

# Seaweed as a Food Source

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## How do we get seaweed?

- Can be either wild harvested or commercially cultivated
  - Farming accounts for 90% of the world's demand
  - Wild harvest in the U.S. in some places, such as Alaska, Maine, and Washington
- Two types of cultivation
  - Off-bottom line farming
  - Floating line
- Most food species grown using the floating line method
  - Suitable for deep ocean areas or areas with weak currents



## Washington - Seaweed Harvesting for Personal Use

### Before You Can Harvest:

- Need a valid license Washington Department of Fish & Wildlife (WDFW)
- Not for sale
- DO NOT harvest seaweed from restricted beaches
  - Seaweed contaminated with sewage or naturally occurring bacteria, viruses or toxic chemicals may present health risks.
  - Restricted beaches may include sewage outfall areas, hazardous waste sites, logging facilities, manufacturing facilities and industrial sites.

# Cultivation Techniques

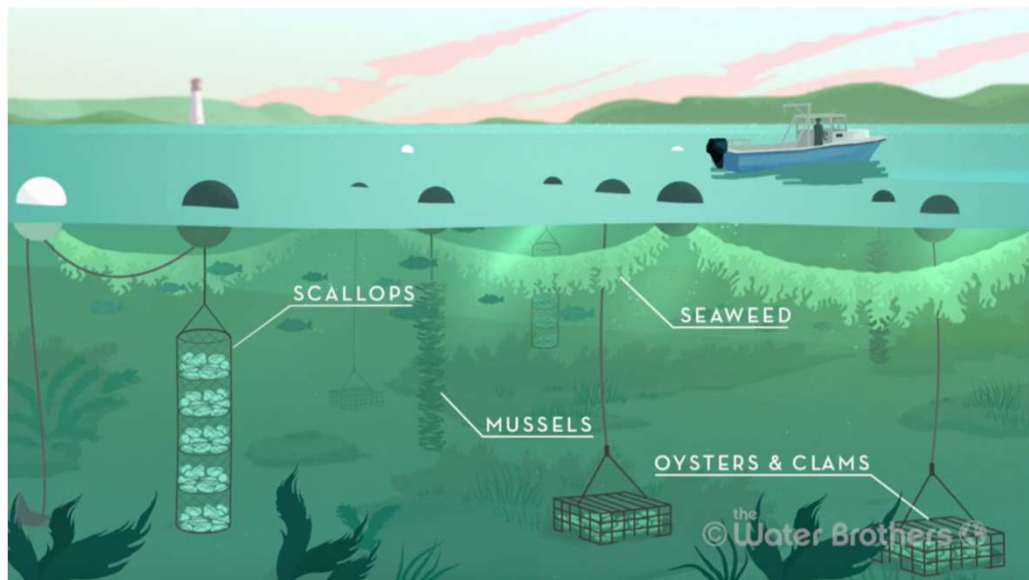
**Off-bottom Line**



**Floating Line**



# Green Wave Method- 3D Ocean Farming



More info at: [greenwave.org](http://greenwave.org)

## Why grow seaweed?

- Ecological impacts
  - Takes up carbon dioxide
    - Mitigate ocean acidification?
  - No fertilizer needed
  - Improves water quality
    - Draws down levels of nitrogen and phosphorus
    - Gives off oxygen
    - When grown with shellfish, can recycle wastes
  - Can moderate tides
- Economic benefits
  - Replace traditional fisheries
  - No fertilizer needed
  - Large market potential
    - \$20 million annually in Maine



Cultivated sugar kelp. Credit: Stephen Schreck, PSRF

## OSU researchers discover the unicorn - seaweed that tastes like bacon!

July 14, 2015



NEWPORT, Ore. - Oregon State University researchers have patented a new strain of a succulent red marine algae called dulse that grows extraordinarily quickly, is packed full of protein and has an unusual trait when it is cooked.

<https://today.oregonstate.edu/archives/2015/jul/osu-researchers-discover-unicorn-%E2%80%93-seaweed-tastes-bacon>

## Challenges

- Cultivation- permit issues
  - Federal and State
- Wild Harvest- public trust issues
  - Is it seafood or produce?
- Food Approval
  - Again, seafood or produce?



## *Ross v. Acadian Seaplants- Maine*



## FDA and USDA Issues

### Direct Food Substances Affirmed as GRAS

Seaweed in its whole form has not been approved on a federal level as a food product.

The FDA has approved as an additive:

- Kelp (21 CFR 172.365)
- Brown Algae (21 CFR 184.1120)
- Red Algae (21 CFR 184.1121)





## KELP

### 21 CFR 172.365

- The food additive kelp is the dehydrated, ground product prepared from *Macrocystis pyrifera*, *Laminaria digitata*, *Laminaria saccharina*, and *Laminaria cloustoni*
- Kelp may be safely added to a food as a source of the essential mineral iodine, but daily maximums exist
  - Generally, 225 micrograms



## Algae

Brown Algae (21 CFR 184.1120)	Red Algae (21 CFR 184.1121)
	
Harvested principally in coastal waters of the Northern Atlantic and Pacific Oceans.	Harvested principally along the coasts of Japan, Korea, China, Taiwan, and the East and West coasts of the US.
<p><b>Category of Food</b> - Spices, seasonings, flavorings</p> <p><b>Maximum Level of Use in Food (as served)</b> - Not to exceed current good manufacturing practice</p> <p><b>Functional Use</b>- Flavor enhancer; flavor adjuvant</p>	

## USDA Organic

- USDA regulates the classification of farmed kelp and other algae as organic, but:
  - Not when for sale in whole form
  - Only as an ingredient in livestock feed, fertilizer, or food for human consumption
- NOP 5027- The Use of Kelp in Organic Livestock Feed
  - Can only be certified through wild harvest provisions
  - Must be harvested in designated areas



So what would be the model for approving seaweed as food?



# Seafood HACCP Plans

- Requires that potential hazards are identified and controlled at specific points in the process- known as **critical control points**
  - Including biological, chemical, or physical hazards
- Prepared for each process or product
- Aim: make sure the hazards are eliminated or controlled to ensure acceptable levels in the food product

**HACCP Plan Form**

Firm Name: ABC Shrimp Company Product Description: IQF cooked, headless, peeled and deveined shrimp

Firm Address: One Water Lane Method of Storage and Distribution: Frozen

Bayside, USA Intended Use and Consumer: Cooked, ready-to-eat shrimp for sale to the general public

(1) Critical Control Point (CCP)	(2) Significant Hazard(s)	(3) Critical Limits for each Preventive Measure	(4) (5) (6) (7) Monitoring				(8) Corrective Action(s)	(9) Verification	(10) Records
			What	How	Frequency	Who			
Cooker	Bacterial pathogen survival	Cook at 212°F for 3 minutes	Cooker temp and cook time	Continuous temperature recorder and conveyor belt time checks with a marked block	Continuous temperature monitoring with hourly checks of continuous temperature log and conveyor belt speed using a marked block	The cooker operator	If cooker temperature <212°F the cook time <3 minutes, then processing line is stopped until temperature is 212°F or > or cook time is > 3 minutes. Affected product is re-cooked or destroyed.	Thermometer calibrated quarterly. Records reviewed daily. Cooked shrimp tested semi-annually for pathogens. Time and temperature critical limits and cooker equipment performance validated as needed. HACCP system verification annually and as needed.	

Signature of Company Official: \_\_\_\_\_ Date: \_\_\_\_\_

# FSMA Produce Safety Rule

- Standards for the safe growing, harvesting, packing, and holding of fruits and vegetables grown for human consumption
- Goal: reduce the presence of potentially dangerous bacteria in the food supply
- Requirements for:
  - Agricultural water quality
  - Employee health and hygiene
  - Animals
  - Biological soil amendments of animal origin (such as compost and manure), and
  - Equipment, tools, and buildings

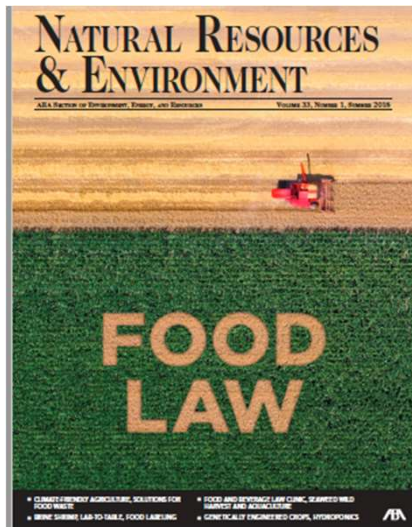


## Best model?

- Seafood HACCP?
- Produce Rule?
- Another model?
  - Is there another new or emerging food source with a model to use?



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### Navigating the Kelp Forest: Current Legal Issues Surrounding Seaweed Wild Harvest and Aquaculture

Catherine Janasick and Amanda Nichols

Seaweed and kelp have traditionally had narrow, exclusive rights to harvest and trade. However, there is a growing interest in seaweed and kelp aquaculture and wild harvest outside of the United States, which presents economic benefits and novel legal considerations. The United States and kelp harvest countries are exploring various regulatory approaches, including the use of the Food Safety and Inspection Service (FSIS) and the Food and Drug Administration (FDA). The United States and kelp harvest countries are also exploring the use of the Food Safety and Inspection Service (FSIS) and the Food and Drug Administration (FDA).

As the United States and kelp harvest countries explore these options, it is important to consider the potential benefits and challenges of each approach. The United States and kelp harvest countries are also exploring the use of the Food Safety and Inspection Service (FSIS) and the Food and Drug Administration (FDA).

#### Statutory and Regulatory Framework

All the federal laws, a lack of current, clear, and applicable statutory and regulatory structure for commercial seaweed and kelp aquaculture activities. 16 U.S.C. § 1401 (a)(1) (1994) provides for certain aspects of aquaculture, but does not specifically address seaweed and kelp aquaculture. The federal regulatory framework for seaweed and kelp aquaculture is currently fragmented and inconsistent.

Available at: [https://www.americanbar.org/groups/environment\\_energy\\_resources/publications/natural\\_resources\\_environment/2018-19/summer/navigatingthekelp-forest-current-legal-issues-surroundingseaweed-wild-harvest-and-aquaculture/](https://www.americanbar.org/groups/environment_energy_resources/publications/natural_resources_environment/2018-19/summer/navigatingthekelp-forest-current-legal-issues-surroundingseaweed-wild-harvest-and-aquaculture/)

## Thank You! Questions?

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<http://nsglc.olemiss.edu/>

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