



bridges
ENTREPRENEURSHIP

UPSCALING THE SEAWEED INDUSTRY THROUGH ENTREPRENEURSHIP

a Guideline for Entrepreneurship Consultancy

D11.4 TOOLBOX FOR SMES INNOVATION ECOSYSTEMS



ENTREPRENEURSHIP CONSULTANCY *TOOLS & STRATEGIES*



This is a Guideline for those looking to learn how to:

- support SMEs
- regional development
- and supporting startups and entrepreneurs
- support aquaculture initiatives

The Guideline is based on Blått Kompetansesenter (Blue Competence Center) work with SINTEF's Seaweed Applications Conference 2023 as a case example.





SEAWEED APPLICATIONS CONFERENCE



A conference where different actors working in or related to the seaweed industry meet to discuss seaweed applications. By seaweed applications we mean in the sense of problem-solving capacities you can gain from seaweed. The main applications discussed at the 2023 conference were:

- Seaweed for food consumption
- Seaweed as feed for Salmon farming, cattle etc.
 - § Seaweed feed to reduce methane emissions from cattle
 - § Seaweed feed to reduce the number of the deaths in salmon aquaculture
- Alginate-extraction from cultivated and harvested seaweed
- Bioplastics production from seaweed
- Seaweed cultivation: Growing seaweed today and potential for cultivation of red algae
- Seaweed as fertilizer for farming
- Seaweed for carbon capture
- Seaweed for the pharmaceutical industry

In addition to these main areas the conference focused on new seaweed research, with some additions of more business-related seaweed presentations by Orkla Ocean and Nestle. The conference was arranged by SINTEF and NTNU.



THE ROLE OF BLUE COMPETENCE CENTER (BCC) AT THE SEAWEED APPLICATIONS CONFERENCE



BCC held a presentation at the conference discussing how Hitra and Frøya as regional innovation-ecosystem can help scale up the seaweed industry with the tools BCC and the Hitra and Frøya Business Cluster (Næringsshagen for Hitra og Frøya) have at their disposal.

The presentation sparked discussions and served as a catalyst, opening doors for potential collaborations with actors who expressed keen interest in the innovation-ecosystem at Hitra and Frøya. These discussions fostered valuable connections and paved the way for future partnerships, leveraging the strengths of BCC and the potential of the Hitra and Frøya region to drive innovation and growth in the seaweed industry.





WHY ATTEND SUCH CONFERENCES

At the Seaweed Applications Conference we learned a lot about seaweed and how we can use this knowledge to support growth of the seaweed industry, seaweed education and supporting the aquaculture industry.

The seaweed industry in 2023 is indeed in a critical phase, as it plays a significant role in the global sustainability transition. Seaweed is considered an important contributor to various sectors, including:

- **food and nutrition**
- **biofuel**
- **pharmaceutical**
- **cosmetic**
- **environmental protection**

As a regional innovation company, business cluster, and local innovation hub, it is crucial to understand the potential of seaweed in order to support entrepreneurs, small and medium enterprises (SMEs), and promote seaweed education at aquaculture VET-schools.



Entrepreneurship and SME support

Seaweed presents a range of opportunities for entrepreneurs and SMEs. By understanding the potential of seaweed, you can provide targeted support and resources to those interested in venturing into the industry. This could involve offering incubation programs, access to funding or investors, networking opportunities, and technical assistance. Encouraging innovation, research, and development in seaweed-based products and technologies can also help SMEs in the sector to thrive.





SEAWEED EDUCATION AT AQUACULTURE VET-SCHOOLS

Incorporating seaweed education into aquaculture VET-schools is crucial for preparing the future workforce and building expertise in this emerging field. Understanding the potential of seaweed will allow you to develop:

- relevant curriculum
- training programs
- practical experiences that equip students with the necessary knowledge and skills

This can include areas such as:

- seaweed cultivation techniques
- processing methods
- quality control
- product development
- sustainable practices



the importance of SEAWEED EDUCATION



By promoting seaweed education, you can create a talent pool that supports the growth of the seaweed industry while addressing the increasing demand for skilled professionals in this field. Collaborating with educational institutions, industry experts, and researchers can further enhance the effectiveness of these educational initiatives as well as synergies with the finfish and aquaculture industries.

Additionally, fostering collaboration among entrepreneurs, SMEs, and educational institutions can create a symbiotic ecosystem that encourages innovation, knowledge-sharing, and the development of sustainable practices within the seaweed industry. This collaborative approach can lead to the creation of new products, technologies, and business models, thereby driving the growth and competitiveness of the sector.

SUMMARY

Overall, understanding the potential of seaweed is vital for supporting entrepreneurs, SMEs, and educational institutions involved in the seaweed industry.

By providing the necessary resources, education, and collaboration opportunities, you can contribute to the global sustainability transition and the growth of the seaweed sector, while fostering innovation and sustainable practices.



CONFERENCE AGENDA SUMMARY

an aquaculture conference example



Seaweed Applications: Opportunities and Challenges 2023 conference Highlights

Seaweed biorefineries and products are the two main topics covered by the Seaweed Applications conference. In this second edition of the conference, after a long break imposed by COVID-19, we witnessed a significant increase in the variety of new products coming into the market according to the organizers. Increasing knowledge of the composition of seaweeds and method development for extraction and characterization of seaweed bioactives have reached a critical point.



DAY 1



- Presentation on how seaweed based functional products are expected to fuel the market expansion outside Asia by Prof. Delin Duan (Institute of Oceanology in the Chinese Academy of Sciences)

§ His group is currently performing population genetic analyses of *Saccharina japonica* in East Asian countries to select strains tolerant to climate change.

- Seaweed Solutions and IFF/DuPont Nutrition Norway talked about future market perspectives for food products, where a trend for meat replacement is seen as the main driver
- Presentation of the SeaSoil project managed by Nofima where Nutrimar collaborates as an industry partner, and state of the art review on fucoidan exudation by seaweed species such as *Fucus vesiculosus* and its contribution to C sequestration in marine ecosystems.

According to Jan-Hendrik Hehemann and colleagues from Max Planck Institute for Marine Microbiology, “Fucoidan shows considerable recalcitrance and has been found to persist for centuries in sediments” which could explain why this substance is so complex to characterize enzymatically.



DAY 2



- Presentation by Finn L. Aachmann (NTNU) on the history of the Norwegian seaweed industry and Seaweed Biorefinery Platform (SBP-N)
 - § One of the latest advances from the SBP-N is the establishment of alginate extraction and sequential polysaccharide extraction methods for cultivated species such as *Saccharina latissima* and *Alaria esculenta*
- Camilla Dore (B'Zeos) presented some of the packaging applications that her group developed from cultivated seaweed biomass within the PLASTISEA project
- Presentations by SINTEF Ocean, DTU and Teagasc on seaweed cultivation and prospects for use of novel seaweed extracts in food and feeds
- Orkla Ocean presented their new market strategies
- Nestlé presented their new market strategies
 - § Purina (Nestlé) recently committed to sourcing 20% (50%) of their key ingredients through regenerative agricultural methods by 2025 (2030)
- Several flash presentations were given by both academia, industry, and the innovation consultancy firm Blått Kompetansesenter. Torjus Dahl (BKS) described Frøya and Hitra as the Norwegian hot spots for seaweed-related R&D and innovation



DAY 3



- Presentation on the fundamentals of mechanobiology and their application to seaweed polysaccharides by Ivan Donati (University of Trieste)
- The company CP Kelco introduced their portfolio
- Qi Zhou (KTH Royal Institute of Technology) presented several applications of seaweed-derived cellulose such as pharmaceutical and microplastic removal from marine systems
 - § One of the latest advances from the SBP-N is the establishment of alginate extraction and sequential polysaccharide extraction methods for cultivated species such as *Saccharina*
 - § According to Zhou and colleagues, the microstructure of nanocellulose obtained from stipe cortex of *Laminaria hyperborea* confers this region high strength properties (aspect ratio of nanocrystals is 750) and the aspect of parenchymal (thin-walled) cells
- The conference was closed by three presentations on different properties of seaweed bioactives
 - § Tallinn University showed how functional properties of seaweed polysaccharides are directly dependent on their molecular weights and introduced the example of funoran from *Gloiopeltis furcata*
 - § Lund University presented an overview of industrial-scale methods to remove heavy metals such as arsenic (inorganic form), cadmium, mercury, and lead, as well as iodine from seaweed
 - § NMBU demonstrated how the use of fucoidan and laminarin from seaweed in feed can contribute to the modulation of the immune system in salmon