Website address:
https://www.biooekonomie-bw.de/en/articles/pm/schaufenster-biooekonomie-industriepflanzen-machen-unproduktives-ackerland-rentabel

Showcase Bioeconomy: Industrial crops make unproductive farmland profitable

Untapped potential: Around 65 million hectares of agricultural land in Europe are barely usable or not usable at all for conventional agriculture. The European MAGIC research project aims to tap into this enormous potential. Researchers from twelve countries are looking at how farmers can make economically viable use of these marginal agricultural lands with little effort by growing industrial crops. The Department of Biobased Products in the Bioeconomy at the University of Hohenheim in Stuttgart is one of 26 cooperation partners in the bioeconomy project, which is funded by the EU with around six million euros. With almost 400,000 euros in funding earmarked for the University of Hohenheim, the project is one of the university's heavyweights of research.

Around 65 million hectares of agricultural land, an area slightly larger than France, have been abandoned in Europe because it was no longer profitable to grow food crops there. Unfavorable conditions such as low temperatures, drought, excessive wetness, soil problems, or even steep slopes made cultivation of these areas unattractive to farmers. The EU project "Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity," MAGIC for short, aims to remedy this situation. For more than three years, scientists from twelve European countries have been working on the question of how these areas can be used in a way that is both economically and ecologically sustainable through the cultivation of industrial crops. Industrial crops provide abundant renewable biomass not only for energy production, but also for the production of biobased raw materials. These, in turn, are used to produce advanced, high-value materials, such as biobased plastics or composites, lubricants, chemicals, and pharmaceuticals.

Sustainable biomass production on marginal land for a growing bioeconomy

The basic idea behind MAGIC is explained by the head of the Department of Biobased Products in the Bioeconomy at the University of Hohenheim, Prof. Dr. Iris Lewandowski: "MAGIC is a broad-based project with which we want to show farmers across Europe options for growing industrial crops and help them make decisions. We start with mapping areas and then include everything from breeding and selecting suitable plants to developing cultivation and harvesting methods. Last but not least, we want to create recommendations for action for policymakers to support this form of agricultural use." On the one hand, the cultivation of industrial crops allows marginal agricultural land to be used to supply valuable raw materials for products with high added value and for the production of bioenergy, all without competing with food production. On the other hand, the farmer's income can also be improved. "By making unused land arable again and thus enhancing its value, and by opening up new markets for biomass, the farmers' income also improves," stated Prof. Dr. Lewandowski.

Reduce loss of biodiversity, soil erosion, and greenhouse gases emissions

Her colleague Dr. Moritz von Cossel, who has managed the Hohenheim work package since 2018, added: "In addition, industrial crop production helps reduce biodiversity loss, soil erosion, and greenhouse gas emissions through its extensive management practices." "The large grass miscanthus, for example, grows on the same field for up to 20 years without the farmer having to till the soil," he said. "And because it is harvested in the spring of each year, it not only prevents valuable soil from being removed during violent fall storms, but also helps promote soil fertility." Sustainability plays a crucial role in the evaluation of all measures. This is because the benefits of growing industrial crops depend very much on whether there is potential competition with food production, whether biodiversity and other ecosystem services are affected, and which industrial crops and which management practices are to be used.

Crops and location must be a good fit

The starting point for the MAGIC researchers was the question of which plants are suitable for cultivation on marginal agricultural land and under which conditions. "Although industrial crops usually bring a different robustness when compared to food crops, for example when it comes to sandy or saline areas, they are also not suitable for all marginal sites," stated Dr.

von Cossel. For this reason, marginal agricultural land throughout Europe was initially surveyed and mapped to determine which industrial crops could be grown in accordance with socio-ecologically sustainable criteria. In addition, the scientists selected a total of 20 annual and perennial plant species for further cultivation trials - including rediscovered old crop species such as camelina or safflower. Many of the plants can also be used for several purposes. For example, oil is extracted from the seeds of commercial hemp, while fiber is obtained from the stalks. "Starting with the planting pot and moving on to small plots and entire fields, we are testing across Europe how plants develop under marginal growing conditions," said Dr. von Cossel.

Special management and harvesting methods

The researchers are also interested in which management practices involve both the least effort for the farmer and have the smallest impact on the ecosystem. They found shown that selecting industrial plants suitable for the location is a decisive factor. This is because all other necessary measures, such as soil cultivation, fertilization, weed control, irrigation, etc., depend very much on how the plant is adapted to the particular site. Likewise, the harvesting technology must be tailored to the plant species in question. Different harvesting methods are often used for industrial crops than for food crops. "Often, farmers don't have the necessary knowledge of how and when to grow and harvest the crops, and so they don't grow them at all," stated Dr. von Cossel. That's why scientists are adapting existing harvesting methods to specific needs or even developing new harvesting methods. Dr. von Cossel described how such an adapted harvesting process can look, using the example of commercial hemp, which is harvested "twice": "Within the harvesting process, first the seed heads are harvested and collected, and only then are the stems of the plant mown. This allows both parts of the plant to be processed separately."

Databases and decision aids for interested parties

All findings from the mapping work will be incorporated into a database publicly available on the project website. Visitors can thus learn about the status of marginal land areas in their region. They can also help improve the quality of the map, though. To complement this, the website has another database with information on the 20 most important industrial crops that can be grown on marginal sites. Fact sheets summarize all the essential information on the crop in question, from its soil and climate preferences, soil preparation and sowing, water and fertilizer requirements, diseases and pests, to yields and uses, as well as specialized information on harvesting methods and storage. An additional decision-making system provides a quick and descriptive overview of the most suitable industrial crops for the given climatic and geological site conditions and is designed to help farmers develop sustainable industrial crop production systems on marginal agricultural land.

BACKGROUND

Marginal lands for Growing Industrial Crops: Turning a burden into an opportunity (MAGIC)
The MAGIC project involves 26 cooperation partners from universities and research institutes as well as companies throughout Europe. These include Wageningen University and Research, AgroParisTech, and the University of Bologna, all of whom with the University of Hohenheim has joined forces in the European Bioeconomy University (EBU). This alliance of leading European bioeconomy universities is led by the University of Hohenheim. The MAGIC scientific consortium is led by the Greek Centre for Renewable Energy Sources and Saving Foundation (CRES). MAGIC started on July 1, 2017, and will end in December 2021. The European Union is funding MAGIC in the Horizon 2020 framework program with a total of almost six million euros. Of this, around €400,000 has been earmarked for the University of Hohenheim, making the project one of the university's research heavyweights.

Heavyweights of research
Scientists at the University of Hohenheim procured 33.9 million euros in third-party funding for research and teaching in 2019. The series "Heavyweights of Research" presents outstanding research projects with a financial volume of at least 350,000 euros for research requiring equipment or 150,000 euros for research without specialized equipment.

Science Year 2020|21 - Bioeconomy In 2020 and 2021
The Science Year will be dominated by the bioeconomy - and thus by a sustainable, biobased economy. The aim is to produce and use natural materials and resources in a sustainable and innovative way, replacing fossil and mineral raw materials, manufacturing products in a more environmentally friendly way, and conserving biological resources. This is more necessary than ever in times of climate change, a growing world population, and a drastic decline in species. The Bioeconomy Science Year, organized by the Federal Ministry of Education and Research (BMBF), shines a spotlight on the topic. At the University of Hohenheim, in April the focus during the Science Year will be on "Biobased products and co. - Alternatives for the future." Bioeconomy is the leading topic at the University of Hohenheim in research and teaching. It links the Faculty of Agricultural Sciences, the Faculty of Natural Sciences, and the Faculty of Business, Economics and Social Sciences. During the Science Year on Bioeconomy, the University of Hohenheim is hosting many events to inform the public and experts on the topic.

Press release

06-Apr-2021
Source: University of Hohenheim

Further information

- University of Hohenheim
- Project site MAGIC
- Science Year 2020/21 - Bioeconomy
- Bioeconomy at Hohenheim