Seaweed Solutions

Tare – en ny grønn industri er på vei

Brohodekonferansen

28. oktober 2020

Seaweed Solutions (SES) – en Frøya- og Trondheimsbasert pinoervirksomhet

- Etablert i 2009 med mål om å utvikle storskala taredyrking som ny industri
- Norges førte taredyrkingsanlegg etablert på Frøya i 2010
- Team på 10 personer (biologi, teknologi, business) i Norge og Portugal
- 10 års erfaring med FoU og praktisk produksjon
- Fra bioenergi til mat, fôr og andre markeder


Trondheim


Frøya


Frøya 2011

Integrert verdikjede– fra spore til marked

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Why seaweed?

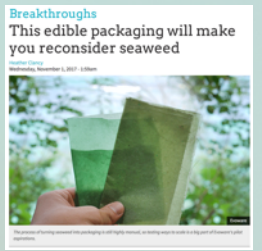
Seaweed – the biomass of the future

Sustainable: No feed, fertilizer, pesticides, freshwater or land use

Scalable: Major potential for upscaling offshore (billions of tons)

Increasing demand: Food, feed, bioplastics, and bioenergy

Perfect timing: hitting the mega-trends (climate, health, blue economy)



Bærekraft

Vi planter en skog i havet!

Trenger bare **sollys** og **sjøvann** for å vokse
(ikke noe fôr, gjødsel, ferskvann eller landareale)

Tare absorberer CO_2 and **næringssalter**, produserer O_2 og skaper **mer liv i havet** ved å gi mat og skjul for fisk og smådyr

Taredyrking er netto POSITIVT for miljøet!

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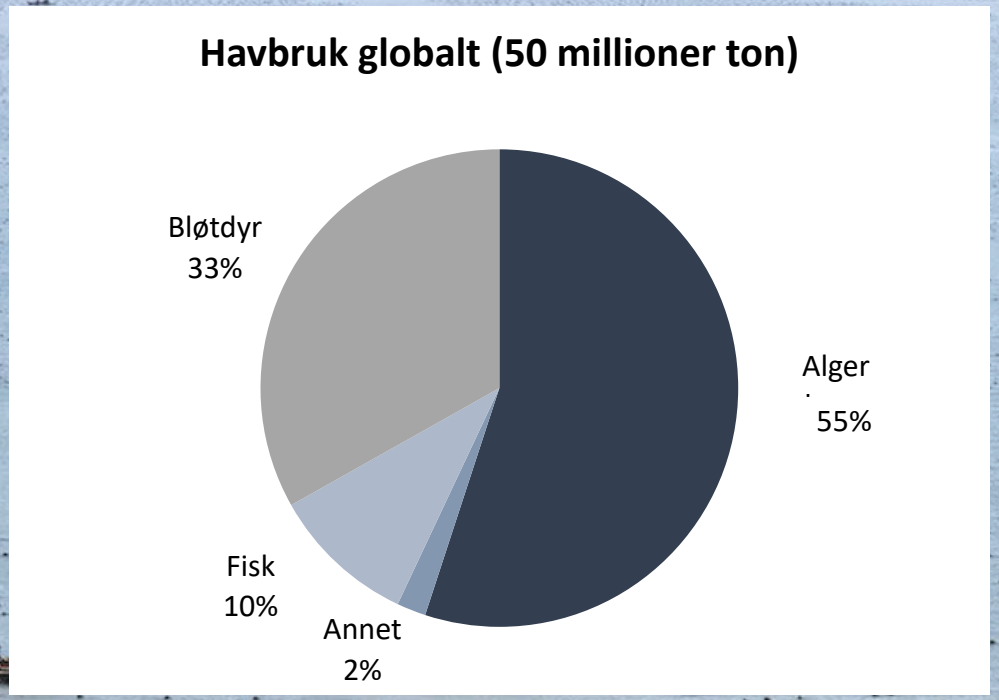
Global produksjon 30 millioner tonn



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United Nations Global Compact | 20 years
Uniting business for a better world

#UnitingBusiness

Lloyd's Register Foundation

> **If we get this right, we are at the start of a great journey together in sustainably harvesting the potential of our largest common good – the ocean.**

Erik Gierckskу
Head, Sustainable Ocean Business
UN Global Compact
United Nations

Vincent Doumeizel
Director Food Programme
Lloyds Register Foundation

FOREWORD

Secretary General of the United Nations, Antonio Guterres, has coined this the Decade of Action and Delivery for the 17 Sustainable Development Goals. Businesses, governments, academia, non-governmental organisations and the UN must act together and deliver solutions addressing key issues such as hunger, poverty and climate change, to name a few.

We are at a point where ocean health is rapidly deteriorating, caused by climate change, pollution and over-exploitation of its resources. At the same time, the ocean holds a huge potential to deliver on the global goals – with more healthy food, renewable energy and green transport for a growing world population.

The current global seaweed production is already a part of the solution. Going forward, we can scale up this industry to deliver safer and healthier food, renewable biofuel, low-carbon feed, as well as capturing and storing carbon dioxide to limit climate change, while also creating new sources of revenue to alleviate poverty in coastal communities. These are some of the direct benefits of seaweed production.

Examples of efforts that can ensure this industry accelerates to the next level:

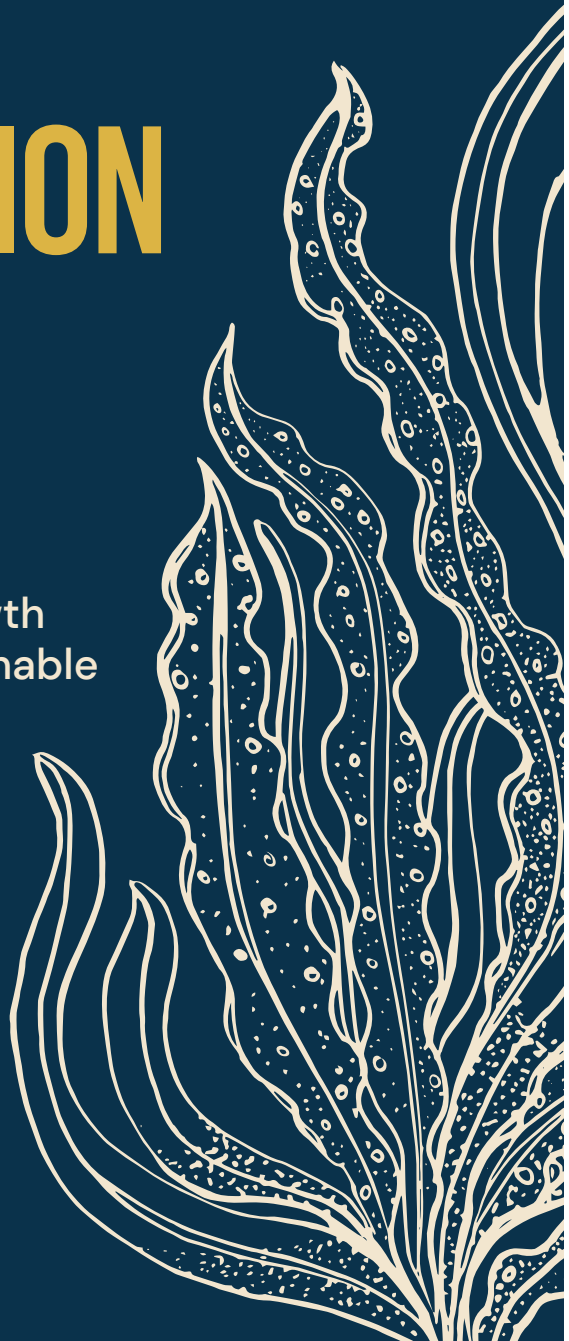
- harmonizing rules and regulations;
- sharing science and safety best practices;
- enabling innovations;
- good marine spatial planning; and
- new investment efforts can ensure this industry accelerates to the next level.

This manifesto outlines the opportunities and barriers ahead of us. If we get this right, we are at the start of a great journey together in sustainably harvesting the potential of our largest common good - the ocean.

This Seaweed Manifesto will be available online at www.seaweedmanifesto.com, where you can also state your support to the manifesto and our common vision for the seaweed industry.

HIDDEN CHAMPION OF THE OCEAN

Seaweed as a growth engine for a sustainable European future



SEAWEED for EUROPE

Funded by SUN Institute Environment & Sustainability
Initiated by Deutsche Post Foundation

Hidden champion at a glance

Seaweed (macroalgae) provides a range of product applications...

Animal feed | Food | Pharmaceuticals & nutraceuticals | Additives | Bio-packaging | Cosmetics | Biostimulants | Biofuels | Valorisation of ecosystem services

...which could scale the European seaweed industry,...

€9.3bn potential market value by 2030

(of which 30% supplied by seaweed grown in Europe)

...creating significant environmental benefits...

Mitigation of **>5m t**[1] of CO_2e emissions p.a.

Absorption of **20,000 t** of nitrogen and **2,000 t** of phosphorus from the ocean p.a.

Provision of **ecosystem services** (food, habitat, nursery ground for marine species)

No need for freshwater, fertiliser or cleared land

...and strong social impact.

Creation of **115,000 jobs** for different skill and experience profiles

Revitalisation of coastal communities

Improvement of diets and general **health**

Europe is perfectly suited for such a scale up.

Ideal growing conditions with nutrient-rich, cold waters

Burgeoning innovation community including start-ups and SME players across the value chain

Existing and fast-growing demand for seaweed-based products and ingredients

Strong alignment with European Green Deal objectives and priorities

To deliver this potential, the nascent European seaweed industry must accelerate and significantly grow its production capacity.

From **~300.000 t** of fresh weight seaweed produced today → to **>8m t** of fresh weight seaweed produced in 2030

By following five key guiding principles, the industry can become a pioneer for green and equitable growth and play an integral part in our "new normal".

- Embrace a system view
- Make the system resilient
- Share benefits fairly among stakeholders
- Be guided and informed by science
- Measure and monitor success using holistic metrics

Targeted action in six priority areas can put this industry on the right track to fully unlock this promising potential.

1. Optimise seaweed farming licensing process
2. Attract public and private investors to the seaweed space
3. Create a strong and collaborative stakeholders network
4. Establish robust safety standards and a comprehensive certification system
5. Raise awareness on the benefits and potential of seaweed
6. Leverage science to accelerate innovation

1 Further research needed to determine full industry potential. Due to limited data availability, figure only includes mitigation potential for animal feed, bio-packaging and biofuel.
2 Based on consideration of every part-time role as a separate job. Equivalent to 85,000 FTE

Status taredyrking i Norge – 97 lokaliteter

Antall tillatelser til taredyrking per fylke

Dyrking 2019:

97 lokaliteter

111 tonn

4.4 millioner NOK

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Hva skal taren brukes til?

Breakthroughs

This edible packaging will make you reconsider seaweed

Heather Clancy

Wednesday, November 1, 2017 - 1:59am

Market opportunities

Food
- Salads, soups, smoothie, herbs
- Snacks
- Vegetarian/vegan
- Salt replacement
- Flavour
- Texturizer




Specialty chemicals
- Alginate
- Carrageenan
- Agar
- Mannitol
- Cellulose
- Bioplastics
- Fiber and textiles
- Minerals

Health & nutrition
- Pharmaceuticals
- Nutraceuticals
- Functional food ingredients
- Functional feed ingredients
- Cosmetics
- Plant biostimulants




Industrial commodities
- Biofuels and biogas
- Biochemicals
- Protein
- Fertilizers

European food innovation – new food products containing seaweed

- ✓ Climate friendly
- ✓ Vegan / plant based
- ✓ Healthy
- ✓ Salt replacement
- ✓ “Clean label”
- ✓ “Natural”

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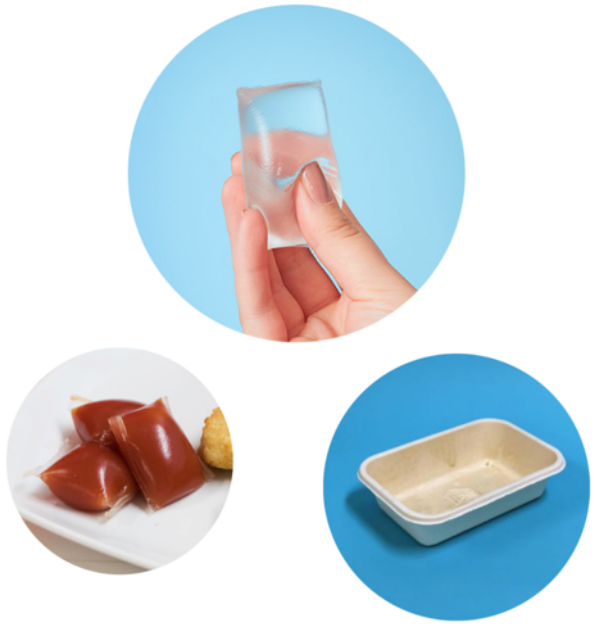
Seaweed for bioplastics



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Breakthroughs

This edible packaging will make you reconsider seaweed

Heather Clancy
Wednesday, November 1, 2017 - 1:59am

The process of turning seaweed into packaging is still highly manual, so testing ways to scale is a big part of Evoware's pilot aspirations.

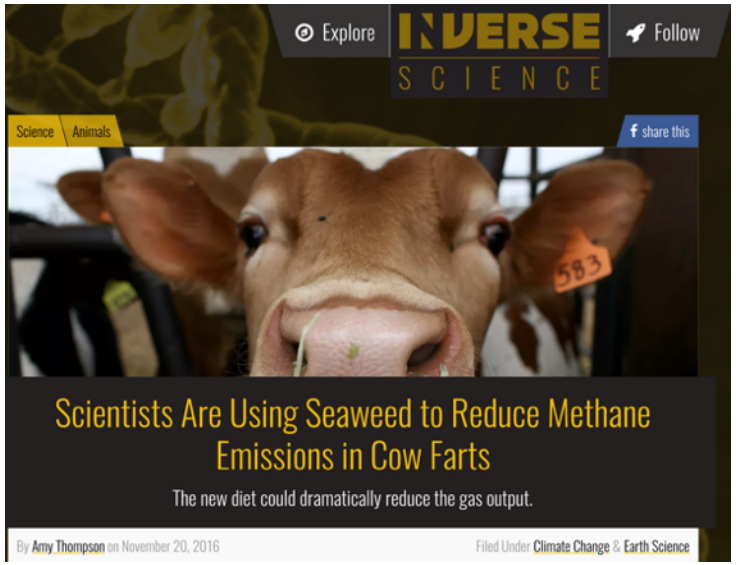
Evoware/GreenBiz 01.11.17

PlastiSea

New project (2020-2023)
ERA-NET BlueBio
(SINTEF, SES, B'ZEOS,++)

Fôr til dyr og fisk

- ✓ Tarmhelse
- ✓ Immunsystem og reduksjon av patogener
- ✓ Reduksjon av metanustlipp
- ✓ Slimlag
- ✓ Bærekraftig, marin, lavtrofisk ingrediens



Integrert havbruk (IMTA)

- ✓ Vinn-vinn
- ✓ Reduksjon av næringssaltproblematikk
- ✓ Økt vekst på tare (og høyere proteininnhold?) – bedre utnyttelse av næringssaltressurser

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Kompetansebehov

- Biologi (klekkeri, vekst, genetikk, miljøinteraksjoner)
- Marin teknologi (design, automatisering, modellering)
- Prosessteknologi
- Drift og produksjon
- Marked and kvalitet (applikasjoner, matsikkerhet)

Muligheter for regionen

- Ta en lederrolle internasjonalt innen FoU på tare
  - Allerede godt posisjonert (og historien på plass)
  - NTNU, SINTEF (og SES)
  - Både teknologi, biokjemi, biologi og samfunnsfag

- Frøya – en ideel lokasjon for fullskala "feltlab" innen tare+laks (IMTA)
  - Demonstrere IMTA i stor skala (FoU-konsesjon)
  - Få på plass instrumentering, modellering, dyrkingsteknologi – bli '*the place*' for IMTA
  - Bruk av tare i laksefôr

- Industriell utvikling
  - SES og Nutrimar er i gang
  - Kommer det flere?

40 år senere...

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Join us in unlocking the potential of seaweed

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