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**Abstract**

The environmental impacts resulting from the cradle-to-grave life cycles of *Enteromorpha prolifera* macroalgae and cattle manure biorefineries are assessed and compared. Sensitivity analysis is carried out to evaluate the response of the impacts to changes in biogas application by using Simapro 7.3.3. Three scenarios are considered in the biorefineries. In the first and second scenarios, the biogas produced is considered to be used for electricity production and transportation, respectively. In the third scenario, the biogas is considered to be recycled back to the systems. Process energy requirements and transportation of inputs contribute the largest share of the overall impacts. The cattle manure biorefinery is slightly more eco-friendly than the macroalgae biorefinery in Scenarios 1 and 2 because it requires more eco-friendly inputs. However, the macroalgae biorefinery becomes more eco-friendly than the cattle manure biorefinery in Scenario 3 because macroalgae require less energy and water for biogas production.

**Keywords:** LCA; macroalgae; cattle manure; biogas; environmental impact.

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