Fish farming can help conserve mangrove*

The vast mangrove areas in the Indo-Pacific region can help mitigate the mounting food problem in the region through their being tapped for aquaculture or fish farming. Now bolstered by recent breakthroughs in hatchery technology, aquaculture can expand to the mangrove areas without fear of depleting its valuable forest resources. Properly designed fishponds provide mangrove conservation plus additional income from forest products as a bonus.

This, according to Herminio Rabanal, fishery officer for aquaculture development of the South China Seas Fisheries Development and Coordinating Program based in Manila.

Mangrove farming has advantages both from forestry and fisheries viewpoints. Where suitable, its practice should not only be encouraged but supported, he said.

Rabanal pointed out that this kind of mangrove fish farming has been demonstrated by some progressive fishpond operators in coastal and estuarine areas. In building fishponds, the operators plant mangrove seedlings in tidal flats around the sites to provide additional buffer area that can protect the fishpond from hard wind and waves, especially during typhoons. These mangrove seedlings also provide an effective sanctuary for fish and other aquatic animals. An effective nursery area will come up perhaps on the fifth year when trees reach a half-meter growth. After about 30 years, the fishpond operator can cut the mangrove trees for additional income. One must, however, replant to continue conserving the mangrove area.

The prospect of mangrove farming to provide fishery resources sanctuaries and future forestry products is exciting considering that there are about 10 million hectares of mangrove areas all over the world. A more recent evaluation provides an estimate of 600,000 hectares in Indonesia, 400,000 in the Philippines, 300,000 in Thailand, and 150,000 in Malaysia, or close to 2 million ha in Southeast Asia alone. If the tidal flats are added, this figure can easily double.

Developed aquaculture in coastal and estuarine areas in the Indo-Pacific region has an aggregate total of 1.2 million ha. Of these, Indonesia has 185,000 ha, Philippines - 175,000, Thailand - 10,000 and Malaysia - 4,500 or a total of 374,500 ha.

Rabanal emphasized the need for proper site selection and fishpond design to succeed in mangrove fish farming. Only improperly selected and poorly designed and managed fish farms tend to sacrifice mangrove conservation. Such fish farms either fail or have relatively low production.

Site selection and fishpond design are explained by Rabanal as follows:

Tidal Characteristics and Site Selection

As water supply is a major requirement in aquaculture development, tidal characteristics prevailing in an area is a determining factor not only for selection of suitable sites but for proper management after the project is developed. Different areas all over the world have various tidal characteristics such as frequency of fluctuation (once or twice a day), amplitude (narrow or high) or annual shift in level, etc. Of these characteristics, the amplitude is of great importance in aquaculture.

There are three types of tides based on amplitude, namely: 1) narrow amplitude or areas with a daily range of fluctuation of 0.5 meter or less and with an annual fluctuation approaching a maximum of only 1 meter; 2) medium amplitude or those with daily fluctuation of 1 to 2 meters and with a maximum annual fluctuation of 3 meters; 3) high amplitude or those with daily fluctuation of 3 to 5 meters with maximum annual fluctuations of over 5 meters.

Of the above types, the first (low amplitude) and the third (high amplitude) are unsuitable for aquaculture development. In the first case, fishponds will suffer from difficulty in renewing the pond water because the high tides are not high enough to provide sufficient head to cause water flow and the low tides are not low enough to effect adequate lowering of water level in the pond. In this case, it may be difficult to completely drain even during periods when it is necessary to drain, clean, and dry the ponds. Sites located under this tidal characteristic can be managed properly only if one uses pumps, but this will mean more expense.

Some examples of areas with this type of tidal fluctuations are northwestern Luzon in the Philippines, most of the northern coast of Java island and the northeastern coast of Irian Jaya province in Indonesia, parts of the southeastern coast of Thailand (Chanthaburi), most of the coasts around Sri Lanka, and the eastern coast of Madagascar.

Areas with high tidal amplitude, on the other hand, include the western coast of Madagascar, coast of Bangladesh, part of northeast coast of India, coast of Sarawak state in east Malaysia, and the southern coast of Irian Jaya in Indonesia. The fluctuations in these areas are so great that development would require enormous dikes to fend off the pressure of water during high tides and prevent the ponds from being completely drained during low tides. As a result, the places

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with these tidal characteristics have very extensive belts of untouched mangrove jungles such as the south coast of Irian Jaya and the west coast of Madagascar.

Mangrove areas vary in elevation in relation to tidal fluctuations. This ranges from highest to lowest as follows:

1. sites with elevation reached only by occasional extreme high tides of the year
2. sites with elevation reached only by the higher high tides
3. sites with elevation reached by lower high tides
4. sites with elevation at average higher low tides
5. sites with elevation at average lower low tides
6. sites with elevation drained only by extreme low tides
7. sites not drained by any tide or always under water.

Mangrove areas with categories 1, 2, 6 and 7 are unsuitable for aquaculture development. There may be instances where sites under category 2 can be made suitable by some excavation and site 6 can also be made suitable if some filling can be done in the area. This will, however, entail considerable expenses.

The most suitable sites in relation to the tide, therefore, are those with elevation below the lower high tides and those that can be drained at least during the lower tides.

One must also consider the soil in choosing the site for mangrove fish farming. A predominantly clayey soil is favorable. Those that are rocky or predominantly sandy are not suitable sites. Dikes cannot be built on rocky or corally substratum and sandy soils. Some mangrove areas have a substratum consisting of thick peaty soil mostly of undecomposed and acidic bottom. These types of mangroves are unsuitable for aquaculture development.

Many areas are thickly forested by big mangrove trees. While these areas can be gradually cleared and developed for fishpond purposes, the large expenses needed to clear and the very slow process to have the area in productive state negate their development for aquaculture.

Properly Designed Projects

In designing the fishpond, one must consider adequate waterways for the drainage for tidal as well as flood waters from the watershed above the site. Also, there must be an adequate buffer zone of mangrove vegetation to provide wind and wave brakes from the coast or river bank. This is especially important in areas where typhoons regularly occur.

Proper layout inside the aquaculture project is also very important. Waterways and water control structures for watering and draining must be provided. Relatively large-sized projects (50 ha or more) require internal growth of mangrove to provide wind and wave brakes inside the aquaculture system. This would also regulate sudden fluctuation in temperature and other physico-chemical conditions. Maintaining some vegetation at appropriate location within the system maintains proper nutrient cycle in the system. All these should contribute to the proper design of the project leading to its success.

Hatchery Technology

The rapid development of fish seed production of cultivable aquatic species through hatcheries should encourage the expansion of the aquaculture industry to mangrove areas. Initially, the induced breeding of cultivable freshwater species were accomplished, e.g. Chinese carps, common carp, Indian major carps. This development has been shifting to species found in brackish and marine waters. Induced breeding of mullet has been accomplished in pilot scale and can now be put in commercial stage. The hatchery technique for cultivable penaeid shrimps has been accomplished and is now in commercial stage in Japan and other areas and under development in the Philippines. The seabass, *Lates calcarifer*, and grouper, *Epihephelus tauvina*, both valuable food fish, have spawned in Thailand and Singapore, respectively. The fertilization of milkfish ova has been done experimentally in the Philippines, and it is perhaps only a matter of time before the production of milkfish fry can be realized.

These developments come just right at a time when aquaculture seedling production from natural areas is fast shrinking. With more rational development of mangroves for aquaculture and the initiation of mangrove farming in suitable areas, the greatest benefit for the greatest number may be achieved. ●