

Organic Agriculture and the Production of Biomass for Energy Use

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Abstract

Modern bioenergy is seen as a promising option to curb greenhouse gas emissions. There is, however, a potential competition for land and water between bioenergy and food crops. Another question is whether biomass for energy use can be produced sustainably given the current conventional agricultural practices. Other than the land and water competition, this question is neglected in scenarios to meet a significant part of global energy demand with bioenergy. This article combines results from several disciplines to address this question, reviews the current state of knowledge, and identifies research gaps.

Organic agriculture (OA) is one sustainable alternative to avoid the negative environmental effects often caused by conventional agriculture. Yet, burning significant quantities of organic matter - inherent in bioenergy use, where the carbon cycle is closed on the level of inorganic chemistry by burning - is incompatible with the principles of OA, where the nitrogen and carbon cycles are closed on an organic chemistry level by microbial decomposition processes. Thus, meeting significant parts of global energy demand with biomass grown organically may not be possible. Due to the dependence of OA on biomass input, bioenergy based on large-scale use of agricultural waste may not be sustainable. There may therefore be a trade-off between strategies to increase bioenergy use and those to increase sustainability in agriculture.

*Further assessment of this critique is necessary, as there are promising proposals for bioenergy generation in the context of or not interfering with OA systems. On-farm biogas digesters and using biomass from forestry are well-established options. Growing certain types of biomass such as *Jatropha* on marginal lands or between other crops is another possibility. Besides providing biomass for energy use, such crops generate additional income possibilities and increase diversity and stability of agro-ecosystems. These are important contributions to sustainable development strategies for agricultural communities, especially in the context of adaptation to climate change in the south. However, on-farm biogas digesters are likely to produce enough energy for on-farm use only. Biomass from forestry or from marginal lands without or with very low nutrient inputs may not produce yields high enough to play any significant role in replacing large parts of global energy supply through bioenergy. Similarly, *Jatropha* hedges grown between plots of other crops may cover too small areas to contribute to this either. However, this needs to be further assessed in detail for the different crops, cultivation systems and climatic zones.*

This article does not criticize bioenergy in general. Some bioenergy production definitely has a potential as part of or not interfering with OA. This paper points to additional, not yet acknowledged potential dangers of bioenergy as a strategy to meet significant parts of world energy demand.

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