Seaweed Production and monitoring

Growing brown kelp species usually takes around 6 months (Oct-Apr) in the North Sea. In this period the seaweeds grow from 2mm to up to 2 m in length. Typical yields are 5kg -wet per meter line, or 10kg -wet per m^2 of net.

For the future, the sector will focus on higher yields, species/strain diversification and predictability of volumes and quality.

Future farms will be equipped with sensors and cameras to reduce the cost of offshore inspections. It will allow real-time monitoring of the farm and seaweed condition from a warm and dry office onshore.

Seaweed production and monitoring in Wier&Wind

During the project HZ University of Applied Sciences and The Seaweed Company monitored the growth in different nurseries and on the different net types. After 6 weeks in the nurseries, the four different nets were installed in the Offshore Test Site. Every 6 weeks the length and width of the seaweed leaves were measured on the cultivation site.

The different nurseries and various net types led to a variety in seaweed growth during the experiment.

Harvesting and harvesting machine

Seaweed Harvesting

The optimal harvesting period for brown kelp seaweeds is between April and June. Harvesting is a time critical operation and therefore a dedicated harvesting vessel with specialised equipment will continuously harvest and pre-process the seaweed.

The harvested seaweed is collected in a separate bulk carrier vessel for transport to the onshore storage or processing location. A typical offshore seaweed farm could have a footprint of around 10km^2 and an annual production volume of around 10.000 ton wet.

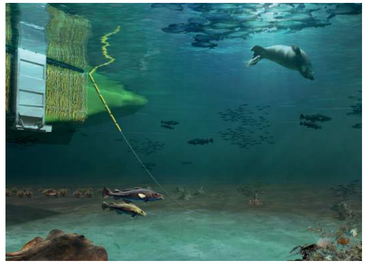
The first farm of this scale is anticipated around 2027. Hopefully the number of farms will increase so that around 2030 the annual production in the Greater North Sea area will be around 100.000 ton wet per year.

Automatic harvesting at Wier&Wind

During Wier&Wind, the first automated harvesting operation on the seaweed pilot installation took place on the North Sea. The fully automated harvesting machine was developed and built by partner Murre Technologies, installed on the mussel ship YE32 and tested on the Offshore Test Site.

The 'Easyfarm' machine has a unique approach where it is lifted overboard and deployed over the operational seaweed growing system. This way, no removal or modification of the seaweed growing system is required making it a potentially much easier and faster harvesting operation.

The test demonstrated that the seaweed can indeed be successfully and swiftly harvested when the seaweed system is lifted just above the water line, whilst removing almost all of the seaweed and keeping this in good quality.



WIER & WIND

Interreg
EUROPESE UNIE
Vlaanderen-Nederland
Europees Fonds voor Regionale Ontwikkeling

Wier & Wind pilot project: A successful demonstration of offshore seaweed cultivation

Seaweed-based solutions can offer a valuable contribution in addressing today's challenges such as climate change, food availability and finding alternatives to fossil-based value chains. To achieve this, the European seaweed sector needs to scale-up, and devise smart solutions d to make the production process more efficient.

That's why 6 partners - The Seaweed Company, Murre Technologies, HZ University of Applied Sciences, Universiteit Gent, GEOxyz and North Sea Farmers - started 1 July 2019 the Flemish-Dutch Interreg project 'Wier&Wind'. This project has successfully completed a pilot to cultivate seaweed in the Offshore Test Site, a representative location for learning how to scale-up seaweed production in wind farms on the North Sea.

Making positive impact means: scaling-up production

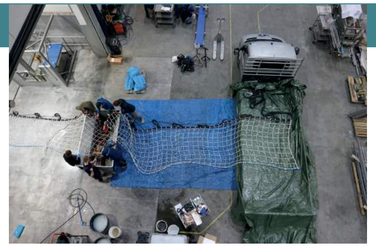
In recent years, many small seaweed growers have started close to home, in the Flanders / Netherlands border region, in sheltered areas or near the coast. However, these sheltered/nearshore production sites are few in number and therefore scaling-up opportunities are limited.At the same time, making positive impact requires large volumes of seaweed and therefore scale.

That's why this project tried to look how the prospect of scaling-up could be brought closer by exploring the technical and biological feasibility of seaweed production offshore. Especially in the many existing and planned offshore wind farms there will be more than enough space to produce the required high volumes of seaweed. To this end, the Wier&Wind partners designed, built, installed and seeded a pilot seaweed farming system that was harvested with an innovative harvesting machine.

Reliable, sustainable, ecologically sound and offshore-proof

The aim of Wier&Wind was to develop a large-scale and automated seaweed production system, that is safe, sustainable and offshore-proof. A system that is reliable at sea and can be used within the many wind farms in the North Sea. Moreover, the system can be made economically viable by applying automation in order to reduce labour costs, increase offshore production speed and thus reducing vessel cost.

The Wier&Wind project has led to a successful demonstration of the Wier&Wind seaweed farming concept. It showcased several seeding methods, seaweed cultivation and growth on net-substates as well as mechanised harvesting of the produced seaweed. All in offshore conditions similar to the wind farms in the Dutch and Belgian North Sea.



Future

Successfully bringing all pieces of the puzzle together into a functioning production system is an important milestone for the Wier&Wind project and also for the European seaweed sector as a whole.

On Friday 2 December 2022 the Wier & Wind project celebrated its end-event with partners, stakeholders and members from the Seaweed Sector. In this brochure, we will guide you through the project. Furthermore, we will introduce the Wier & Wind partners and their contributions in developing (offshore) seaweed farms for the future.

Seaweed as a circular resource

Food is the first association most people have when they hear the word seaweed. Nevertheless, current players in the seaweed sector are quickly diversifying and creating an enormous portfolio of innovative applications for markets such as:

- food (ingredients) & feed (ingredients)
- functional ingredients for food, feed, cosmetics, medical devices and medicines
- biostimulants (a crop health and resilience enhancer)
- biodegradable replacers for plastic, textile, paper, building materials, etc.
- energy (only for unusable side streams)

In the future these potentially large markets could be supplied with seaweeds from sustainable European seaweed farms.

With its own local farms that produce reliable seaweed volumes in a nature-inclusive way, Europe would become more self-reliant. And if the disposal of these seaweed-based products is done sensibly, it creates the potential to close nutrient cycles towards a truly sustainable society.

Knowledge of seaweed and seeding About seeding operations

Seaweed needs to be (re)seeded every season. For this, the best seed material (depending on location and/or market) will be procured from specialised seed companies. Seeding itself is a time critical process to be executed offshore, after which the seeded lines or nets will be connected to the farm infrastructure.

Seeding during Wier&Wind

For the project the seeding of the seaweed occurred onshore, at Murre Technologies in Zeeland. Here the sporophytes and gametophytes were mixed with algae glue. This mixture was put into a big tub and four different types of nets were taken through the seaweed mixture. In order to test the best way of seeding, sporo- and gametophytes and glue were also spray-painted to nets. About 30 meter of nets were seeded with seaweed.

The nets were placed in different nurseries. Nearshore in the Oosterschelde, at a nursery tub at Hogeschool Zeeland and at a nusery in Oostend. Then the seedlings were able to grow. At the start of 2022, the nets with seaweed were relocated to the offshore test site near Scheveningen.

Technology and Installation

Farm design & certification of offshore seaweed farms
Offshore seaweed farms will be carefully designed and certified for the conditions that occur in wind farms and will have a lifetime similar to the wind farms, between 25-40 years.
To start the operational farm, the main anchor points will be installed first. These will last the whole lifetime of 25 -40 years. The use of eco-anchors stimulates the biodiversity around the seaweed farm.

Thereafter, the floating infrastructure (lines, chains, floatation) will be installed. This infrastructure typically has an expected lifetime of 7 years. Finally, the required navigational aids will be installed.

Technology and installation within Wier&Wind

The project aimed to proof the production of seaweed in offshore conditions. A new challenge, because of the conditions at open sea, as well as tidal streams and waves.

The installation of the system at the Offshore Test Site in February 2022 followed a week full of rough weather at sea. Finally, the conditions settled just enough to go out and perform the installation of the seaweed cultivation system and two innovative eco-anchors.

The seaweed cultivation system was a 50m long, net-based system design that builds on experience from the mussel sector. For this test four different net structures have been incorporated to test attachment strength of the seaweed on different substrates and with different seeding techniques. This combination provided improved insight in the optimal seeding & net combinations.

UNIVERSITY OF APPLIED SCIENCES

HZ University of Applied Sciences is an educational and research institute located in the Southwest of the Netherlands. HZ focusses on marine low trophic aquaculture. In collaboration with SME's we strive to address practical problems within the aquaculture sector.

UNIVERSITEIT GENT

With more than 400 marine and maritime scientists UGent has a strong background in the field of Aquaculture and Blue Life Sciences. The Phycology team pioneers the cultivation of seaweed in offshore environments focusing primarily on seeding techniques and estimating growth, while the Maritime Technology Division marine and maritime sciences designs the optimal cultivation systems able to withstand the most extreme wave forces characteristic for high energy offshore environments.

The Seaweed Company

The Seaweed Company is a value driven Netherlands-based organization that operates worldwide since 2018. We combine unique biological & technological expertise to efficiently grow, harvest and process seaweed at commercial scale from our open water facilities in Ireland, Morocco, India, Greenland and The Netherlands. We aim to contribute to a livable future for our children and the generations to come and to improve the health and well-being of humans, animals, crops & soils with our seaweed-based solutions. Meanwhile regenerating our oceans.or any enquiry in the area of seaweed production or the seaweed-based products that we have in the market, you can contact us at contact@theseaweedcompany.com

Murre Technologies
Total solutions for food processing

Murre Technologies is aware of the fact that the world needs to become more self-reliant whilst contributing to a truly sustainable society. That is why they do not cease developing the offshore seaweed harvesting machine, now that Wier&Wind has successfully ended. They are looking for a reliable partner to further develop a seeding module together that fits on their existing harvester. Together with a partner, they would like to upscale their experience and knowledge from 1 seaweed system to 10 systems. Step 3 would be to design a complete vessel suitable for seaweed farming. If you are interested to become Murre Technologies' partner in contributing to a sustainable society, please reach out to Jan Murre: jm@murre.nl

GEOxyz
GEOMATICS ENGINEERING SOLUTIONS

GEOxyz has established itself as a European leading service provider, focusing on Marine Site Investigation, Asset Integrity and Terrestrial Survey. Our expertise, people, equipment and technology provide our clients with the information and data required to design, construct and maintain structures and infrastructures. GEOxyz carries out activities across Europe and performs specific projects all over the world. We firmly believe that our future services will increasingly be based on automation and remote control, therefore a key focus for our R&D teams is to develop and enhance our autonomous instrumentation and fleet, nearshore, offshore and in the air. We are driven by a focus to improve the key performance metrics of time, cost and quality, while at the same time reducing our environmental impact and improving safety.

NORTH SEA FARMERS

North Sea Farmers is the seaweed sector organisation for the Greater North Sea region. Become a member of North Sea Farmers to get access to knowledge, the network, market information, events and participation in joint industry (subsidy/grant) projects.

Interested in starting an offshore seaweed farm?

This pilot aimed to demonstrate that nature-inclusive seaweed production is ready for future deployment in offshore wind farms in the challenging North Sea. Although there is still a road to go, it was a successful demonstration that offered valuable insights. Do you also want to start a seaweed farm in the North Sea? The partners that participated in Wier&Wind can help you with practical information, , knowledge and systems and supporting services that you can procure.

Please contact the partners of Wier&Wind for:

HZ University of Applied Sciences
Universiteit Gent
The Seaweed Company
Murre Technologies
GEOxyz
North Sea Farmers