



Norwegian Seaweed Cluster - collaboration and competition

Heidi Meland

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**NORWEGIAN
SEAWEED
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From single companies to cluster

- Motivation for seaweed farming
- Why collaborate – and about what
- Organizational structure
- Focus areas



Figure 1 – Applications and benefits of seaweed

♥ Health benefit 🌿 Environmental benefit

Segment	Example application	Primary functions	Benefits
 Food	Raw salads, crisps, spaghetti, burgers	Source of energy, protein and vitamins	♥ Supports healthier diets due to high minerals, vitamins, protein and fibre contents 🌿 Lower environmental footprint than animal or land-based alternative protein sources
 Additives	Gelatine substitutes, processed meat and dairy	Provision of thickening, stabilising and emulsifying properties	♥ Natural and vegan-friendly 🌿 Lower environmental footprint than animal-based alternatives
 Animal feed	Livestock feed supplements, aquafeed supplements, pet food additives	Promotion of positive immune response and gut health; improvement of digestive processes	♥ Improvement in animal health, production yields 🌿 Reduction of methane emissions from livestock
 Biot stimulants	Seed treatments	Stimulation of plant growth, protection against abiotic stress	🌿 Lower environmental footprint than nitrogen fertiliser alternatives 🌿 Promotes plant health, productivity and soil regeneration
 Pharmaceuticals & nutraceuticals	Gastrointestinal protectors, biodegradable wound care products / nutrient health supplements	Source of bioactive and nutrient-rich ingredients	♥ Disease prevention and treatment ♥ Natural health enhancers
 Cosmetics	Anti-aging moisturisers, toothpaste	Source of bioactive and nutrient-rich ingredients; provision of thickening, stabilising and emulsifying properties	♥ Natural and vegan-friendly ♥ Supports skin health
 Bio-packaging	Packaging, coatings and plastic films for food containers	Source of marine-safe and compostable plastic molecules	🌿 Replacement of substances causing environmental damage in production (fossil fuel) and after end-of-life (ocean leakage)
 Biofuels	Biodiesel for use in cars	Source of energy	🌿 Replacement for fossil fuels or land-intensive biofuels 🌿 Made from seaweed processing by-products

Note: This list seeks to highlight some of the most exciting applications only. Seaweed can be used in many more promising and innovative applications, including textile fibres, laundry detergents and construction materials.

Motivation for seaweed farming in Norway

- Large, and growing global demand
- Sustainable production
- Wide range of applications: From biofuels to pharmaceuticals
- Long coastline, fresh seawater, experience in fishing, aquaculture, maritime operations and offshore
- Seaweed farming will differentiate the Norwegian aquaculture with new products, and will strengthen the salmon industry by using released nutrients from aquaculture and other land activities
- Seaweed farming can contribute to restoring kelp forests along the coast

The process

- 2010-2015
 - Many permissions and locations opened for seaweed farming
 - Private money, small operations
 - Searching for solutions
 - Institutional and R&D initiatives for cooperation
- 2015-2020
 - Two separate network emerged in Western Norway and Northern Norway by companies initiative. 6 + 8 member companies
 - Sharing experience and knowledge, identifying challenges, formulating guidelines, meetings, workshops, study trips
 - Public funding of network management, companies in the boards

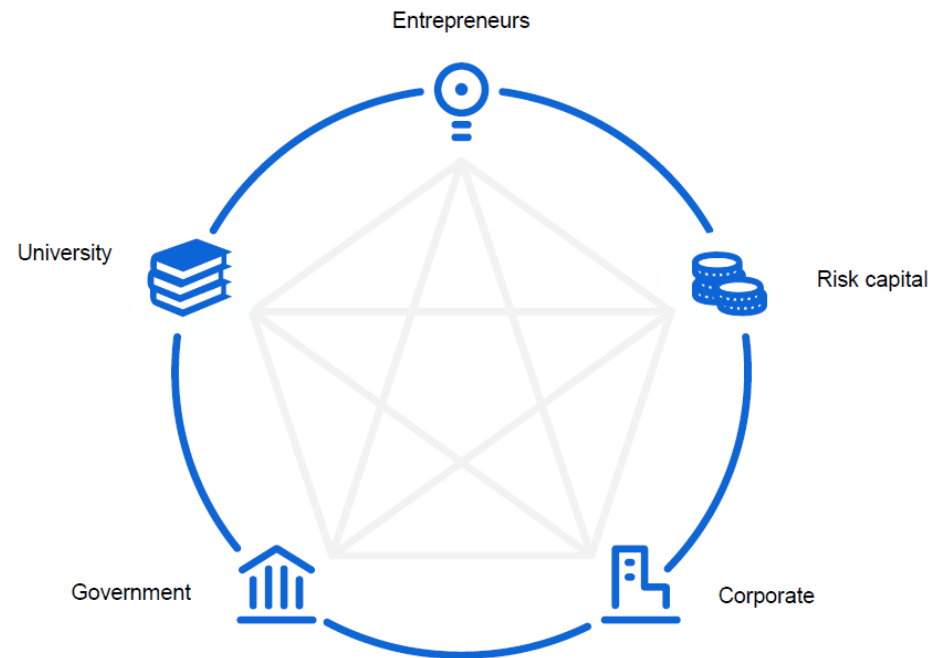




Common challenges and problems

- Biology, technology, regulations, marketing – all areas call for more research and development
- Common efforts => more resources => better chance for success
- An unanimous voice gets heard in important matters
- Hard to find customers and keep them satisfied alone
- Copying the early Norwegian salmon industry

The process

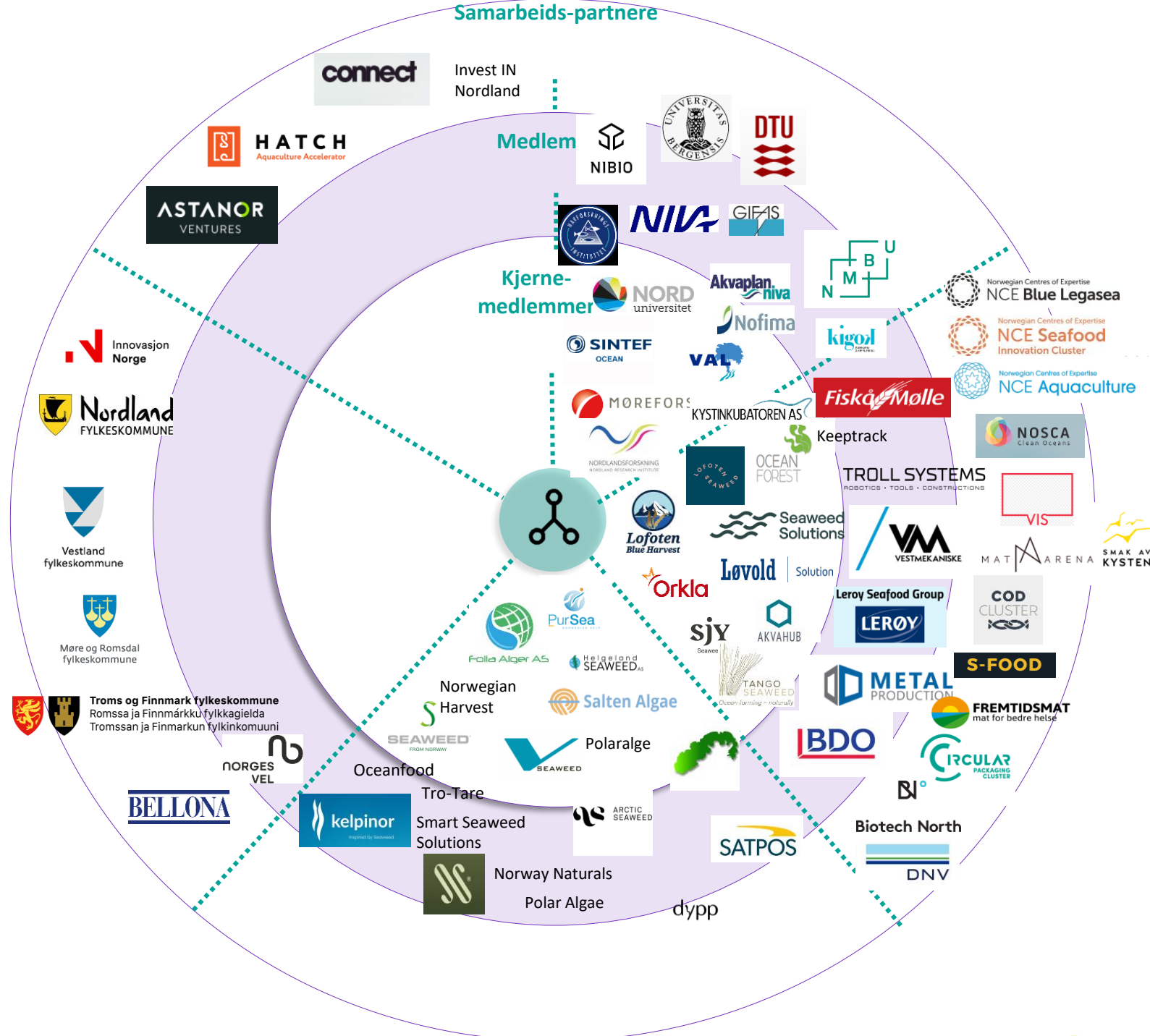


- 2020-2023
 - 2021 Merging the two networks into Norwegian Seaweed Association – a shareholders company – expanding from 14 network members in the very start to 28 companies
 - Membership fee
 - 2021 Applying for Norwegian Innovation Clusters – 67 partners
 - 2022 and forward: Innovation Norway Nordland funded Norwegian Seaweed Cluster as project for four years

Norwegian Seaweed Cluster

75 partners

Innovation system for seaweed

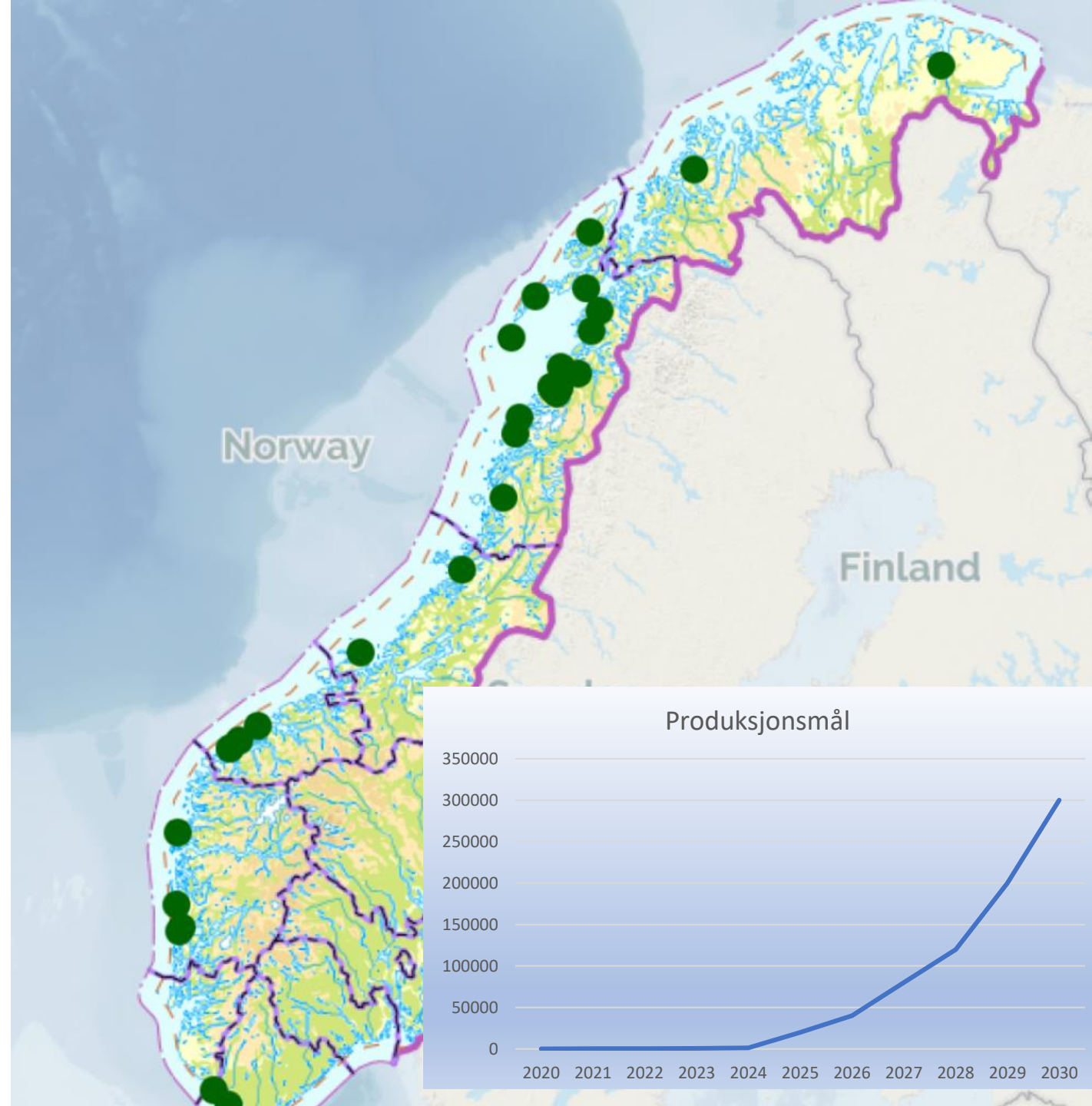


Farming status

- Permissions: 539
- Localities: 105
- Operation: 25
- Active companies: 20

- Area: 989 ha
- Production potential: 50' t (crop 50 t/ha)
- If all localities are usable....

- Harvesting *Laminaria hyperborea*: 150' tons
- Harvesting *Ascophyllum nodosum*: 20'-30' tons



Collaboration activities

- Meetings
 - Learning to know each other, exchanging experience and knowledge, building confidence and trust
 - Engaging experts, scientists and researchers
 - Mutual visits on locations
 - **No NDA's**
- 20 webinars a year
- Newsletter every week
- Workshops, e.g. common brand, fermenting, sustainability strategy
- Advisory Board and Public Instruments Forum
- R&D projects
- Communication with public authorities – counties, municipalities, environmental protection authorities
- Material
 - Farming course
 - Farming protocols
 - Industry guidelines
 - Template for contingency plan
 - *Template for sustainability strategy*
 - *Guide for product development*
 - *Monitoring program*
 - *Insurance contracts*



Focus areas



Marketing



Product development and quality



Production technology



Sustainability



Public framework conditions



Focus Market

Collaboration with Norwegian Seafood Council - seaweed for food

- Marketing in Norway
- Export
- Market analyses and market data
- Export certificats – customs
- Purchasing ans sales cooperation

Introduction of the brand Seagreens of Norway

Generic marketing for feed, biostimulants and refined ingredients

- Marketing in Norway
- Export
- Market analyses and market data
- Export certificats – customs
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Projects

- Common brand
- HoReCa – commercial kitchens
- Arena Querini
- Company network China

Focus Product development and quality

Standard documentation harvesting and product declaration

Brand manual

Quality, taste, shelf life, iodine

Format, product categories

Projects

- Digitalizing of documentation and tracability
- SusKelpFood
- SafeKelp
- SeaSoil
- AlgaeProBanos
- SeaMark
- GPseaweed
- SeaSolutions
- Canning





Focus Production technology

Seedling production

- Stabilization of the production
- Direct seeding

Deployment and sea farming

- Area efficiency
- Mechanization/Automation of deployment and monitoring

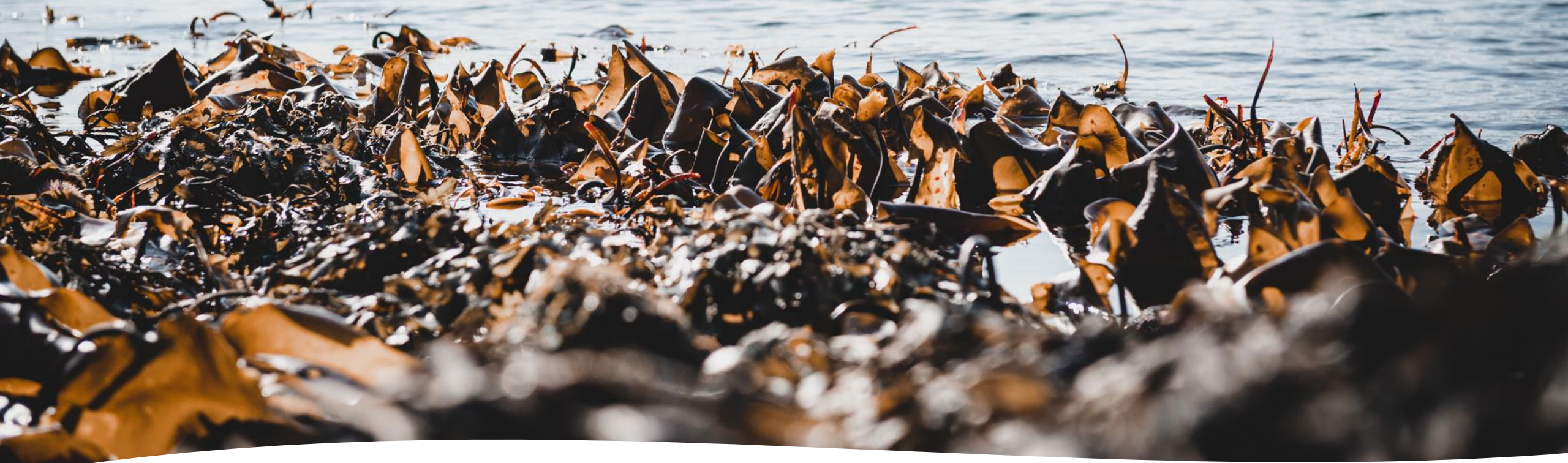
Harvesting and stabilizing

- Streamlining harvesting
- Quality control
- Technology for stabilization; drying, blanching, fermenting, freezing
- Packaging
- Logistics, shipping
- Common reception facilities

Regenerative methods and equipment

Projects

- Autogametofytt
- Kelpprime
- ArkKelp
- Olamur
- RI Seaweed
- Waste heat for drying



Focus Sustainability

Projects

- C-faarer
- Aurora
- Astral
- Locality
- iSea



Monitor the farming environment



Define and valorize ecosystem services



Develop a template for sustainability strategy and -report



Recycling, regenerative operation



Integrated, multitrophic aquaculture

An underwater photograph showing green seaweed in the foreground against a clear blue background with some bubbles.

Focus Public framework conditions

Masterplan – Ambitions and potential

- Profitability

Area access

- Spatial planning in coastal areas
- Contact with public authorities
- Passive permissions

Procedures for permission applications

Regulations concerning environmental monitoring, food safety, internal control, HACCP, fees, reporting etc.

Projects

- C-faarer
- Good localities
- iSea



Seagreens
of Norway™





What is achieved?

- Common brand: Seagreens of Norway
- Technical and biological progress – less mistakes
- Spinoff collaborations
 - R&D projects
 - Collaboration on deployment, harvesting and processing
 - Common marketing towards different segments
 - Cross ownership, new diversified companies
- Public citizen interest and recognition
- Recognition from public authorities
- Cultivating seaweed is little by little gaining a position as the new Norwegian aquaculture adventure – and this time as a *regenerative* marine production

mg@norgesvel.no

mob: +47 93663860

heidi@melands.no

mob: +47 95700163



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