MANUAL ON SEAWEED CULTURE
2. POND CULTURE OF *CALLIEPRA*

by
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TABLE OF CONTENTS

1. INTRODUCTION
2. TAXONOMY AND DISTRIBUTION OF *CALLIEPRA*
2.1 Phycology
3. MAJOR ACTIVITIES
3.1 Site selection
3.2 Pond preparation
3.3 Culture of *Callipra*
3.4 Harvesting and post-harvest activities
4. ECONOMICS OF PRODUCTION AND ECONOMICS
5. REFERENCES

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TABLE OF CONTENTS

2. POND CULTURE OF *CALLIEPRA*
3. SEAWEED CULTURE OF *GRACILARIA*

MANUAL ON SEAWEED CULTURE
2. POND CULTURE OF *CALLIEPRA*

by
Gaspar Y. Jacinto, Jr.[1]

1. INTRODUCTION

Several species and varieties of Gracilaria may be utilized as feed in the farm of finfish vegetables. These are mainly produced through gathering of natural stocks. Only *G. gracilaria* is commercially cultivated in ponds in the Philippines. The culture of the species dates back to the 1970s when Gracilaria was used as a substitute for agar. Production was then in the vicinity of 1 metric ton per month. Production increased to 10 metric tons per month in 1980 and 100 metric tons per month in 1981. Production then dropped to 10 metric tons per month in 1982 because of the low demand for Gracilaria. Gracilaria is a good source of agar, but its agar content is low compared to other species of Gracilaria. Its agar is of high gel type, soft and succulent texture. It is also a fast growing species.

Gracilaria is a good source of carbohydrates, minerals and vitamins. Processing for Alginate and carrageenan is not economical. At the beginning, Gracilaria was in economic crop in that was among the main resources of the marginal population of land and seashore dwellers. Gracilaria was used as food, medicine and as a fertilizer. Gracilaria is cultivated in Cebu and Bataan. Production in Cebu is in the range of 100 metric tons per month. Production in Bataan is in the range of 10 metric tons per month. Gracilaria is also cultivated in Pangasinan and Ilocos Sur. Gracilaria is also cultivated in Pangasinan as part with the remainder of the pond area used for culture of Chanos Chanos. Gracilaria is also cultivated in Ilocos Sur. Gracilaria is also cultivated in Quezon's Mariveles Cove and Ilocos Sur. Gracilaria is also cultivated in Pangasinan as part with the remainder of the pond area used for culture of Chanos Chanos. Gracilaria is also cultivated in

range of 20–25 (29) °C or slightly higher should be maintained in ponds for maximum growth.

Frequent change of water is necessary to maintain the optimum temperature of water in the ponds. The water is changed every two to three days. About 50 to 75 percent of the "old" pond water should be drained and replaced with fresh seawater.

Fertilization with either organic or inorganic fertilizers may be done to enhance the growth of *Gracilaria*. Weekly application of 3 kg of urea per hectare should be sufficient. Fermented pig manure may be applied at a rate of 160 to 180 kg per hectare two to three days after the pond water has been changed. Pond water should not be changed for several days after fertilization.

3.5 Harvest and post-harvest activities

The harvesting may be done two to three months after seeding depending on the growth of the crop. The crop may be harvested manually or by using scoop nets every 10 to 40 days. The frequency of harvests should be primarily dictated by the market price, amount of harvestable biomass and the season. In subtropical and temperate areas, the low temperature during winter is inimical to the growth of the crop.

The harvest should be thoroughly washed in pond water to remove the silt, sand, pieces of shells and other extraneous materials such as snails and other algae. The clean *Gracilaria* is spread uniformly on bamboo screens or plastic sheets for drying. An average wet to dry ratio of 7:1 is generally attained.

Standards set by the Bureau of Standards in Taiwan for the export of dried *Gracilaria* require that the product should not contain more than 1 percent of mud and sand, not more than 1 percent shells and not more than 18 percent other seaweed species. Moisture content should not exceed 20 percent (T.P. Chen, 1976).

Dried *Gracilaria* is packed into bales of 100 kg weight for export or sold to local processing plants. Production of 10 to 12 metric tons of dried *Gracilaria* is attained in a hectare of pond in Taiwan. More recently fresh *Gracilaria* crops are utilized as feed in the culture of abalone.

3.6 Polyculture with shrimp and/or crab

Gracilaria may be polycultured with shrimp (*Penaeus monodon*) and/or crab (*Scylla serrata*) as is being done in southwestern Taiwan. Stocking materials for a hectare of farm consist of 4 000 to 5 000 kg of *Gracilaria*, 5 000 to 10 000 crabs and 10 000 to 20 000 shrimp fry. Crushed trash fish and snails are generally used as feed for the crabs. Crabs are harvested after three months and the shrimps after four to seven months. Survival rates as high as 80 percent for crabs and 80 to 90 percent for shrimps have been documented making this polyculture one of the most profitable aquaculture methods in Taiwan. The net income from polyculture has been proven to be three times as much as from monoculture.

3.7 Pests and predators

The presence of other seaweed species (weeds) in the ponds mixed with *Gracilaria* is one of the problems in the culture of this seaweed. The weed species have to be removed or weeded out to prevent these from becoming dominant. The weeds compete with *Gracilaria* for nutrients and light. These also lower the quality (value) of the crop. Epiphytes, other smaller algae growing on *Gracilaria*, are other problems which may be solved by the introduction of grazers in the ponds. Tilapia has been found to be effective in the control of epiphytes. A low density of milkfish or tilapia may be stocked in *Gracilaria* ponds to control epiphytes and other green algae.

3.8 Economics of Gracilaria farming

The culture of this alga in the Philippines used to be an extensive method applied by milkfish farmers primarily for the food of the milkfish. During the period of abundance of *Gracilaria* in Manila Bay, fishpond operators collect them for stocking in milkfish ponds. There has been no documentation of this practice but the use of the algae as milkfish feed has been reported. Unfortunately, there was no economic evaluation of the practice. The Philippine experience on the farming of this seaweed, although not for its agar but for milkfish feed was, however, short lived due to the heavy pollution of Manila Bay. Milkfish ponds generally rely on benthic algae or "lab-lab" by organic and inorganic fertilization of ponds.

The economics of *Gracilaria* farming in this manual is, therefore, based on Taiwanese experience where the practice is more intensive. Table 1 summarizes the costs and earnings per hectare of *Gracilaria* farming.

Table 1. Costs and returns (NT$ of Gracilaria monoculture per hectare) 1975 and 1977[1]

	1975[2] (NT$)	1977[3] (NT$)
Costs		
Labor		
Seeding (2 days)	190	400
Seeding (30 days)	2 850	6 000
Harvesting/drying (100 days)	10 450	20 000
Management (6 months)	14 250	24 000
Sub-total	27 740	50 400
Other operating costs		
Seed stock (5 000 kg)	9 500	15 000
Fertilizer (4 000 kg)	3 800	6 000
Tax and maintenance	4 750	20 000
Sub-total	18 050	41 000
Fixed costs		
Depreciation	5 092	10 000
Lease	1 505	4
Sub-total	6 597	10 000
Total costs	52 387	101 400
Revenue	104 500	182 000
	(10 tons at NT$ 10.45/kg)	(13 tons at NT$ 14/kg)
Net income	52 113	80 600
Rate of return on initial investment	56%	5
Net income per unit of total cost	0.99	0.79

1 Source: Smith, I., 1987
2 Shang (1976)
3 Chueh and Chen (1982)
4 Included in tax figure above
5 Chueh and Chen did not report an estimate of initial investment
In both 1975 and 1977, NT$38 = US$1.00

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