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Contractor Final Report Template

Please submit a report based on this template to stephane@seconference.org as part of the completion of your AMC-funded project.

Name of Project: **Cultivation protocol for the indoor cultivation of Pacific Dulse, *Devaleraea mollis* from Alaska**

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PROJECT REPORT:

Purpose and Context

This project addressed the need to evaluate the feasibility of cultivating dulse (*Devaleraea mollis*) in Alaska using controlled, land-based cultivation systems. Dulse is a red seaweed with strong market potential due to its nutritional value, culinary applications, and increasing consumer demand for specialty sea products. Although Pacific dulse cultivation has been explored in parts of the Pacific Northwest, there has been limited Alaska-specific information on cultivation protocols, infrastructure requirements, operational costs, and economic feasibility. Alaska presents unique environmental, logistical, and economic challenges that require tailored cultivation approaches rather than direct adoption of systems developed elsewhere.

This project was designed to support the Alaska mariculture industry by developing a practical framework for indoor and on-land dulse cultivation that could be adapted for use across the state. Specifically, the project sought to:

1) Review existing cultivation methods and technologies currently used in research

and commercial settings;
2) Develop cultivation guidance tailored to Alaska conditions and operational realities; and
3) Conduct an economic and feasibility assessment to evaluate the practicality of implementing dulse cultivation systems in different regions of Alaska.

The Mariculture Lab conducted the work at UAF under an applied research and development framework intended to support industry growth and technology transfer directly. The project emphasized practical outcomes to help current and future mariculture operators understand infrastructure requirements, operational considerations, production risks, and potential economic barriers associated with dulse cultivation.

An important aspect of the project was recognizing that Alaska's geographic isolation, transportation costs, energy costs, and environmental variability significantly influence the feasibility of land-based mariculture operations. Existing cultivation systems developed in California and Oregon often rely on infrastructure, supply chains, and climatic conditions that differ substantially from those found in Alaska. As a result, one of the primary goals of this effort was to present existing technologies and methodologies that could be adapted into scalable, replicable systems that are realistic for Alaska producers.

In addition to supporting industry diversification, the project also contributed to broader mariculture development goals by increasing knowledge of alternative seaweed species with commercial potential. Diversification into additional seaweed crops may improve economic resilience within the mariculture sector by expanding product opportunities and reducing dependence on a limited number of species or markets. Pacific dulse may also provide opportunities for value-added products, specialty food markets, and year-round production systems that complement existing seaweed farming activities.

Activities and Outcomes

Deliverable 1: Review of Existing Indoor Cultivation Protocols for Dulse

The first phase of the project focused on conducting a comprehensive review of existing dulse cultivation methods and technologies currently used in research programs and commercial operations. This work drew on prior experience gained in the UAF Mariculture Lab through indoor cultivation initiatives and experimental seaweed production efforts. Existing scientific literature, cultivation manuals,

technical reports, and operational approaches from West Coast cultivation facilities were reviewed to identify best practices and critical operational considerations relevant to Alaska.

The review emphasized several key components of dulse cultivation systems, including:

- Seedstock acquisition and propagation
- Water quality management
- Nutrient delivery strategies
- Temperature and light control
- Tank and infrastructure design
- Aeration and circulation systems
- Biomass handling and maintenance requirements
- Operational scalability

To complement the literature review and obtain direct industry knowledge, project team members engaged with commercial-scale cultivation operations located in Oregon. These interactions provided valuable insight into practical cultivation approaches currently being used in operational facilities, including system engineering, production scheduling, labor requirements, and environmental control strategies. The exchange of information also helped identify technologies and methodologies that may be transferable to Alaska, while highlighting limitations in adapting lower-latitude systems to northern conditions.

The primary outcome associated with Deliverable 1 was the completion of a technical summary documenting:

- Existing cultivation approaches evaluated during the project
- Information gathered from commercial operations
- Observations regarding infrastructure and operational requirements
- Considerations for adapting cultivation systems to Alaska conditions

This deliverable established the technical foundation for the subsequent development of an Alaska-centric cultivation protocol and economic analysis.

Deliverable 2: Development of a Tailored Pacific Dulse Cultivation Manual

Information synthesized during Deliverable 1 was used to develop a cultivation

framework specifically tailored to Alaska conditions and operational constraints. The project focused on designing cultivation guidance that emphasized scalability, replicability, and accessibility for Alaska mariculture operators.

The resulting cultivation framework was structured as a practical manual intended to support pilot-scale and future commercial-scale cultivation efforts. The manual incorporated information about:

- Water sourcing and treatment
- Tank configurations
- Lighting systems
- Temperature management
- Nutrient supplementation
- Aeration and circulation
- Biomass maintenance
- Harvesting procedures
- Operational monitoring

A major emphasis of this effort was identifying materials, equipment, and infrastructure that could realistically be shipped to, installed in, and maintained within Alaska. This consideration was key, given the logistical and supply chain limitations faced by many coastal communities. The project, therefore, prioritized cultivation approaches that minimized unnecessary complexity while maintaining operational effectiveness.

The cultivation manual also considered environmental conditions unique to Alaska, including colder ambient temperatures, seasonal variability in light, and regional differences in infrastructure availability. Recommendations were developed with the understanding that cultivation systems may need to be adaptable across different geographic regions and operational scales.

Deliverable 3: Economic Analysis and Feasibility Assessment

The final component of the project evaluated the economic feasibility of indoor and on-land dulse cultivation systems in Alaska. This analysis examined key cost components associated with establishing and operating cultivation facilities and considered how costs may vary across different regions of the state.

The economic assessment incorporated information gathered from previous pilot-

scale cultivation efforts, existing operations, and observations from West Coast facilities.

An important outcome of this deliverable was the development of an Alaska-centric interim feasibility framework that can inform future investment decisions, pilot projects, and industry planning efforts. While challenges remain, there is meaningful potential for Pacific dulse cultivation to contribute to diversification within Alaska's mariculture sector. However, continued refinement of cultivation methods, infrastructure optimization, and economic modeling will be necessary before large-scale commercialization can be fully evaluated.

Comparison to Original Objectives

- The project successfully addressed the primary objectives identified in the original proposal by completing the major deliverables outlined in the agreement.

- The project also generated several additional outcomes beyond the immediate deliverables. These included improved understanding of the technological and logistical barriers to land-based seaweed cultivation in Alaska, identification of infrastructure limitations affecting scalability, and development of foundational information to support future applied research and industry expansion efforts.

- Importantly, the project helped establish a framework for the continued development of alternative seaweed species within Alaska's mariculture industry.

DATA G WORK PRODUCTS:

PROJECT VISIBILITY AND OUTREACH:
The final draft of the cultivation manual was printed and shared at the Alaska Mariculture Conference in 2026. Links to the final file will be shared broadly once approved by Alaska Sea Grant. The manual will be available as a downloadable PDF file stored here: https://seagrant.uaf.edu/bookstore/pubs/SG-ED-80.html

PARTNER ORGANIZATIONS AND COLLABORATORS:
The cultivation manual will be published by Alaska Sea Grant, which has a wide reach and a collection of documents supporting mariculture operations in Alaska. Aside from our editing efforts, ASG has also reviewed the manual and is working on copyright compliance for all included photos.