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8592 words from Introduction to Conclusions

Greenhouse gas emissions related to biodiesel from traditional soybean farming compared to integrated crop-livestock systems

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Highlights

- Life cycle assessment of soybean biodiesel in Central Brazil was based on primary data
- Emissions assessment from different integrated farming systems was carried out
- Sub-process division, system expansion and allocation were used to apportion emissions
- More frequent rotation (crop/livestock) and types of management affect emissions
- Integrated farming systems optimize land use with crops recovering degraded pastures

Abstract

Biodiesel has great potential to reduce greenhouse gas emissions, as an alternative to fossil diesel. However, its production occurs under different agricultural systems, with different levels of emissions in the farming phase. Integrated crop-livestock systems can play an important role in this sense, since they combine livestock with crop farming, optimizing land and input usage, with good potential to reduce total emissions from energy and food agriculture. This study compares integrated crop-livestock systems with traditional soybean farming systems regarding biodiesel production, through life-cycle assessment. Additionally, it compares different integrated crop-livestock systems in Central Brazil, to evaluate their impact regarding greenhouse gas emissions. The life cycle assessment performed adopts two approaches to apportion the farming phase emissions (sub-process division and system expansion), as well as two functional units (emissions per hectare and per kilogram of biodiesel). The system expansion approach appears to be the most suitable because the studied agropastoral systems have strong reciprocal relationship and exchange of benefits among the different farming activities. This approach also considers co-products as avoided products, showing that the whole integrated system is environmentally more attractive due to negative emissions. When analyzing only biodiesel production, results show no substantial difference between traditional and integrated systems. Therefore, the factors with the greatest impact on biodiesel production, concerning GHG emissions, are the frequency of rotation (pasture/crop) and type of management in the agricultural system.

Keywords

Biodiesel, Soybean, Greenhouse gases (GHG) emissions, Life Cycle Assessment (LCA), Integrated Crop-livestock system (ICLS).

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