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A hierarchical techno-economic sensitivity approach for evaluation of agroindustrial production chains

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Abstract: Sustainability of agroindustrial production chains presents high volatilities owing to the nature of feedstocks which are mainly commodities with uncertainties in costs and social problems generated in rural areas. In this work, a hierarchical technoeconomic sensitivity approach for evaluation of agroindustrial production chains is introduced; in a first stage, a technoeconomic evaluation is performed for finding economic indicators of the production chain, if results are suitable, a break-even analysis is performed for statement of technoeconomic reference stage, and finally, a technoeconomic sensitivity analysis previously developed by authors is performed taking into account critical parameters as on-stream efficiency at the break-even point, cost of raw materials, normalized variable operating costs among others, and analyzing its effect on economic indicators calculated in step 1. A case study for methodology application is presented for palm oil production chain. Results shows in first stage that for a processing capacity of 240,000 tons per year of palm bunch with a plant life of 15 years, the plant is an attractive project due to the annual sales (43.24 MM US$/y) are almost 50 % higher that the annualized operating cost (19.37 MM US$/y), making that ROI and NPV be 49.30 % and 369.85 MM$/y, respectively. In second step, technoeconomic reference stage was found in 50,000 t/y for production capacity and 1,667hours. In third step, analyzing on-stream efficiency, it was observed that plant has a broad range of possibilities to assign prices to its product between 680 and 980 US$/t, and it will tolerate a significant increase in the raw material price up to 100 US$/t. Finally, the plant can support high changes in NVOC, however, if they come up to 167 US$/t, there will be no return on investment, the plant will lose all its feasibility and the payback period will be higher than 19 years.
Keywords: Agroindustrial production chains, Hierarchical Process Evaluation, Techno-economic sensitivity, Plant Profitability.

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