

## Providing growledge – resources and products for the bioeconomy

**Miscanthus and hemp are biomass plants that can be used as raw materials for a wide range of products and can be grown on land areas that are currently underutilised. A European consortium led by the University of Hohenheim in Baden-Württemberg has started a five-year project to demonstrate the economic potential of these plants.**

Products such as chemicals, building materials, composites, herbicides or medicines are currently made mostly from fossil fuels. In the future, biomass plants such as miscanthus and hemp that can be used for a wide range of different applications, have the potential of being used to place the production of these products on a renewable foundation.

Hemp is one of the oldest crops in the world and is mainly known for the use of its fibres in the textile industry. However, other parts of the plant can also be used in many ways: pelargonic acid can be obtained from hemp seeds and be used in agriculture as a biological herbicide; threshing residues that accumulate after harvesting contain cannabidiol, which has the potential of being used for the treatment of epilepsy.

Miscanthus, which comes originally from Southeast Asia, is another excellent biomass feedstock for a plethora of applications. Amongst other things, the grass can be used for the generation of fuels, basic chemicals or insulating materials. It has sparked a lot of interest among researchers and is characterised by high biomass yields.

In addition to their wide range of uses, hemp and miscanthus have an additional advantageous feature: their cultivation is relatively inexpensive compared to conventional crops. Therefore, both miscanthus and hemp can be produced on marginal land that cannot be used for the profitable cultivation of other crops. The two crops can also be cultivated in land areas that are contaminated with heavy metals and which cannot be used for the production of food crops. Currently unused land can thus be used which will relieve the pressure on farmers to produce food crops rather than other crops.

## New value chains for a biobased economy

On the experimental station, the Oberer Lindenhof of the University of Hohenheim Faculty of Agricultural Sciences, eight hectares of land is being used to grow various miscanthus genotypes to study their suitability for being grown on marginal locations as well as specific product applications.  
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The GRACE (GRowing Advanced industrial Crops on marginal lands for bioRefineries) research consortium led by the University of Hohenheim is focused on exploiting the advantageous characteristics of miscanthus and hemp. The aim of the project is to grow miscanthus and hemp on suitable locations and utilising the biomass as efficiently as possible. Cultivation trials are being carried out in six European countries with a specific focus on ten value creation chains.

The 22 participating partner organisations, which include universities, companies and cluster organisations, are funded by the Biobased Industries Joint Undertaking (BBI-JU). This public-private partnership between the European Union and an industrial consortium of more than 200 companies is funding the project with a total of 12.3 million euros. These funds allow the partners from France, Great Britain, Italy, Croatia, the Netherlands and Germany to work on the GRACE project for 5 years. BBI-JU projects are characterised by a strong application and industry focus. For example, several innovative small companies such as MOGU, larger companies such as the Croatian oil company INA or medium-sized agricultural companies such as Terravesta are involved in GRACE. GRACE aims to connect biomass growers and the processing industry more effectively and ensure a reliable supply of sustainable biomass.

The researchers from the University of Hohenheim are the coordinators of the project, but also play important roles in other functions. Researchers from the Department of Renewable Resources and Bioenergy Plants are responsible for the miscanthus cultivation experiments on the University's Lindenhöfe research station. Here, new miscanthus genotypes are examined for their suitability for growth on marginal sites as well as for specific product applications. For example, the researchers are studying the impact of commercial miscanthus cultivation on local species diversity and the socioeconomic and ecological benefits of the selected value chains examined. In order to achieve this, biobased products such as insulating material or

composites are compared with conventional alternatives using established methods of sustainability assessment.

## Biogenic chemicals from decentralised biorefineries

The project is hoping to demonstrate the suitability of hemp and miscanthus for various products and applications based on ten different demonstration cases.

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The researchers from the Department of Renewable Resources and Bioenergy Plants are working together with researchers from the Department of Conversion Technologies of Renewable Resources as well as with researchers from the State Institute of Agricultural Engineering and Bioenergy. Both institutes deal with the transformation of miscanthus into platform chemicals. The researchers focus specifically on the production of hydroxymethylfurfural (HMF), an organic compound that can, amongst other things, be used for the production of biogenic alternatives to PET or formaldehyde. In the GRACE project, the researchers want to demonstrate the feasibility of scalable HMF production using miscanthus as the raw material. To show this, they are testing HMF conversion in a newly-constructed demonstration plant on the edge of the Swabian Alb mountains. The plant was set up at the University's own agricultural research station, Lindenhöfe, near the city of Eningen in order to find out whether the idea of processing the biomass into HMF in on-farm refineries can be turned into reality. Residual waste streams from the farm where the plants are grown and processed will be used in the biogas plant on the farm.

The strong application and industry focus of the project takes into account the practical implementation and how the resulting products can be used. An example of this is the process for the production of HMF, the further development of which is jointly pursued by researchers from Hohenheim and the Swiss chemical company AWA Biochem. The exchange of information between the partnering research institutions, companies and biomass growers is supplemented by what is known as an "industry panel", a platform that enables companies that are not part of the consortium to benefit from the project results; hemp or miscanthus biomass generated in the cultivation trials or product samples of the value chains studied can be obtained for experiments in order to assess their quality and also test the suitability of the products for further processing. In addition, farmers interested in alternative crops can learn from the results and experience obtained from commercial hemp and miscanthus cultivation on "farm days". Thus, the project is bringing together resource and product perspectives and is also making a significant contribution to the successful transformation of a fossil fuel-based economy to a bioeconomy.

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### Article

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### Further information

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