strong expansion. The awareness that the era of cheap oil has reached an end and the growing energy concerns made the search for viable alternatives to hydrocarbon-based fuels into a global priority. The role of biofuels and bioenergy has shifted from a solution for reducing Green House Gases (GHG) emissions to the cause of rising food prices, environmental degradation and even threatening global food security.

At the same time, increasing income in developing countries has brought millions of people to increase their levels of food consumption, boosting international demand. National demand for agricultural products has also increased, pushed by biofuels (mainly ethanol) and grains for food and feed production. Within this context, Brazilian agricultural industry has responded to the world's need for food, feed, fiber and biofuels by both improving its yields and expanding cultivated area and investments.

To analyze this issues properly, in partnership with FAPRI (Food and Agricultural Policy Research Institute), ICONE developed an economic model called Brazilian Land Use Model (BLUM). The present application proposes the use and development of the BLUM for the food versus fuel debate. The BLUM will be sufficiently general to forecast all the main agricultural products in the entire national territory and, at the same time, detailed enough to deal with the (very) different regional characteristics of national territory.



Methodological diagram of Brazilian Land Use Model

With this project, ICONE wants to answer to the following questions: what will be the growth in sugarcane planted area to respond to a growing demand? How will it affect land use change? What will be the main positive and negative environmental impacts? Is there any policy to be implemented by the government or the private sector to improve the rational use of the land?

The research on Indirect Land Use Change (ILUC) methodology is under continuous development. The BLUM has been improved to generate results on land use change instead of only land allocation. However, the need for additional improvements has been identified, which is the aim of this project.

## SUMMARY OF RESULTS TO DATE AND PERSPECTIVES

ICONE has been working in the BLUM since 2008 and have reached many advances and has established an intelligence network with specialists of several university research institutes in Brazil and abroad. The national network includes the Censoring Remote Center, at Federal University of Minas Gerais (UFMG), various centers of Brazilian Agricultural Research Corporation (EMBRAPA), National Institute for Space Research (INPE), Center for Alternative Energy of Fortaleza (Centro de Energias Alternativas de Fortaleza), Sugarcane Technology Center (Centro de Tecnologia Canavieira – CTC), Luiz de Queiroz Agriculture School (ESALQ/USP), Laboratory of Remote Sensing (Laboratório de Sensoriamento Remoto) of Federal University of Goiás (LAPIG), among others. At the international level, we can mention the Center for Agricultural and Rural Development like the main partner and the World Bank (WB).

Main improvements developed so far in the model:

- ICONE innovated methodologically in, at least, four aspects. First, using satellite images (using GIS – Geographic Information System), which contributes to the incorporation of data of potential area for expansion of agribusiness, considering physical, environmental and legal restrictions – AgLUE-BR model (Esalq-USP). Second, projecting endogenously pasture area, which has not been considered in other land use models. Third, ICONE separates winter crops, which are planted after a primary crop in the same season. Finally, BLUM treats Brazilian agriculture dynamic considering six different regions and its peculiarities, which is essential for more accurate land use change analysis.
- Modification of the structure of the BLUM in order to respect the economic conditions of homogeneity, symmetry and adding up.
- BLUM was integrated to the international model and included into FAPRI's Outlook 2010.

Improvements to be developed in FAPESP project:

- Use deforestation data in the *Cerrado* Biome and land use, in order to estimate more trustworthy parameters (agricultural expansion over vegetation and substitution among different agricultural activities in the *Cerrado* Biome), based on empirical data.
- Estimate parameters using secondary data and satellite images for the different regions in the model.

## MAIN PUBLICATIONS

Moreira M, Nassar AM, Feldman S. 2009. ICONE study disputes preliminary ILUC results for RFS2. *Bioenergia*. November 2009:49-51.

Nassar AM, Harfuch L, Moreira M, Bachion L, Antoniazzi LB. 2009. Impacts on Land Use and GHG Emissions from a Shock on Brazilian Sugarcane Ethanol Exports to the United States using the Brazilian Land Use Model (BLUM). Report to the U.S. Environmental Protection Agency Regarding the Proposed Changes to the Renewable Fuel Standard Program. Docket EPA HQ OAR 2005 0161.

Nassar AM. 2009. Land use changes and the expansion of agricultural production. *Agriculture, Climate Change and Trade – Selected Articles*. 1:34-36

Nassar M et al. 2008. Prospects of sugarcane expansion in Brazil: impacts on direct and indirect land use changes. In: *Sugarcane Ethanol: Contributions on Climate Change Mitigation and the Environment. The Netherlands: Wageningen University*. 63-92.

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