Novel lignocellulosic value chains – A sustainable solution for a developing bioeconomy?

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Climate change and the ongoing depletion of fossil resources emphasize the need for a shift from a fossil-based economy to a bioeconomy based on renewable resources. However, as the debate about the sustainability of first generation biofuels based on conventional starch or oil crops showed, the biobased alternatives are not per se more environmentally friendly than their fossil-based counterparts. Therefore the questions remain if the bioeconomy can contribute significantly to CO₂ emission reduction targets and which trade-offs with other environmental impact categories might occur.

The sustainability of biobased value chains is strongly impacted by the biomass cultivation as well as the further processing. Perennial lignocellulosic crops often have a better environmental performance in comparison to conventional annual crops. In addition, perennial crops such as miscanthus can be cultivated on marginal land, which is unsuitable for the production of food crops. Currently there are several different conversion pathways for lignocellulosic biomass under development or in commercialization such as the production of bioethanol, construction material or basic chemicals.

In this presentation the environmental sustainability of several lignocellulosic crop-based value chains will be assessed. In addition, hot-spots and decisive methodological choices will be critically discussed. The results of these assessments show, that there is a considerable carbon mitigation potential when fossil-based products are substituted though bio-based alternatives. In other environmental impact categories however, there are clear risks of net negative impacts caused by this substitution. Thus there are still significant challenges to be overcome in order to ensure a sustainable bioeconomy.