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BRAZIL LOSES THE RACE IN CELLULOSIC ETHANOL

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Brazil is a pioneer in the production of first generation ethanol from sugar cane, and is currently the second largest producer of ethanol. However, as for the second-generation ethanol-extracted from the pulp of biofuel agricultural residues such as sugarcane bagasse, corn cobs and wood-the country does not display the same prominence previously occurred, when referenced in international networks of scientific collaboration dedicated to overcome bottlenecks in the production of ethanol from cellulose.

Article published in the journal *Scientometrics* indicates that Brazilian science is at a disadvantage in this race competitors countries. Is signed by researchers at the University of Campinas (Unicamp) and the Escola Superior de Agricultura "Luiz de Queiroz (Esalq) of the University of São Paulo (USP). The work mapped published scientific articles in the world during 30 years on second-generation ethanol. 6,053 reviewed scientific articles from the database Web of Science published until 2012. The innovation systems of countries like United States, China and Germany have more expressive presence on these networks than Brazil, according to the survey.

According to one of the authors of the article, the economist Luiz Gustavo Antônio de Souza, *"scientific knowledge is rarely produced in isolation and relies on collaboration between various institutions and countries to advance"*. And he adds: *"there is a proven technology, but alternative packages in studies, the exploration of opportunities depends on the cooperation of various groups"*. Already according to professor José Maria Ferreira Jardim da Silveira, of the Instituto de Economia da Universidade Estadual de Campinas, *"the Brazil, apart from the difficulty in participating in research networks, also has to involve the business sector"*.

However, the Brazilian research stands out when the analysis focuses on institutions. The USP is the third strongest institution in collaboration, after the United States Department of Agriculture and the University of California. Institutions such as

Unicamp and Universidade Federal de São Carlos also appear in the chart. Other institutions also contribute, though less expressive. Has the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), through the FAPESP program of research in Bioenergy (Bioen), the National Institute of science and technology (INCT) of bioethanol, the Biological processes and industrial center for biofuels (CeProBIO).

In the field of technological application, the National Laboratory of Bioethanol Science and Technology (CTBE), acronym in Portuguese, in Campinas, has set up a pilot plant of second-generation ethanol to assess proposals and technologies marketed in the world.

In enterprise search, an important initiative is the plan to Support Technological Innovation in the Sugar/energy Sector and Industrial Sucroquímico (Paiss), acronym in Portuguese, released in 2011 by the Banco Nacional de Desenvolvimento Econômico e Social (BNDES) and the Financiadora de Estudos e Projetos (Finep), which provided R\$ 3 billion for biomass processing technologies.

This portfolio of projects there is some demonstration plants for the production of second-generation ethanol: the GranBio company, installed in 2014 in São Miguel dos Campos, Alagoas; the of Raízen, which began producing power plant Costa Pinto, in Piracicaba; and the Abengoa which will begin operating in 2016 in Pirassununga, both in São Paulo. The Sugar Cane Technology Center (CTC) acronym in Portuguese has a smaller scale, in the municipality of São Paulo São Manoel.

In common these plants operate with technologies developed abroad through foreign companies: the DSM, the Netherlands provides yeast; Novozymes, Denmark, provides enzymes for hydrolysis; the Italian Beta Renewables is the responsible for the pre-treatment of biomass systems.

Factors that contribute to the Brazil won't be on the front line in the polls of the second-generation ethanol, are: a) the bagasse and sugarcane straw is the raw material used in milling plants to generate power, which reduces production costs and uncertainty about the energy blackouts prowl the country; b) freezing the price of petrol to prevent inflation pressure is negative to the ethanol that is the replacement of gasoline by reducing their consumption; c) since 2008 were closed about of 80 plants and 67 are in reorganization, part still in operation and other inactive, which creates instability in the sector; d) according to Elizabeth Farina, Director President of the sugar cane industry Union (Only), 369 plants operating today in the country, but estimates that this year there's the closure-which need not be set in stone – 15 more plants.

But regardless of these short-term factors that hinder the production and stability of its productive chain, ethanol is a fuel that is here to stay because of increasingly aspects taken into consideration as a clean energy matrix and sustainable production through biomass. Brazil will have major stake in them, and even more so because it has available to expand the production area.

Even the oil "reigning" in the last century as the principal international energy matrix, and in particular for motor vehicles, this position began to change. Currently the world is going through changes that put the environment and the sustainable

production as variables of growing political and economic importance, each time on the agenda of the discussions.

In this new scenario of the globalized 21st century societies opens up significant space for the expansion of a strong market for alternative energy sources, with emphasis on biofuels and, in particular, ethanol and biodiesel, considered less pollutants.

In 2010, the global demand for ethanol, for example, amounted to about one million barrels per day in 2035, will be 3.4 million barrels. The increase must come from different countries. In the USA, the volume will increase to 600 thousand barrels to 1.4 million per day. Europe, which consumed virtually no ethanol, will need about 200 thousand barrels within the next three decades.

Total anthropogenic emissions (resulting from human action), in 2011, associated with the Brazilian energy matrix has reached 395.8 MtCO₂-EQ. Being most of that value (192.0-MtCO₂ eq) generated in the transport sector. The carbon intensity of the Brazilian economy, in 2011, was 0.16 kg CO₂/\$, which means that, on average, our economy is about 2.0 times less carbon intensive than the USA economy, 1.4 times less than the European economy, and 2.8 times less than the Chinese economy.

In that context, Brazil stands out, with ethanol, in a very advantageous position, as was a pioneer in the field of this technology, with the creation of the Proálcool, in 1975, and putting himself in the position of second largest producer and leading exporter of ethanol in the world. According to the energy research company-EPE, the Ministry of mines and energy in its energy balance of Brazil -2012, total energy supply was 272.3 million tonnes of oil equivalent (Mtoe), with the participation of renewable energies in electricity production in the country, increased 2.5% in 2011, reaching 88.8%. However, the competition between international prices of sugar and ethanol in Brazil, always made it difficult the control of supply of this fuel in Brazil.

It is observed that the current position of Brazil in search of cellulosic ethanol will tend to change in view of the potential of this biofuel and also by the conditions of the country for their production. The oil as energy matrix will not keep the lead which he held in the last century. But the country needs not just in the speech or in good intentions, is pressing to be done long-term planning, and for both the role of society to understand the subject and act politically is critical.