

Principles and concepts of mangrove-friendly shrimp culture

By

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For a long time aquaculture development in general and shrimp culture in particular paid only scant attention to the environment. As a result, mangroves and other ecologically sensitive areas were destroyed in the process. Belatedly people realize that being friendly to the environment in general and to mangroves in particular is actually important to the industry because of the following reasons.

- The growth and survival of shrimps depend on a clean and healthy environment;
- The international market is getting more and more sensitive to wholesomeness;
- There is a tremendous pressure on developed countries to ban the import of shrimps from countries practicing environmentally damaging methods of shrimp farming;
- It is the only way to ensure sustainability of the industry.

Shrimp farming in particular is coming under attack by well-meaning environmental groups due to the following reasons.

- A large percentage of the mangrove forests in the world is alleged to have been cleared to make way to shrimp farming.
- Irresponsible practices by shrimp farmers such as improper use of chemicals and discharge during harvest have led to conflict with coastal communities.
- Shrimp farming has not helped the poor in the coastal communities and may even have made them poorer because the destruction of mangroves deprives them of a source of livelihood and reduces the aquatic resources that would have been available to the poor.

The efforts of various international NGOs to require importing countries to buy shrimps only from countries deemed to be mangrove or environmentally friendly cannot be ignored. One NGO in the United States has succeeded in requiring “turtle-friendly” certification for all shrimps coming from Asia even if these are raised in farms and not captured by trawlers. It is for this reason that the ASEAN countries have decided to take an active move to show that they are just as concerned about the mangroves and the environment.

Importance of mangrove forest to aquaculture

It used to be that mangroves are simply clear-cut to make way for fish or shrimp farms. Even if there are laws requiring buffer zones

where the mangrove trees should not be cut these laws are often ignored. Little do the developers realize that mangroves are important to aquaculture for the following reasons.

- Protect perimeter dikes of fishponds and shrimp farms from strong wind and wave action;
- Act as natural biological filter by absorbing excess nutrients from pond discharges;
- Condition water for shrimp farms and fishponds;
- Act as nursery grounds for various species.

The role of mangroves as natural biological filters becomes even more important with intensification. Traditionally aquaculture is always regarded as recipient or victim of industrial pollution. Untreated effluents from various industries always cause problems for nearby shrimp farms. Traditional aquaculture at extensive levels generates very little waste all of which can be consumed by other organisms or will eventually decompose to more basic nutrients. With intensification, the amount of waste generated exceeds what can be consumed and decomposed naturally and aquaculture becomes a source of pollution as well, shrimp culture in particular produces both solid and soluble wastes. Solid wastes from shrimp culture include the following:

- Uneaten feeds;
- Feces;
- Bodies of dead shrimps (or fish);
- Shell cast off during molting.

The soluble wastes on the other hand can consist of:

- Excess fertilizers, chlorine, BKC and other chemicals used during preparation;
- Antibiotic residues during culture;
- Metabolic wastes from culture animals;
- Phosphates leached out from feeds.

With intensification the following events happen:

- Nearshore water becomes enriched adding to the organic load and therefore bacteria;
- Solid wastes accumulate on bottom, become growing area of disease organisms; natural process of decomposition becomes overloaded and cannot cope up;
- Water supply system becomes contaminated and adjacent farms start to pollute each other.

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In many of the shrimp producing countries in Asia, intensification set off a series of events which eventually lead to the collapse of the industry in many countries as shown in Figure 1.

Sustainability

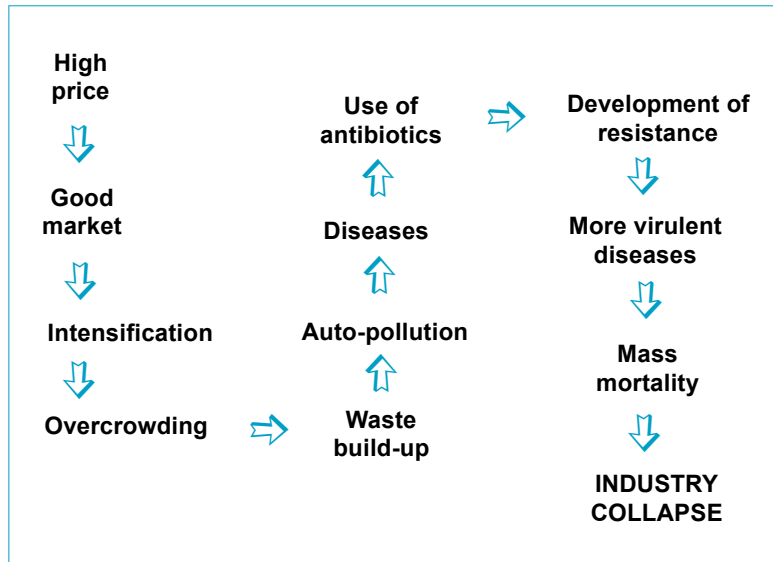
The single most compelling reason to farm shrimps without harming the environment is to ensure sustainability. Just what does sustainable aquaculture mean? To the fish farmer sustainable aquaculture would simply mean survival. Sustainable development in general has been broadly defined as development which meets the needs of the present without compromising the future (WCED, 1987). A more comprehensive definition of sustainable development comes from the Food and Agriculture Organization of the United Nations which goes as follows: "Sustainable development is the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry and fisheries sectors) conserves land, water, plant and animal resources, is environmentally non-degrading, technically appropriate, economically viable and socially available."

In the welter of definitions one of the more comprehensive definition of sustainability comes from land management which appears to be just as appropriate for both aquaculture and agriculture. Sustainable land management according to Dumanski (1993 as cited by Greenland, 1997) is a condition where technologies, policies and activities are used together to integrate economic principles with environmental concerns so as to:

- Maintain or enhance production;
- Reduce the level of production risk;
- Protect the potential of natural resources and prevent degradation of water quality;
- Be economically viable;
- Be socially acceptable.

This definition embodies the various environmental, economic and socio-political issues which forms the matrix of sustainability. By going through the objectives of sustainability it becomes clear that aiming for sustainability not only has a practical value but also is

Figure 1
Events leading to diseases in shrimp farms and eventual collapse of the industry



essential towards attaining food security.

The various actions required to attain each of the five objectives are as follows:

- Maintaining and Enhancing Production*
 - Select sites which are suitable for the organism being cultured, in this case shrimps, has good soil characteristics and good supply of unpolluted water;
 - Employ proper design so that water in the shrimp farm can be maintained at the recommended depth, water can come in and out as required without delay, inputs can be

brought to all parts of the farm without much trouble, the stock can be easily harvested, the whole facilities is safe for workers especially when it comes to electrical connections.

- Make sure to select sites where it does not take too long to bring in fry from the hatchery.
 - Use good quality feeds and appropriate inputs.
- Reducing Production Risk Level*
 - Avoid areas that are subject to constant flooding and/or strong wind and wave action.
 - Employ sound engineering to maintain the integrity of the dikes, water conveyance and other structures.
 - Use healthy and uninfected seedstock.
 - Apply proper technical skills
 - Use appropriate prophylactic measures
 - Dispose of all wastes properly.

- Protecting Natural Resource Potentials*
 - Avoid ecologically sensitive areas such as mangroves.
 - Avoid use of harmful chemicals, antibiotics and other inputs which might affect the environment.
 - Treat water discharged from the shrimp farms.

- Economic Viability*
 - Find areas with favorable investment climate.
 - Find financing institutions that give favorable financing.
 - Make sure inputs will be easily available when required.
 - Employ efficient production methods.
 - Pay particular attention to product appearance and wholesomeness.

and commercial viability under different climatic conditions at stocking densities ranging from 25-60 shrimp fry per m² with production ranging from 6-15 tons per ha. [Very recently, AQD has demonstrated this technology overseas in coordination with the Department of Fisheries in Myanmar with a consistent production of about 10 tons per ha.]

Phase II engaged the participation of private tiger shrimp operators nationwide by using their farms, which is the ultimate goal to revive the shrimp industry. The JMANTTP also includes the conduct of nationwide skills development sessions that consist of lectures and practicals on the environment-friendly intensive shrimp farming technology. ###



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- Know the local market channels.
 - Market price of product
- e) *Social Acceptability*
- Farm should have minimal to zero impact on the environment.
 - Farm should have minimal to zero conflict with other users of common resource.
 - Use local human resource where advanced technical skills are not required.
 - Shrimp farm should have clear benefit to locality such as for instance payment of local taxes.
 - Pay farm workers just and fair wages.
 - Be a good neighbor

Conclusion

To sum up the above points a shrimp farm can be made mangrove-friendly by avoiding the selection of mangroves in the first place. Once operating, the farm should use only inputs that will not harm the environment. All types of wastes, whether solid or soluble, should be treated properly. Solid wastes which can be physically

gathered such as dead fish and shrimps should not simply be thrown into the water where it will find its way out and decompose. They should be properly disposed of by burying. Water coming out of the farm in the course of water change and during harvest should be allowed to settle in a treatment pond and not released directly to the water. Further treatment should be done with the use of filter feeders such as oysters and finally aquatic plants such as *Gracilaria* to reduce the nutrient load. It is not enough to just consider the immediate environment. The shrimp farm should maintain good relations with the farm workers and the community. Farm workers should be paid fair and just wages. Permits and licenses that may be required by all levels of government must be properly complied with. It is only by so doing that shrimp farming can be made sustainable.

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