Do bioenergy systems mitigate climate change: insights from Life Cycle Assessment

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Abstract

Biomass and bioenergy systems have come under increasing scrutiny due to the urgent need to replace fossil fuels in order to mitigate climate change. This paper aims to clarify the importance of choices related to key methodological issues in climate impact assessment, and demonstrates the dependency of climate-change results on i) the inventory-modelling approach adopted, ii) land use reference system, iii) indirect land-use change, iv) inclusion of biogenic carbon flows and v) method applied for time-accounting. Life Cycle Assessment (LCA) is a methodological framework used to assess a range of environmental, social and economic impacts of product systems (e.g. climate effects). LCA is the established framework with which to assess the climate effects of biomass and bioenergy systems. However, the above methodological choices required when performing an LCA study have significant impact on the results and their interpretation. Furthermore, these methodological choices are the topic of ongoing debate, so there is no unambiguous and agreed guidance to practitioners. Consequently, the climate effects of a bioenergy system have been reported as both positive and negative relative to its fossil counterpart; the inconsistent handling of the methodological choices above has made the climate benefits of biomass and bioenergy systems inconclusive.

***Miguel Brandão** is Associate Professor in Industrial Ecology and Life Cycle Assessment at KTH, Stockholm. Over the last 10 years, he has taught and/or researched on Life Cycle Assessment (LCA) at a number of organisations around the world. His main interest is on the use of industrial ecology and life cycle approaches to support decision-making regarding our transition towards a sustainable society. His research has focused on the integrated sustainability assessment of land-use systems, with emphasis on their impact on climate change, resource depletion, ecosystem services and biodiversity. Other research interests include Sustainable Development, Environmental and Ecological Economics, Industrial Ecology, Agroecology, Life Cycle Assessment, Material and Energy Flow Analysis, Sustainable Production and Consumption, Globalisation, Poverty, Food Security and Bioenergy.*

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