

SEAWEED USE IN FINLAND:

An overview of an emerging industry

María Teresa Camarena Gómez
Finnish Environment Institute
Latvian meeting, 25 May 2021



Past

Uses of *Fucus vesiculosus* (rakkolevää)

➤ Produce *alginate glue* (1918)

1. Notice to fishermen!

12 N:o 194 — 1918.

Kalastajien huomioon!

Täten kehoitamme kaikkia rannikkoseudun asujamia ryhtymään keräämään rakkolevää (merijäkälää), jota kasvaa suunnattomat määrät meressä ja järvissä, matalikoilla ja lahtien pohjuksissa. Rakkolevää on väriltään tummanruskeaa, jikällä tapainen vesikasvi, joka kasvaa Etelä-Suomen saaristossa meirin jopa kahdenkin korkeihin kimppuihin. (Tunnettu kiusankappale kalanpyydyksiä kokeillessa.) Rakkolevää ostamme rajattomat määrät vielä tämän purjehduskauden aikana. Rakkolevät kootaan rannoilta ja asetetaan kuivamaan rinkujen päälle, jossa ne tuulisenä päivänä kuivuvat käyttökelpoisiksi muutamassa tunnissa. Asiamehiä halutaan. Lähempiä tietoja hinnasta y. m.

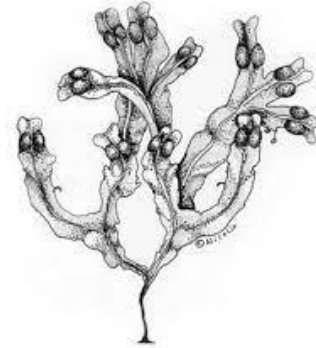
Osakeyhtiö Vanamo, Salo.

2. Domestic adhesive production

— Kotimainen liimavalmistus, Toht. S. V. Hintikan liimavalmistuksen menetely, jossa raaka-aineena käytetään rakkoleviä, on luovutettu O. Y. Vanamolle Salossa. Menetely sovelletaan pikimmiten käytäntöön.

Tuotetta, josta asiantuntijat ovat antaneet hyvät lausunnot, voidaan käyttää paperitehtaissa, tultikkutehtaissa, sitomoissa, tekstiilitehtaissa, kirjekuori- ja kotelotehtaissa, etikettien ja merkilliimana y. m.

O. Y. Vanamo aikoo ruveta valmistamaan liimaa uuden hartsitehtaansa yhteydessä Salossa. Aikomus on valmistaa aina 5.000 kg. päivässä. Rakkolevien ostopaikkoja järjestetään rannikkoseuduillamme ja sisävesien varsille.



- Fertilizer for tobacco or potato
- Prepare iodine as disinfection measure

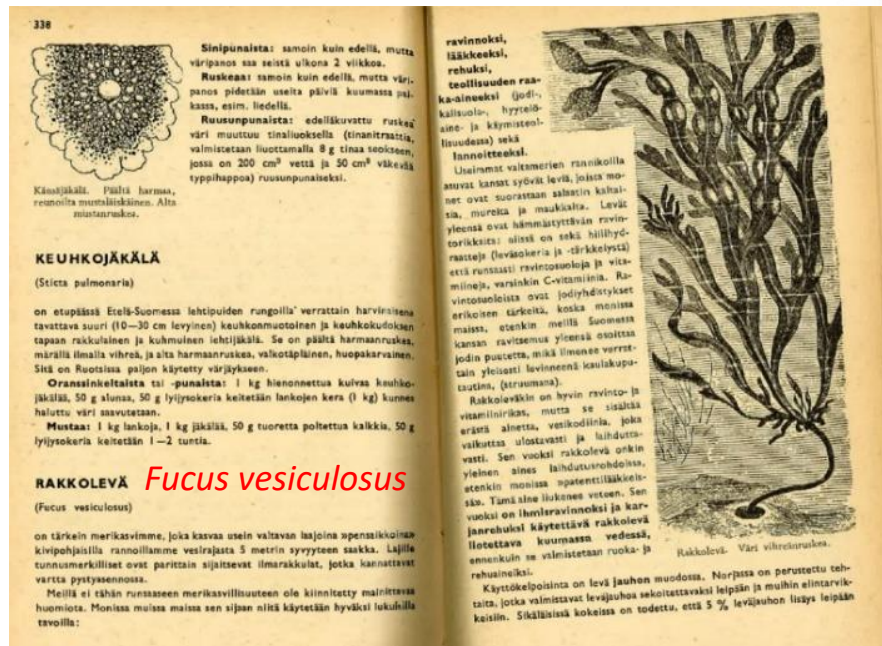
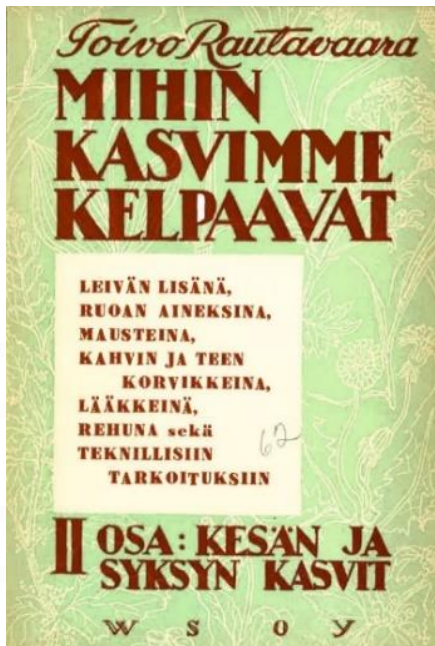


Past

Toivo Rautavaara, MIHIN KASVIMME KELPAAVAT, 1943

(What are our plants good for)

The botanist Toivo Rautavaara encourage people to utilize wild plants (seaweed)



SYKE

Present

Professor *Barou Yang* and colleagues

Food Chemistry and Food Development Unit, University of Turku, Finland

- **Research**
- Biorefinery business
- Cooking
- Art



SUBMARINER network: *The Finnish media takes an interest in edible seaweeds of the Baltic Sea, 2019*

- Research on new food and feed ingredients from seaweed

F. vesiculosus rich in iodine, vitamin C and antioxidants

- Promising market:

- ✓ Sustainable
- ✓ Vegetarian diets
- ✓ Local production

- Knowledge on environmental effects and techniques

Present

Dmitrii Sidorov, Miriam Thapamagar, Siiri-Maria Valli, Anna Vertuhov, Jonna Virtanen & Tuulia Vuorenmaa

Metropolitan University of Applied Science, Helsinki, Finland

- **Research**

- Biorefinery business

- Cooking

- Art

Fermented algae sauce from *F. vesiculosus*, 2021

➤ **Investigation**

1. Selection of raw material, assessment of its health effects and use
2. Algae cultivation and collection
3. Fermentation process and production of the sauce
4. Regulation and market

➤ **Findings**

1. Easily to carry out on larger industrial scale
2. Possible using Finnish raw materials (*F. vesiculosus*)

Present

Senior researcher Kristian Spilling and colleagues

SYKE-FI; KTH-SE; UT-EE + UiA-NOR; DTU-DK; UW-ICE

- **Research**
- Biorefinery business
- Cooking
- Art

SUSTAINABLE CULTIVATION OF SEAWEED – *SUSCULT (2020-2021)*



Present

Finnish company Origin by Ocean, 2019

Refining marine biomass for cleaner water

- **Research**
- **Biorefinery business:**
Origin by Ocean
- **Cooking**
- **Art**



Cultivation *F. vesiculosus*



Biorefinery process (Nauvu®)

1. BIOMASS



Harvesting cyanobacteria



Alternative feedstock:
Sargassum sp.



ABN: ship of Sargassum
to Finland, 2021



For the Natural Balance
of the Ocean

2. REFINARY

Refinery process

3. PRODUCT

Sugar
Emulsifiers
Pigments
Antioxidants

4. APPLICATIONS

Medicine
Cosmetics
Household goods
Food, feed
Fertilizers

Present

Finnish company Origin by Ocean, 2019

Refining marine biomass for cleaner water



For the Natural Balance
of the Ocean

- **Research**
- **Biorefinery business:**
Origin by Ocean
- **Cooking**
- **Art**

4. APPLICATIONS

Cosmetics, cleaning

Food and feed

Biomaterials

Harvesting technology

PARTNERS



Food industry



Cleaning and
cosmetics



Brewery products



Fish-algae farm



Brightplus



Present

Finnish chef Ari Ruoho

- **Research**
 - Biorefinery business
 - **Cooking:**
- Chef Ari Ruoho**
- Art

Prepares gourmet dishes with *F. vesiculosus*



"I have cooked, fried, stewed, deep-fried and dried"

"Cooked is the simplest, just add salt"

Nokka restaurant, Helsinki



Present

Finnish designer Anne Hirvonen

Contemporary Design, Aalto University, Espoo, Finland



- **Research**
- Biorefinery business
- Cooking
- **Art:**

Exploring seaweed as material



Anne Hirvonen

- Collaboration with the Kristineberg Marine Research Station, Sweden
- Exploring algae-based materials
- Packaging alternative



Present

Professor Julia Lohmann

Contemporary Design, Aalto University, Espoo, Finland



- **Research**
- Biorefinery business
- Cooking
- **Art:**

Julia Lohmann

Exploring the potential of seaweed as a design material



<https://www.julialohmann.co.uk/>

Present

Finnish Marine Strategies (MS) and Marine Spatial Planning (MSP)

Marine Strategy Framework Directive 2008/56/EC; Maritime Spatial Planning Directive 2014/89/EU

- **MS**

- **MSP**

- Regulation

- Licensing

➤ **Finnish Bioeconomy Strategy:** algalculture as a resource supporting bioeconomy in terms of energy production

➤ **Finnish MSP2030**

✓ Approved in 2020; March 2021 approved in Åland Islands

✓ Covers EEZ and three territorial waters

✓ **BLUE BIOTECHNOLOGY SECTOR:** includes macro/microalgae cultivation

1. Synergies production plans: fish + algae farming

2. Food, pharmaceutical and energy industry

3. Improve the marine environment by removing nutrients

Present

Laws and licensing process

- MS
- MSP
- **Regulation**
- **Licensing**

- **Regulation:** Water Act (Vesilaki 587/2011) and Environmental Protection Act (Ympäristönsuojelulaki 527/2014)
- **Contact authorities for license:** ELY, AVI, MMM, Väylävirasto, Ympäristöministeriö
- **Application authority:** ELY
- **Grated authority:** AVI
- **Form:** fish farming application
- **Permits**
 - **Currently:** experimental permit (valid for 2 years)
 - **Future:** water and environmental permit



Future

ObO *"The market is promising"*

ELY *"Start the operation with experimental permit, it is easier to get"*

Thank you!!!



S Y K E