



Brazil determined to increase role of biofuels

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Determined to boost Brazil's already strong position in biofuels, president Michel Temer has recently sanctioned the RenovaBio program. Besides energy security and jobs, the program intends to contribute to Brazil's promises at the climate conference COP21 in Paris. Meanwhile, the collaboration with the Netherlands in the development of advanced biofuels continues to grow, as this article shows.

New federal policy to stimulate biofuels

In December 2017, Brazil's president Michel Temer sanctioned a new law establishing the RenovaBio program which is expected to boost the use of biofuels. The origin of this law is Brazil's commitment to further 'decarbonize' its energy matrix, as agreed at the climate conference in Paris (COP21). Brazil has committed itself to, by 2030, a 43% reduction in greenhouse gas emissions (versus 2005 levels) and a 45% share of renewable energy in the country's energy matrix with biofuels representing 18%.

RenovaBio will set annual national carbon reduction targets for a period of at least 10 years. This national target is then translated into targets for individual fuel distributors, depending on their share in the fossil fuels market, who then need to buy so-called emission reduction certificates to comply with their targets (otherwise, they are fined). Meanwhile biofuel producers will be audited on a mill-by-mill basis and receive a number of certificates, depending on actual fuel production volumes and production efficiencies. In other words, these certificates are based on actual emissions associated to these fuels (bioethanol, biodiesel but also bioenergy and biogas). Fuel distributors can acquire these certificates directly by purchasing biofuels or indirectly via a secondary market from parties that have a surplus. Brazil's National Economic Policy Council will oversee the relationship between demand and supply.

The bioenergy sector is content to see this law come into force. The sugar cane industry, represented by UNICA, expects that RenovaBio will significantly boost investments in biofuels, by increasing demand and providing long-term stability; a boost deemed necessary for the currently stagnating sector which had a hard time competing with fossil fuels in recent years.

Research institutes are hopeful the RenovaBio program will stimulate further R&D in biofuels and closer collaboration between research and industry. Researchers from Brazil's largest agricultural research institute Embrapa, the University of Campinas (Unicamp) and Brazilian Bioethanol Science and Technology Laboratory (CTBE), are already involved in RenovaBio. Together, they are developing the protocol to evaluate the environmental performance of biofuels, using a new model called RenovaCalc.

Brazil aspires to have the RenovaBio program fully operational in 2020. The ministry of Mines & Energy (MME) expects that the program will eventually generate around 1 million jobs along the total value chain (from feedstock production to fuel distribution). The Brazilian consultant Datagro estimates that RenovaBio is able to increase domestic demand for bioethanol to 40 billion liters in 2030.

Under the program, imported fuels can also be certified. At this moment, it's unclear how imported biofuels would compare to Brazilian bioethanol in terms of emissions. NB: In many aspects, RenovaBio is inspired by California's Low Carbon Fuel Standard (LCFS) program and that program assigns a better carbon rating to Brazilian sugarcane ethanol than to corn ethanol from the USA.

The law foresees a two year period for full implementation of the program, likely due to the many steps that still have to be taken with many actors involved. Furthermore, RaboResearch Food & Agrobusiness identified other complexities such as external influences of e.g. oil and sugar markets on the pricing of certificates, the effect the program could have on fuel prices, and the availability of affordable capital to invest in new production capacity. The program can be seen as a sign of Brazil's commitment to combat climate change and to support its biofuels sector. However RaboResearch

expects “a slow and steady expansion of capacity, rather than another boom, if all goes well with RenovaBio and the markets”. As is the case with complex and ambitious programs, its success will depend on the way that the law will be implemented, and time will tell if RenovaBio is able to live up to current, high expectations.

Brazil launches international Biofuture Platform

At the climate conference COP22, Brazil launched an international platform called Biofuture, with the mission to accelerate the transition to a global biobased economy. Currently the platform has 20 member countries, including the Netherlands. At the climate conference COP23 in Berlin, a joint declaration was signed, underlining the importance of increasing the role of biobased energy sources and bioproducts and the urgency to take actions.

Brazil already has a unique position in biofuels

Brazil’s energy matrix already has 41% of renewable energy, of which 17,2% is related to sugarcane, the most important bioenergy source. In 2017 Brazil produced around 27 billion liters of sugarcane ethanol and around 9% of Brazil’s electricity is based on biomass. Brazil is in the unique position of having 4 decades of experience in developing and using biofuels and 15 years of experience with flex fuel vehicles (vehicles that run on ethanol or gasoline or any mixture of these fuels) which currently dominate the market.

This position has in part been acquired by great advances in science and innovation, which makes Brazil an excellent academic partner for Dutch researchers for many years now. The Science Foundation of the State of São Paulo (FAPESP) sees an important role for biofuels in a sustainable energy matrix. According to FAPESP, it is as integral part of a biobased economy. Therefore, in addition to providing around 400 scholarships in this field, they have invested around €20 million so far through its bioenergy program called BIOEN, which was established in 2008. In recent years, FAPESP has launched no less than 6 Biobased Economy calls with Dutch partners such as the science foundation NWO and public-private consortium BE-Basic (TKI-BBE).

Brazil and the Netherlands jointly tackling challenges for advanced biofuels

Part of these investments are aimed at “advanced biofuels”, i.e. sustainable biofuels from non-food feedstock, for transport applications (road, air, water). Although Brazil currently has two ‘commercial’ production plants of so-called 2nd generation biofuels (operated by Granbio, using technology from the Dutch company DSM, and by Raízen, a joint venture between Cosan and Shell), there are still several challenges ahead in order to compete with today’s fuels.

A recent study done by the Brazilian Bioethanol Science and Technology Laboratory (CTBE), commissioned by the Brazilian national development bank BNDES, concludes that 2nd generation ethanol (or cellulosic ethanol) could become economically viable in 2025, provided certain advances are made in agriculture and industrial technologies and if the Brazilian bioethanol sector can overcome its current stagnation. Advances such as:

- Reduction of production costs of biomass (relevant for all biofuels), further integration of agricultural and industrial systems to fully use a feedstock and alternative crops to enable industrial operation all year round.
- Reduction of capital costs for industrial plants, in which the lessons learned from the first plants (as always) play an important role. One aspect is the optimal technological route for 2G ethanol, e.g. a stand-alone 2G plant (the Granbio project) or an add-on where a 2G unit is integrated with an existing bioethanol plant (the Raízen project).
- Technological breakthroughs in for example pretreatment of biomass (i.e. preparing biomass residues for the extraction of sugars) and optimization of the conversion of so-called pentose sugars, originating from the hemicellulose in the feedstock.

Several of these topics will be addressed in the recently approved EU-Brazil H2020 project on advanced lignocellulosic biofuels, composed of the BioVALUE consortium on the Brazilian side (led by CTBE) and the BECOOL consortium on the European side (with three Dutch partners: Energy research Center of the Netherlands, Wageningen University and Biomass Technology Group).

Dutch presence at Brazil’s largest bioenergy conference

Advances and challenges in this field were among the main topics of the third edition of the Brazilian Bioenergy Science and Technology Conference (BBEST), which took place in Brazil in October 2017. With around 400 participants from 13 countries (including 6 from the Netherlands), BBEST is one of the largest events of its kind in the world. This 3rd edition was co-chaired by a Brazilian and Dutch biobased economy expert.

The Brazilian press paid special attention to recent research on the sustainability of biofuels, done by the Netherlands Institute for Ecology (NIOO-KNAW) with Brazilian partners such as the Agronomics Institute of Campinas (IAC). This work is focused on soil ecology in sugar cane cultures, in particular on nitrogen cycles, since nitrogen emissions from the soil (in the form of N₂O) strongly contribute to global warming. NIOO and its partners target to understand the role of micro-organisms in the soil, the presence of straw on top of the soil, and different ways to apply fertilizers in order to minimize emissions. NIOO and partner IAC will further share and discuss their knowledge on this matter during a workshop "Soil sustainability in a biobased society" which will take place in Campinas, Brazil in February 2018.

Besides NIOO, the Dutch company Corbion came into the spotlight at this conference, as sponsor of the Global Biobased Business competition (G-BiB), a student competition for best business plan for sustainable production of biorenewable products such as biofuels and biomaterials. Corbion is already active in Brazil and has recently acquired, via the purchase of Terravia, other production assets in Brazil (formerly owned by Solazymes).

Transport: electric or fuels

At the BBEST conference, panelists also compared fuel-based and electric road transport. In this comparison overall energy density (energy carrier, storage and drive train) favors the liquid fuels, at least for the near future. It's therefore expected that there will be a demand for both types of transport, depending on energy requirements (due to distance or weight).

The introduction of fully electric cars in Brazil has a relatively slow start and the cars that do appear are imported. Brazil seems to be, for several reasons, more focused on improving flex fuel cars and using ethanol to charge hybrid vehicles. An example of this focus is the 10-year R&D program on the development and optimization of internal combustion engines particularly for biofuels, jointly funded by the science foundation FAPESP and Peugeot Citroen do Brasil. The program is expected to have a total volume of €8 million. The recently established Research Center for Gas Innovation, funded by Shell and FAPESP, includes a project on developing a so-called penta-fuel flex engine (petrol, petrol/ethanol mix, ethanol, natural gas and electricity). In addition, car manufacturer Toyota is said to be finalizing a prototype of a flex-fuel hybrid engine which could be launched in Brazil in 2019. Brazilian Toyota engineers have adapted an imported hybrid car to run on ethanol and are planning road tests in the first half of 2018.

More information

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