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Final Results

SW97-025

Sustainable Culture of the Edible Red Seaweed, *Gracilaria parvispora*, in Traditional Hawaiian Fishponds

Location:

Molokai, Hawaii, and Tucson,
Arizona

Funding Period:

July 1997 - December 1999

Grant Award:

\$95,201

Project Coordinator:

Edward Glenn
Environmental
Research Laboratory
2601 East Airport Drive
Tucson, AZ 85706
Phone: (520) 626-2664
Fax: (520) 573-0852
E-mail:
Eglenn@ag.arizona.edu

Major Participant:

Colette Machado, Ke Kua'aina
Hanauna Hou, Molokai

Cooperators:

Hawaii Sea Grant,
University of Hawaii

OBJECTIVES

1. Establish methods to break dormancy of sporelings
2. Establish methods for sustainable cage cultures
3. Design and test seaweed cleaning machine
4. Disseminate information through workshops, growers' network, revised how-to manual and technical publications

ABSTRACT

Experiments were conducted with sporelings as well as older plants to determine the factors limiting growth on the reef. Plants were placed out at six locations on the reef and biomass production was compared to water quality factors (water motion, temperature, salinity, turbidity, nitrate, ammonia, phosphorous and silicon levels) at each site. The experiment was repeated three times, in spring, summer, and winter. The results showed that ammonia levels in the range of two to ten micromoles controlled the growth of *Gracilaria* on this reef ($r^2 = 0.83$); no other water quality factors were significantly correlated with growth. Elevated ammonia levels at specific sites were associated with land-based activities that enriched the reef levels of ammonia. These land use practices including cattle pasturage and shrimp farming.

A sustainable production system was developed in which *Gracilaria* was harvested from the reef or from shrimp effluent ditches, then transferred to cages for additional growout. Plants removed from effluent ditches were found to be highly enriched in nitrogen content, so when transferred to cages they were able to utilize this nitrogen for growth. After three to four weeks in cages, the plants doubled or tripled in weight and were much cleaner than when taken from the reef or ditches. This material was cleaned and sold in Honolulu.

Funding to build a cleaning machine was removed from the budget by USDA. Rather than fabricate a machine, we conducted time-and-motion studies on the hand-cleaning process and identified procedures that could be streamlined to increase the efficiency of post-harvest handling tasks.

Numerous workshops and public demonstrations were held throughout the project, and participation in ogo growing increased to over 30 families as a result. Ke Kua'aina Hanauna Hou and the University of Arizona are producing a revised *Limu Growers Manual*, which will be self-published by Ke Kua'aina and distributed to participants in the limu project on Molokai. The manual contains: introduction; life cycle diagrams; ogo cultivation procedures; explanation of the 'Ohana Growers Network and Limu Buyback Program; and a section on marketing fresh and value-added ogo products.

POTENTIAL BENEFITS

This project provides an important means by which local coastal residents can derive an economic benefit from the public-domain reef on Molokai. This reef has been subjected to siltation and eutrophication from non-traditional land use practices, which include clearing native vegetation on the slopes to improve grazing (which produces erosion) and residential development along the coast which increases nutrient levels through leakage from septic systems. Growing ogo on the reef aids the environment by giving local residents an economic stake in maintaining a productive reef ecosystem and by introducing a crop that can help absorb excess nutrients entering the reef. At present, sales of Molokai ogo are approximately \$100,000 per year, providing supplemental income to some 30 families along a 16-mile length of coastline.

There is great potential for expansion, as the wholesale buyers pay a \$2.50 per kilogram premium for Molokai ogo and have markets in Japan and the mainland USA that would absorb unlimited additional production.

DISSEMINATION OF FINDINGS

Findings have been disseminated through journal articles prepared by the University of Arizona, and by workshops, outreach and extension carried out by UA, Ke Kua'aina, and Glen Tevis, University of Hawaii Agricultural Extension Agent on Molokai. In addition, Ke Kua'aina will self-publish and distribute the *Limu Growers Manual*. The project will continue under separate funding, and UA and Ke Kua'aina will continue to disseminate results and increase the community participation in ogo growing on Molokai.

FARMER ADOPTION AND DIRECT IMPACT

The coastal residents have been enthusiastic about growing ogo. The limiting factor for community participation has been the difficulty in finding productive sites on the reef, but research showed a very high correlation between productivity of ogo and local ammonia levels. Hence, evaluating potential new sites can be done with accuracy now.

FUTURE RECOMMENDATIONS OR NEW HYPOTHESES

The high dependence of ogo productivity on ammonia opens up several avenues for increased production and greater environmental stewardship. For example, we are now initiating a project to combine ogo production with shrimp and fish culture (already practiced on Molokai). The ogo will help scrub nutrients from effluent water before it is discharged onto the reef. We believe this type of project would also be successful in other Pacific Island locations, including Guam and the former Pacific Trust Territories for which USDA still has responsibility.

This summary was prepared by the project coordinator for the 2000 reporting cycle.