INTRODUCTION & OBJECTIVE

The Rehap project aims to strengthen the European bioeconomy industry by creating novel materials from agricultural and forestry waste, and will demonstrate how they can be used commercially in the green building sector.

The project is substituting petrochemicals found in chemical products with natural building blocks found in biomass components, such as lignin, cellulose, hemicellulose and tannin.

The University of Augsburg’s role in Rehap is to analyse the prevalence of underutilised agroforestry residues such as agricultural by-products (harvesting residues) and residues of the forestry and wood industries.

MATERIALS & METHODS

How will the feedstock potentials of the most important agricultural lignocellulose residues develop in the next decade in the EU28? To address this question, one has to answer how harvesting residue potentials are defined and which variables influence the future availability of residues?

1. Theoretical potential
   Theoretical Potential = Yield x Area x R:C ratio

2. Technical potential
   Technical Potential = Theoretical Potential x Sustainable Removal Rate

3. Bioeconomic potential
   Bioeconomic Potential = Technical Potential x Competing Application

To forecast future potentials, all independent variables need to be forecasted. For the crop yield, the cultivated area and the competing applications, historic time series of each NUTS1 region are analyzed to parametrize time series models (First order exponential smoothing, Holt’s linear trend method, Holt’s linear trend method with logarithmised values, logistic growth model, naïve prognosis as well as literature based forecasts). For the residue to crop ratio and the sustainable removal rate, constant values are assumed.

RESULTS & DISCUSSION

Wheat straw already has the highest potential with expected further growth by about 10% until 2030 compared to 2017. Grain Maize shows the highest growth rate of about 17%. Barley straw is expected to remain rather constant. Rape straw potentials are expected to slightly drop until 2030.

Aggregated historic and forecasted theoretical potential of the four most promising feedstocks in the EU28

Eastern countries of the EU28 are especially expected to further increase agricultural production with improved increasing residue potentials. Due to currently improving farming patterns, countries like Bulgaria, Estonia or Romania are likely to increase crop yields in the near future.

(Right) Total bioeconomic potential per NUTS1 region in 2030.

CONCLUSION & OUTLOOK

Lignocellulosic materials from agricultural harvesting residues are expected to become an important renewable resource for materials and biofuels of the post-petrolea era.

There are still many technical and economic questions that have to be answered before lignocellulosic from agricultural residues can be used in large scales.

Wheat straw shows the highest potentials as well as a robust growth in production until 2030. Rape straw potentials are likely to increase by about 17% until 2030. Barley straw potentials are supposed to stay nearly constant. Rape straw potentials are likely to contract slightly in the coming decade.

Extreme weather events have strong impacts on the annual agricultural production, respectively on agricultural residues potentials. Future works should focus on the assessment of the impact of extreme weather events on the production and how climate change could lead to an increased numbers of such events.