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Uncertainty in the potential of biofuel and electricity production from non-food feedstock in Europe

Sylvain Leduc (1), Piera Patrizio (1), Sennai Mesfun (2), Georg Kindermann (1), and Florian Kraxner (1)

(1) International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria (leduc@iiasa.ac.at), (2) RISE Research Institutes of Sweden, Stockholm, Sweden

As a low-carbon energy resource and a carbon management mechanism, biomass is expected to play essential role in the transformation of European energy sector under stringent climate change mitigation accords. In the last two decades, biomass has attracted a growing interest for developing conversion technologies that generate bioenergy and biofuels using different types of non-food feedstock like forest residues. The efficient utilization of modern bioenergy technologies will be of high importance for the future development of the European energy supply system, especially in balancing out fluctuations in energy generation from other renewable sources like wind and solar.

The present study investigates the potential of non-food and non-industrial biomass feedstock for energy purpose in Europe and evaluates the techno-economic feasibility of converting the identified feedstock to energy products. A geographic explicit techno-economic model, BeWhere (www.iiasa.ac.at/bewhere), has been developed at the European scale at a 40km grid size, to assess the potential of bioenergy and biofuel from non-food feedstock. Based on the minimization of the supply chain from feedstock collection to the final energy product distribution, the model identifies the optimal bioenergy production plants in terms of spatial location, technology and capacity. The feedstocks of interests are woody biomass based on different database, one derived from the S2Biom project, and the second one from the Global forest model developed at IIASA (www.iiasa.ac.at/g4m). For each type of feedstock, one or multiple technologies can be applied for either heat, electricity or biofuel production.

The model is run for different policy tools such as carbon cost, biofuel production incentives, or subsidies. The optimal mix of technologies and biomass needed is optimized to reach a production cost competitive against the actual reference system which is fossil fuel based. At the same time, the impact of the trades on the European bioenergy potential is investigated.

The results will highlight the uncertainty that lies in the potential of production of biofuel and bio-electricity at the European and the country level based on diverse policy scenarios.