

# The market is demanding macroalgae – dozens of products under development

SIG SEAWEED 15. NOVEMBER 2022



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# A global and national demand in the market

- Global market continues to grow
- Prices in China doubled from 2021 to US \$ 400 pr ton
- Norwegian food industry in lack of supplies of high-quality kelp, even of *Alaria esculenta* and *Saccharina latissima*.
- A wide range of products with kelp as ingredient introduced the last years on the Norwegian market

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Transcript 17:38, 06-Jul-2022

## China Kelp Production: Seaweed products give high returns in Dalian city

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The price of kelp has increased exponentially in the global market this year. In northeast China's Dalian city, kelp cultivation and production has become one of the most profitable agricultural industries. Yu Li reports.

Kelp and wakame are used in some of the best dishes in Asia. In the Lvshunkou District of China's Dalian City, fishermen had a bumper harvest of algae this year, and the yield per unit increased by about 20% compared

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# Attitudes to seaweed

Survey among Norwegian consumers © Nofima 2021



Willing to eat  
seaweed



Seaweed is  
healthy



Seaweed is  
safe to eat



Seaweed is  
organic

*Results from a consumer study conducted in 2020. The percentage refers to the amount of respondents who agreed to the statement.*

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# Far back in history ..... and into modern times.



Source: Wikipedia / Egill Skallagrimson

# Some early products



**GO<sup>2</sup>**  
GRILL

VINNER AV  
**NM I SUNN FASTFOOD**  
2018

#mer av grovt, grønt og fisk

**HEART SMART MEALS**

### Mango-curry burger

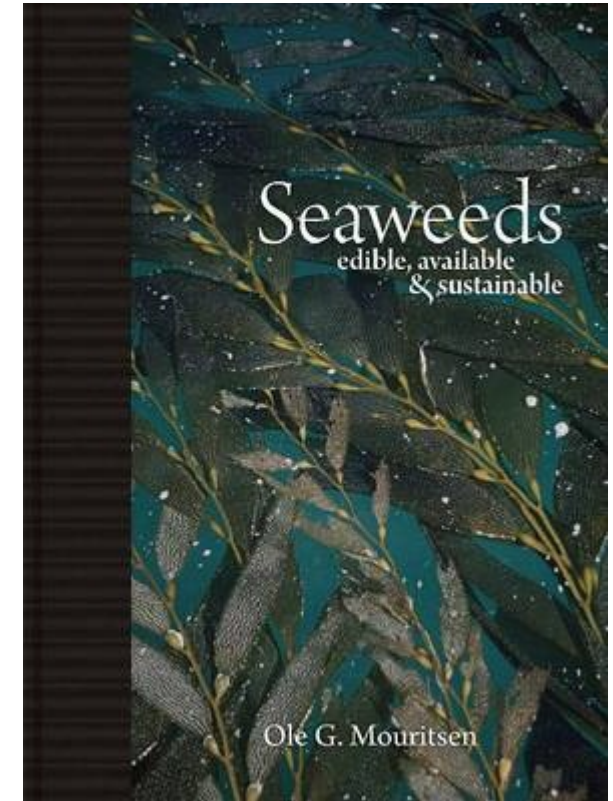
Fiskeburger m/tare, i valgfritt brød, toppet med tomat, sylteagurk, rødløk, polarsalat og mango-curry dressing  
Serveres med søtpotet fries, løkringer og beger aioli dipp.

Allergener: gluten (hvete), sesamfrø, fisk, egg, melk



# Examples of released food products

- Fishburger (Slåtto/Patricias Gatekjøkken)
- Quini urkornsgrøt (Quini)
- Seaweed spice / seaweed salt (Algetun)
- Snack (Sjy seaweed)
- Spicy nudel meal (OFN)
- Mackerel i tomato (Lofoten)



# Current situation

- A growing potential
- Cultivation of more species
- The market is still unmaturing
- Moving from enthusiastic try and failure to systematic innovation
- Further work on upscaling cultivation with an end product perspective
- Reducing energy consumption for:
  - Drying
  - Freezing
  - Alternative preservation technologies
- Joining forces
- Utilising all of the raw material

Trends in Food Science & Technology 118 (2021) 765–776



Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Trends in Food Science & Technology

journal homepage: [www.elsevier.com/locate/tifs](https://www.elsevier.com/locate/tifs)



## Seaweed products for the future: Using current tools to develop a sustainable food industry

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### ARTICLE INFO

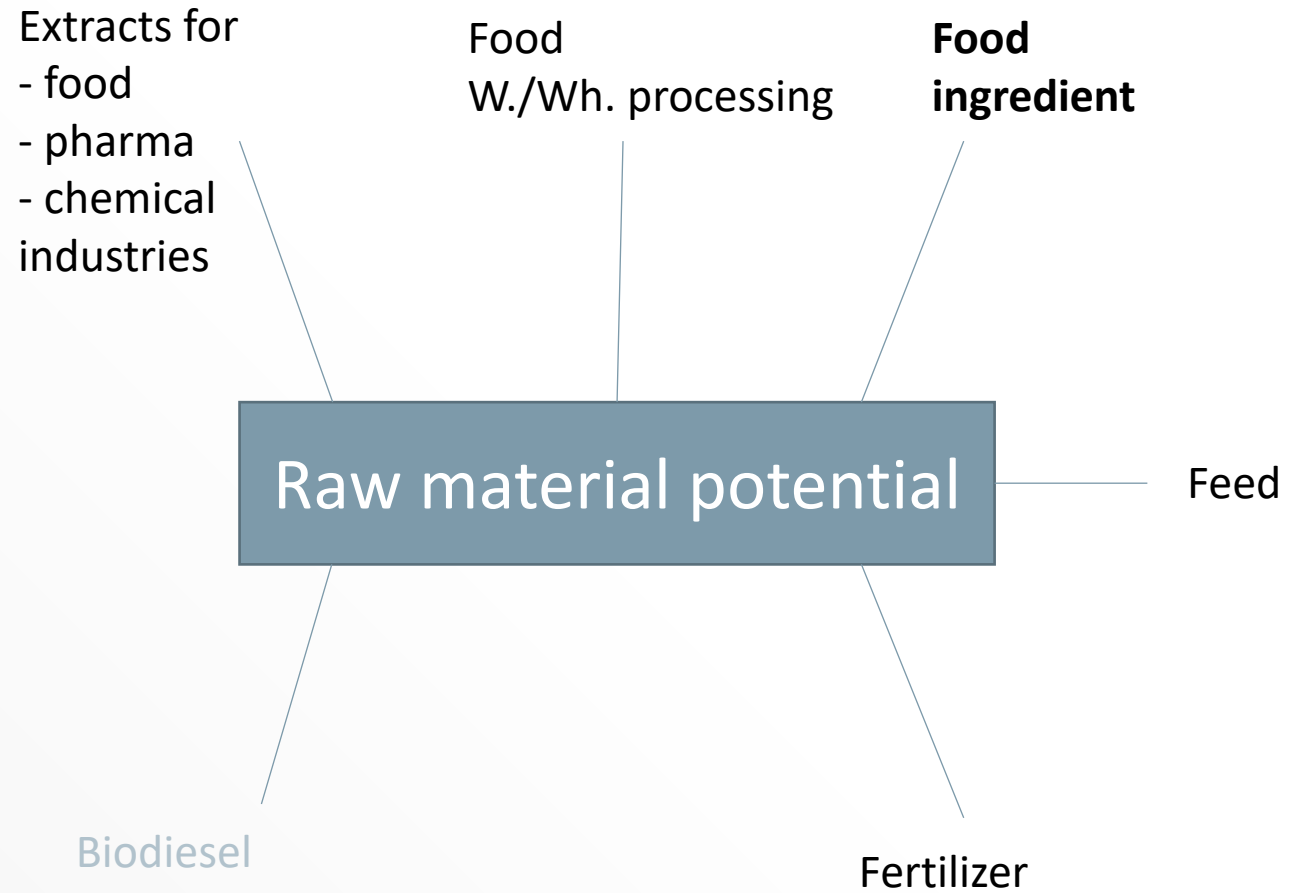
#### Keywords

Seaweed  
Food applications  
Food safety  
Food processing  
Novel technology  
Consumer

### ABSTRACT

*Background:* Although commonly consumed in Asia, seaweeds are a largely underutilized food source in the Western world. However, interest is rising, and seaweeds have a major potential as both main and functional ingredients in European markets. The current barriers for seaweeds as food products relate to food safety, quality preservation and optimization, and food neophobia.

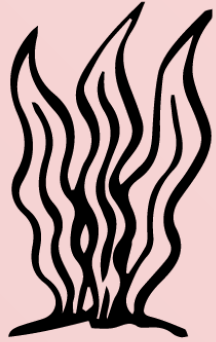
*Scope and approach:* This commentary provides an overview of current challenges to providing seaweed in the European market and proposed solutions to tackle these obstacles, taking inspiration from other food sectors. Processing and packaging concepts for future manufacturing of seaweeds as food are explored and insight into



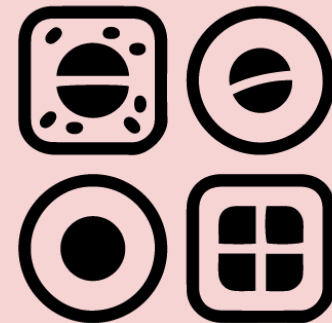


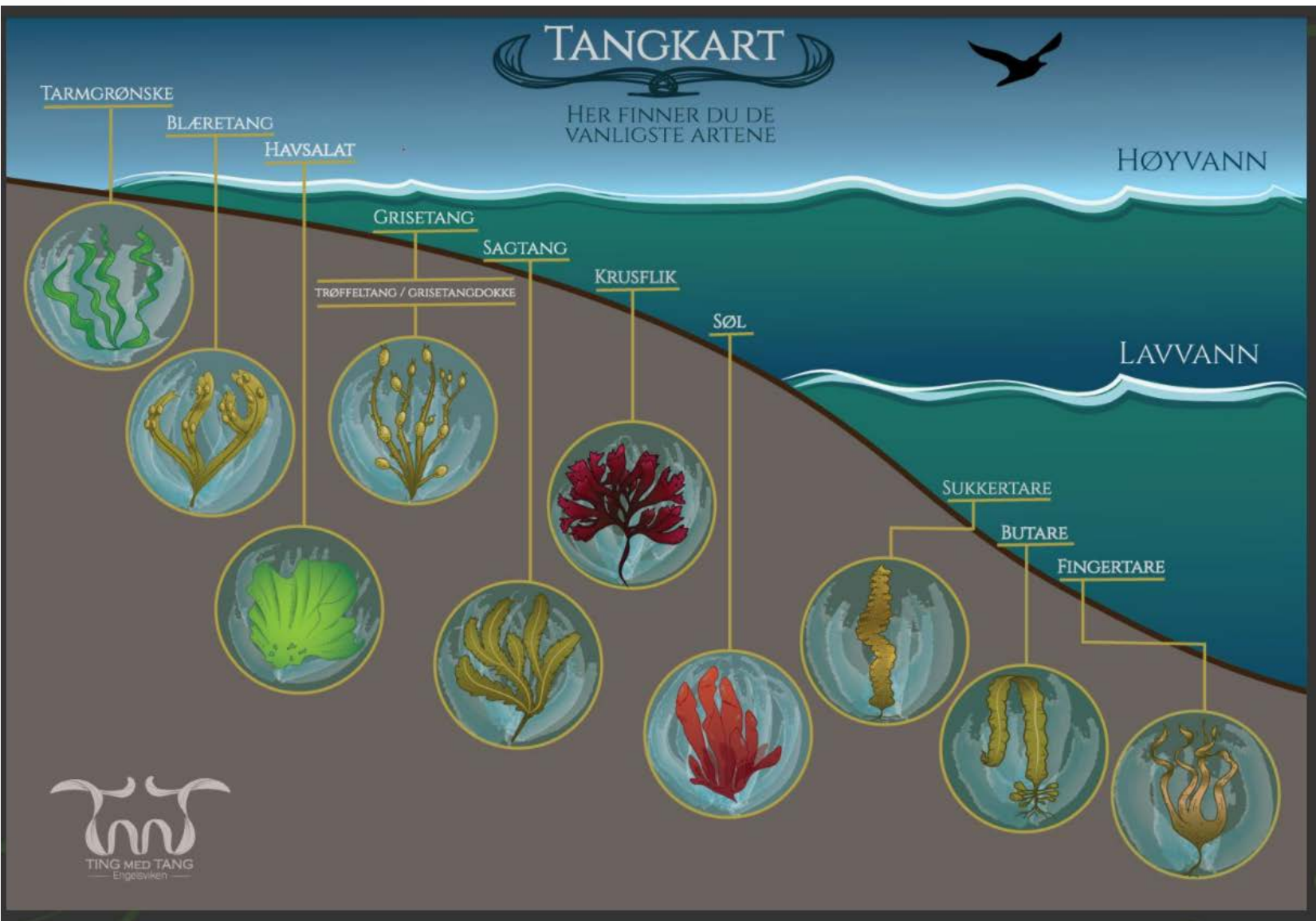
# Is food ingredients a niche market?

If 15 % of minced fish products (fish burgers, puddings etc) contained 5 % seaweed ingredient the total national production would be spent. Imagine the potential for other foods and snacks!



## Species with potential





## Ideas

- Tangweb  
<https://tingmedtang.no/tangweb/tangkart/>
- Cook books
- Prannie Rathigans seaweed kitchen
- Ole Mouritsen's book mentioned above

# Choosing species by taste

Screening of species potential

- *Palmaria palmata*
- *Vertebrata lanosa* (found on *Ascophyllum nodosum*)



# Choosing species by functionality or nutritional content - Proximate composition

	<i>S.latissima</i>	<i>A.esculenta</i>	<i>L. digitata</i>	<i>L.hyperborea</i>	<i>P.palmata</i>	<i>V.lanosa</i>
Water content (fresh) g/kg	840.0	826.4	839.8	833.1	819.5	823.8
Water content (freeze dried) g/kg DW	87.0	53.9	68.1	52.7	37.8	57.0
Lipids g/kg DW Dm/me	6.1	13.0	11.3	14.2	13.3	13.0
Proteins DW	81.8	91.1	53.1	50.2	122.6	115.6
Ash g/kg DW	264.5	245.6	244.3	287.5	422.3	287.8

Reworked from Mæhre et al. 2014  
plus own data for *S. latissima*

## Free amino acids

In g/kg	<i>S.latissima</i>	<i>A.esculenta</i>	<i>L. digitata</i>	<i>L.hyperborea</i>	<i>P.palmata</i>	<i>V.lanosa</i>
Threonine	-	0.3	0.3	0.3	0.2	0.2
Valine	-	Nda	Nda	Nda	0.1	0.2
Lysine	-	0.2	Nda	Nda	0.1	0.2
Histidine	-	Nda	Nda	Nda	Nda	0.1
Glutamic acid	-	2.9	0.7	1.0	6.1	1.1
Sum Free Amino Acids	12.3	15.5	4.9	5.3	16.2	10.8

Reworked from Mæhre et al. 2014 plus own data for *S. latissima*

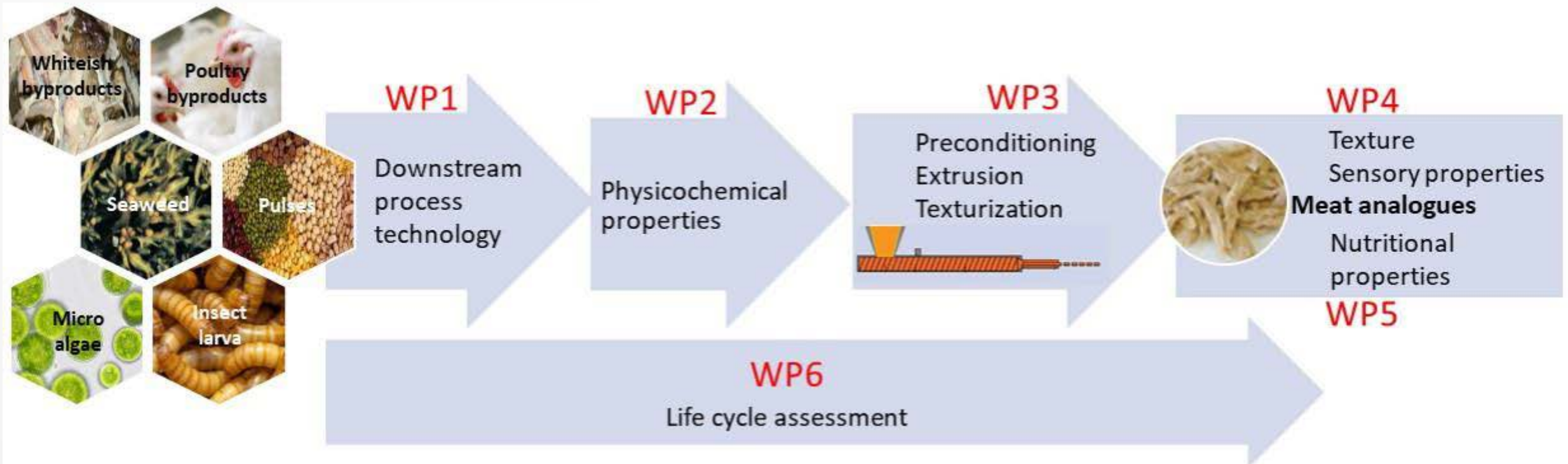
## Fatty acid composition

In % of total fatty acid content	<i>S.latissima</i>	<i>A.esculenta</i>	<i>L. digitata</i>	<i>L.hyperborea</i>	<i>P.palmata</i>	<i>V.lanosa</i>
Sum PUFA	60.0	33.2	45.6	34.2	35.4	45.8
n3	23.9	20.4	29.1	21.5	34.3	33.8
n6	-	12.8	16.5	12.7	1.1	11.9
n6/n3	-	0.6	0.6	0.6	0	0.4

Reworked from Mæhre et al. 2014  
plus own data for *S. latissima*

# Choosing by functional properties - Project: Novel texturized hybrid foods targeting future sustainability and health challenges in the Anthropocene

Two ongoing projects leading to products texturized by seaweeds: SusKelpFood and Hybrid Foods







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