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 SCAN ME

ULTFARMS Dutch Pilot Borssele

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About the pilot

The Dutch pilot **focuses on offshore/exposed mussel aquaculture combined with nature-inclusive elements to promote biodiversity at Borssele Offshore Windfarm**. It features a depth-adjustable Semi-submersible Mussel Farm (SMF) Platform (10x10x10m, 4 longlines). This semi-submersible system is designed to protect aquaculture lines from harsh North Sea conditions and has potential for other low trophic aquaculture.

The pilot monitors mussel performance, quality and food safety, and biodiversity. In an associated area in the Voordelta biodegradable BESE structures are tested to enhance seabed life, potentially creating a reef with species like European flat oysters and ultimately *Sabellaria spinulosa*. An AUV will track changes in biodiversity under the system.

Main Achievements

- **Mussel Production Platform:** Tested the OOS SMF unit, demonstrating technical reliability and performance.
- **Monitoring Technology:** Applied AI and automated image recognition for offshore monitoring of biodiversity and species performance.
- **Biological Performance:** Gained insights into biofouling and production species performance.
- **Physical Performance:** Characterized production system design through force measurement tests.
- **Price & Quality:** Assessed product price flexibility, sensory quality, and characteristics.
- **Stakeholder Engagement:** Engaged with key stakeholders in the Community of Practice North Sea (mussel) and NORA (reef).

Main Challenges



- **Licensing and Infrastructure:** One of the first NL pilot in wind park co-use. The complex and lengthy licensing process for infrastructure, including additional vessel and system requirements, has caused delays missing a production season.



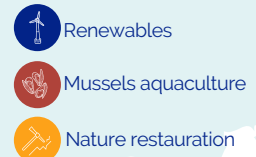
- **Licensing Reef:** Licenses and activity procedures did not meet required pre-requisites, and testing nature-inclusive design options faced additional licensing complication (decommissioning requirement), cost, and logistical challenges, particularly in wind park conditions.



- **Harsh Offshore Conditions:** Severe exposed/offshore conditions led to the need for over-dimensioned physical structures for the pilot. Tests will validate the impact on the business model. Time-window for O&M is very limited and vessel capacity not guaranteed.

BORSSELE

Sectors covered:



Piloted Solutions

- **OOS Platform:** Installed and tested without mussel lines (droppers), to validate system performance and requirements pending operational conditions.
- **BESE Products:** An exposed nearshore test site in the Voordelta is selected and equipped with BESE elements implemented to promote reef-building species.
- **Reef Development:** An exposed nearshore test site in the Voordelta is selected with a potential for long term (post-pilot) extension.
- **Biodiversity Monitoring:** Using AUV to track benthic biodiversity under future mussel lines.

Application

Scientific

- **Innovative Monitoring:** Validated remote monitoring techniques using AI and video technology to track macro benthos and aquaculture species performance.
- **Habitat Complexity:** Studied the presence of drop-offs on benthic communities and biodiversity around mussel lines.
- **Semi-Submerged System:** Tested submersible mussel cultivation systems with sensor technology under challenging conditions.
- **Restorative Aquaculture:** Integrated nature restoration elements to enhance biodiversity through artificial hard substrates.

Commercial

- **Biodegradable Reef Modules:** Developed artificial reef modules from biodegradable materials tailored to target species and environments.
- **Automated Species Identification:** Created an automated system using deep learning for marine species identification.
- **Industry Collaboration:** Engaged with a community of practice to co-design commercially viable, sustainable aquaculture solutions.
- **Nature-Inclusive Designs:** Integrated nature restoration into aquaculture systems, aligning innovations with social/political demands for sustainable practices.