

# The Brazilian biofuel industry: achievements, challenges, and geopolitics

What is the role of energy in today's world? Arguably, there are three points which are important to keep in mind. First, energy is an essential input to production in a world of increasing consumption and demand for goods and services. Therefore, energy is an essential resource for development. Second, energy is at the heart of environmental debates. The large-scale production and utilization of energy has created a number of ecological implications that cannot be left unchecked – most notably global climate change. Finally, energy is also a key part of geopolitics, particularly liquid energy – petroleum – on which the whole world depends, but which is produced primarily by a handful of countries.

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IT IS IN THIS CONTEXT that Brazil's emerging biofuel industry stands out as an important initiative which may promote clean development and, in the process, contribute to geopolitical shifts. Biofuels are liquid fuels extracted from biomass and which can replace or be blended with petroleum-based fuels, such as gasoline and diesel. Gasoline is replaced by ethanol, normally produced from starch- or sugar-rich crops (e.g., corn, sugarcane), and diesel is replaced by biodiesel, produced from vegetable oils or animal fats.

In Brazil, sugarcane and soybean are, respectively, the main crops utilized. The country has already successfully replaced more than half of its gasoline consumption by domestically-produced ethanol. Together with electricity produced from sugarcane biomass, the sugarcane sector already represents nearly 20 percent of the country's total energy production. Biodiesel, although a relatively infant industry in Brazil, is growing fast and has already replaced 5 percent of the country's overall diesel utilization. Thus, biofuels have contributed to Brazil having one of the cleanest energy production systems in the world – where almost 50 percent of it derives from renewable sources.

The question, however, is what ecological and socio-economic implications this growth in biofuel production and utilization may have. In addition, Brazil's ascension as a renewable energy power – eventually as a clean-fuel exporter – is poised to alter geo-economic and geopolitical configurations, especially if other countries that currently import oil follow suit.

## Challenges of Brazilian biofuel industry

The chapter in *Secure Oil and Alternative Energy*,<sup>1</sup> on which this essay is based, conducts an in-depth analysis of those two questions by fleshing out the development path of – and the challenges faced by – Brazil's emerging biofuel industry. Although biofuel production in Brazil dates as far back as 1905 and has gone through many periods of ascension and decline, the current boom had its thrust in the 2003-2008 period, with the introduction of flex-fuel cars – which can run on any combination of gasoline and/or ethanol – and the increase in oil prices on the international market, suddenly making biofuels more competitive. Flex-fuel cars have given consumers the freedom to move between various fuels, based on relative price, shielding them against price volatility in either gasoline or ethanol.

As far as global climate change is concerned, Brazilian sugarcane-ethanol (which accounts for about 95 percent of the country's biofuel production) also seems to be a major tool for mitigation. It has been estimated that its utilization creates about 80 percent less greenhouse gas emissions than gasoline. This does not account for eventual emissions provoked by land-use change, i.e., clearing of natural vegetation for expanding sugarcane plantations. However, this has seldom been the case in the sugarcane sector. As a safeguard, the government in 2010 launched a Sugarcane Agroecological Zoning policy that creates disincentives for encroachment on forests or environmentally-sensitive areas. As such, sugarcane-ethanol has efficiently contributed to low-carbon energy development in Brazil.

It is important, however, to have a broader view on sustainable development and go beyond climate only. A more thorough assessment has to recognize additional elements of biofuel production – or, for that matter, of any production system – such as impacts on freshwater, on ecosystems more broadly, and on society and the economy. For instance, in 2009 Brazil became the world's largest consumer of pesticides in agriculture – 713 million litres in a year. In the case of sugarcane, pesticide utilization almost doubled between 2004 and 2008. This, of course, bears a number of impacts on water resources, soil, biodiversity and human health. It is thus important to understand how production systems can become more sustainable on all fronts, as it has on reducing greenhouse gas emissions.

One important move in that direction, made by Brazilian biofuel policy, has been the incorporation of traditional, smallholder farmers into the biodiesel production chains. With its National Programme on the Production and Use of Biodiesel (PNPB) the government has provided regulatory and economic incentives for industries to promote the cultivation of biofuel crops among small farmers, and to establish seed-purchasing contracts with them.

There are important lessons to be learnt, in terms of institutional arrangements and contract design, in order to optimize the results of such partnerships and to avoid drawbacks, such as farmers eventually replacing food cultivation for biofuel crops and becoming exposed to greater food insecurity. However, after initial difficulties, the programme has succeeded in integrating tens of

Above: The growing and processing of sugarcane to produce ethanol, Brasil. Photos reproduced courtesy Shell, Creative Commons /Flickr.

thousands of poor Brazilian farmers, tackling poverty, countering the erosion of traditional smallholder farming and thus reducing rural-urban migration, and promoting a type of agriculture that is far more equitable and sustainable, from both social and ecological standpoints.

The Brazilian biofuel industry therefore has both achievements and challenges to account for. Much has been done to improve its sustainability, and more is still needed. However, the ascension of the country, not only as an emerging economy, but also as a new global player in the energy field is already having international implications – and more are in sight. In Brazil, oil-imports have been almost completely phased out (compared to 80 percent oil import dependence in the 1970s) partly due to biofuels, allowing the country to have greater economic and political leverage. Over the last few years the country has also become firmly engaged in disseminating biofuel cultivation, policies and technologies in much of Africa and Central America, knowing that an international biofuel market will not become established until there are a larger number of producers. Moreover, it has become a new fuel exporter to traditional oil-importers such as Europe and China. Even if in absolute terms the volume of biofuel trade is still small compared to overall fossil fuel consumption, it has certainly started to appropriate some of the power wielded by oil-exporting countries. One of the lessons seems to be that the environmental qualities and benefits of renewable energies should not overshadow the economic and ultimately political implications.

The emergent energy transition toward renewables is one of the most important global changes taking place, and Brazil is at the forefront of this trend. To understand the sustainable development and geopolitical implications of this movement is of crucial importance. A closer examination of the Brazilian case may thus offer many valuable lessons to a worldwide audience.

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## Notes

1 Amineh, M.P. & Yang Guang (eds.) 2012. *Secure Oil and Alternative Energy: The Geopolitics of Energy Paths of China and the European Union*. Leiden-Boston-London: Brill Academic Publishers.