

# Land-use implications of future ethanol demand in Brazil

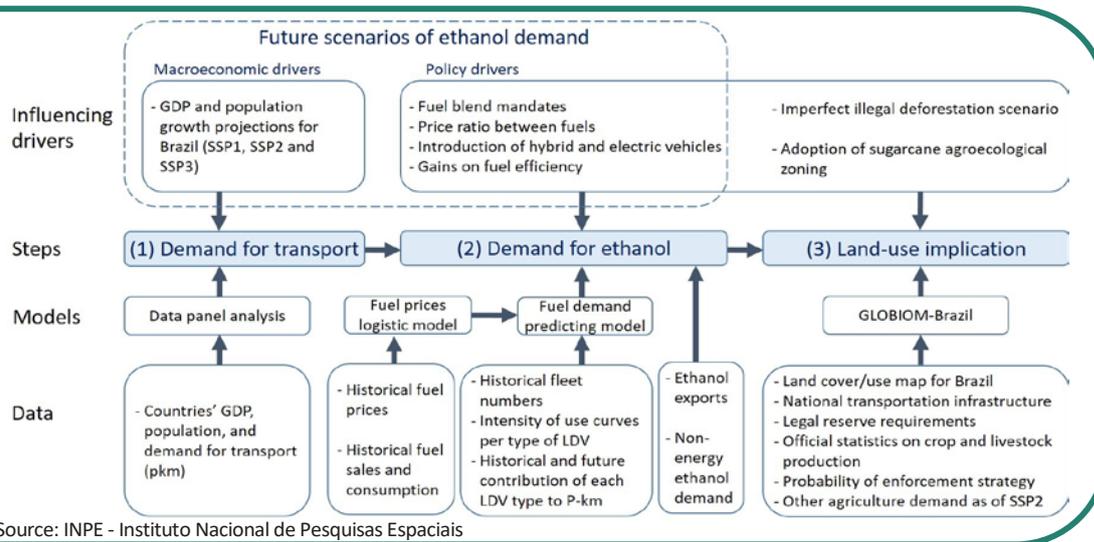


Figure: Drivers, models and input data: on top, both macro-economic and policy drivers; the dashed line highlights the ones considered to vary across future scenarios of ethanol demand.

Source: INPE - Instituto Nacional de Pesquisas Espaciais

- › Using GLOBIOM-Brazil, scenarios of ethanol demand in Brazil towards 2030 were developed, based on a thorough examination of key influencing drivers, i.e. GDP and population growth, fleet composition, blending policies, fuel prices and energy efficiency
- › The present analysis supports Brazil's national scenarios of restoration and sustainable food/energy crop production on degraded lands, such as abandoned lands and low productivity pastures
- › Depending on the future demand for ethanol, production could increase between 37.4 and 70.7 billion liters in 2030, representing an expansion in sugarcane area between 1.2 and 5 million hectares
- › Even in a high demand scenario for ethanol in 2030, sugarcane expansion will mostly expand into pastureland (72%) and natural vegetation mosaics (19%)
- › Future ethanol demand in Brazil should not substantially affect food production nor native forest; this outcome will however depend on the compliance with the Brazil's sugarcane agro-ecological zoning (AEZ)

## Approach and aim

Despite having a consolidated ethanol sector in the country, the Brazilian government with its Nationally Determined Contribution (NDC) for the Paris Agreement, announced the intention to further increase biofuels supply and consumption. This increase is targeted at raising the share of sustainable biofuels in the energy mix up to 18% by 2030. Accordingly, the Brazilian legal framework has reinforced commitments like the NDC with the recently approved 2017 National Biofuels Policy (also known as *RenovaBio*). Brazil is the largest producer of sugarcane crops globally, which are essentially used as feedstock in the production of sugar and ethanol. Although external markets mostly drive production of sugar, the ethanol produced in Brazil is primarily consumed domestically in the transportation sector.

## Methodology

Scenarios of macroeconomic and policy drivers that shape the future demand for ethanol in Brazil and their land-use implications were estimated for 2030 (see Figure). Future demand for fuel depends on the growing demand for passenger transport in Brazil, combined with other variables such as the fuel prices and fuel blend mandates. Land-use competition was modeled using the detailed partial equilibrium economic model GLOBIOM-Brazil, considering the current land-use policy in Brazil and assuming a scenario of imperfect illegal deforestation control in the Amazon and the Cerrado biomes. Among other specificities, for this study GLOBIOM-Brazil includes the agro-ecological zoning (AEZ) for sugarcane in Brazil. The AEZ for sugarcane identifies the areas where sugarcane crops can be planted, and areas with restrictions regarding soil, climate, topography, water and others. It also prohibits sugarcane expansion

in ecologically sensitive areas, like the Amazon and the Pantanal biomes. Results on land-use and competition are key information to understand the consequences of increasing the supply of Brazilian ethanol towards 2030 in the context of the Paris Agreement.

## Results

Ethanol demand could increase between 37.4 and 70.7 billion liters in 2030 depending on the scenario, representing an expansion in sugarcane area between 1.2 and 5 million hectares (14%–58% above the land-use in 2018). Compared to the low demand scenario, a high demand for ethanol in 2030 would drive sugarcane expansion mostly into pastureland (72%) and natural vegetation mosaics (19%). Although sugarcane area is substantially smaller than the pastureland area in Brazil, a larger sugarcane expansion, would increase to some extent the pressure on pastureland and incentivize higher cattle stocking rates.

Moving from the low to high demand scenarios only marginally impact net native vegetation area. Sugarcane expansion in response to higher ethanol demand is expected to take place primarily over pasture and to a lesser extent over non-productive lands. These results suggest that Brazil can meet future demand for ethanol with limited effects on other crops and native vegetation, if the ethanol industry continues to follow the sugarcane AEZ.

*Further reading: de Andrade Junior, M.A.U., Valin, H., Soterroni, A.C., Ramos, F.M. and Halog, A., 2019. Exploring future scenarios of ethanol demand in Brazil and their land-use implications. Energy Policy, 134, p.110958.*

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