

Maine Algal Cluster Initiative



Highlights from the Maine Algal Cluster Initiative Planning Project
Maine Algal Cluster Advisory Group

Maine has been home to macroalgal businesses for over a century, with a focus on macroalgae (seaweeds) as whole foods, nutraceuticals, and as ingredients and extracts used in animal feeds, fertilizers, and agricultural products. The industry has developed technologies and accumulated substantial information and experience in harvesting, culturing, preparing, marketing and selling Maine seaweeds.

Demand for a wide range of algae-based products is growing globally as well as in the state of Maine. The existing macroalgal industry in Maine is poised to expand to meet growing demand and new markets for algal biomass, locally, regionally and globally. In addition, there is a nascent microalgal industry in Maine with an international reputation as a source of seed stock. **With its extensive pristine coastline, long history of vibrant marine enterprises, and a globally recognizable brand, the state provides an ideal incubator for business development with algae at its core.**



This summary highlights key challenges and opportunities identified during the Maine Algal Cluster Initiative Planning Project and provides examples of activities that can be undertaken by interested parties in the state of Maine to facilitate the growth of both macroalgal and microalgal industries within Maine. More detailed information on the outward-looking market analysis and the inward-looking industry survey can be found at this URL: <http://ncma.bigelow.org/mac>.

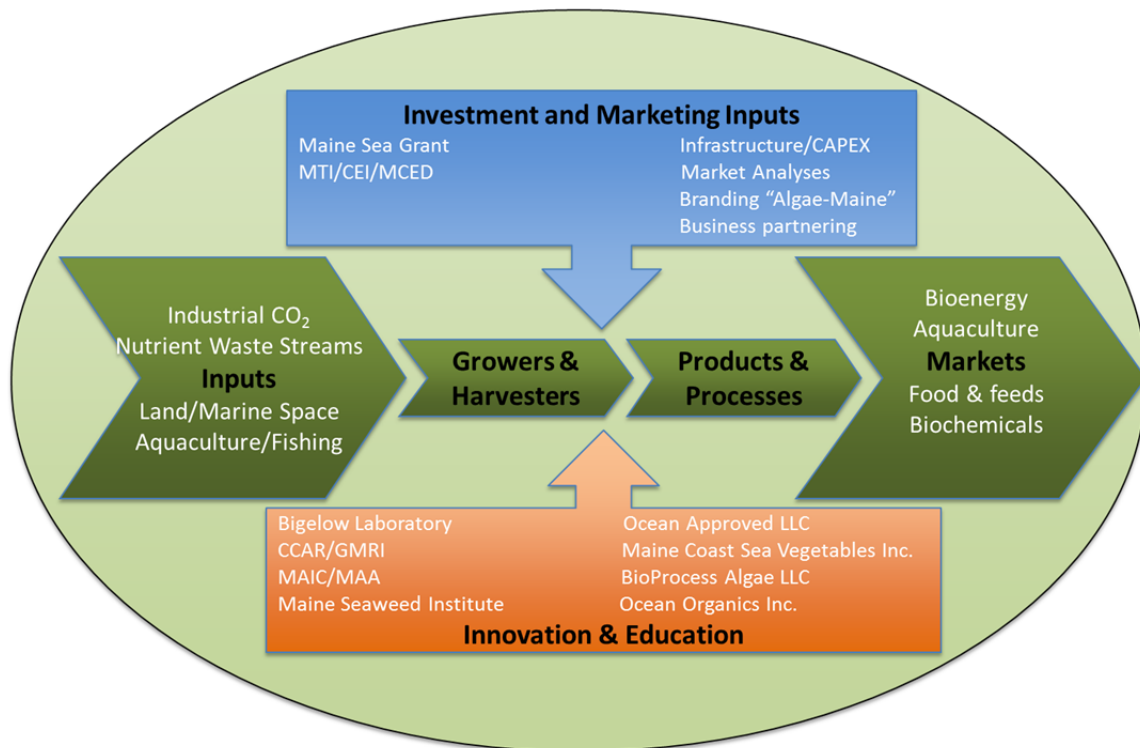
Project Team (Maine Algal Cluster Advisor Group in alphabetical order)

Michael Lomas	Bigelow Laboratory/NCMA (Chair)	Jen Levin	Gulf of Maine Research Institute
Peter Arnold	Maine Fresh Sea Farms	Chris Maloney	BioProcess Algae, Inc.
Sebastian Belle	Maine Aquaculture Association	Nichole Price	Bigelow Laboratory
Susan Brawley	University of Maine at Orono	Sarah Redmond	Maine Sea Grant
Richard Clime	Coastal Enterprise, Inc.	Elizabeth Solet	Maine Coast Sea Vegetables
Chris Davis	Maine Aquaculture Innovation Center	Sara Yentsch	Bigelow Laboratory/NCMA
Shep Erhart	Maine Coast Sea Vegetables		



Overview of a potential Maine Algal Cluster

Clusters are important drivers for the growth of business and economic development. They represent concentrations of companies that served similar customers and draw on complimentary knowledge and workforce skills in the development of innovative services and products. As a geographical concentration of common organizations such as specialized suppliers, industry-knowledgeable universities, trade associations, legal and financial experts, sources of funding, and government agencies. Typically, a competitive advantage for each member comes from participating in the range of activities and sharing of knowledge generated within the cluster such as supply-chain and incubator service development, market intelligence, attraction of capital, management training and education opportunities, and compatible research and development efforts.



Schematic diagram of the anticipated Maine Algal Cluster, showing important restrictions such as availability of skilled growers/harvesters and new products, and needed developmental inputs from Investment and Marketing and Innovation and Education.



MAINE'S ALGAL CLUSTER FACES MANY CHALLENGES ...

- **Maine's macro- and microalgal companies are small, when compared nationally and globally, which amplifies perceived impediments to consolidation into a cluster.** As a cluster of small companies, it is more difficult to access capital and serve as a nucleus around which other supporting components of a cluster might aggregate. This is balanced however, by a strong opinion within the state of significant commonalities between macro- and microalgal activities particularly in the area of value-added processing, education and marketing, that would further a cluster.
- **Macro- and microalgal activities have important overlapping limitations to production that ultimately increase costs.** Algal production activities are currently limited by a lack of needed technology, a small workforce of skilled labor, new market development, and high capital and operational expenses.
- **Macro- and microalgal activities also share common limitations to expansion.**

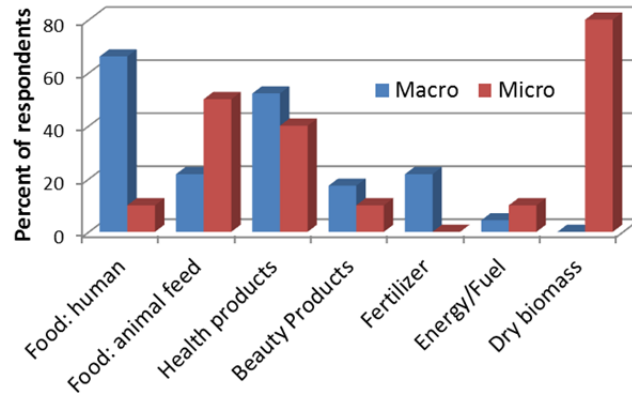
Production limitations also limit the rate of expansion of macro- and microalgal businesses, but they are only a subset of limitations, which include regulatory and 'perception' concerns. Shared challenges between macro- and microalgal culturing are shown with a green 'X'.

Challenge	Wild Harvest	Macro-Aquaculture	Micro-algae
Contaminant Control		X	X
Development of new markets/products	X	X	
Storage/Handling capacities	X	X	X
Opposition from riparian landowners	X		
Production scalability			X
Feedstock availability		X	
Operating Expenses			X
Product Demand	X	X	
Market Competition	X		X



... BUT MAINE'S ALGAL CLUSTER ALSO PRESENTS MANY OPPORTUNITIES

- **Despite differences in biology and growth methods, there is a significant overlap of products derived from macro- and microalgae.** The primary difference between the two is that a large fraction of macroalgal biomass is produced for use as human food items, while a large fraction of microalgal biomass is produced as dry biomass to support derivative products from biofuels to beauty products. The overlap of value-added products, regardless of source, can provide for some economy of scale.



- **Global demand for algae products, particularly aquaculture products, is rising rapidly.** The global aquaculture market is large and growing rapidly. This growth is driven on the macroalgal side by demand for hydrocolloids (e.g., carrageenan) and direct human consumption of macroalgae. On the microalgae side, there is demand for microalgae as food additives and as a source of high-value bioactive compounds (e.g., omega-3 fatty acids and carotenoids).
- **Maine is viewed as a pristine environment.** The Maine coast has long been used as a source of high-quality food and is much less developed than the shorelines of many other states and countries. This perception increases demand as consumers become more educated and carefully choose products they purchase based upon origin. In the wake of the Fukushima Daiichi nuclear disaster, for example, coupled with an expanding market for organic produce, the demand for seafood products coming from 'clean' waters is rising.
- **Maine already has several marine-oriented clusters and thus a strong context for growth.** The State of Maine has leveraged well its marine resources in other cluster activities under the Marine Technology and Aquaculture sector providing a strong backdrop for successful implementation of an Algal Cluster.



TARGETED RECOMMENDATIONS TO MEET CHALLENGES AND EXPLOIT OPPORTUNITIES

1. Develop an action plan focused on attracting new businesses aligned with the algal cluster and stabilizing existing in-state businesses.

Actions:

- Improve diversified and effective communication within the state.
- Develop metrics against which decisions and actions can be evaluated.
- Improve education of all stakeholders within the state on the value of algae, to balance 'emotional-only' points of view.
- Create and improve visibility of the Maine-brand and algal capacity outside state borders.
- Evaluate the species and products currently being developed and research new market opportunities

2. Connect in-state resources to the action plan and identify remaining gaps.

Actions:

- Convert 'view of commonalities' into an economy of scale reality.
- Improve productivity of limited financial resources through idea accelerators, Joint Industry Partnership programs, sponsored research agreements, and others.
- Develop a network for the established algal-related groups within the state (e.g., Maine Seaweed Council, MAIC, MAA) to promote communication and collaboration.

3. Develop strategy and detailed implementation plan for growth of the algal industry sector.

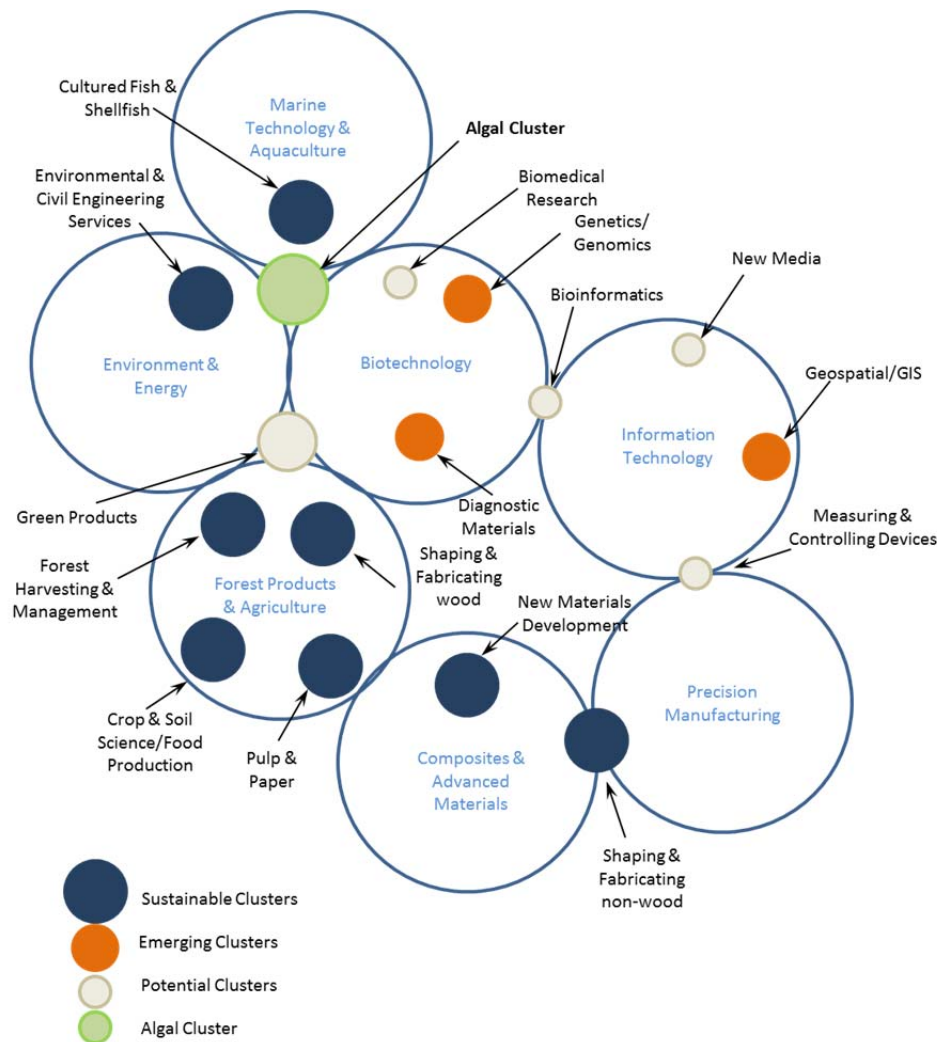
Actions:

- Coordinate activities on the product end across sources to improve cost efficiency of downstream processing, to create product value pyramids for both macro and micro, and exploit overlap.
- Leverage brand and products into new investment opportunities both large and small.
- Take advantage of state and federal STEM and other training grants (e.g., *Make it in America* grants, DOE-funded Algae Technology Educational Consortium program run by the University of Southern Maine) to improve skill of the workforce.



RELATIONSHIP OF THE MAINE ALGAL CLUSTER TO MAINE TECHNOLOGY SECTORS AND OTHER MAINE CLUSTER INITIATIVES

The Maine Algal Cluster has a number of yet-to-be-realized opportunities within and among its participants, along with connections to a wide range of potential partners and activities, as illustrated below. Many opportunities exist to capitalize on a variety of sectors within Maine's economy -- from Technology and Aquaculture, Environment and Energy to the Biotechnology sectors¹. This document and supporting information gathered as part of the cluster panning activity² provides a roadmap to transitioning the Maine Algal Cluster from a 'potential cluster' to a 'sustainable cluster'.



¹ http://www.mainetechnology.org/docs/colgan_cluster_report_2008_full_report_final_040908.pdf; modified to include the position of the Maine Algal Cluster.

² <http://ncma.bigelow.org/mac>

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For more information please read the detailed reports upon which this summary is based. They can be found at <http://ncma.bigelow.org/mac>.

