



D4.2.1 Market potential report for cultivated seaweeds in existing seaweed food markets

as part of the Interreg 2 seas ValgOrize project, January 2021



NORTH SEA FARMERS

Preface

This report (D4.2.1) is part of the Interreg 2 seas project ValgOrize. The project is coordinated by Flanders Research Institute for Agriculture and Fisheries (BE) and includes 10 other partners among which; Flemish Institute for Technological Research (BE), Royal Netherlands Institute for Sea Research (NL), HZ University of Applied Sciences (NL), North Sea Farmers (NL), Zeewaar BV (NL), University of Littoral Côte d'Opale (FR), University of Lille (FR), University of Greenwich (UK), Marine Biological Association of the United Kingdom (UK), Nausicaa (FR). The ValgOrize project runs for a period of four years, started in 2018 and is funded by Europe via the Interreg 2 Seas Programme. For more information about the project, visit <https://www.interreg2seas.eu/en/ValgOrize>

This report is a co-production of Anke Bergmans from Mountainview Research and several team members of North Sea Farmers; Lotte Bronswijk, Marlies Draisma, Eef Brouwers, Femke Prins and Koen van Swam. As a community of businesses with a passion for seaweed, North Sea Farmers work towards positive climate impact. By growing a sustainable seaweed sector, we aim to improve biodiversity, reduce carbon emissions and be part of the circular economy. We are a non-profit organisation with an ANBI status. For more information, visit <https://www.northseafarmers.org/>

In the ValgOrize project, North Sea Farms are leading the study on valorisation aimed at supporting and accelerating the development of a technically and commercially viable seaweed supply chain for food applications, and the development of a roadmap towards sustainable production of micro-algae for food applications.

Contact information

Questions and remarks about the report and the project can be shared with Lotte Bronswijk: lotte@northseafarmers.org

Disclaimer

All data that has been collected is used for purposes of the Interreg 2 seas ValgOrize project and only to the context it is necessary to fulfil those purposes. North Sea Farmers attempts to work only with reliable and accurate data. However, North Sea Farmers do not give any warranty or other assurance to the content of the material appearing in this report. Furthermore, no rights can be derived from this publication.

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0.1 About ValgOrize

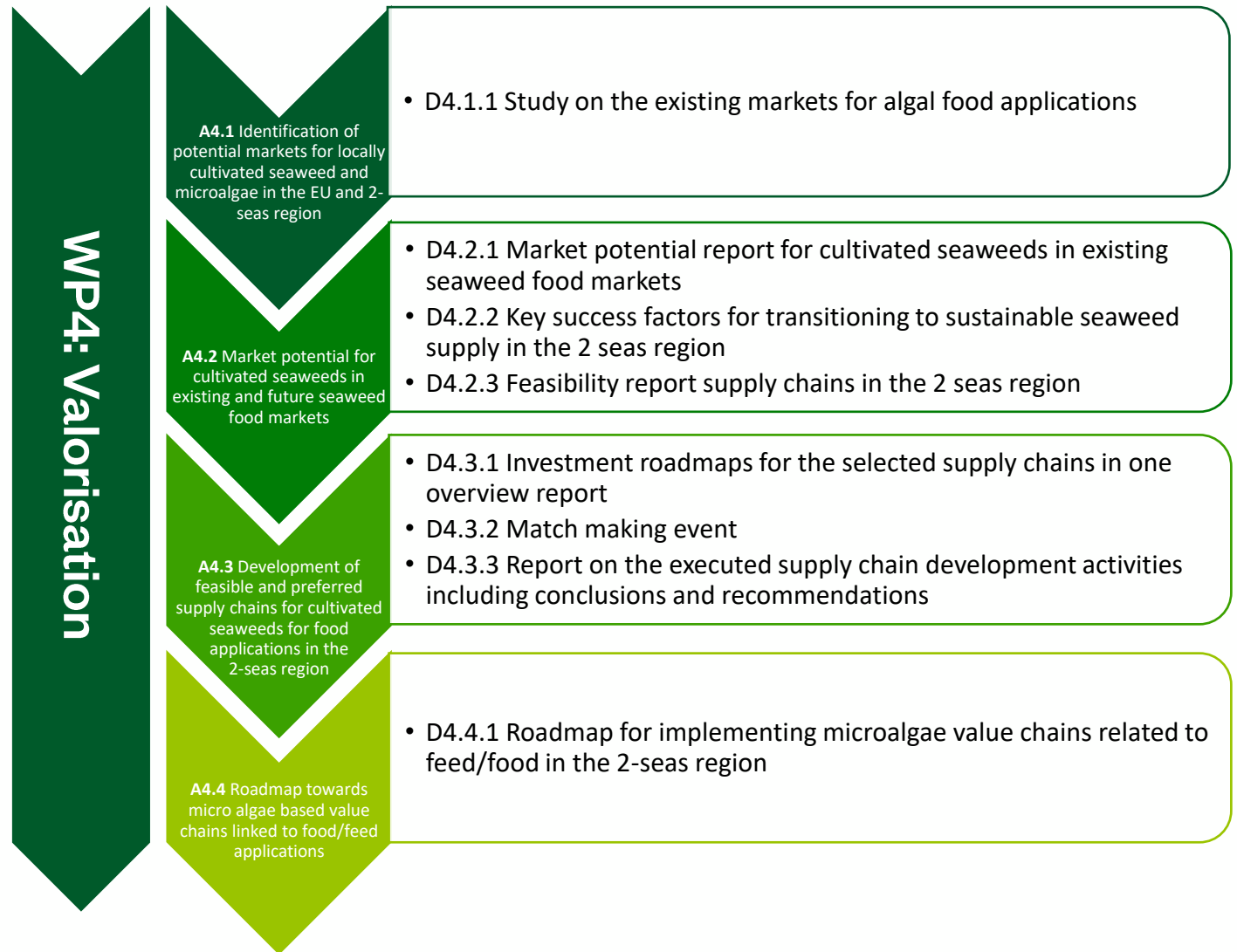
This report is part of the Interreg ValgOrize project for the European Union. The project aims at enhancing innovation in the algal sector, by creating an interdisciplinary platform for sustainable production of flavoursome, high quality algal foods that meet the requirements of the European market. The project comprises of 6 work packages:

- **Work Package 1:** Macroalgae cultivation; optimized macroalgal growth conditions (quality, reproducibility and reliability) for best food parameters.
- **Work Package 2:** Microalgae cultivation; optimization of cultivation methods for maximal productivity and yield of biochemicals and markers of taste.
- **Work Package 3:** Acceptance of the produced micro/macroalgal biomass and algae products for consumption; assessing algal safety, quality (as food product), optimal taste, product development, sustainable/zero waste.
- **Work package 4:** Valorisation; support and accelerate the development of a technically and commercially viable seaweed supply chain for food applications, and the development of a roadmap towards sustainable production of micro-algae for food applications.
- **Work Package 5:** Project management
- **Work package 6:** Communication

0.2 Work package 4

This report is part of Work Package 4: Valorisation; support and accelerate the development of a technically and commercially viable seaweed supply chain for food applications, and the development of a roadmap towards sustainable production of micro-algae for food applications. Within the work package, the results and insights as obtained in WP1, 2 and WP3 will be valorised. This specific report constitutes the required deliverable D4.2.1 'Market potential report for cultivated seaweeds in existing seaweed food markets' as part of activity A4.2 'Market potential report for cultivated seaweeds in existing and future seaweed food markets'.

North Sea Farmers are responsible for Work Package 4. Furthermore, Flanders Research Institute for Agriculture and Fisheries, Flemish Institute for Technological Research, University of Greenwich and Zeewaar are involved in the Work Package. And North Sea Farmers wants to thank all other partners and observer partners who contributed and shared their insights in various interviews for D4.2.1 and D4.2.2.



0.3 Introduction

Unfortunately, in Europe and the Netherlands, the availability of quantified and accurate seaweed market data is limited. Monitoring and reporting processes are not (yet) in place in this young sector. Reports from the Food and Agriculture Organization are not up to date and do not cover the entire European Union. Most of the time, other studies build upon these data. This makes it difficult to assess the barriers, drivers and overall progress of the sector. We feel reliable market data is essential for the further development, growth and professionalisation of the seaweed sector in Europe and the Netherlands.

Scope and objective

The overall objective of this report is to assess the market potential for seaweeds in existing and future food markets. Furthermore, North Sea Farmers aims to determine to what extent these markets could be supplied with locally cultivated seaweed; being a sustainable, short chain supply instead of imports.

Research question

What is the market potential for cultivated seaweeds in the identified existing and potential seaweed for food markets?

0.4 Research design

To get a complete overview of the market potential for local cultivated seaweed as food, information was gathered on the following topics:



0.5 Methodology

Information was gathered by combining qualitative and quantitative methods from various sources:



Desk Research

Sources on market information and trends in seaweed and food markets



Experts interviews

42 interviews with professionals in the food sector



Community survey on market estimation

60 respondents from the ValgOrize network

0.6 Scope

	IN SCOPE	OUT OF SCOPE
TYPE	seaweed	micro-algae
APPLICATION	Food products, additives (hydrocolloids)	feed, biostimulants, pharma, nutraceuticals, cosmetics, biofuels, bio-packaging
MARKET	main focus: 2 seas region: United Kingdom, The Netherlands, Belgium, France secondary focus: other European countries	markets outside of Europe



1. Global seaweed production & market



1.0 In this chapter

The global seaweed production & market explained:

- Summary
- Global seaweed production
 - Global seaweed production per type
 - Most produced species globally
 - Origin of the seaweed
 - Ratio cultivation and wild harvest
- Global seaweed market
 - Global seaweed market for human consumption
 - Application: food products
 - Application: hydrocolloids
- In sum: key takeaways

Sources: 10, 20, 27

1.1 In sum: Global seaweed production & market



Global production of seaweed



32,4 million tonnes (wet weight, 2018)

- 53% red seaweeds
- 46% brown seaweeds
- 1% green seaweeds



Origin of seaweed

95% of seaweed comes from Asian countries

97% is obtained through cultivation

Global market for seaweed



\$ 13.3 billion (€ 10.9 billion) total seaweed market (2019)

77% seaweed for human consumption

\$ 10.2 billion (€ 8.4 billion) seaweed for human consumption



Largest market share

- Asia 61%
- North-America 19%
- Europe 10%
- Other 10%



Growth

Expected yearly growth: between 7% and 12%

Sources: 10, 20, 22, 27, 28, 29 30, 31



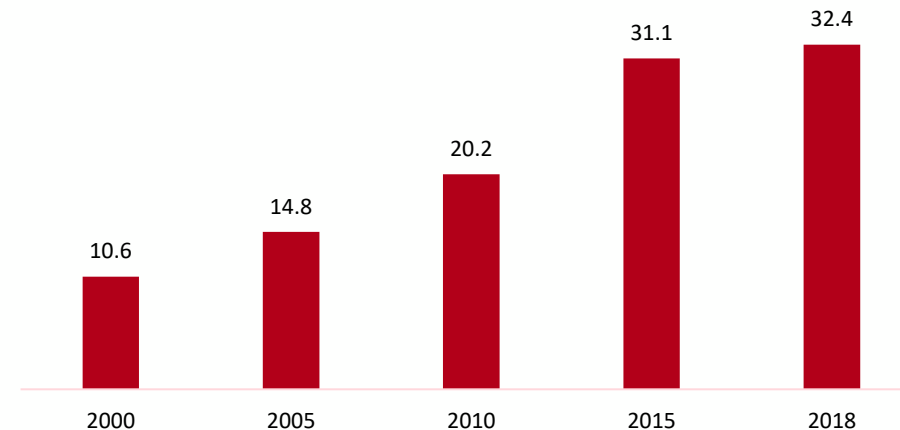
1.2 Global seaweed production

Global production of seaweed 2000-2018

The seaweed production has tripled since 2000, but growth seems to flatten since 2015. This is caused by a stabilization of the production of tropical species in South-East Asian countries.

On the other hand, farming of coldwater species is still in its infancy and rising. North-America, Europe and South America are exploring the possibilities of local cultivated seaweeds with known and new species which can open new markets and opportunities.

Volume of produced seaweed in million tonnes (wet weight)



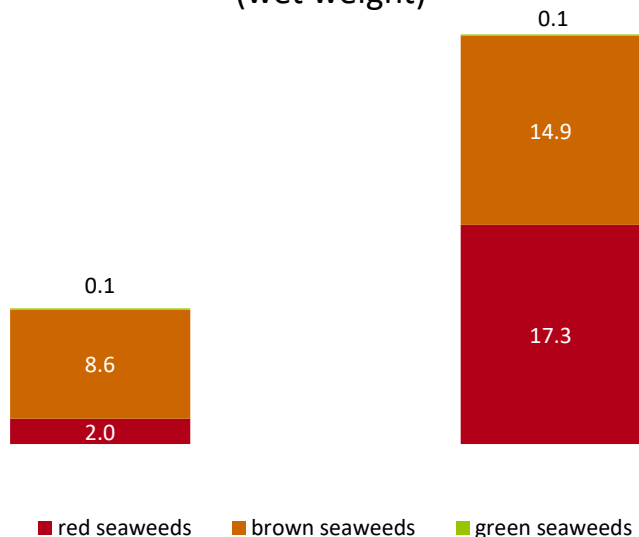
Sources: 10, 20, 27



1.2.1 Global seaweed production per type

Global production of seaweed, specified for red, brown and green seaweeds

Volume of produced seaweed in million tonnes (wet weight)



Red seaweeds are responsible for most of the growth and since 2015 more red seaweeds were produced than brown seaweeds. This is mostly due to a major increase in the carrageenan producing species (in particular *Eucheuma*) and the agar producing species (*Gracilaria*).

Sources: 10, 20



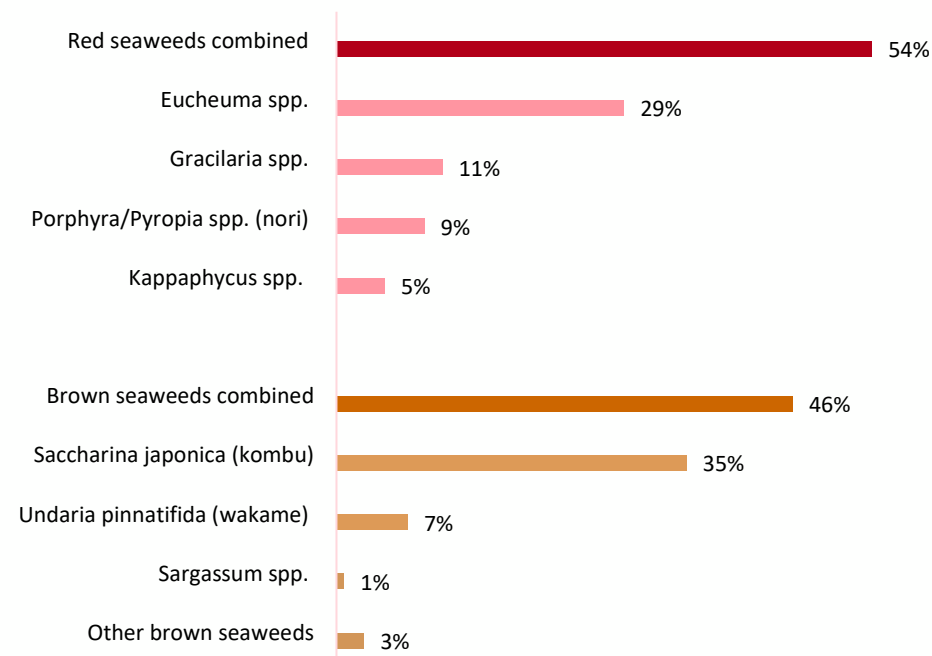
1.2.2 Most produced species globally

Eight species make up for 99% of the global seaweed production.

Red seaweeds cover just over half of the global produced volumes, brown seaweeds make up for the other part. Green seaweeds are a niche, with less than 1% of the seaweed market.

Euचेuma sp. (a source of carrageenan) and *Saccharina japonica*, known as Kombu, are the most produced species.

Seaweed production by species



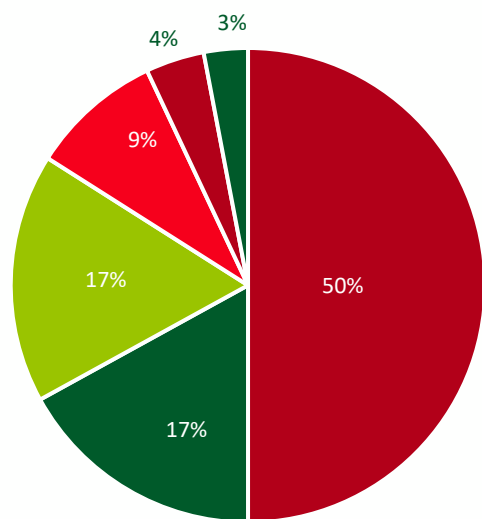
Sources: 10



1.2.3 Origin of seaweed

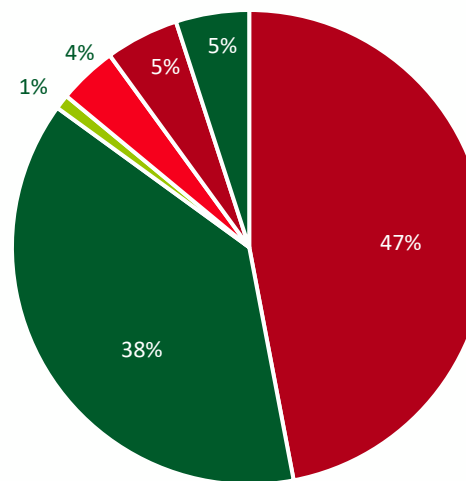
Almost all seaweeds on the global market are produced in Asia with China and Indonesia as main producers.

Seaweed production by country (value in USD)



■ China ■ Indonesia ■ Japan ■ Republic of Korea ■ Phillippines ■ other

Seaweed production by country (volume in tonnes)



■ China ■ Indonesia ■ Japan ■ Repulic of Korea ■ Phillippines ■ other

Sources: 27



1.2.4 Ratio cultivation and wild harvest

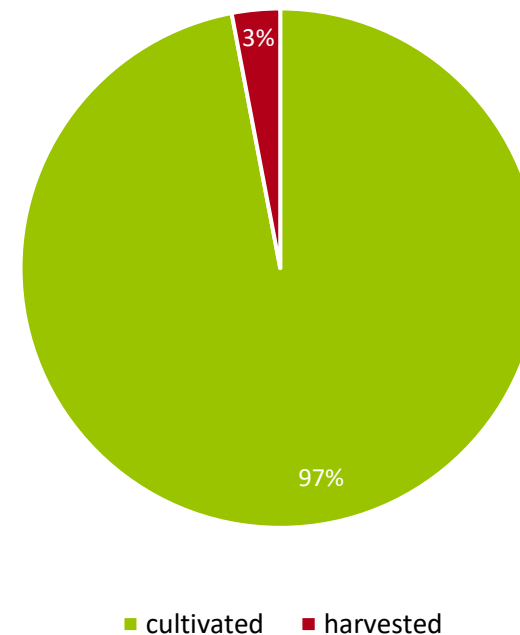
World wide: 97% of the seaweed production is obtained by cultivation.

Production of seaweed cultivated and wild harvested – world market 2018

Production of seaweed worldwide

32.4 million tonnes (fresh weight, 2018)

- 31.4 tonnes of seaweed were cultivated through aquaculture (97%)
- 0.9 tonnes were wild harvested (3%)



Sources: 20, 31



1.3 Global seaweed market

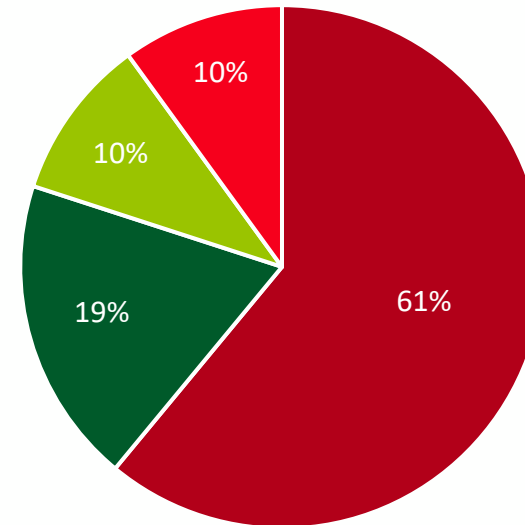
The global market for seaweed is estimated at \$ 13.3 billion (€ 10.9 billion) in 2019.

The regions with the largest market share are:

- Asia 61%
- North-America 19%
- Europe 10%
- Other 10%

The global market for seaweed is expected to grow yearly between 7% and 12%

Global seaweed markets share per region (in %)



■ Asia ■ North-America ■ Europe ■ Other

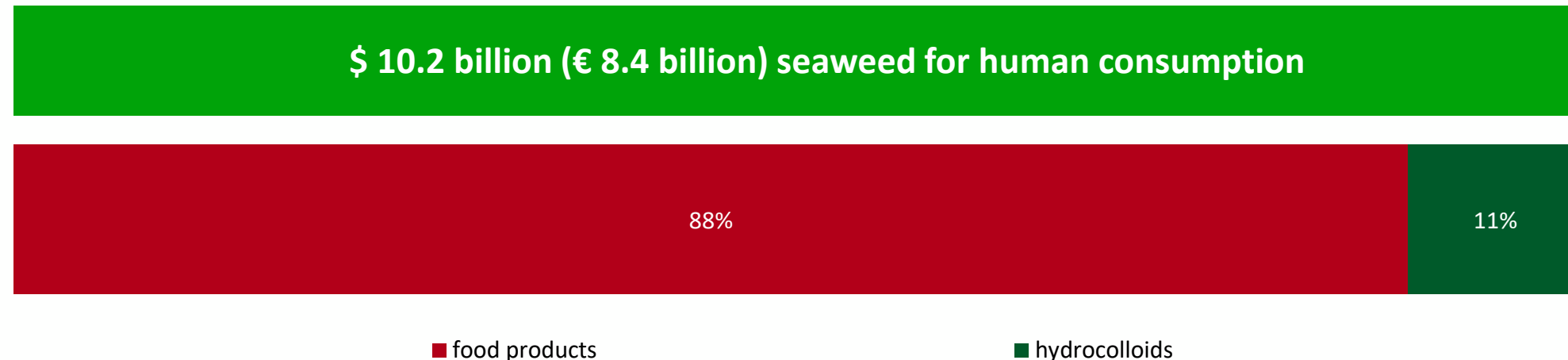
Sources: 20, 22, 30

1.3.1 Global seaweed market for human consumption



The global seaweed market is estimated at \$ 13.3 billion (€ 10.9 billion) in 2019. Thereof, 77% is used for human consumption.

The global seaweed market for human consumption is estimated at a value of 10,2 billion dollar (8.4 billion euro) in 2018. The use of seaweed for food products is by far the largest part of this market. Hydrocolloids cover approximately 11% of the market.



Sources: 10, 20, 22, 28, 29



1.3.2 Application: Food products

In Asia seaweed has been a common part of the everyday diet for centuries. Since Asian cuisine is getting more and more known in the rest of the world, consumers from western countries are getting used to seaweed as food as well.

Currently three species dominate the edible seaweed market: Kombu (*Saccharina* and *Laminaria*), Nori (*Porphyra*), and Wakame (*Undaria*). However, there are many other seaweed species that can enter the food product market which can provide diversification and unlock new markets.

The food products market opportunities for seaweed are very diverse and vary from a small percentage of seaweed in a product to 100% seaweed products.



Kombu

35% of produced volume



Nori

9% of produced volume



Wakame

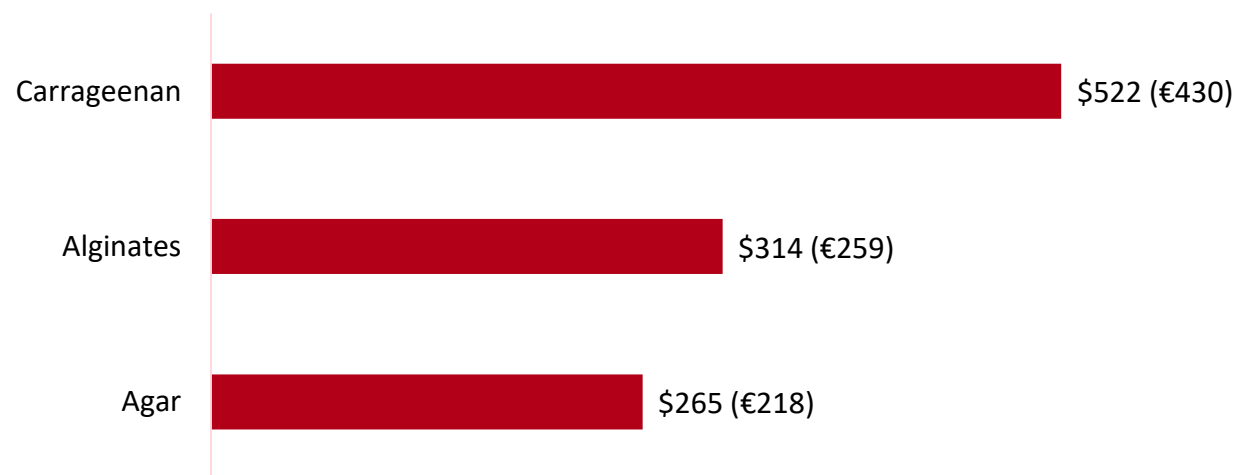
7% of produced volume

Sources: 10



1.3.3 Application: Hydrocolloids

Global market for seaweed hydrocolloids in million dollars (million euro's) 2018



Hydrocolloids are used in many types of food, specifically for their thickening and gelling properties. Hydrocolloids are for example used in dairy products, candy, bakery, beverages, processed meat products, jams and sauces.

Of the total hydrocolloids market, approximately 10% comes from seaweed. Carrageenan is the most used seaweed hydrocolloid, followed by alginates and agar.

Seaweed hydrocolloids are produced from an extensive variety of seaweed species from around the world, with China and Indonesia being the largest producers.

The hydrocolloids market is a mature market that expects a steady growth of approximately 5% yearly.

Sources: 28, 29



1.9 In Sum: Key takeaways



The global seaweed market is estimated on \$13,3 billion value and 32,4 million tonnes (fresh weight).



77% of the global seaweed market is used for human consumption. The 2 main applications of seaweed for human consumption are food products and hydrocolloids.



China is the main producing country, followed by Indonesia, Japan and Republic of Korea. These countries make up for 95% of the total global production.



97% of the world wide seaweed is obtained by cultivation.



The global seaweed sector expects a yearly growth between 7% and 12%.



2. European seaweed market overview

2.0 In this chapter



The European seaweed market explained:

- Summary
- European seaweed production
- European seaweed market for human consumption
 - Application: food products
 - Application: hydrocolloids
- In sum: key takeaways

Sources: 10, 20, 27

2.1 European seaweed market – summary



Production of seaweed in Europe



300,000 tonnes (fresh weight, 2018)

Market of seaweed for human consumption in Europe



\$ 1.02 billion (€ 0.84 billion)

10% of the global market (2018)

Origin of seaweed in Europe



1,450 tonnes of seaweed were obtained through cultivation (0,5%)

294,744 tonnes were harvested from the wild (99,5%)

Sources: 19, 20, 27, 30

2.2 European seaweed production



The seaweed cultivation in Europe is still in start-up phase. The most recent numbers from 2015 show that less than 1% of the European seaweed supply is obtained through cultivation.

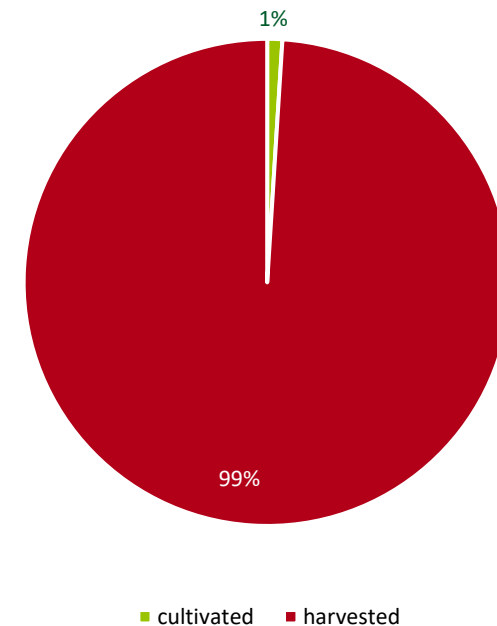
Production of seaweed in Europe

300,000 tonnes (fresh weight, 2015)

- 1,450 tonnes of seaweed were obtained through cultivation (0,5%)
- 294,744 tonnes were harvested from the wild (99,5%)

Europe produces less than 1% of the global production volume of seaweed.

Ratio cultivated and wild harvested seaweed in Europe (2015)



Sources: 19, 27

2.3 European seaweed market for human consumption



The European seaweed market for human consumption is estimated at a value of 1.02 billion dollar in 2018. This is 10% of the global market of seaweed for human consumption. Three quarters of this market consist of red seaweeds.

\$ 1.02 billion dollar (€ 0.84 billion) seaweed for human consumption

74%

24%

2%

■ Red seaweeds ■ Brown seaweeds ■ Green seaweeds

Sources: 1, 2, 24, 25, 26, 30

2.3.1 Application: food products



- In Europe, seaweed is not only applied to Asian foods, but it is extensively applied in a wide range of food products. For example as a source of umami, salt replacement, flavour enhancer, alternative (plant-based) source of protein, or sustainable alternative ingredient.
- European entrepreneurs are very innovative when it comes to the development of new seaweed products, to meet the demands of European consumers.
- In food products, in particular a wide range of brown seaweed species are being used.

Most important seaweed species for the European food product market (text colour indicates the colour of the seaweed species):

- **Atlantic wakame/ Winged kelp** - *Alaria esculenta*
- **Rock weed/ Knotted wrack** - *Ascophyllum nodosum*
- **Irish moss** - *Chondrus crispus*
- **Bladderwrack** - *Fucus vesiculosus*
- **Slender wart weed** - *Gracilaria sp.*
- **Sea spaghetti** - *Himanthalia elongata*
- **Oarweed** - *Laminaria digitata*
- **Dulse** - *Palmaria palmata*
- **Nori/ Purple laver/ Laverbread** - *Porphyra sp.*
- **Royal Kombu/ Sugar kelp** - *Saccharina latissima*
- **Sea lettuce** - *Ulva sp.*
- **Wakame** - *Undaria pinnatifida*

Sources: 1, 19, 24, 25, 26, 30

2.3.2 Application: hydrocolloids



- France, Portugal and Spain are the main producers of seaweed hydrocolloids in Europe.
- The price of seaweed hydrocolloids produced in Europe is generally higher than those produced in Asia, but European hydrocolloids are perceived to provide higher quality.
- The vast majority of seaweed hydrocolloid production takes place outside Europe (in Indonesia & China), which is why most seaweed hydrocolloids for the European market are imported.
- European demand for hydrocolloids is driven by increasing sales of processed and packaged foods, as well as organic and vegan products (carrageenan and agar are being used in plant-based milks and as a gelatine substitute in vegan products)
- Germany, Spain, the UK, France, the Netherlands and Belgium are the leading importers of seaweed hydrocolloids in Europe.

Most important seaweed species for European hydrocolloid production (*text colour indicates the colour of the seaweed species*):

- **Agar:** *Gracilaria sp. & Gelidium sp.*
- **Alginate:** *Ascophyllum nodosum, & Laminaria sp.*
- **Carrageenan:** *Chondrus crispus*

Sources: 6, 16

2.4 In sum: Key takeaways



European seaweed market is estimated at 1.02 billion dollars (€ 0.84 billion)



Production of European seaweed is marginal compared to the world market. Europe produces 300.000 tonnes, which is less than 1% of the global volume of 32.4 million tonnes.



In Europe 99% of the seaweed comes from wild harvesting, this is contrary to the global market where 97% comes from cultivation



There are numerous opportunities in European food product market. On the other hand, the hydrocolloids market is more saturated.



Photo by Wolfgang Hasselmann on Unsplash

3. Potential of European cultivated seaweed for the food market

3.0 In this chapter



The potential of the European seaweed market for food explained:

- Potential EU seaweed market for human consumption
- Potential local (EU) cultivated seaweeds
- Potential applications local cultivated seaweeds
- Promising countries in Western Europe
 - Belgium
 - France
 - The Netherlands
 - United Kingdom
- In sum: Key takeaways

3.2 Potential EU seaweed market for human consumption

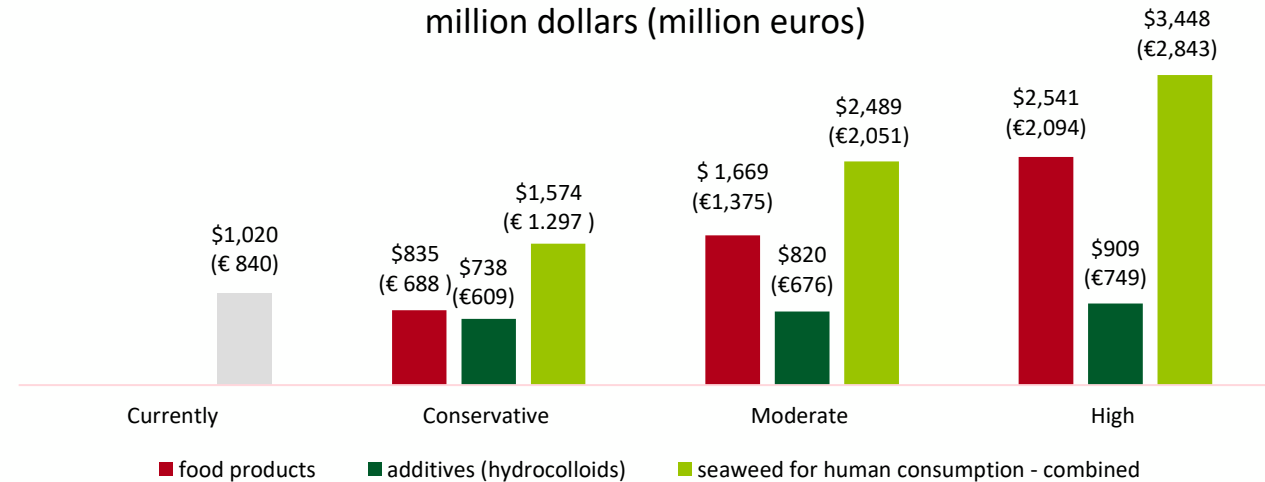


The potential of the European seaweed market has been investigated in three scenarios.

In the moderate scenario the European seaweed market for human consumption can grow to almost 2.5 billion dollars (2 billion euros) in 2030. In the high ambition scenario, the market can even grow to a 3.4 billion dollars (2.8 billion euros) industry.

The most potential is expected in the food products market.

European seaweed food market potential – estimation 2030 in million dollars (million euros)



Scenario's:

- *Conservative ambition level: minimal change to current demand trends, policies and cost trajectories.*
- *Moderate ambition level: isolated changes in demand trends, policies and cost trajectories that positively impact the context for the seaweed industry in Europe*
- *High ambition level: significant changes, including favorable policy environments, considerable economies of scale, further cost efficiencies from technological innovations, and strengthening advantageous consumer trends.*

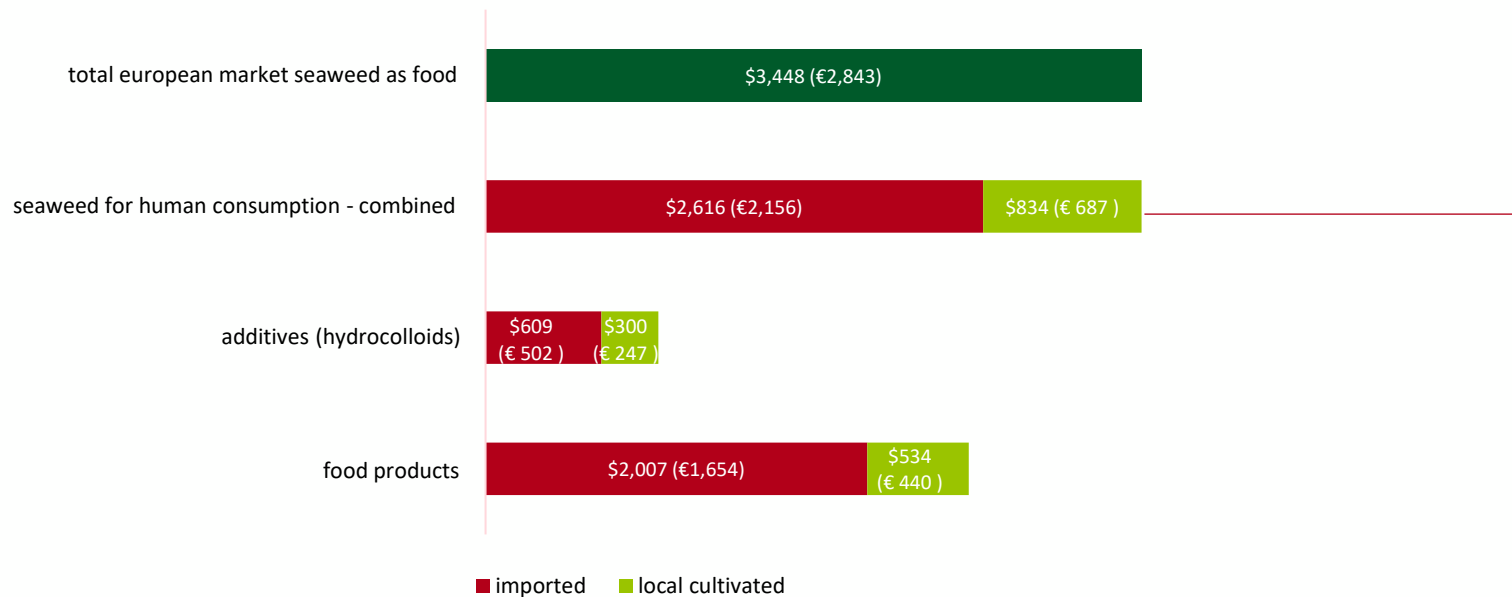
Sources: 30

3.3 Potential for local (EU) cultivated seaweed

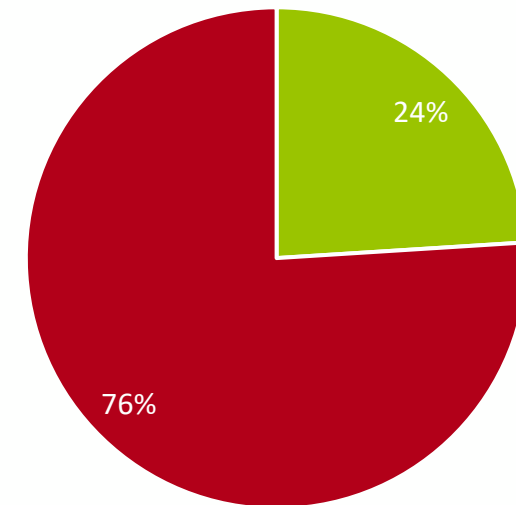


Looking at the potential of local cultivated seaweed in Europe for food applications. In the high ambition scenario 24% from the demand could come from European suppliers.

European seaweed food market potential – estimation 2030
in million dollars (million euro's) – high ambition scenario



Potential market share



■ European cultivated
■ imported, mainly from Asia

Sources: 30

3.4 Potential applications for local (EU) cultivated seaweed



Food products

The highest potential for local cultivated seaweed can be found in the food products market. There is a demand for seaweed as food in Europe and with the trends for healthy and plant-based food, the demand will only increase.

Because the food applications for seaweed are numerous, the potential is huge. Besides, the versatility makes it easy to be agile and to respond to new trends with seaweed products. However, because of its diverse applications, food producers and retailers are not always sure how to market seaweed.

One of the main distinctive features of local cultivated seaweed is its freshness, which matches with the demand for healthy, fresh and local food.

Hydrocolloids

The market for hydrocolloids is a mature market that expects steady growth. The market is already saturated and more difficult to enter with new products.

European seaweed can only compete with its Asian competitors if the quality is high enough to make up for the higher price.

To enter the hydrocolloids market a consistent supply and quality is necessary.

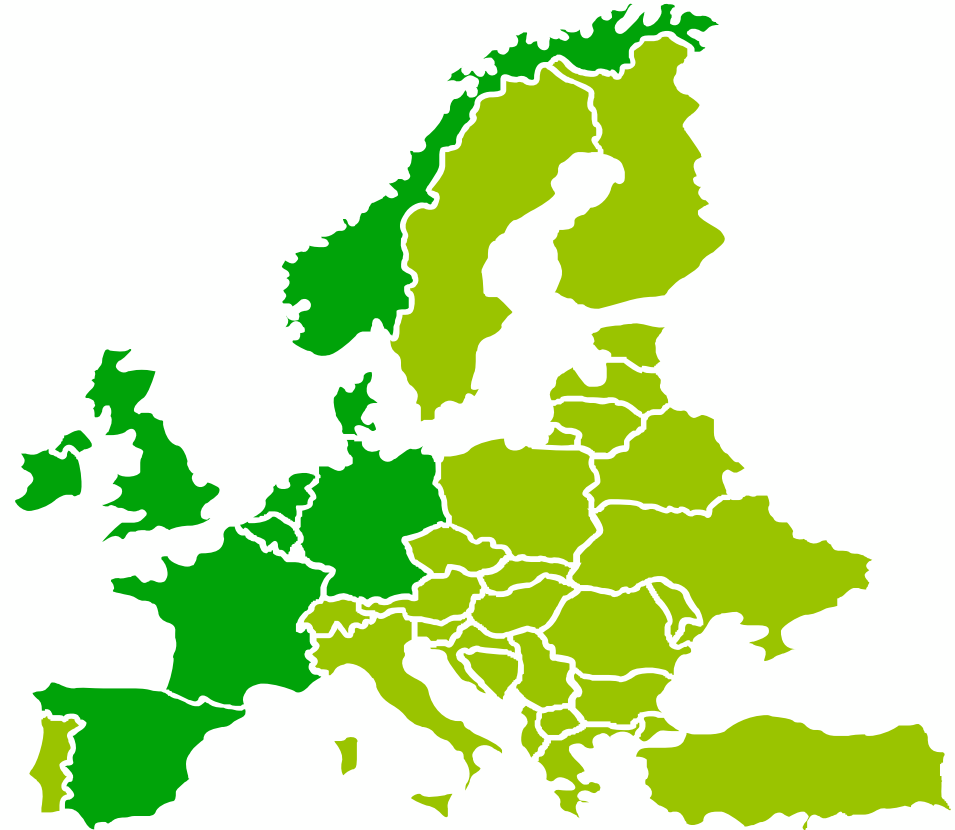
Nutraceuticals

Because of the healthy image of seaweed, the nutraceutical market is another relevant market for seaweed. Seaweed capsules are already on the market, but market information is scarce and more research is needed in order to indicate the potential for local cultivated seaweed.

3.5 Promising countries in Western Europe

This study focusses on the countries around the 2 seas region: The United Kingdom, The Netherlands, Belgium and France. In all four countries there is potential for local cultivated seaweed, but all with different angles. This potential will be further elaborated on the next pages.

Other countries that are promising for local cultivated seaweed are Germany because of the market size and Spain, Norway, Ireland and Denmark, because of their history with seaweed and because these countries are already experimenting with local and/or cultivated seaweed.



3.5.1 Belgium



- Belgium has a rich traditional cuisine and the food service industry is mainly serving traditional Belgian and French food. Seaweed is not a common ingredient in the Belgian kitchen.
- There is, similar to other Western European countries, a growing market for healthy and plant-based food. The government is raising awareness for a healthy diet to increase the public health.
- Belgians have a more wait-and-see mentality which makes them less open to innovative food than other countries in the 2 seas region. However, the health conscious and plant-based consumers might accept seaweed as a relevant addition to their diet.

3.5.2 France



- France has a very strong culinary culture in which traditional local food plays an important role. Seaweed is not a standard ingredient in the French cuisine, but due to wild harvest traditions in Brittany French consumers are somewhat familiar with seaweed as food. Combined with the fact that seafood is very common on the menu, the French might be open to seaweed as food.
- The French cuisine has a good reputation worldwide and chefs are always looking for high quality ingredients. With the local, plant-based and health trends seaweed can provide an attractive and new ingredient in the French cuisine.
- The French are known for their chauvinistic attitude. This makes the French market appealing for local produce, such as seaweeds cultivated at the French coast.

3.5.3 The Netherlands



- The Netherlands does not have a strong culinary culture. Typical to the Dutch cuisine are the many foreign influences, which stem from its colonial past. The Asian cuisine, among other things, is integrated into the Dutch food culture. Besides, the traditional Dutch cuisine is not of a high culinary level, so most restaurants serve non-Dutch food. This makes the Dutch consumer open to new kinds of foods and flavours in restaurants.
- Dutch consumers highly appreciate convenience. This leads to growth in packaged food and in takeaway and home delivery food. Besides, the Dutch are known for their cost-consciousness and they are looking for low priced food.
- From a business perspective The Netherlands is perceived as a highly innovative country. The countries reputation on highly efficient agriculture and as a front runner on water management make The Netherlands an attractive country for collaboration on seaweed innovation.

3.5.4 United Kingdom



- In the UK there is a clear trend towards more local produced food. The government has set a goal on self sufficiency and producers respond to the patriotic culture with branding their products as locally produced.
- Besides, there is a strong focus on healthy food. The UK has a high level of obesity and related diseases. The government is focussing on improving a transition to a more healthy diet to increase the health of its residents. Besides, like in other countries there is a trend to more plant-based food.
- The UK has a strong fishery sector. This can be a challenge and an opportunity for the seaweed sector. On the one hand, the seaweed sector has to be careful not to get in the way of fishery. But from a consumers perspective seaweed and fish make a good combination, which makes a collaboration appealing.
- The UK does not have a strong culinary culture and consumers eat a lot of highly processed food. Seaweed might be a type of food that consumers have to get used to. Because of the strong fish sector, this might be the entrance for seaweed on the British plate.

3.6 In sum: Key takeaways



In 10 years the European seaweed sector for food can grow to a market of 2,8 billion euro. In this high ambition scenario European cultivated seaweed should be able to cover 24% of this demand.



There are numerous opportunities for the application of seaweed in food products. It has potential to further grow and innovate to meet European consumer demands.



The hydrocolloid market is more mature and therefore more saturated with Asian suppliers. European hydrocolloids are distinctive in their quality, which is perceived very high.



Countries in the 2 seas region are all open for seaweed as food, but all for different reasons and with different angles.



4. Conclusion

4.0 Conclusion

The current global market

The global seaweed market represents a value of \$ 13,3 billion (€ 10.9 billion) Approximately 77% is used for human consumption. Seaweed as food is used in multiple applications, which for the purpose of this report are categorized in three markets:

- Food products in which seaweed is a substantial component
- Seaweed as a functional ingredient (with hydrocolloids as main application)
- Nutraceuticals where seaweed is for example offered as a food supplement.

The food products market is by far the largest market covering an estimated 88% of the value. Hydrocolloids make up for 11% of seaweed for food. The value of the nutraceuticals market is hard to estimate, because it is often combined with other pharmaceutical applications.

Asian countries are by far the largest producer of seaweed; 95% of the seaweed is cultivated in Asia.

The current EU market

The European seaweed supply is small compared to Asian producers. In 2018 European countries produced 300.000 tonnes of seaweed, less than 1% of the global production of 32 million tonnes. In contrary to the global seaweed supply, in Europe 97% of seaweed comes from wild harvesting.

Seaweed is a growth market in Europe

The global seaweed market is expected to grow. Several sources expect a yearly growth between 7% and 12%. The largest growth is expected for food product applications.

Also in Europe, the potential is large: It is estimated that in 10 years the European seaweed market for human consumption can grow to a market of 2,8 billion euro. In this high ambition scenario European cultivated seaweed should be able to cover 24% of this demand.

Close to home: seaweed from the North Sea

Based on the above conclusions, the future for local cultivated seaweed looks bright. However, the cultivation of European seaweed is just getting started with several start-ups experimenting with offshore cultivation. To match supply and (potential) demand on the European market, there are still some crucial steps to take. The upcoming ValgOrize deliverable, D4.2.2 will go further into depth on these key success factors for transitioning to local, cultivated seaweeds in the 2 seas region.



Photo by [Marco Zuppone](#) on [Unsplash](#)

5. Appendices

5.1 Methodology

Research goal

The goal of this study is to gain insight in the market for local cultivated seaweed as food in the European 2 seas region. This study is part of the European Interreg ValgOrize project.

Research question:

- What is the market potential for cultivated seaweeds in the identified existing and potential seaweed for food markets?

Research phases

- Desk research (sources in next appendix)
- Interviews (sources in next appendix)
- Survey among seaweed community Europe (question set-up in next appendix)

Fieldwork

- Research period: September – December 2020

Analysis and reporting:

- For the analysis we derived insights on the food markets, applications and countries from the various sources. Only insights that are found in more than one sources are reported.
- In this report for context we started with a description of the world market before focussing on the European market
- On pages with specific numbers on market size and predictions, sources are reported. All other information in the report comes from several sources combined.
- For comparison on commercial market size alle numbers are reported in dollars (as is the default on global market information) and in Euro's (for the European market). The conversion is based on the exchange rate on January 20th 2020.

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5.3 Sources – community survey

Community survey

- The community survey is shared with the seaweed network of all ValgOrize partners
- The fieldwork period was from 28/10/2020 – 28/12/2020
- A total of 63 participated in the survey, of which 14 seaweed producers, 20 seaweed buyers and 29 other professionals involved in the seaweed sector

Community survey - set-up

The goal of the community survey was to collect the information and knowledge from the European seaweed network. Depending on the role of the respondent in this network (seaweed producer, buyer or other), the respondents were asked different questions.

Survey set-up:

- Background information on respondent and organisation
- Seaweed production companies: Information on current production size
- Seaweed buyers: Current use and buy of seaweed
- Other groups than producers and buyers: Knowledge of current seaweed market
- Market growth estimation
- Trends

5.4 Sources - interviews

Interviews

In total we conducted 42 interviews with professionals in the food industry with a variety of roles and companies.

- The Vegetarian Butcher
- KFC
- Nestle
- Lloyd register foundation
- Givaudan
- LNV Landbouwattachee UK
- LNV landbouwattachee France
- New Now Next
- Unilever
- LNV landbouwattachee Belgium
- Schuttelaar BV
- And 31 other food professionals

Interview protocol expert interviews

The goal of the interviews was to gain information on what the potential is for local cultivated seaweed in the food processing industry. The questions were divided in these categories. For interviewees that did not work in the food processing industry directly, we adjusted some questions.

Interview set-up:

- Introduction & practical announcements
- Introduction of interviewee and organisation
- How does purchasing/new product design process go?
- Familiarity with and experience with seaweed
- Explanation of seaweed
- Potential for seaweed in organisation
- Potential for seaweed in the market in general
- Closing remarks