

MACRO CASCADE

Cascading Marine Macroalgal Biorefinery

Summary

The MACRO CASCADE project will prove the concept of the cascading marine macroalgal biorefinery. This is a production platform that covers the entire technological chain for processing sustainable cultivated seaweed into highly processed value added products.

The MACRO CASCADE project will address many of the existing challenges and barriers encountered in previous and ongoing projects on refining seaweed biomass.

Ultimately, it will allow the oceans to provide much more of the food that Europe will need in future.



<http://www.macrocascade.com/>

Type of Action:
Research & Innovation Action

Value Chain: Aquatic biomass

Start date: 01 October 2016

End date: 30 September 2020

BBI JU contribution: € 4,156,356.25

Objectives

- Obtain optimized strains of seaweeds to increase levels of target components in *Saccharina Latissima* (sugerkelp, kombu) and *Palmaria palmata* (red seaweed, dulse).
- Improve scalable cultivation of seaweeds using 1D and 2D cultivation substrates, develop mechanical harvesting, increase biomass yield by a factor of 5, and reduce overall cultivation cost 50-75%.
- Improve methods for seaweed biomass preparation and storage stability.
- Develop patentable feed and food products with health promoting functionalities through innovative microbial refining methods of macroalgae in combination with rape seed.
- Develop scalable and sustainable extraction/separation methods for the production of multiple products from brown and red seaweeds or seaweeds residues by enzyme aided physicochemical methods. Targeted intermediate products are alginate, fucoidan, mannitol and protein.
- Develop a variety of efficient and robust carbohydrate active enzymes, with a range of specificities of relevance for processing macroalgal polysaccharides. Target high

Expected impacts

- Scaling up macro-algae cultivation and the pre-treatment industry.
- Impact on the innovative biorefinery processes for turning seaweed into a commodity.
- Impact on industrial exploitation of the findings and methods in Macrocascade.
- European seaweed cultivation of 4 million tons ww/year in 2030 and 20 Million tons 2050.
- Increase total value of biomass from €25/tons ww to €1000/tons ww, corresponding to an annual revenue of €2 Billion in 2025.
- Novel business opportunities for on short term for feed and food products, and on midterm for high value pharma- and nutraceuticals, large volume chemicals and bio materials and marine based proteins and fatty acids in high demand.
- Expected job creation is expected to be one employee for every 700 tons ww produced/year¹³ in coastal regions of Europe as a consequence of this Blue Growth.
- The growth of macroalgae can assimilate CO₂ and perform bioremediation, e.g. neutralizing impact on the marine ecosystem.

- Value products for feed, food, pharmaceuticals, cosmetics and chemicals are enzymatic derivatives of alginate, laminarin and fucoidans.
- Study the economic viability of the macroalgae cascading valorization schemes.
 - Quantitatively assess the sustainability of the seaweed-based value chains, via a multi-criteria evaluation of the technological, environmental, economic, and social aspects.
 - Develop sustainable business cases for a “Blue Print” of the cascading marine macroalgal biorefinery.

Project coordination

- Danish Technological Institute (Denmark)
- Ocean Rainforest (Faroe Islands)
- Stichting Dienst Landbouwkundig Onderzoek (The Netherlands)
- Matis (Iceland)
- Fermentation Experts AS (Denmark)
- Stichting Energieonderzoek Centrum Nederland (The Netherlands)
- eCoast (Belgium)
- Novozymes (Denmark)
- Lund Universitet (Sweden)
- Danish Technical University (Denmark)
- Hortimare AS (Norway)
- Silkeborg Regions Hospital (Denmark)
- Cargill R&D Centre Europe (Belgium)

Organisation name: Danish Technological Institute (Denmark)

Phone: +45 72202000