From: Individuals who support Marine Agronomy
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Dr. Jeff Silverstein,
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5601 Sunnyside Ave., Room 4-2106, Beltsville,
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Reference: RIN 0648-XC007.

Dear Dr. Silverstein,

Re: DRAFT 'NATIONAL AQUACULTURE RESEARCH & DEVELOPMENT STRATEGIC PLAN
Comments relating to Marine Agronomy

The signatories to this letter commend the JSA for its work on the National Aquaculture Research and Development Strategic Plan and agree with its vision and recognition of aquaculture as a strategic priority for the U.S. However, we suggest that recent aquaculture developments and global trends call for emphasis on a sector of marine aquaculture that is inadequately recognized in this plan. Specifically, we refer to the farming of marine macroalgae or seaweeds.

In 2010, 19 million metric tons of seaweed was produced by aquaculture worldwide valued at $5.7 billion. This was mostly produced in Asia[1] and was mostly eaten directly by people as food or processed to produce marine hydrocolloids. In terms of weight, this global seaweed harvest contributed 50% of all marine aquaculture production worldwide and promises much more, with interest now developing in the farming of seaweed for biofuel, animal feed, and as a source of renewable biochemicals.

In the years ahead, we believe that seaweeds, because they are primary producers, will come to dominate global marine farming as the farming of plants dominates (terrestrial) agriculture today. Therefore, marine aquaculture, as we know it now, will transition to become a self-sustaining 'Marine Agronomy' that provides raw materials for feed for its aquatic livestock, as well as providing food for people and chemical feedstocks for industrial processes. Such an industry will also contribute environmental services while offering a major economic development opportunity for maritime nations.

We believe it is time for the U.S. to recognize the potential benefits of developing such an industry and to establish a dedicated Marine Agronomy Initiative similar in scope and intent to NOAA's recently established National Shellfish Initiative. We offer the following information in support of this suggestion:

1. This is not a new idea[2]. The U.S. invested in a major marine biomass program in the 1970's to produce 'substitute natural gas' as a response to the world oil crisis at the time. The program lapsed later in the decade, however, as the oil crisis subsided and fuel prices declined.

2. In the years since, pressure on both fuel and food supplies has increased as well as recognition of the potential environmental benefits of using 'biofuels'. Therefore, it is an idea whose time may now have come. The U. S. Department of Energy has recognized this and is already sponsoring several marine biomass projects through its Algal Biofuels Research Program[3].

3. There is a natural synergy between the use of carbohydrates (sugars) from seaweed for making biofuel and retention of the protein and fat fractions of the biomass for aquaculture feeds, because aquatic livestock do not require the 'carbs' to maintain body temperature. Therefore biofuel could become a co-product of marine finfish and shrimp aquaculture, which would then become independent of outside sources of raw materials for feed, countering criticisms about their present dependence on such sources.

4. With estimates indicating that the world may need up to 70% more food (5 billion metric tons) per year by 2050[4], there is doubt if this can be done by traditional agriculture given uncertainties about the availability of land, freshwater and the effects of climate change. This has caused some to ask – should we and can we turn to the sea for relief[5]?

5. The oceans cover 70% of Earth but presently yield only 1.5% of our food. By farming seaweeds, as primary producers, the oceans could be made massively more productive, while sparing land and freshwater[6] and being less vulnerable than terrestrial agronomy to the impacts of climate change.

6. Since seaweeds use CO_2 and nutrients (nitrogen and phosphorus) in seawater as raw materials for growth, large scale seaweed farming could help to slow ocean acidification in some areas as well as bioextracting nutrients that accumulate in coastal waters as a result of human activity on land. Therefore seaweed farms could be used to reduce or eliminate 'dead zones' in our coastal waters, potentially recovering nutrients for return to terrestrial farms.

7. Reflecting these needs and this opportunity, the U.S. now has its first successful seaweed farm in Maine[7]. The company has already been successful at propagating seaweed seedlings in the hatchery with the help of funding from SBIR and in marketing its products to retail and food service companies. It provides a model and a demonstration on which the Nation should now build.

We believe that these circumstances and potential benefits justify a dedicated National Marine Agronomy Initiative, as indicated above, and we propose that the following Strategic Goal be added to the JSA Plan.

PROPOSED STRATEGIC GOAL 10: DEVELOP METHODS FOR THE FARMING AND PROCESSING OF MACROALGAE (SEAWEEDS) FOR FOOD, FEED, BIOFUELS AND OTHER MATERIALS USED IN INDUSTRY AND AGRICULTURE.

In the years ahead, it seems likely that the farming of seaweeds, because they are primary producers, will come to dominate global marine aquaculture, as the farming of plants dominates agriculture today. Only in this way can the aquaculture industry sustain itself by providing its own raw material needs for feed, as well as providing food for people and raw materials for industrial processes. Such an industry will also contribute environmental services while offering a major economic development opportunity for maritime nations worldwide.

Already, seaweeds contribute half of all global marine aquaculture production by weight (19 million metric tons) and there is opportunity to produce much more. As nations grapple with the pressures created by increasing human demands for food and fuel, at a time when the availability of more land and freshwater for agriculture is uncertain, the oceans offer an alternative setting for large-scale food, feed and fuel production that must be tested as a matter of urgency.

With its huge EEZ and resources of talent and money, the U.S. is in a pre-eminent position to lead such an effort. Research is needed throughout all stages of the value chain from the selection and genetic improvement of cultivated seaweed species to refinement of farming methods and the bio-refining of seaweed biomass to maximize the value of its component parts.

Outcomes

- Select native seaweed species with most potential for farming, perfect techniques for propagation and begin selective breeding.
- Conduct commercial scale farming trials in selected regions of the U.S. EEZ.
- Model and test the potential for large-scale seaweed farms to improve water quality in coastal ‘dead zones’ and determine other environmental benefits and/or impacts.
- Examine the claimed human nutritional benefits of eating ‘sea vegetables’ and promote those that are well-founded.
- Develop non-destructive bio-refining methods to separate materials that can be used in a wide range of food, feed, biofuel and other applications.

Milestones

- Identification of up to 10 seaweed species that have culture and composition characteristics that make them well suited for farming and processing in different regions of the U.S.
- Establishment of five regional, commercial scale seaweed farms to serve as research platforms and demonstration units in the same way as the Agriculture Experiment Stations serve U.S agriculture.
- Comparison of the economic and environmental value of seaweed biomass for food, feed and biofuel production with terrestrial counterparts.
- Demonstration of the environmental services that large-scale seaweed farms may be able to provide, especially as regards nutrient recovery, CO_2 removal and sparing of land and freshwater.

Performance Measure

- Availability of technical, commercial, environmental and spatial data on seaweed farming in the US EEZ to allow the prospects for its long-term, large-scale development to be assessed; and policies to be put in place for implementation of large scale marine agronomy, if justified by the data.

Thank you for your consideration.

Sincerely,

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Please note that the signatories above endorse this letter in their capacity as individuals not as representatives of their organizations.

References

[1] FAO 2012. The State of World Fisheries and Aquaculture 2012.

[2] Roesijadi et al 2008. Techno-Economic Feasibility Analysis of Offshore Seaweed Farming for bioenergy and Bio-based products http://www.scribd.com/doc/16595766/Seaweed-Feasibility-Final-Report

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