Biomass forecasting

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Biomass is a vital component in helping to meet the demands of the growing bioeconomy. The EU-funded REHAP project aims to create new bio-based chemicals that can be used to make eco-friendly resins for wood and greener cement from materials derived from plant-derived lignin, tannin and cellulose. Project researchers have developed novel processing routes capable of using lignocellulose residues – carbohydrate and aromatic polymers – from biomass that is not destined for the important food or fodder sectors.

To ensure this demand is met with supply, the Resource Lab at the University of Augsburg, Germany, which is a REHAP partner, has recently developed a timely assessment for forecasting biomass availability in Europe.

The availability of lignocellulose feedstock is a very regional question. Every region has individual geological, climatic, technical, cultural and societal preconditions that define their agricultural systems. REHAP's methodology is to subtract the important competing applications that need these localised feedstocks, such as soil conditioning or animal bedding, from their overall availability.

The amount left is the 'bioeconomic potential' available for energy, fuel and material applications; according to REHAP's research, these lignocellulosic residues are currently under-utilised and ready to be exploited further. As more applications are found for this feedstock, it is fundamental that we know their potential availability and how it will develop in the future.

The agricultural sector is exposed to constantly fluctuating environmental conditions that impact availability. An emerging bioeconomy, however, needs planning reliability. At the University of Augsburg, we have developed a regionalised forecast of the future availability of lignocellulosic feedstock from agricultural residues, so enterprises can produce sustainable bio-products from high-quality renewables.

Of the many feedstocks investigated for this assessment modelling, wheat straw, maize stover, barley straw and rapeseed straw show good potential to serve as substitutes for petrochemicals. This is true for many regions in the EU, with the north-western regions of France – Bassin Parisien and Ouest – being at the vanguard of producing agricultural goods and thus agricultural residues. Dryer regions along the Mediterranean Sea and the wetter regions in the north of the UK or Scandinavia show lower to nearly no potentials.

Across Europe, by 2030, the bioeconomic potential of wheat straw is forecast to increase by *ca* 10%, grain maize stover by up to 20% and barley straw by 6-7%. However, after years of strong increases, rapeseed straw could drop by 4 or 5% until 2030.

Increments in residue potentials are not at all uniformly distributed in the EU. Further increase is expected to come mainly from eastern European countries such as Estonia, Lithuania, Romania, Czech Republic and Hungary, where crop productivity still has some way to go to catch up with other countries. Yields in many French, Danish or German regions have stagnated in the past decade, while in some regions of Bulgaria, by contrast, the average crop yield of wheat grain has risen from 3t/ha to about 5t/ha in just 15 years. The contraction of rapeseed straw is due to declining acreage, which can only partly be compensated by increasing yields.

However, the very dry summer of 2018 highlights the problem of reliability of forecasts. According to climatologists, extreme weather events could become more frequent in the years to come, with droughts and heavy rain strongly impacting on agricultural production. With these unpredictable factors in the future, compromises in regional crop production are likely. Despite these limitations, a forecast of biomass potential will be an important part of the planning process for future biochemicals production.

REHAP provides the bioeconomic community with an indication of how lignocellulose compounds can be used sustainably now and in the future, without impacting on other important uses for biomass.

Once the methodology is published, it will be made available for agricultural residues as well as other biomass. The aim is to enable industry, transporters, businesses and regional authorities to forecast future biomass potential on a local level, providing valuable information for stakeholders and, in turn, strengthening the European bioeconomy for the future.

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