

# VERIFICATION AND REFINEMENT OF INTENSIVE SHRIMP CULTURE TECHNIQUES: THAILAND

## Mangrove Plantation for Enhancing Food Web in Water Recycling Shrimp Farms<sup>1</sup>

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*Note: This activity was implemented from November 2000 to April 2001. As reported during the Mid-Project Workshop in September 2001, the change in the Center's thrust towards freshwater aquaculture made it not possible to conduct the activity in Chachaengsao beyond 2001. Hence, this activity was no longer reported during the Regional Seminar-Workshop held in Bangkok in June 2003.*

### BACKGROUND

Environmental deterioration in ponds and coastal waters has been a common evidence after each intensive shrimp culture due to the accumulation of organic wastes and occurrence of eutrophication processes. Mangrove is a wetland that potentially supports the natural food web in the estuary and coastal areas. The planting of mangroves in recycling shrimp farms would serve the purpose of developing sustainable shrimp farms by utilizing the enriched organic matters and nutrients thus enhancing the natural food web in the shrimp farms. However, mangrove trees in pond dikes tend to grow small and the roots may not be able to support the tree during pond erosion resulting in the mortality of the mangrove trees. Brackishwater weeds, which cover the soil in the pond dikes, could serve the function of the young mangrove trees.

### OBJECTIVES

1. To study the growth and survival of planted young mangrove trees in a water recycling shrimp farm;
2. To evaluate the nutrient removal efficiency of brackishwater weeds; and
3. To assess the food web enhancing effect of mangroves in water recycling shrimp farms.

### RESEARCH ACTIVITIES

The water recycling shrimp farm used in this study was constructed with a ratio of 40-50% grow-out pond, 25-30% polyculture (treatment) pond, and the remaining area for infrastructures. Water was pumped to the grow-out and treatment ponds without screening. Fish fingerlings were transferred to the treatment pond to build a natural food web. In the polyculture or treatment pond, various fishes and weeds were reared to treat the water quality and turn non-available shrimp food into shrimp food sources. Shrimp feces, organic particles and sludge were re-suspended using a chain harrowing at the bottom of the grow-out and treatment ponds in order to accelerate the aerobic degradation process and creating a nutrient source for the natural food web. During the culture period, water was circulated from the treatment pond to the grow-out pond. Under this study, three sub-activities were carried out from 2000 to 2001.

<sup>1</sup> As reported during the Mid-Project Workshop, Mangrove-Friendly Shrimp Culture Project, Bangkok, Thailand, 3-4 September 2001

### ***Growth and Survival of Planted Young Mangroves in Water Recycling Shrimp Farms***

Young mangrove trees (*Rhizophora* sp.) were planted in the slope of shrimp grow-out pond dikes and both sides of the polyculture (treatment) pond. The mangrove trees in the initial stage did not grow well in the grow-out pond due to the erosion of the dike. Thus, brackishwater weeds were used to supplement the functions of the mangrove trees. The growth of the young mangroves was measured in terms of stem growth and survival every month. This evaluation served as basis for the estimation of the suitable density of mangrove trees per square meter of shrimp pond and the suitable species of weeds that would prevent erosion of the pond dike.

### ***Nutrient Removal Efficiency of Brackishwater Weeds in a Water Recycling Shrimp Farm***

When water is discharged from the grow-out pond to the treatment pond, organic wastes and nutrients are removed. The study therefore aimed to evaluate the efficiency of brackishwater weeds in removing nutrients and improving the water quality of shrimp farm effluents before the water is recycled to the grow-out pond. The water from the outlet of the grow-out pond and outlet of the treatment pond were sampled periodically and suspended solids, dissolved nitrogen, and dissolved phosphorus were measured. Evaluation of the water quality after the flow passed the treatment pond as well as the growth performance and nutrient removal rate of the brackishwater weeds were carried out.

### ***Food Web Enhancing Effect of Mangroves in Water Recycling Shrimp Farms***

The organic load and nutrients enriched water is beneficial for the natural food web, thus the study was conducted to trace the food web. In the grow-out pond, the qualitative assessment of the species diversity of the organisms in the natural food web was investigated. The supply and consumption of the shrimps in the grow-out pond were compared to evaluate the efficiency of the natural food in the pond. The growth performance and production of shrimps in the water recycling shrimp farms was compared with those in traditional farms.



**The treatment pond (left) and grow-out shrimp pond (right) at Chachaengsao**

The summary of the results of the activity in Chachaengsao before this was phased out in 2001, indicated that the shrimp (*P. monodon*) cultured in 2400 m<sup>2</sup> of mangrove integrated shrimp farm using water recycling, had a production of 2940 kg/ha with ABW of 20 g, survival rate of 50% and FCR of 1.4. The mangrove trees (*Rhizophora* sp.) had diameter growth rate of 0.12 cm/mo. The water quality in the grow-out pond was not different from the water in the treatment pond. The activity was no longer continued in 2002 to give way to a new focus of the Chachaengsao Coastal Aquaculture Development Center, which was on the giant freshwater prawn.