Aquaculture: definition, systems and common practices in Bangladesh

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Definition

Any human means to improve growth of a given organism in a given area

Any means to improve fish production than that of the production naturally found.

Man's attempt through inputs of labor and energy to improve the yield of useful aquatic organisms by deliberate manipulation of their rates of growth, mortality and reproduction (Reay, 1979).

Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production such as regular stocking, feeding, protection from predators etc. Farming also implies individual or corporate ownership of the stock being cultivated (FAO, 1988).

Aquaculture is the water farming activities where some sorts of controls (mostly based on environmental principles) are exercised over the organisms and environment with a view to earn profit (Grover *et al*., 2000).

Aquaculture systems

Extensive fish culture system: Fish are cultured under this type of management with virtually no cost or very little cost. Only a few fish fry are released in the pond. No fertilizer or supplementary feed are used in the pond, fish fully depend on natural food present in the pond. Besides, neither any initiatives are taken nor any technological aspects of fish farming are considered in extensive fish culture method. As a result, only 1-2 kg fish per decimal are produced annually. Example can be given as releasing fish in the pond without any calculation and not following gradual steps of fish culture and harvesting fish irregularly.

Improved extensive culture system: A little improved culture management, where fish are stocked at relatively low density after removing aquatic weed and weed fish / predatory fish. In addition to irregular fertilizer and feed application, other activities of planned fish culture are also performed irregularly. Presently, this type of culture management is most commonly practiced. In the improved extensive culture method fish production is 5-12 kg / dec annually.

Semi intensive culture system: In the semi intensive culture system, the necessary renovation of the water body, complete control of predatory and weed fish, medium stocking density, regular fertilizer and hand made feed application, partial harvesting and restocking after 3-4 months of fry stocking and if necessary water exchange and supply of oxygen (aeration) are performed. That is, some modern technologies of fish culture are followed under semi intensive culture system. Under this type of culture management, per decimal annual fish production may reach 15 – 30 kg or even more.

Intensive culture system: The culture of fish using very advanced technology after costly infrastructural restoration as necessary is known as intensive culture system. It requires high investment and rigorous labour. Although intensive culture system is highly profitable, it has high risk with potential negative impact on the environment.

Common aquaculture practices

The commonly practiced fish cultures in Bangladesh are - pond aquaculture, culture in rice fields, culture in cages, cage-pond integrated aquaculture, and culture based fisheries. The culture methods fish farmers follows are carp polyculture, carp prawn polyculture, *Pangasius* culture, Thai *Anabas* culture, tilapia mono culture, prawn mono culture, crab culture. Recently a number of different fish cultures are practiced including small fish, like mola-carp polyculture, mola-golda-carp polyculture, mola-punti-carp polyculture, shing-magur culture, pabda-gulsha culture, bata-carp polyculture and small fish culture in rice fields.

Type of fish culture

Monoculture: When only one species of fish or shrimp / prawn is cultured in a water body, the culture method is known as monoculture. e.g. only tilapia or golda prawn or magur or Thai pangus culture in a pond. In general, fish are cultured commercially following this method under intensive management system. Here, fish farming is not much dependant on natural food. Through the application of well-balanced diet / food, fish with high market price are cultured. However, even

under the commonly practiced management system, fish are farmed using monoculture method in the seasonal pond of our country.

Polyculture: When more than one species of fish are cultured in a water body, the culture method is known as poly culture. Considering the optimal use of the natural food items present in the water body, fish of different species are stocked in a water body. In this case, the stocked fish, generally, are of different food habits. Under regular management system, higher yield is obtained from poly culture than that from monoculture. e.g., poly culture of rohu, mrigal and catla, silver carp, Thai sarpunti and common carp etc. together.

Fish culture in cages: Fish culture in cages is relatively a new method of fish farming in Bangladesh. However, cage fish culture is an age-old practice in some countries of Asia such as Indonesia, China, Thailand, the Philippines, Vietnam and Nepal. Fish monoculture can be performed in the cages made from easily available materials found locally in any kind of open waters – *beels*, canals, rivers, streams and floodplain. In general, cage is suitable for monoculture of fish. However poly culture of some fish species can also be carried out in cages. Though this type of fish culture fully depends on the application of the balanced diet / feed, fish culture in cages may also be profitable using feeds available free of cost or very low cost feed. There is no need of huge investment in cage culture. Therefore, the future of cage culture is very promising in many water bodies of our country.

Integrated fish culture**:** Integrated fish culture is farming of more than one crop concurrently in a water body to ensure maximum production maintaining the balance of the environment. Such as fish culture in rice fields, poultry cum fish culture, vegetable farming in the pond dyke, fish and livestock culture etc. The basic principle of integrated fish culture is incorporating different agro-farming like duck, chicken, livestock, vegetables and other crops with fish culture. In this instance, the input cost of fish culture substantially decreases and on the other hand, one or more extra crops are produced along with fish. Though recently integrated fish culture has been discussed a lot, the culture has traditionally been practiced more or less in Bangladesh and other Asian countries since long time. Integrated fish culture should be expanded fast and made popular to boost up the agriculture dependant economy of our country.

Fish culture in pen in the floodplain: Fish culture in pen or *gher* is the management of stocked fish in an area of floodplain encircled from one or more sides by bamboo frame, other fencings or nets. The feature of this type of fish farming is the base of the fence is planted in the bottom mud of water body and the water of the pen is well-connected with the water outside (water flow between pen and floodplain). The fish culture in the pen is not a very old practice. The pen culture technology expands during the third decade of the last century, at first in Japan, later on in China and other Asian countries. Recently countries like the Philippines, Indonesia, Thailand and Malaysia have widely been using the pen culture technology for commercial fish production. The commercial fish culture in pens has huge potential even in Bangladesh.

Multi species poly culture is highly profitable in the pens as in ponds or other closed water bodies. Nevertheless, the fish production and profit solely depend on selecting right species composition and stocking density, survival rate and culture management. Per ha 2.96 tons and 5.4 tons of fish production have been yielded, respectively, in 1991 and 1992 by Bangladesh Fisheries Research Institute, Riverine Center, Chandpur from experimental poly culture of carps in irrigation canals using semi intensive fish culture method.