Partners make this project possible:

University of Alaska
Principal Investigator: Dr. Michael Stekoll, UAF

Woods Hole Oceanographic Institute

Blue Evolution

Kodiak Island Sustainable Seaweed

Kodiak Kelp Company

TendOcean

C.A. Goudey and Associates

GreenWave

Alaska Fisheries Development Foundation

F/V Savage

Kelson Marine

University of Connecticut

Marine Biological Laboratory, Woods Hole Oceanographic Institute

Thank you to all of the partners that make this work possible!

Learn more about research on seaweed production at-scale:

Hauke L. Kite-Powell, Erick Ask, Simona Augyte, David Bailey, Julie Decker, Clifford A. Goudey, Gretchen Grebe, Yaoguang Li, Scott Lindell, Domenic Manganelli, Michael Marty-Rivera, Crystal Ng, Loretta Roberson, Michael Stekoll, Schery Umanzor & Charles Yarish (2022) Estimating production cost for large-scale seaweed farms, Applied Phycology, 3:1, 435-445, DOI: 10.1080/26388081.2022.2111271

Lean more about ARPA-E and the Kodiak project:

Kelp Cultivation: Lessons from Kodiak

U.S. Department of Energy
Advanced Research Projects Agency-Energy (ARPA-E)
Macroalgae Research Inspiring Novel Energy Resources (MARINER)

Project Background

Led by the University of Alaska Fairbanks, this 4-year project focused on the integrated cultivation and harvest system design of kelp farms with the goal to increase efficiency and/or reduce costs. This project was funded by the U.S. Dept. of Energy (DOE), Advanced Research Projects Agency-Energy (ARPA-E) which is interested in the scalable production of macroalgae for potential future use as a biofuel.

The intent of this project was to design replicable farms that are cost-effective systems for growing sugar kelp. Through innovative technology and practical solutions, the project team's objective was to reduce costs associated with kelp farming. Test sites for this project were identified in New England and Kodiak, Alaska.

The first outplanting at the Kodiak farm site took place in the fall of 2019. Since then, the project team has learned a lot about growing kelp! The goal of the project is to integrate all aspects of kelp farming into the test site. From seed production to harvest and reseeding, these efforts look at the many ways we can best grow sugar kelp in Alaska's productive waters. There is still more to come with this project! This is a fist look at some of the techniques and gear used at the Kodiak farm site.

Farm system: Catenary Array

Designed by Cliff Goudey at TendOcean, the catenary array is designed to maintain tension across a farm structure. This design has been used at the demonstration site in Kodiak. Although the diagram below, provided by project partner GreenWave, is not an exact rendition of the array in Kodiak, it generally depicts the catenary array design.

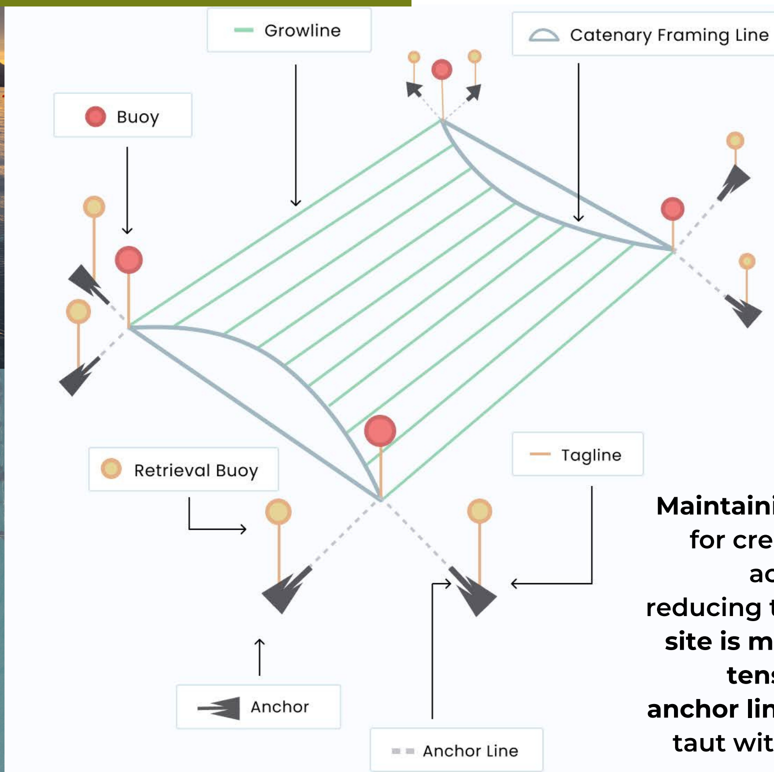
The Kodiak site includes three different buoy types (not all depicted in the diagram):

Polyform A-5: 10 x $252 = $2,520

Polyform A-2: 15 x $72 = $1,080

Spar Buoys: 4 x $2000 = $8,000

Where the polyforms act as retrieval buoys, the more dynamic spar buoys frame the farm array. Distance between buoyancy is approximately 100 ft.



C-links: 220 x $4 = $880
These c-links (not pictured) provide connections between the lines on the array where needed.

Maintaining tension is important for creating consistent growth across the array as well as reducing tangling. **Tension at this site is maintained with deadeye tensioners on each of the 8 anchor lines.** The system is pulled taut with the help of hydraulics.

Site Overview

Location: Kodiak, Alaska

Area: 17 acres

Current speed: ~0.5 knots

Bottom type: soft

Depth: 55-80 feet

High nutrient levels: >5 umol nitrate (most of the season)

Not exposed to ocean swell (fetch is ~10 miles)

Seed

The cost of seed depends on the hatchery and the transportation costs. For this project, seed was $1/ft which totaled around $44,000 for the entire array.

Generally, outplanting occurs between end of October and middle of November.

Yield

Max: 19 lbs/ft, from subsampling

Average: 4.8 lbs/ft, average across the entire farm

Typically, the kelp is harvested in early May.

Total annual harvest: from 100,000 to 170,000 lbs