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Environmental Impacts Assessment of Biodiesel Production from Soybean in Brazil

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Abstract

This paper presents the results of the environmental impacts of biodiesel production from soybean in Brazil. For this objective it were used the environmental impact indicators provided by energy accounting method, the embodied energy analysis and the material flow accounting. Results show that energy content in a liter of biodiesel is only 2.3 times greater than the fossil-based energy required to produce it. The transformity of biodiesel ($4.59E+05$ seJ/J) is higher than those calculated for fossil fuels (coal, $6.70E+04$ seJ/J; natural gas, $8.04E+04$ seJ/J; oil $9.05E+04$ seJ/J; gasoline and diesel, $1.11E+05$ seJ/J) and also for other biofuels (Ethanol from sugarcane, $3.15E+05$ seJ/J; Biodiesel from sunflower, $2.31E+05$ seJ/J) indicating a higher demand for resources. Similarly, the biodiesel energy yield ratio was 1.46, while it ranges from 3 to 7 for fossil fuels indicating lower net energy that is delivered to consumers. When crop production and industrial conversion to fuel are supported by fossil fuels (considered as non renewable energy sources) in the form of chemicals, goods, and process energy, the fraction of fuel that is actually renewable is low (around 25%). In this way, the future of biodiesel production is very likely to be linked to the ability of clustering biofuels production with other agro industrial activities at an appropriate scale and mode of production to take advantage of the potential supply of valuable co-products.

Keywords: Energy accounting; Energy balance; Material flow accounting; Soybean Biodiesel.
