

Summary

For the first time, the ZIM-cooperation networks “Microalgae”, “Environmental Technologies and Soil Recultivation”, “Water4All”, as well as the future network “Food Systems” came together for the circular bioeconomy cluster meeting.

Due to the current Corona situation, the meeting took place in a digital setting instead of as originally planned in the rooms of the Magdeburg-Stendal University of Applied Sciences. Its rector Prof. Dr. Anne Lequy greeted the participants of the virtual meeting with a video message at the beginning. Prof. Lequy referred to the parallelism of the topics that connect the university with its departments and the networks mentioned. In particular, she referred to the subject area of water, environment, construction and safety and how the content overlaps with the topics of the networks: water management, energy and resource management, waste prevention and climate change.

She also referred to ongoing cooperation projects in which the university is involved, such as the R&D project in the field of water and renaturation ecology under the responsibility of Prof. Dr. Volker Lüderitz, a partner in the Water4All network.

Session 1: µAlgen

At the beginning of the “Microalgae” session, Prof. Ben Hankamer from the University of Queensland first presented the content of his work. Prof. Hankamer is founding director of the Solar Biofuels Consortium (2007) and the Center for Solar Biotechnology (2016), which focuses on the development of next-generation microalgae systems.

Prof. Hankamer referred to the fact that the importance of algae in biopharmaceuticals is only just beginning. Above all, the applicable regulations hindered a faster approach. There is great potential for algae, especially since production can be ramped up quickly in an emergency.

In the area of the energy transition, the importance of algae could grow in the future, for example as an alternative to conventional fuels, said Hankamer.

Then Jörg Ullmann went into the current trends in the algae industry. Mr. Ullmann is one of the leading algae experts in Germany. He is a trained biologist and is the manager of the microalgae company Roquette Klötze in the Altmark. He referred to the millennia-old tradition in algae production and algae as a food. However, today's industrial algae production did not start until the 1950s. Around 30 million tons of algae are currently produced industrially each year, the majority of them in Asia, while less than 1 percent is produced in Europe. Ullmann also referred to the current EU Green Deal and the importance of algae as biomass.

However, Ullmann stated that there was not yet general acceptance of the production and use of algae in business and the population. Above all, science has to communicate its achievements better in this field. Only in the area of the use of algae in food is there definitive customer acceptance.

When asked about the financing of start-ups, Ullmann complained about the reluctance of venture capital investors. The establishment of "algae start-ups" must also be further promoted and accelerated in the future. The further development of this innovative technology requires more time, money and more heads, says Ullmann. In addition, there is a lack of a well-founded market analysis and in-depth cooperation between business and scientific institutions.

The third participant in the panel, Gunnar Mühlstädt, is the managing director of MINT Engineering GmbH. The focus of MINT lies in the further development of stable and effective processes and systems for the economic cultivation of microalgae. Intelligent process automation plays an essential role in this.

He referred to the quality of the food industry as a classic industry. Especially in the food sector, for example, the taste of algae is a challenge for producers in the area of production development, in order to further promote the general acceptance of algae. Accordingly, even large corporations would have to be ready to produce and process large quantities of algae. In 30 years, according to Mühlstädt, the topic of "algae" will be on the move.

Enrico Ehrhardt represented the Association for the Promotion of Medical, Bio and Environmental Technologies e. V., which through its innovation and development activities represents a link between applied basic research and the private sector. Mr. Ehrhardt dealt with the potential of algae as a "sponge system" in the field of water recovery / recycling and highlighted the topic of phytohormones in algae and their possible growth-stimulating use in agriculture. Here, too, the bottleneck is the approval of these stimulants for use in agriculture.

Session 2: UtBr

For the panel discussion "Environmental Technology and Soil Recultivation (UtBr)" with Dr. Markus Zaplata from Nagola Re and Frank Roscher from ENAS, they dealt with questions such as "Acceptance of new technologies and customers' willingness to pay", "Growth potential, internationalization and competition" or "Efficiency and sustainability - how well they can be combined" and use of biotic materials and natural products. Political framework conditions were also discussed.

Dr. Zaplata pointed out that biodiversity is currently threatened at many levels, despite high public attention and existing agreements to protect endangered animal and plant species. Although there is currently immense competition between individual species, people often do not accept the naturally occurring coexistence between animals and plants.

One prefers, for example, the nice, green lawn devoid of disturbing weeds, or another example, the implementation of gravel-landscaped gardens. A reference was also made to the worldwide negative consequences of industrial agriculture, which is considered one of the main factors in the extinction of certain species.

Mr. Roscher further explained how the use of sensor technology in agriculture is advantageous in order to promote a sustainable increase in production and thus to secure the food supply. Growing consumer behaviour requires the further intensification of agriculture, the preservation of biodiversity and the avoidance of pollutants such as microplastics. The further development and use of biodegradable materials and sensors leads to less pollutant input into the soil.

Roscher discussed with the participants the need for farmers to make better use of sensor technology. On one hand, they offer advantages by providing more comprehensive information, on the other hand, their use incurs higher costs for farmers as well as additional problems in the areas of data security, data protection and management of a constantly growing database of information.

With regard to the future vision, it was discussed why further digitization as well as internal and external networking are so important for the economically successful development of agricultural businesses in Germany. The question of whether comprehensive digitalization would only be worthwhile for large agricultural holdings (> 100 ha) was also raised. Finally, a solution was sought for how to deal with the steadily increasing flood of data in the future.

Session 3: Food Systems

During the session "Food Systems - Brainstorming on the role of environmental technologies, water and microalgae in the food sector" two presentations were made. The first was from Dr. Diana Seserman from the Institute of Environmental Sciences at BTU Cottbus–Senftenberg, where she discussed her experiments in understanding agroforestry systems as an efficient land-use alternative to conventional monocropping systems. Establishing different land-use purpose is an important aspect in agricultural development and sustainability for the future.

The other presenter was Yanik Nyberg from Seawater Solutions. His agri-environmental company in the UK supports sustainable agricultural practices in coastal and wetland areas. He explains that Seawater is brought onto degraded land, on which wetland ecosystems are created for food production, carbon capture, and bioremediation purposes, supporting wildlife and allowing for the rehabilitation of land within 6 months. In the UK alone, over 8 thousand farms are threatened by drought, rising seas and soil degradation.

In general, according to the participants in the panel, the subject of "food" does not only have to do with classic biotechnology. Modern industrial segments such as the "Internet of Things" (IoT) are used more and more frequently.

According to Nyberg, the decisive factor in moving the topic forward is the scalability of the operations. He also called for a stronger networking of science and politics in order to put decisive regulations and legislation into practice more quickly.

Session 4: Water4All

The last session “Water4All” focused on issues primarily around groundwater. The Water4All Panel Discussion consisted of 5 members, all with differing backgrounds: Prof. Merz from the Geohydrology department at Frei Universität Berlin, Dr. Raufuß as the head of Research and Innovation at Schoenborner Armaturen, Joern Toelle as the Application Development Manager for Danaher Water Quality Group, Prof. Peter van Bodegom is professor and head of the department of Enviromental Biology within the Institute of Environmental Sciences at Leiden University in The Netherlands, and Brett Gracely is the practice Leader in Water Resource Planning and the Business Unit Leader in Environmental Mgmt. at the company Leonard Rice Engineers in Colorado.

The first questions posed was to Prof. Merz regarding limited ground water supplies and any interesting research or innovative advancements to address this problem. Prof. Merz confirms the summary of worldwide freshwater security but stresses that indeed the challenges can be quite regional. However, he identified two main drivers of the freshwater challenges and that is first, climate change, particularly in terms of precipitation timing and drought, and secondly, the practice of artificially forcing fast drainage of watersheds without allowing natural recharge. An opportunity for research and development would be projects that aim to lengthen the residence time of runoff during precipitation events.

Brett Gracely also confirmed as a response that the western United States is also wrestling with similar issues of change in precipitation patterns, since they indeed rely heavily on annual snowmelt and this can be seen in an intensified hydrograph with earlier snowmelt runoff. The timing has an impact on prior appropriation rights and therefore can lead to a breakdown of the water rights allocation scheme. In addition, there are issues with increased salinization in the groundwater supply.

Peter van Bodegom spoke about integrating saline water agricultural into the mainstream but explains that currently it is only available in niche markets. Another option he explains is to encourage saltwater agriculture by paying farmers to use this method and in return the water board and water managers benefit by not having to drain the water. Similarly, there could be a paradigm shift in general by paying farmers to retain water storage during certain times of the year.

The moderator also asked Joern Toelle what business opportunities or technologies are available in terms of managing groundwater levels. There are currently many measurement devices for this but he emphasizes water quality measurement and confirms the observation from Brett Gracely that their snowmelt runoff from the Andes is indeed also occurring earlier.

Joern also explains that in Chile their challenges of increasing water demand are not only with agriculture but also mining and these consumption rates keep growing.

Dr. Raufuss emphasizes important efficiency measures for water distribution systems and irrigation. However, most of his emphasis was concerning the use of stored heat in the subsurface for heating purposes and then returning the cooled water back underground. However, later Dr. Raufuss is asked from an audience member whether there are any regulations regarding the use of groundwater for cooling purposes since this mechanism has been shown to be ecologically damaging downstream. Likewise, Brett says that in the U.S. effluent water temperatures must stay within an ambient temperature range or otherwise the discharge is considered a pollutant.

The moderator also asks if there are any interesting developments in the field of nitrate treatment. Joern confirms there is indeed. However, nitrogen problems also come from wastewater and there are measurements and system products in place to optimize these processes.

Cooperative use of water and reuse from multiple farmers as an innovative approach toward improved water management was given as an example by Peter van Bodegom, where then new business models can emerge. In addition, there was additional discussion on the general price of water and shifting consumer mindset.

In summary, all panelists have emphasized the effects of climate change but also regulation problems in water management as well as utilization of new technologies to better deliver the required measures for future freshwater security.