SHADES OF GREEN (IV)

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Sustainable Agriculture in Brazil

CHAPTER 4 - RENEWABLE AGRO-ENERGY

AGRICULTURE AND THE BRAZILIAN ENERGY MATRIX

Brazil has one of the Earth's cleanest energy matrixes, thanks to agriculture[1]. The renewable energy generated by the biomass produced by agriculture and livestock raising alone accounts for about 30% of the Brazilian energy matrix, equivalent to 250 million metric tons of oil (toe)[2]. At least 75 million tons per year in agroenergy[3]!

What is agroenergy? ln a nutshell, agroenergy is solar energy transformed into chemical energy by plants through photosynthesis. Essentially, it is stored in stems, leaves and fruit or in fat from plant-fed animals.

At the base of agroenergy is the production of solid (firewood and charcoal), liquid (ethanol and biodiesel) and gaseous (biogas) fuels, not counting so-called bioelectricity (cogeneration of electric energy).

The sustainability of Brazilian agroenergy lies not only in this primary production, it also lies in the fact that agriculturists choose suitable crops and cultivars and also use innovative technologies to reduce energy consumption and carbon emissions in the process of planting, treating and harvesting. ln Brazil, agriculture consumes, on average, only 4.0% of fossil energy from the energy matrix (to move tractors and machinery, for example), and it produces more than 30% of the total energy used in the country.

The balance is positive and sustainable. Agriculture, by the way, is the sector that consumes the least amount of energy in the national matrix (4.0%). lndustry leads in energy consumption (33.0%), followed by the transportation sector (32.4%) and households (9.7%).

Such efficiency in Brazilian agroenergy is only possible thanks to technified tropical crops. The production cycles are long in the intertropical zone (there is adequate sunlight and proper temperatures all year long!). This allows plants to accumulate more chemical energy throughout the year. In temperate countries, the number of hours of sunlight falls considerably in autumn and winter, and low temperatures limit photosynthetic activity to a maximum of 120 days per year (spring and summer). Therefore, it is only possible to grow short cycle crops – wheat, oats, corn and oilseeds. This is only one third or even one quarter of the time used annually by sugarcane, energy forests (eucalyptus and pine) and other tropical long cycle crops (manioc, oil palm, pasture). Photosynthesis in these tropical crops is almost constant throughout the year.

In addition, long cycle crops occupy the land for several years until they are renewed, which is another of the factors that reduce energy consumption and carbon emissions in the tropics. Short cycle crops, on the other hand, must be planted annually, with higher fossil fuel consumption for land preparation, input use, and other resultant environmental impacts.

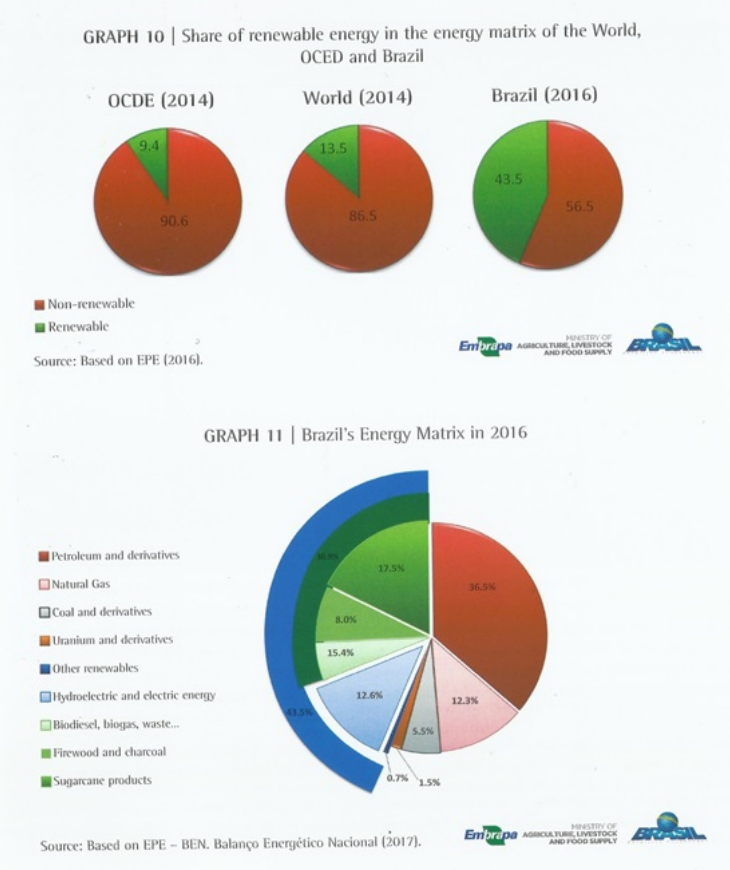
THE ENERGY MATRIX OF THE OECD, THE WORLD AND BRAZIL

In 2016, 43.5% of Brazil's energy came from renewable sources, whereas the world average was 13.5%. The energy coming from countries belonging to the Organization for Economic Co-operation and Development (OECD) was only 9.4% (Figure 40). In other words, more than 90% of the energy used in developed countries derives from non-renewable fossil fuels (oil, gas and coal), which emit high amounts of CO2 and other polluting gases, or it comes from nuclear power plants.

The sustainability and volume of agroenergy in Brazil can be illustrated by one fact among several others: sugarcane alone guarantees about 50 million annual toe. It contributes more to the country's energy matrix[4] than all of its hydroelectric plants combined (Figure 41). By order, in 2016, contributions to the renewable part of the Brazilian energy matrix were: sugarcane (ethanol and cogeneration of electricity): 17.5%; hydroelectric plants: 12.6%; energy forestry (firewood and charcoal): 8.0%, and vegetable oils (soybeans, cotton …) plus beef tallow in biodiesel, energy exploitation from agricultural wastes and other renewable sources such as wind and solar: 5.4%[5].

A LOW CARBON ECONOMY

In low carbon economy terms, Brazil's situation is enviable. In 2016, emissions associated with the Brazilian energy matrix were equivalent to 428.95 million tons of carbon dioxide (Mt CO2 -eq), with the largest amount (194.3 Mt CO2 -eq) generated by the transportation sector.



(https://panamazonsynodwatch.info/wp-content/uploads/2019/09/Carbon.jpg)

The carbon intensity in the Brazilian economy was 0.15 kg of carbon per dollar produced or CO2/US$ ppp[1]. Brazil remains less carbon intensive than the European (-11%), the USA (-50%) and the Chinese (-70%) economies, according to data from the 2014 USA Energy Information Administration (EIA)[2]. Brazil's electric sector emitted, on average, 101.3 kg CO2 to produce 1 MWh, a very low amount when compared with countries of the European Union, the USA and China.

There are some partial sectoral analyses – such as methane emissions from cattle excrement – whose figures suggest an unfavorable balance for livestock raising. However, if all the data (emissions x abduction) are analyzed together and according to international parameters, Brazil's low carbon economy is, in fact, anchored in agriculture and livestock raising. And this is due to the large-scale production of solid (firewood and charcoal), liquid (ethanol and biodiesel) and gaseous (biogas) fuels and bioelectricity (cogeneration).

From the book: Shades of Green – Sustainable Agriculture in Brazil (2018)

[1] The electric matrix is only a share of the energy matrix, which sums all energy resources of a given country and period of time used by every productive processes, transport, consumption etc. It is similar to the concept of Total Primary Energy Supply (TPES).
[2] The figures regarding the energy matrix are subject to annual variations due to fluctuations in economic activity, rainfall (hydroelectric) and other factors. They are presented in detail in the National Energy Balance (Balanço Energético Nacional – BEN), according to international standards, by the Energy Research Company (Empresa Pesquisa em Energia – EPE).
[3] BRASIL. Balanço Energético Nacional – 2017. Ano-base 2016. Ministério de Minas e Energia. Available at: https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_20 1 7.pdf.
[4] (https://panamazonsynodwatch.info/?p=2185&elementor-preview=2185&ver=1567519824#_ftnref1) BRASIL. *Balanço Energético Nacional – 2017.* Ano-base 2016. Ministério de Minas e Energia. Available at: <https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_2017 .pdf>.
[5] (https://panamazonsynodwatch.info/?p=2185&elementor-preview=2185&ver=1567519824#_ftnref2) Idem.
[6] PPP = purchasing-power price.
[7] EIA. U.S. Energy Administration. Available at: https://www.eia.gov/ (https://www.eia.gov/). Acess in Sep. 2017.

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