



BlueBio – SUSFOOD2 Cofund: Market pathways for sustainable algae products – Final Report



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INTRODUCTION

In September 2021, the ERA-Net programmes BlueBio and SUSFOOD2 jointly organised an online workshop on market pathways for sustainable algae products. The goal of the workshop was to bring research and industry together to discuss the future of sustainable algae products and especially about market issues like regulation, pilot scale infrastructure, techno-economic feasibility and sustainability. Algae were chosen as topic of the joint workshop since they are a natural, innovative and sustainable resource of fatty acids, proteins, carbohydrates, antioxidants and colorants. They will play an important role in the blue bio-economy of the future as resource for food, feed, chemical and material applications. In both ERA-Net programmes, several research projects based on algae as resource are funded.

AGENDA

After an introduction by Frank Hensgen (SUSFOOD2) and Kristin Thorud (BlueBio), the following two keynotes from a company perspective were given:

- 1) Astaxanthin made in Schleswig-Holstein: key points for sustainable algae products (Stefan Hindersin, Sea & Sun Technology)
- 2) The power of seaweed: a sustainable raw material (Angela Garcia Agis, CEAMSA)

The keynotes were selected to have a broad perspective from industry on production and processing of micro- and macroalgae.

The keynote presentations were followed by four flash project presentations from the SUSFOOD2 and BlueBio programmes:

- 1) **Aquahealth**: Microalgae microbiomes: a natural source for the prevention and treatment of aquaculture diseases (Sarah Löhn, Technical University of Hamburg)
- 2) **PlastiSea**: Novel enhanced bioplastics from sustainable processing of seaweed (Øystein Arlov, SINTEF)
- 3) **BIOCARB-4-FOOD**: Extraction and characterization of BIOactives and CARBohydrates from seaweeds and seagrasses for food-related applications (Amparo Lopez-Rubio, IATA, Institute of Agrochemistry and Food Technology)
- 4) **SEAFEED**: Sustainable and healthy food and feed ingredients from seaweeds: from ocean to functional food-and feed-ingredients (Dominic Wimmer, Fraunhofer-Institute for Process Engineering and Packaging)

The project presentations were followed by four breakout rooms on the following topics:

- Regulation (moderator Øystein Arlov, reporter Inderjit Singh Marjara)
- Pilot testing and upscaling (moderator Christophe Cotillon, reporter Marijke Hunnicks)

- Economics (moderator Maarten Uyttebroek, reporter Isey Disa Havarsdottir)
- Sustainability (moderator Amparo Lopez-Rubio, reporter Frank Hensgen)

Every participant could join two breakout rooms of choice to discuss key questions prepared by moderators. Time to connect and exchange ideas was given after lunch. Participants could meet for an hour at wonder.me - an online networking tool.

RESULTS

The main conclusions of each breakout room can be found below.

Regulation

- There are no specific rules for microalgae, the legislation is more of a general type. It is difficult to get algae as a feed/food ingredient legalized. The major constraints are competence (lawyers are not biologists), it is a time consuming process and it is very expensive. The help of EATIP (European Aquaculture Technology and Innovation Platform (www.eatip.eu)) could be beneficial.
- Regulation is not harmonised throughout the EU and every EU regulation has to be translated to national regulation.
- Taxonomy of algae can be an issue: sometimes the name of algae species is changed.
- There is a different regulation for use of algae as food, feed, chemicals.
- Some algae are allowed as food supplement but not as a pure product and there are differences between EU countries. For example, in France 25 microalgae are allowed to be used as food.
- Many new algae species exist and the Novel Food regulation can slow down the introduction of new products/species to the market.
- Regulation is an interplay between policymakers, scientists and other stakeholders. Understanding between different stakeholders is not easy.

Pilot testing and upscaling

- For ultrasound technologies, only lab scale equipment is available and link with industry is missing. In the lab, the innovative technology works very well, but it cannot be tested on pilot/industrial scale.
- Research organisations focus on lab scale testing and sometimes pilot scale testing. Access to pilot scale facilities is not always easy in every country.
- There can be issues with confidentiality of results. This can be solved via a strict agreement between partners.
- National and international funding for pilot scale facilities is difficult to obtain.
- Pilot and demo infrastructure is available at Nofima but also at other locations in Europe (database for open access multipurpose pilot and demo infrastructures for the European bio-economy can be found at www.biopilots4u.eu)
- Pilot scale facilities can be found within research organisations but also within companies (open access infrastructure).
- Microalgae are often low concentrated biomass so you need large equipment to separate water and dry matter. This is an energy consuming and costly step in the biorefinery process.
- There is sometimes a lack of open information from industry due to confidentiality issues.
- There are often storage and transport problems especially in research organisations.

- There is sometimes a big gap between research and industry. open access pilot scale facilities can be beneficial.

Economics

- The dewatering and separation of the algae from the growth medium is the most difficult and costly step in the process. If we can find a method to do this more efficiently, we might have a breakthrough in the algae production.
- Biorefinery of algae: the idea is to valorise all macro-constituents or as many as possible to secure the sustainability of the process.
- Consumer behaviour research (consumer acceptance) that goes along together with the scientific research on the algae products is important to incorporate in projects.
- Marketing research and sensory science research (taste, texture, and odour) are important aspects to incorporate in research projects.
- Growing algae is different for each region in Europe. For example, access to light as free energy source is different between Northern and Southern Europe. It is important to utilise the resources close to consumers and to grow the right types of algae for each region and local systems.
- Growing algae on sidestreams can be an important option from a sustainable point of view.
- Possibilities to reuse infrastructure: for example greenhouses for vegetables can be used for algae growth.

Sustainability

- Life cycle analysis (LCA) needs a lot of data which are sometimes not available.
- There are different aspects that need to be considered in terms of sustainability (social, economic, geographical...).
- Biorefinery concepts are important to increase sustainability.
- There is more research needed to understand the characteristics of algae-derived ingredients (toxicological, bioavailability, digestibility) to set up legislation.

CONCLUSION

The organisation of this joint workshop was an excellent opportunity to increase interaction between industry and research and to enlarge networking between participants of both ERA-Net programmes on blue-bio-economy and sustainable food systems. In the breakout rooms, researchers got more insight in the challenges of industry and this will generate ideas for future projects. For the BlueBio programme, a third and final call will be launched in 2022. Additional activities (online and in person) will be organised to create connectivity and stimulate synergy among ongoing projects for example in next e-coffee meetings, but also during mid-term and final project meetings. Furthermore, a foresight exercise to identify research and innovation gaps and system bottlenecks will be organised by the BlueBio consortium as input for the next partnership on blue bio-economy as follow up of the ERA-Net programme.