

**Norwegian Seaweed Association AS
Industry guidelines**

Version 2.1 – 12.2021

**Cultivation, harvesting and handling of
sugar kelp and winged kelp**



December 2021



**NORWEGIAN
SEAWEED
ASSOCIATION**

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1 Introduction

Cultivation of macroalgae is an environmentally friendly and sustainable form of aquaculture that can be a key contribution towards a more ecological production. The conditions along the Norwegian coast, with their fresh clean waters, are suitable for growing kelp for food of very high quality. Currently, sugar kelp and butare are grown for commercial purposes on a small scale in Norway.

1.1 Joint work of the seaweed companies

Norwegian Seaweed Association AS (NSA) is a business-driven corporate network of seaweed farmers, small-scale harvesters and producers located along the Norwegian coast from Farsund in the south to Tana in the north. The association was founded by fusing two previous organizations, Algenettverk Nord AS and Norsk tare dyrkerforening, which were established in the period 2015 to 2017. They work together to e.g. solve practical challenges in production or to gain market insights. Two important prerequisites for successful food production are deliveries of a quality that meets the customer's expectations, as well as operations in accordance with Norwegian food legislation administered by the Norwegian Food Safety Authority Mattilsynet. Development of quality criteria / standards is one of several areas that NSA works with, and these guidelines are based on continuous work initiated by Norsk Tare dyrkerforening.

1.2 Scope

The industry guidelines include two species of macroalgae, the brown algae sugar kelp (*Saccharina latissima*) and winged kelp (*Alaria esculenta*). These are cultivated by the NSA companies today. Sugar kelp and winged kelp can be sold as food product without applying to the EU for approval, namely they are not categorized as novel food in the EU, and thus not in Norway. New foods are foods that have not been significantly eaten by humans in the EU before May 1997, when the new food regulation came into force. Such new foods must be risk assessed and approved by the EU Commission before they can be sold in the EU. If there is a need for further information on species of macroalgae that are to be regarded as «not new food», reference is made to a letter from the Norwegian Food Safety Authority Mattilsynet dated July 20th 2017.

1.3 Regulations

The regulations in the food area shall contribute to ensuring consumers safety for food and drinking water, namely that the food does not harm the consumer when it is prepared and / or consumed in accordance with the intended use. Furthermore, it must ensure that food is sold in a fair manner with the correct labeling and weight. Everyone who runs a food business must register at the Norwegian Food Safety Authority - Mattilsynet - through using their form service. It is the companies' responsibility to ensure that the products are safe.

1.3.1 General regulations

So far, no specific regulations have been elaborated for macroalgae in Norway. However, the Norwegian Food Safety Authority Mattilsynet is about to acquire more information, and is assessing the need for the development of national and international regulations in collaboration with other countries. Norway is obliged to adapt its own regulations to EU regulations.

Until further notice, everyone who wants to grow or further process macroalgae for food must comply with the general regulations in the food area. The most important laws and regulations are:

1. Lov om matproduksjon og mattrygghet mv. (matloven)
<https://lovdata.no/dokument/NL/lov/2003-12-19-124>

2. Forskrift om næringsmiddelhygiene (næringsmiddelhygieneforskriften)
<https://lovdata.no/dokument/SF/forskrift/2008-12-22-1623>
3. Forskrift om matinformasjon til forbrukerne (matinformasjonsforskriften)
<https://lovdata.no/dokument/LTI/forskrift/2014-11-28-1497>
4. Forskrift om materialer og gjenstander i kontakt med næringsmidler (matkontaktforskriften)
<https://lovdata.no/dokument/SF/forskrift/1993-12-21-1381>
5. Forskrift om internkontroll for å oppfylle næringsmiddelovgivningen (IK-mat forskriften)
<https://lovdata.no/dokument/SF/forskrift/1994-12-15-1187>

In case the goal is organic production status and Debio certification, the company must also comply with the regulations mentioned below. Organic production of seaweed and kelp is discussed especially in Chapters 2 and 3. Debio controls and approves organic productions in Norway on behalf of the Norwegian Food Safety Authority Mattilsynet.

- Forskrift om økologisk akvakulturproduksjon og merking av økologiske akvakulturprodukter
<https://lovdata.no/dokument/SF/forskrift/2015-07-07-879>

1.3.2 Iodine labelling

The Norwegian Kelp Growers' Association has prepared a recommendation for how food products containing seaweeds should be labeled:

Pure seaweed and kelp products:

The nutritional values are displayed in accordance with current requirements.

The nutritional values overview must also state how much iodine there is per 100 g.

Regarding the warning about high iodine content, growers will mark the product with:

The "seaweed / kelp species" has a naturally high iodine content. The recommended daily intake of iodine is 0.15mg. Excessive iodine intake over time can affect the thyroid gland.

"seaweed/kelp species" needs to be replaced by the name of the species (e.g. sugar kelp, winged kelp, etc.).

Mixed products:

For mixed products, the manufacturer must calculate and label the amount of iodine in milligrams per. 100 grams of the whole product.

1.3.3 About internal control for food

The Norwegian general regulations are based on a risk-based approach. This means that all members of the value chain are responsible for the food products being safe for consumers by following good systems and routines to reduce the risk of health damage. Health damage can be caused by substances / hazards that enter the body when ingesting food. Examples of such hazards can be pathogenic microorganisms such as *Escherichia coli* and *Bacillus cereus* (biological), environmental toxins such as PCBs (chemical), or foreign bodies such as metal pieces from equipment (physical). The requirements and good systems and routines are specifically explained in the «IK-Mat regulations», see regulation no. 5 above.

The Norwegian Food Safety Authority Mattilsynet has prepared a guide: [«Rutiner for trygg mat – en innføring i internkontroll og HACCP»](#). This can be accessed on Mattilsynets website, and provides a good introduction to what internal control is and how it can be built up. Internal control is a collection of routines the company must have in order to follow the regulations and the food to be safe. Examples of this can be good routines for cleaning of facilities and equipment, personal hygiene of employees, training, protection against pests, maintenance, control of purchase and reception, drinking water quality, etc., also termed basic prerequisites. Once these are in place, relevant challenges that may arise in the process should be documented on the basis of product specifications / descriptions and flow charts of the process.

All food companies that produce, pack, store or sell food are required to establish internal control. The requirement does not apply to primary producers, e.g. if you only grow seaweeds and deliver directly to a receiver without further handling, such as packing and storage, the requirements in the «IK-Mat regulations» do not apply. Primary producers must, however, comply with the regulations on food hygiene. An excerpt from the food hygiene regulations on primary production states: "In general, it is not yet possible to apply the principles of hazard analysis and critical control points (HACCP) in primary production. Guidelines for good practice should, however, facilitate the use of appropriate hygiene practices at the operating unit level."

2 Potential threats

In 2016, the Norwegian Food Safety Authority Mattilsynet commissioned the "Nasjonalt Institutt for ernærings- og sjømatforskning (NIFES)" to review current literature on seaweed and kelp to identify the most important substances that can have a negative effect on public health and animal health - with emphasis on the most important species in Norwegian waters actually in use as food and feed. The most important risk substances in Norwegian seaweed and kelp were considered to be the metals cadmium and inorganic arsenic, as well as the mineral iodine when ingested at too high daily doses. Below is a more comprehensive summary of examples of potential hazards in sugar kelp and winged kelp, presented by its category.

In August 2020, NOFIMA published a report [«Utfordringer knyttet til prosessering og analyse av norsk tare, med fokus på sukkertare og butare»](#). The report draws the same conclusion as the report from NIFES in 2016. An updated report from Havforskningsinstituttet (HI) based on the NIFES report in 2016 was published in December 2020. "[Knowledge update on macroalgae food and feed safety](#)". For the species sugar kelp and butare, there were few new discoveries.

Biological hazards

Disease-causing microorganisms can pose a danger. However, in most cases very low bacterial counts have been found in samples from cultivated sugar kelp and winged kelp. So far, no disease-causing bacteria or indicators of fecal contamination have been found (indicator = *E. coli* bacteria). However, fecal contamination can occur if cultivation facilities are located near drains, or if bird droppings or similar things contaminate the biomass during harvesting. Spore-forming bacteria have been found in very low numbers. These can create problems with further processing if no measures are taken to reduce the risk.

Chemical hazards

Regarding cadmium and inorganic arsenic, one can find high concentrations in brown algae as mentioned above. However, analyzes of cultivated sugar kelp and winged kelp sampled from kelp farmers during harvest indicate that the levels are not alarmingly high.

The concentration of iodine is relatively high in cultivated sugar kelp and somewhat lower in cultivated winged kelp. Iodine, however, is an important mineral that the body needs. Measures to reduce the risk of health hazards are therefore to give recommendations on meal sizes.

The report from NIFES and analytical results from samplings by kelp farmers document very low levels of organic pollutants such as dioxins and PCBs. However, the level may be higher in species that contain more fat, and therefore absorb more dioxins.

Physical hazards

Relevant examples are impurities such as plastic and metal pieces from equipment. Rinsing reduces the risk of physical hazards.

Allergens

Macroalgae are not included in the Norwegian Food Safety Authority's overview of the 14 categories of ingredients that can cause allergic reactions. However, it is recommended to label kelp products with "may contain traces of shellfish, mollusks and fish", as it can be challenging to ensure that smaller shellfish, mollusks and fish that are naturally present in the kelp plant are washed away during the production process.

3 Process flows and examples on checklists

The members of NSA have agreed on quality criteria for the production of 1st class fresh, frozen and dried sugar kelp and winged kelp as a raw material for food and food products. The first version as of October 2016 was updated September 2020 and December 2021. The quality criteria meet both health criteria and general criteria, and are inserted as an illustration in the process flow below.

3.1 Process flows

Process step	Method
1. At sea	<ul style="list-style-type: none"> - The kelp must be grown on a site that has a license, and ensures safe raw materials - The kelp must be harvested before significant contamination by bryozoans and other organisms if the market is human consumption - At the time of harvest, the biomass must appear delicate with fresh odor and natural color
2. Harvesting and transport	<ul style="list-style-type: none"> - Harvesting must be carried out in a way that the quality of the biomass is preserved - Sun and wind exposure shall be avoided - Avoid contamination via boots, dirty equipment or bird droppings - Do not store directly on or in contact with the floor during transport - When cutting from cultivation substrate, contamination of substrate residues (e.g. rope fiber) must be avoided - Storage and transportation under conditions that preserve the quality of the biomass
3. Receiver	<ul style="list-style-type: none"> - Sort out kelp that does not meet the criteria for human consumption - Sort out other seaweed and kelp species, small fish and other organisms

	- Sampling of kelp
4. Rinse and drain	- The biomass should be rinsed in clean water - The water quality must be in accordance with the regulations in the food sector - Freshwater or seawater is selected according to the customer's wishes and needs
5. Packing	- Sampling for analysis, defining method and batch - The inner packaging must be suitable for packing food (This can be an EK certificate if it contains the information that the Food Contact Regulations provide for a declaration of conformity. See also the relevant link to the guidelines)
6. Processing	- Follow the company's individual flow chart or IK system after sorting, whether the kelp is to be frozen, dried, smoked, fermented or used fresh
7. Labelling	- Labeled according to «Forskrift om matinformasjon»
8. Shipping	- Ensure the preservation of the quality of the kelp as fresh, frozen, smoked, dried or fermented

The table above shows a starting point for checklists in the production process. Every single company that dries, freezes or ferments kelp must have its own internal control systems to ensure good quality during the processes.

3.2 Checklists

When preparing flow charts for use in the company's own operations, it may be appropriate to prepare checklists for self-assessment in relation to what is considered best practice. Below are a few examples.

Example checklist for a suitable location that ensures safe raw materials

- ✓ Good flow of seawater, which maintains good water quality according to the water directive's assessments.
- ✓ No emissions from pollution sources such as industry, agriculture and households
- ✓ Small risk of emissions from ship traffic

Example checklist for marking the finished product

- ✓ Product name
- ✓ Ingredient list
- ✓ Net content (weight)
- ✓ Expiration date
- ✓ Special conditions for storage or use (e.g. temperature and advice on meal sizes)
- ✓ Company name and address
- ✓ Nutritional values
 - Energy KJ/kcal
 - fat (if the amount is less than 1%, it is sufficient to indicate this); For contents above 1%, it must be shown:
 - saturated fat
 - polyunsaturated fat
 - Carbohydrates, of which
 - sugars (starch, sugar)

- fiber
- Protein
- Salt
- ✓ May contain traces of shellfish, mollusks and fish
- ✓ Iodine content

3.3 Analysis and nutritional content

We want sugar kelp and winged kelp to be included into the food table and are working on this. After further processing (except freezing) of sugar kelp and winged kelp, the nutrient content will vary according to the processing method. This means that the individual manufacturers must ensure documentation related to their own products.

3.4 Export certificate

Some sugar kelp and winged kelp that is grown in Norway today is exported. There are no clear and distinct guidelines in this area. The first thing that should be done when exports are relevant is to clarify what requirements the customer and the recipient country have for documentation. There is no need for an export certificate to the EU. However, some countries request this in the form of a "Plant Health Certificate". Several countries outside the EEA may require a sanitary certificate that is valid for fish and fish products. We recommend that you inform the Norwegian Food Safety Authority of any plans for export in good time, in order to obtain assistance and ensure that the documentation requirement in itself does not become an obstacle to sales.

Required information to include in an export certificate includes:

- ✓ The species (sugar and/or winged kelp)
- ✓ Quantity
- ✓ Location of the farm
- ✓ Name and contact information of the company

We recommend all companies that want to export to also contact Innovation Norway's export center for advice. Contact info: eksportsenteret@innovasjon Norge.no phone: 22002500

4 Definitions and references

4.1 Definitions

Macroalgae - includes macroscopic and multicellular marine red, green and brown algae. The brown algae are known as seaweed and kelp.

- *Seedling plant* – young seaweed.
- *Health hazards* - Biological, chemical or physical factors as well as allergens that can make food harmful for health.
- *Risk* - The probability that a danger may occur, together with the consequence if an unwanted event occurs.
- *Batch* - Lot, lot size and batch are basically the same and are used interchangeably. It is up to the individual company to define what should be a batch. It is related to the company's own risk assessment, and is seen in connection with the extent of a possible withdrawal / recall of products.

4.2 References and links

[Rutiner for trygg mat - En innføring i internkontroll og HACCP](#)

[Utfordringer knyttet til prosessering og analyse av norsk tare, med fokus på sukkertare og butare.](#)

[Rapport Makroalger HI - KNOWLEDGE UPDATE ON MACROALGAE FOOD AND FEED SAFETY](#)

[Matmerking - allergenmerking](#)

[Bruk av emballasje og andre typer matkontaktmaterialer i matproduksjon](#)

[Matmerking – merking og næringsdeklarasjon](#)

[Eksport utenfor EU/EØS](#)

[Nye marine arter.](#)

[Tang og tare og mattrygghet](#)

APPENDIX: Letter from the Norwegian Food Safety Authority dated July 20th 2017