Second-Generation Biofuels from Lignocellulosic Residues.

Assessing the global potential for sustainable transport fuels until 2030

Diploma Thesis

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Abstract

Today's transport fuel demand is covered mainly by fossil fuels. Over recent years, concerns on energy security and climate change have led to great interest in biofuels as low-carbon alternative to current transport fuels. Public discussions on the sustainability of first-generation biofuels spurred interest in lignocellulose-based second-generation biofuels.

While technology development is advancing, the short- and medium-term feedstock potential has not yet been sufficiently studied and could become a bottleneck for the further development of this new industry. This study presents an assessment of the global technical potential for second-generation biofuels based on agricultural and forestry residues in 2008 and 2030. The assessment is based on FAO crop and timber production data and uses production growth estimates available in literature to project future crop and roundwood production. It includes primary residues from agricultural and forestry in 18 geographical sub-regions and discusses to which extent they can be used in a sustainable manner.

The results presented here indicate that a considerable potential for production of second-generation biofuels from residues exists. The current technical residue potential would have been sufficient for second-generation biofuels to meet between 10.5-16.6 % (256-406 billion litres gasoline equivalent (lge)) of transport fuel demand in 2007. By 2030 the technical potential for second-generation biofuels reaches between 340-360 billion lge of cellulosic-ethanol or BtL-diesel, or up to 540 billion lge of bio-SNG. The regions with the highest second-generation biofuel potential are Eastern Asia and Northern America, followed by Southern Asia. The estimated potential could meet 10.5-16.7 % of total transport fuel demand in 2030 projected in the International Energy Agency's *World Energy Outlook 2009 450 Scenario*. The assessed potential is considerably higher than the projected second-generation biofuel demand of 210 billion lge in this scenario. In combination with internationally agreed certification schemes that are locally implemented, the indicated second-generation biofuel potential could be mobilised without compromising sustainability. At the same time it would provide considerable benefits in terms of GHG-emission reductions and additional income to rural communities. Substantial investment into technology development and feedstock supply concepts is needed to ensure that second-generation biofuels can reach their full potential.

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