

2021 Sea Grant Funding Opportunity Selected Projects Addressing Economic and Market Needs of the U.S. Aquaculture Industry

Selected Projects

Business and Economic Planning for Seaweed Aquaculture Systems in the United States

Connecticut Sea Grant

Principal Investigators: Pomeroy and Concepcion

Federal Funding: \$766,650

Project Description: Kelp (*Saccharina* spp.) are the most common seaweed species cultivated in the United States. Kelp farming, as well as the farming of various other seaweeds, is a significant and growing industry in the U.S. as seaweeds, especially kelp, can be used for food, medicinal products, additives and bioremediation. With any new industry, barriers to its development and expansion always emerge. One of the greatest barriers is the lack of economic/financial information on the cultivation of domestic kelp. There is a need to better understand the realistic economic and financial parameters associated with kelp aquaculture in order for farmers, investors and lenders to make more informed decisions regarding investment in this type of venture. The goal of this project is to support the development of a vibrant, profitable and sustainable seaweed aquaculture industry in the U.S. Project objectives include: (1) Develop business planning and management tools for kelp aquaculture systems, which improve the economic and financial viability of this industry; (2) Increase access to capital among existing and prospective seaweed farmers via an emphasis on improved industry knowledge for investors/financers/potential market entrants; (3) Conduct a comprehensive economic assessment of the ecosystem services provided by seaweed aquaculture; and (4) Develop outreach and education activities through SG extension for industry, regulators and financial institutions to support the development of a seaweed aquaculture industry. Anticipated outcomes include more access to capital, more informed business decisions by farmers, investors and lenders; increased employment; greater success of business; and environmental improvements.

Economics of Risk in U.S. Aquaculture Production and Markets

Florida Sea Grant

Principal Investigator: Asche

Federal Funding: \$249,979

Project Description: The overall goal of this project is to provide information about the impact of economic and production risk to producers, investors, bankers, and decision-makers, while identifying measures to mitigate risk, increase profitability, and attract investment in United States aquaculture. The project aims to develop firm-level, intertemporal economic models evaluating risks and returns in various aquaculture systems (i.e., feed, hatchery, grow-out and processing/wholesale operations). Models will be designed for three production technologies (recirculating, bottom-culture, and cage systems) and parameterized for three species (salmon, shrimp, and clams). The risks and returns of health management and biosecurity practices, scale, and intensity of production will be analyzed stochastically and ranked to identify the most profitable investments under various risk circumstances and at various modular integration levels. Emphasis will be given to quantifying risks and risk mitigation strategies associated with input prices, output prices, fish health and disease. The project will provide specific recommendations on how to alleviate risk and increase net returns. A dynamic interface of the model will be developed to enable investors, farmers, and Sea Grant Extension to apply the model to specific circumstances. Training programs/workshops will be conducted to promote the use of the model and to train producers as well as students in risk mitigation aspects of aquaculture. The project deliverables will provide better

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understanding of economic risk associated with aquaculture ventures and foster a more favorable lending environment and greater approvals of loans for aquaculture ventures.

Utilizing an Aquaculture Industry Collaborative to Increase Hawaii's Resilience and Food Security

Hawaii Sea Grant

Principal Investigator: Schneider

Federal Funding: \$249,999

Project Description: The aim of this project is twofold: 1) Convene aquaculture industry and support partners in a collaborative effort that identifies and solves economic and market challenges to help grow and strengthen Hawaii's aquaculture industry; and 2) Promote aquaculture as an economic engine that will contribute to Hawaii's economic recovery, resilience, and food security. This project will create an industry-focused Hawaii Aquaculture Collaborative that will invigorate discussion and actions, intensify synergy, and leverage resources. Outcomes include specific industry-identified economic and market priorities, and initiatives and solutions to advance those priorities. This includes developing an industry-wide strategy for consumer education, marketing, and branding for Hawaii's aquaculture industry and products. Support partners will leverage their strengths and resources to support industry-driven initiatives. This partnership will set up an industry engagement framework for collaborating and communicating that is easily integrated into support partner activities and will endure beyond the funding provided by this project.

Assessing Economic Feasibility of Aquaculture Feed Production in Hawaii

Hawaii Sea Grant

Principal Investigator: Lee

Federal Funding: \$226,763

Project Description: Hawaii is the most remote archipelago on Earth; close to 90% of its food, including seafood, is imported. Although the islands are surrounded by pristine seawater, Hawaii still imports more than 50% of the seafood needed to meet consumer demand. To achieve food security in Hawai'i, it is essential to sustainably utilize the abundance of natural resources to farm food locally. Hawai'ians did so for centuries, producing large amounts of crops and seafood through a coordinated network of terrestrial agriculture and fishponds. This rich history coupled with decades of both public and private research to develop and implement aquaculture technology in Hawaii have created much of the capacity necessary for a successful industry. However, the limited availability of affordable feed has hindered the expansion of aquaculture in the region. This project proposes to assemble a team of experts from multiple disciplines to assess the feasibility of local aquatic feed production. The team will conduct a survey to estimate the total feed requirements for aquaculture production, and then develop both an economic model to estimate the production cost and a strategic plan to meet the demand for feed in Hawaii. The expected result is a detailed economic assessment that includes specific strategies for reducing the cost to produce feed in Hawaii. Ultimately, this project will advance the establishment of a sustainable aquaculture industry to help secure the animal protein supply for the state of Hawaii.

Economic Status and Contribution of U.S. Aquaculture: Analyzing Viability Structures, Economic Impact, and Management Measures for Future Success

Mississippi-Alabama Sea Grant Consortium

Principal Investigator: Karunakaran

Federal funding: \$999,992

Project Description: This integrated multi-partner project supports the sustainable development of U.S. marine and Great Lakes aquaculture industries through the provision of contemporary and accurate

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economic, financial, and market-level information and by addressing critical gaps in aquaculture economics, knowledge base, and training. Comprehensive updated information on the economic, financial, and investment feasibilities and contribution of major aquaculture sectors in the U.S. will be developed employing primary farm-level data. This project facilitates the development of comprehensive non-proprietary business management tools that will provide readily accessible economic feasibility indices that would help existing aquaculturists, aquaculture entrepreneurs, investors, and lenders. Having unique primary datasets on farm-level expenditures for various aquaculture sectors will allow for the most reliable estimation of national economic impact of the domestic aquaculture industry (before-and-after COVID-19) using customized IMPLAN sector activities employing an “Analysis-By-Parts” approach. The development of a price database and outlining the diverse supply-chain structures for major aquaculture sectors will provide insights into dynamic-market trends and inherent vulnerabilities. The project will also identify the economic risks associated with various production practices and outline management measures for risk mitigation. These four objectives are highly pertinent in the wake of the COVID-19 pandemic. Additionally, the Extension component will create a core capacity-building network of economists and Extension specialists, providing updated web-based economic and market information concerning various aquaculture industries. The education component will train the next generation of aquaculture economists by providing experiential and in-field training. All these research activities will be ably guided by an advisory council composed of distinguished aquaculture leaders.

Developing A Web-Based Business Planning Tool for Increased Shellfish Aquaculture Success & Profitability

Maryland Sea Grant

Principal Investigator: Parker

Federal Funding: \$126,612

Project Description: This project will convert an existing Microsoft Excel-based business planning tool that utilizes Monte Carlo simulation to estimate a shellfish farm’s likelihood of success into a web-based model. The development of a web-based model will increase the availability of the tool to Maryland stakeholders, as well as stakeholders in other regions of the U.S. This tool will inform stakeholders of an estimated net present value of their operation over a 10-year period. It will also estimate the rate of return on the project. The model will be able to compare self-financed operations with the effects of debt financing on farm financial performance. These metrics will allow stakeholders to make informed financial decisions on starting a shellfish farming operation.

Expanding Maine’s Blue Economy

Maine Sea Grant

Principal Investigator: Brayden

Federal Funding: \$400,499

Project Description: Maine’s blue economy faces a daunting future, where a decline in wild-capture fisheries and an increase in regulations challenge the backbone of Maine’s coastal communities. In response, many fishers, among other coastal residents, have turned to sustainable aquaculture. Then, COVID-19 arrived, reducing demand to a fraction of its former status, causing supply to outpace demand. Growers, even before COVID-19, had expressed strong interest in exploring new, out-of-state markets. Now, it is a necessity. This project seeks to improve understanding of potential new and underserved markets for Maine-produced aquaculture seafood. In exploring the possibilities for new markets, the proposal will also assess the seafood supply chain and seek synergies between aquaculture and wild capture seafood. To achieve this goal, we propose a collaborative, industry-propelled, interdisciplinary research project to address two specific objectives: (1) identify barriers and opportunities in existing

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aquaculture and other seafood supply chains that supports increased consumption of Maine marine aquaculture products within U.S. markets; (2) evaluate consumer preferences for Maine marine aquaculture products with varying attributes and branding. Improving the understanding of the Maine aquaculture industry's marketing needs, the seafood supply chain, and consumer preferences will strengthen the industry's resilience towards economic shocks, such as COVID-19, improve the tools and analysis available for growers and policymakers, and improve the long-term economic sustainability of aquaculture in Maine.

Determining Market Potential for Food-Fish Aquaculture in Minnesota

Minnesota Sea Grant

Principal Investigator: Schrank

Federal Funding: \$249,052

Project Description: Food-fish aquaculture in the Great Lakes region is a small and relatively new industry. Interest in aquaculture is growing in Minnesota and the Great Lakes region because of the emphasis on local food sources, food security, worldwide demand for increased protein, and continued decline in wild-capture fisheries. A major barrier to the development of aquaculture in Minnesota is a better understanding of potential markets and market-price targets for locally produced fish. Specifically, potential growers are interested in credible data to help them decide which production strategies and species are best suited for profitable production. At the same time, Minnesota's regulatory and management agencies are interested in being prepared for the development of new and diverse forms of aquaculture at all operational scales. To determine the viability of a sustainable aquaculture industry in Minnesota, the project team plans to 1) analyze consumer knowledge, preference, and willingness to pay for aquaculture products; 2) assess the current food fish supply to determine what production systems and species will be most profitable for producers and identify market opportunities; 3) provide clear recommendations to the aquaculture industry and policymakers through an outreach program based on our results; and 4) contribute to workforce development in U.S. aquaculture by involving a graduate student and a research fellow. By addressing critical gaps in economic and market knowledge, this project will help determine the potential for expansion of a sustainable aquaculture industry in Minnesota and the Great Lakes region and contribute to job creation, healthy food production, and local business growth.

Production Economic Analysis of Market Stage Black Sea Bass in a Recirculating Aquaculture System: Impacts of Improved Fingerling Prices, More Sustainable Feeds, and Faster Growth from Selective Breeding

North Carolina Sea Grant

Principal Investigator: Watanabe

Federal Funding: \$135,006

Project Description: The goal of this research is to develop a generalized spreadsheet economic model of a commercial land-based RAS facility that can be parameterized for alternative locations and scales of production. As an example, we will parameterize the model for black sea bass (a high-value, high-demand species), produced in coastal North Carolina. The model will allow for the production facility to be scaled and configured in alternative ways and allow input of alternative values of the biological and economic parameters to accommodate other geographic areas and species. The financial performance of model growout production facilities would be measured by assessing farm input costs (e.g. labor, feed, energy, oxygen and bicarbonate consumption, waste treatment), duration of the production cycle, farm gate revenues and returns to owner per production cycle, break even prices, discounted payback period, modified internal rate of return, and cumulative net present value. Through sensitivity analyses, the

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economic analyses will assess the impacts on financial performance of recent advances in hatchery production of black sea bass fingerlings, more sustainable feeds that incorporate cheaper protein sources in replacement of fish meal, alternative grading practices, and higher safe stocking densities. The potential impacts of faster fish growth resulting from selective breeding over five generations will also be analyzed. Such information is critical to identify economic constraints and opportunities, to aid researchers, investors, and policy makers, and to accelerate commercial RAS production of marine finfish in the U.S.

Developing Farm and Market Tools for Shellfish Mariculture in North Carolina

North Carolina Sea Grant

Principal Investigator: Alphin

Federal Funding: \$236,024

Project Description: North Carolina has one of the longest and most complex shorelines of any state along the east coast of the U.S., with extensive inshore and estuarine areas that provide a wide range of shellfish growing conditions and lead to widely distributed support resources for shellfish mariculture efforts. This proposal addresses several program priorities including the provision of tools to address the knowledge gaps in business development, focusing on areas of marketing and economics for the shellfish cultivation industry in North Carolina. We will develop tools that will provide industry participants with the resources they need to address and respond to volatile conditions (weather perturbations, uncertain markets, and varying demands). This effort takes steps to establish a business incubator that will provide mentorship for entry level and current farmers and utilizes diverse expertise to provide an online tool for farm business management. This goal addresses issues recognized by recent reports on addressing challenges to growing the shellfish culture industry in North Carolina. Given the uncertain economic backdrop for 2020-2023 this effort will focus on providing resources with remote access options (either entirely or in part) to provide greater flexibility to industry participants. This is a three year effort that incorporates the expertise of the North Carolina Sea Grant aquaculture extension, University of North Carolina Wilmington's Center for Innovation and Entrepreneurship, and researchers from University of North Carolina Wilmington's Center for Marine Science to develop a business incubator to address the needs of the shellfish cultivation industry.

The Aquaculture Explorer Platform: Integrated Spatial-Financial Tools to Catalyze Aquaculture Investment

Oregon Sea Grant

Principal Investigator: Sylvia

Federal Funding: \$692,571

Project Description: Potential U.S. aquaculture investors, especially small- to mid-size investors, often need assistance in navigating the difficult decisions involved with selecting, designing, and managing aquaculture businesses. This is especially true in regions of the country that may not have a strong aquaculture tradition, or where aquaculture opportunities may be spread over diverse landscapes and seascapes. To address this challenge a group of Oregon industry and university partners has developed a unique set of software tools called the Oregon Aquaculture Explorer Platform. This innovative Platform supports investment by providing integrated information on aquaculture systems including GIS tools for exploring the geophysical, regulatory, and market related characteristics of the state, site reports summarizing critical information, and a library of pre-investment financial models that link with the GIS system. The first phase of the project addresses three inland aquaculture systems and is close to being beta tested by industry experts. This Sea Grant proposal, as part of a "Phase II" effort, seeks to expand the Oregon Aquaculture Explorer Platform, adding estuarine and marine dimensions while expanding

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investment models. The project supports new partnerships with state agencies and industry associations in California and Washington, integrates with undergraduate and graduate education, increases connectivity with Oregon State University, and supports outreach including workshops and conferences targeting new aquaculture investors. It is expected these spatially-based investment and educational tools will advance the rate of aquaculture investment in Oregon and along the West Coast and serve as a model for other states seeking to advance aquaculture development.

Collaboratively tracking shellfish aquaculture production data in Washington State

Washington Sea Grant

Principal Investigator: Hudson

Federal Funding: \$376,990

Project Description: Through accurate quantification and valuation of Washington's shellfish industry, support can be realized toward the productivity and economic sustainability of the industry and advance the U.S. Department of Commerce's goal of growing domestic aquaculture. West Coast shellfish production is of interest because farm gate value exceeds \$128 million and accounts for two-thirds of all oyster, mussel, and clam aquaculture sales in the United States (Northern Economics 2013). Bivalves also provide cultural value, recreation, food, jobs, and revenue for coastal regions, often in communities that are experiencing retraction of natural resource-based economies. Information collection and data visualization tools to assist sustainable shellfish aquaculture management and development is the focus of this proposed project, which is a "win-win" for shellfish managers and the shellfish aquaculture industry. The project will include the following five objectives: 1) Determine Washington State shellfish production information needs for public health requirements, state reporting requirements, and economic contributions and impacts. 2) Develop, through stakeholder and agency engagement, data collection protocols, the data portal, and multi-agency access for production information. 3) Survey selected shellfish farms to calculate the relative cost of materials and labor involved in various bivalve shellfish growing practices. 4) Conduct regional shellfish aquaculture production and value analysis, utilizing current data and updating a 2015 Washington Sea Grant report. 5) Develop an online "economic dashboard" for the output of objective four. Outputs will be useful for ongoing economic analysis, business planning, marketing efforts, public health compliance, as well as shellfish disease and pest risk management and response.