

Regional integrated assessment of environmental and socio-economic impacts of biofuel production demonstrated for Mozambique.

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Dedicated bioenergy crops are expected to become the main contributors to future bioenergy supplies. Large scale deployment of biomass for bioenergy could contribute to GHG emission reduction, energy security, rural development and restoration of degraded lands. However, an increased implementation of dedicated bioenergy crop production could also have significant adverse socio-economic and environmental impacts such as deforestation, loss of carbon sinks, biodiversity and other ecosystem functions and services, increased competition for land and higher food prices. Many of these impacts are related to land use change (LUC). Therefore, expansion of bioenergy in the absence of monitoring and good governance of land use carries the risk of significant adverse environmental and socio-economic impacts.

The type and magnitude of the environmental and socio-economic impacts depend on the design of the biomass supply chain (type of feedstock, plantation management, logistics, conversion plants, and distribution) but also on the biophysical and socio-economic context of the region of implementation. As these characteristics are spatially heterogeneous, the sustainability of biomass supply chains should be assessed at a local or regional level.

A methodological framework has been developed to perform an ex-ante regional assessment of potential environmental (e.g. GHG emissions and impact on soil, water and biodiversity) and socio-economic impacts (e.g. economic viability, rural development, employment) of large scale biofuel production. For all impacts it was aimed for finding an appropriate quantitative method to analyse the potential impacts taking into account the availability of methods and data. The methodological framework is demonstrated for two potential bioenergy supply chains (ethanol production from switchgrass and eucalyptus) in two regions in Mozambique (Gaza-Inhambane and Nampula) under different scenarios (low and high agricultural productivity). The results show large variations in impacts for the different supply chains, the regions, and the scenarios and they show that there are tradeoffs between the impacts.

An ex-ante regional sustainability assessment could help to identify 'go' and 'no-go' areas for bioenergy production and to select suitable bioenergy crops and management regimes. This could contribute to sound land use planning, informed decision making concerning project investments, and to develop strategies to avoid negative impacts and optimise positive environmental and socio-economic impacts.