THE SUSTAINABILITY OF BRAZILIAN ETHANOL – AN ASSESSMENT OF THE POSSIBILITIES FOR CERTIFIED PRODUCTION

Edward Smeets*, Martin Junginger*, André Faaij*, Arnaldo Walter, Paulo Dolzan****

*Copernicus Institute for Sustainable Development - Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands. Corresponding author: Edward Smeets, Email: E.Smeets@chem.uu.nl, phone ++31 30 2537688, fax ++31 30 253 7601.
**State University of Campinas, 13083-970, Campinas, São Paulo, Brazil.

Please refer to this article as: Smeets, E., Juninger, M., Faaij, A., Walter, A., Dolzan, P. (2007) The sustainability of Brazilian ethanol – An assessment of the possibilities and limitations for a sustainable and certified production of ethanol. Biomass and Bioenergy (submitted).

Abstract

In this article the environmental and socio-economical impacts of the production of ethanol from sugarcane in the state of São Paulo (Brazil) are evaluated. Subsequently, an attempt is made to determine to what extend these impacts are a bottleneck for a sustainable and certified ethanol production. 17 environmental and socio-economic areas of concern are analysed. Four parameters are used to evaluate if an area of concern is a bottleneck: (1) the importance of the area of concern, based on the severity of the impact and the frequency of which an aspect is mentioned is the literature as an area of concern, (2) the availability of indicators and criteria, (3) the necessity of improvement strategies to reach compliance with Brazilian and/or (inter)national legislation, standards, guidelines and sustainability criteria, and (4) the impact of these improvement strategies on the costs and potential of ethanol production. 14 areas of concern are classified as a minor or medium bottleneck whose negative impacts can be avoided or reduced at an additional cost of ≤10% for each of the seven areas of concern for which costs have been calculated. Synergy effects and the impact of higher yields can reduce the total additional production costs of compliance with various environmental and socio-economic criteria to +36%. The results also show that the energy input to output ratio can be increased and the greenhouse gas emissions can be reduced by inceasing the ethanol production efficiency (in l/t) and by increasing the use of sugarcane waste for electricity production. Major bottlenecks are the increase in cane production and the resulting impact on biodiversity and the competition with food production. Genetically modified cane is presently being developed, but is at this moment not (yet) applied. Both a ban on and the allowance of the use of genetically modified cane could become a major bottleneck considering the potentially large benefits and disdvantages, both are at this moment highly uncertain. The approach demonstrated in this report provides a useful framework for the development of a practically applicable certification system, but further monitoring and research is required to reduce gaps in knowledge in combination with stakeholder consultation (particularly with respect to the three bottlenecks identified in this article).

Keywords: sugarcane, ethanol, sustainability, certification system.