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Fuel ethanol production from sugarcane and corn: Comparative analysis for a Colombian case

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Abstract

The Colombian government has defined the use of bioethanol as a gasoline enhancer to reduce greenhouse gases, gasoline imports, and to boost the rural economy. To meet the projected fuel ethanol demand needed to oxygenate the gasoline in the whole country, the construction of about five additional ethanol production plants is required. For this, a comparative analysis of the technological options using different feedstocks should be performed. In this work, a comparison of the economical and environmental performance of the ethanol production process from sugarcane and corn under Colombian conditions has been carried out. Net present value and total output rate of potential environmental impact were used as the economical and environmental indicators, respectively. Through the integration of these indicators into one index by using the analytical hierarchy process (AHP) approach, sugarcane ethanol process was

determined as the best choice for Colombian ethanol production facilities. AHP scores obtained in this study for sugarcane and corn ethanol were 0.571 and 0.429, respectively. However, starchy crops like corn, cassava or potatoes used as feedstock for ethanol production could potentially cause a higher impact on the rural communities and boost their economies if social matters are considered.

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Keywords

Economic evaluation; Environmental assessment; Fuel ethanol; Sugarcane; Corn

Abbreviations

AHP, analytic hierarchy process; ATP, aquatic toxicity potential; AP, acidification potential ; BOD, biological oxygen demand; CFBC/TG, circulating fluidized bed combustor/turbogenerator; DDGS, distiller's dried grains with solubles; GWP, global warming potential; HTPE, human toxicity potential by inhalation or dermal exposure; HTPI, human toxicity potential by ingestion; IRR, internal rate of return; LCA, life cycle assessment; MESH, mass; equilibrium; summation; and heat; NPV, net present value; NREL, National Renewable Energy Laboratory; NRTL, non-random two-liquid; ODP, ozone depletion potential; PCOP, photochemical oxidation potential; PEI, potential environmental impact; PSA, pressure swing adsorption; SSF, simultaneous saccharification and fermentation; Ton, metric tonne; TTP, terrestrial toxicity potential; USEPA, Environmental Protection Agency of the United States

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