Silvofisheries in Indonesia

By **MB Surtida**

The coastal and marine habitats of Indonesia has the most extensive mangrove forests in the world, seagrass beds and coral reefs which provide breeding and nursery grounds for a large number of fish species, crustaceans, bivalves, and endemic animals. Approximately 75% of Indonesia is marine and coastal waters including 3.1 million km^2 of territorial seas and 2.7 million km^2 of exclusive economic zone (EEZ).

With extensive resources, it is no wonder that the use of man-made ponds in rearing brackishwater animals has been practiced in Indonesia for hundreds of years. With this consideration, the Government of Indonesia adopted policies to promote the development of modern and traditional systems side by side through its pond forest or "tambak" areas. The "tambaks" covered an estimated 174,605 ha in 1977 and by 1993 it has risen to 268,743 ha.

Silvofisheries

Two alternatives to aquaculture pond development are silvofisheries and mariculture. Silvofisheries is a form of low input aquaculture integrating mangrove tree culture with brackishwater aquaculture. This approach to use and at the same time conserve mangroves maintains that while mangroves remain healthy, the economic benefits of brackishwater aquaculture can be realized. It is a labor intensive operation appropriate for individual or family operation and can be a viable alternative to brackishwater pond culture.

According to W. Fitzgerald Jr. of Oceania-Pacific Rim Consultant Services, there are two silvofisheries models, Type I, A, B and Type II, C,D (figure next page). The first model has 60-80% mangrove and 20-40% pond canal culture water area. The next model (Type II), consists of mangroves outside the pond with similar mangrove to water ratio. The pond/mangrove forest (Type II) should be constructed with mangrove strips perpendicular to the coast so that the flow of surface runoff is allowed to be transported through the mangroves coastward. The advantages of the type II model are better management of the ponds, high potential production, and low production coast. Added to these, it avoids the potential toxic levels of tannin from the mangrove areas. It also allows for natural species diversity and flushing of the mangroves but the system is susceptible to development abuse such as encroachment on mangroves.

In the "empang parit" (also tambak tumpangsari) pond in Sinjai, South Sulawesi, the pond was within the planted mangrove. The pond is one hectare with two wooden gates. The screened gates are open all the time for the water level to fluctuate with the tides. The canal is 5 m wide, 1-0.7 m depth (below the central platform area). The central platform has an average water depth 20-30 cm. The ponds are stocked naturally with juveniles from incoming tides. The species are siganids, mullets, milkfish, tilapia, shrimp, mangrove crab, and seabass. These are harvested by gill nets during low tide when the fish are concentrated in the perimeter canal.

Significant increases have been made in the volume and value of shrimp and fish exports. In an analysis by the Forest Management Division, "empang parit" in Cikiong and Cibuaya in West Java showed an annual net profit (ha/yr) of $1,367 for mangrove crab, 1,347 for seabass, 2,601 for tilapia and chicken, 2,508 for milkfish and shrimp, and 1,322 for milkfish. In Bogor, West Java

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is a form of low input aquaculture integrating mangrove tree culture with brackishwater aquaculture.

THE POND FOREST

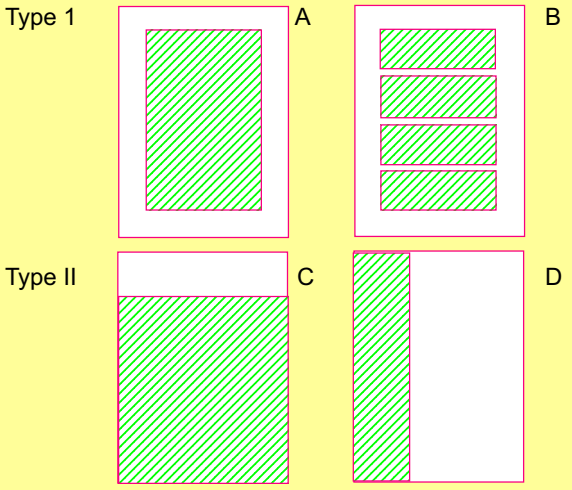
a.k.a. **"tambak tumpangsari"** is an example of silvofisheries

In connection with the reforestation program of the Indonesia State Forestry Corporation, the pond forest or "tambak tumpangsari" was applied to reforest the mangrove areas. Its purpose is to save the existing mangroves and to provide traditional fishery products. In the provinces of Riau, South Sumatra and South Sulawesi, large areas of mangroves have been converted to "tambak" shrimp ponds. But there is increasing pressure from international non-government environmental groups to stop destruction of mangroves specifically targetting shrimp culture. With this pressure, a balance to simultaneously address both development and conservation must be maintained. Social issues are closely linked to sustainable development while the economic need of the coastal population for jobs and income must be addressed. Aquaculture is one of the economic activities that has utilized the mangrove areas as a resource.

(9,047 ha), milkfish production was 1300 kg per ha per yr while shrimp was 400 kg per ha per yr. In Indramayu, also West Java (6421 ha), shrimp was 300 kg per ha per yr, while milkfish production was 500 kg per ha per yr. But over the past six years, the shrimp yield from "tambak" has decreased from a peak of 140,131 tons in 1991 to 79,494 tons in 1995. This has been believed to be related to increased levels of pollutants in the "tambak" areas. Full analysis of profit from silvofisheries has yet to be done.

With the success of the "empang parit," two alternative designs are being planned. This design has low dike walls and no gates. Greater water exchange can be achieved, thus, minimizing water stagnation and the possibility of low oxygen levels that may result in mortality. The second design has no dikes and bamboo pens are placed within the mangrove. This is a lower cost method, eliminating investment on the construction of dikes, canals, and gates. It lessens the impact of aquaculture on the mangroves but it also dimishes the profit from raising fish and crustaceans in the canal areas.

SILVOFISHERIES MODELS
(green cross-hatched areas represent mangrove forest)



A postcard from Indonesia by an unknown artist
courtesy of CR Lavilla Torres

Existing programs for the utilization of mangrove areas

In the period since 1977, the fisheries sector proved to be the leading sector in economic growth. With this, the fisheries Directorate launched a program PROTEKAN 2003 to boost foreign exchange earnings from US$2 billion in 1997 to US$ 10 billion in 2003 through aquaculture shrimp production. Brackishwater aquaculture would propel PROTEKAN 2003 to produce 700,000 tons of brackishwater shrimp (*Penaeus monodon*). To achieve this, 256,555 ha of brackishwater ponds would be operated intensively, and extensively develop 123,800 ha of new ponds. To prevent uncontrolled destruction of mangroves, promotion of silvofishery technology would be in full swing while replantation of mangrove trees would be undertaken in 27,427 ha of brackishwater areas.

Although development of marine aquaculture is a huge potential, it is still in its infant stages. There are at least 10 million hectares of marine area considered as potentials, with 3.5 million ha for fish, 5 million ha for pearl oyster, 1.85 million ha for seaweeds and 700,000 ha for mollusc culture. At the present time, marine aquaculture is into growing natural caught fish into bigger size because seed production has not been developed, including nutrition and feed technology.

Indonesia's Law No. 5 of 1990 adopts the concepts of sustainable use and ecosystem integrity. It provides the basis for the operation of protected natural areas, coastal zone such as mangrove rehabilitation while Law 24 of 1992, integrates management functions in the context of land use management. This law sees to it that any implementation of projects conforms to the spatial plan, especially in efforts to improve mangrove areas in terms of sustainable aquaculture use. But even with detailed legislation, effective law enforcement can be undermined by social and economic factors such as low wages of forest guards.

Recommended national and regional approaches to silvofisheries

For planning purposes, Resource Management Areas (RMA) have been identified to manage coastal resources. The RMAs contain different combinations of different combinations of resource-use options. RMAs in the intertidal zones focus on options in managing "tambak" areas. For a management plan to be effective, it is necessary that local authorities clarify ownership status in mangrove and the whole coastal zone.

For mangroves, social and economic sciences and management aspects must be included in any ecosystem research. "Tambak" farmer communities should be part of an overall management strategy for the mangrove habitat.

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"Here in the Philippines, our society is more open. Thus, decisions in the workplace are generally arrived at using participative procedures," he said.

He also added that the English-language proficiency of Filipinos is many times more than that of the Indonesians. Thus, Filipinos have an easy access to new technologies. It is in this context that Filipinos fit the role as sources of new knowledge and skills.

"Indonesia is a huge country and the aquaculture potential is as huge. Even if the shrimp technology is not very advanced, by the sheer size of the shrimp industry, its absolute production is bound to be big. Shrimp aquaculture will continue to expand. Filipinos are popular choice for expatriate manpower because they easily adapt to the Indonesian work environment. I think, Filipino specialists or senior aquaculturists should have no difficulty getting a job in Indonesia," Torres concluded.

Edgardo Reyes

In his 24 years in aquaculture, Edgardo Reyes spent four years of it in Indonesia – particularly in PT Dipasena Citra Darmaja and PT Birulaut Khatulestewa, Bandar Lampung.

"They were looking for an aquaculturist with background in doing research work and I was seeking employment. The company that hired me is the biggest integrated shrimp aquaculture project in the world and joining them will give me a good exposure."

In Indonesia, Reyes was involved in research, technology development and verification. He provided technical assistance to the farmer-grower/beneficiary through demonstration and actual run. He also conducted several seminars and trainings to develop and update the technical capability and skills of the research and technical staff.

But before his stint there, Reyes was involved in SEAFDEC's training and extension programs for eight years. After which, he served as a consultant-technician to various shrimp hatchery and grow-out projects in the Philippines. He then went to India for three years where he worked as hatchery manager and grow-out consultant.

With his extensive experience in aquaculture, coupled with the Indonesians high regards for Filipinos, it was not difficult for him to train the locals.

According to Reyes, some of the shrimp aquaculture projects there are big and integrated; these do not exist in the Philippines or elsewhere. They are community-based and involved a vast area. The projects have also the latest technology and equipment.

"The work there is gratifying and rewarding. Filipinos working there were able to improve their social status and technical skills. The experience is not available anywhere and could be an advantage when the trend for aquaculture development becomes massive and community-base."

To end, Reyes is hoping that the people he has trained will be able to carry on and improve the coming generations of technical manpower for the Indonesian aquaculture.

Precilla Subosa

"After serving SEAFDEC for 22 years, I decided to work in Indonesia to share and widen my experience in aquaculture, but specifically for self-improvement," so said Precilla Subosa, who served as a research specialist for 3 years at Telukbetung, Bandar, Lampung, Indonesia.

She managed the soil feed and water quality laboratory of the R&D Department. She also conducted several researches on environmental quality, feeds, pond water and soil management, natural food and fertilizer, and other pond inputs both in lab and pond scale.

"My work required too much self-sacrificing effort to achieve the goal of the Department. But I am grateful that in one way or another, I took part in developing and establishing the feed, soil, and water quality monitoring scheme for an intensive shrimp farm there."

Having devoted 26 years of her life to aquaculture, Subosa is now concentrating in both social and economic affairs of her family. ###

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A licensing program of all commercial activities based within mangrove areas should be established. This would serve as a sort of control that balances environmental, developmental, and social needs. This program requires diligent and equitable enforcement because without them, there is danger of uncontrolled development and regulatory abuse.

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