Better Management Practices in Mariculture

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Introduction

The marine finfish in Asia are cultured in ponds, recirculating systems, cages or pen systems. The farming methods mostly involve stocking of fingerlings or juveniles that are caught from the wild or hatchery raised seed. Mariculture is not a well established activity in India, but of recent, picking up However, scope is there for its successful emergence in the immediate future because of the interest of the farmers in diversification of farmed species and the ongoing efforts in cage farming in the country. The high value species suitable for mariculture in India are Asian seabass *Lates calcarifer*, groupers *Epinephelus* sp., snappers *Lutjanus* spp., cobia *Rachycentron canadum*, silver pompano *Trachinotus blochii*, Indian pompano *T. mookalee*, grey mullet *Mugil cephalus*, milkfish *Chanos chanos,* seer fish, pomfrets and a variety of marine ornamental fishes.

The term good practices (GP) have been used in several ways. It can refer to the best-known way to undertake any activity at a given time. GP refers to the practice or practices of only one or a very few producers. It can also be used to define a few, often different, practices that increase efficiency and productivity and/or reduce or mitigate impacts. Better practices are often required by government or others to encourage a minimum acceptable level of performance with regard to a specific activity. In aquaculture, good practices have been developed largely for shrimp and salmon aquaculture, although some efforts are being made to develop that for other aquatic commodities such as tilapias, catfish, molluscs, eels, *etc*, and marine cage culture. GPs should involve positive cooperation rather than more regulations. They are flexible and can be tailored to species, updated to fit new production methods.

GPs suitable for sustainable mariculture with maximum production and minimum issues

1. Site selection

- Based on current flow, wave action and wind speed, open sea sites have to be selected. The site should be free from any fishing and other activities. To select ponds in coastal area specific criteria should be followed.
- Environmentally-sensitive areas that require precaution due to features and characteristics that support protected species and/or unique habitats (*e.g.*, rearing or spawning habitat, migration corridors, protected areas or proposed protected areas, sensitive migratory bird habitat, *etc*.) should be excluded.

2. Design and construction

- Eco friendly structures with minimum impact on environment should be used.

3. Planning

- Plan farming activities in advance of the season among the selected fishermen/ farmer group(s)
- Plan the crop within the capacity of the group in terms of investment, level of commitment possible, and consider local water quality parameters and possible threats in that.
- Follow crop calendar system for farming (in such cases, the fishers will be occupied throughout the year and they will be provided with income during lean fishing season also)
- Implement entire activities in a disciplined and cooperative manner.

4. Seed selection (wild or hatchery reared)/ stocking density

- Select a high value species for which abundant seed availability (wild/ hatchery) is proven after proper survey.
- Quality of the seed and stocking rate (moderate stocking) of the fish in farms need to be standardized for individual species based on growth rate and feeding habits.

5. Water quality management

Effluents of concern from aquaculture systems

- Nutrients (Nitrogen, Phosphorus)
- Settleable solids (especially from harvesting during draining)
- Oxygen demand from organic matter

GP components to reduce effects of effluents

- Reduction of water exchange rates
- Reduction of production levels
- Use of feed trays
- Settling basins of at least 10% pond area
- Forcing farms to reduce discharge (only 2% water exchange rate)
- Stocking calendars to be prepared to follow a uniform pattern of stocking

6. Feeds and feed management

- Mostly high value marine fishes are carnivorous and are fed on trash fish/ bycatch. When trash fish is used as feed, it will not supply adequate nutrients to the growing fish. So for more growth excess feeding is done which results in increased FCR leading to high feeding cost and excess waste discharge to the ambient water (as uneaten feed and faecal matter).
- Select high quality feeds that contain adequate, but not excessive, nitrogen and phosphorous (to avoid eutrophication).

- Store feed in well-ventilated, dry bins, or if bagged, in a well ventilated, dry room. The feed should be used on a first in and first out basis by the expiration date suggested by the manufacturer.
- Apply feed uniformly
- Do not apply more feed than what fish will eat.
- Maintain adequate dissolved oxygen concentrations in ponds to prevent fish stress and enhance the capacity of the pond to assimilate metabolic wastes.

7. Health management

- Establish Fish Health Management Plan, a comprehensive plan for maintaining optimum health of the aquatic stocks in culture, usually consisting of procedures and guidelines for procuring healthy stocks, fish handling and transport, vaccination, feeding and veterinary practice.
- Regular monitoring of the cultured organism for health and growth

8. Disease management

- Make diagnosis for diseases and a recommendation for disease treatment before applying the rapeutic agents. Disease diagnosis and recommendations for treatments should be done by fish health specialists.
- Therapeutic agents to be used only in closed systems. Manage pond water levels to prevent or minimize overflow until therapeutic agents have degraded. Use good water quality management procedures to prevent unnecessary stress to fish.
- Do not allow escape of infected animals to the main water source to prevent spread of disease to other farms

9. Better Harvest and post-harvest Practices

- Improve the quality and sale price of the crop by using better practices for crop harvesting and post-harvest handling of shrimp, fish and seaweed (which retain the freshness of the catch).
- Establish better market access by collaborating with a reliable and good local processor/ trader

10. Record maintenance of daily culture operation should be mandatory

11. Environmental awareness

- Fallowing or site fallowing, to discontinue production at a culture site for a short period, generally up to one season (or year) to sustain the environmental conditions.
- People should be aware of Marine Protected Areas (MPAs), for the conservation and protection of: commercial and non-commercial fishery resources and their habitats; endangered or threatened marine species and their habitats; unique habitats; marine areas of high biodiversity or biological productivity; and any other marine resource or habitat for which special attention is needed should be exempted from aquaculture operations.

Suggested GPs for cage farming

- Cages should be placed in areas with good water circulation.

- It is ideal to change cage locations after each operation to protect the sediment quality.
- It is common for nets, cages, and other gears to become clogged or obstructed with natural foreign matter such as algal and invertebrate species. Deploy anti-fouling techniques to reduce the attraction of fouling organisms and/or to remove them from the affected gear.

GPs for non-native species

- Measures must be taken to minimize the potential escape of non-native species, if they are stocked.
- Active feed monitoring as in closed systems
- Minimize uneaten feed accumulation beneath nets
- Proper disposal of feed bags
- Limit waste discharge during harvest & transport

Possible chances of fish kill in farms/cages and its management

Mortality due to disease or pathogen transmission from wild to farmed fish

- Licensed veterinarian to examine the cultured fish on a regular basis and treat as required.

Mortality due to predation

- Appropriate predator deterrence including predator nets, scaring devices, frequent removal of mortalities, regular inspection of nets.
- Mortality due to abrupt physico-chemical changes
- Select sites of suitable water temperature

Mortality due to hydrogen sulphide

- Do not allow farm waste to accumulate in the benthic environment.

Mortality due to algal blooms

- Consider the potential for algal blooms prior to site selection.
- Cages should not interfere with navigation or other permissible water uses.

Asian seabass (*Lates calcarifer*)

It is a high value carnivorous fish suitable for mariculture in Indian waters. The advantage of the species is that it can grow in very varied conditions and in tolerant to wide temperature ranges. The most advantageous fact is that the hatchery production of seabass seed is standardized and is being done commercially in India.

Contributions towards GP in mariculture by research institutes are:

1. Development of technical guidance documents for brackishwater/estuaries and coastal waters that will serve as "user manuals" for assessing trophic state and developing region-specific nutrient criteria to control over enrichment due to aquaculture practices.
2. Monitoring and evaluation of the effectiveness of nutrient management programs as they are implemented. In shrimp aquaculture, well designed GPs can support producers to:

- increase efficiency and productivity by reducing the risk of shrimp health problems;
- reduce or mitigate the impacts of farming on the environment;
- improve food safety and quality of shrimp farm product; and
- improve the social benefits from shrimp farming and its social acceptability and sustainability

GPs could, in many instances improve the culture activities. Their impacts on resource use efficiency, productivity and more importantly on profitability, environment and social aspects can be similarly striking when compared to worse practices. GPs can be country specific, or developed for a particular location, taking account of local farming systems, social and economic context, markets and environments. GPs are often voluntary practices, but can also be used as basis for local regulations, or even certification programmes.

Positive outcomes of GP in Indian aquaculture

- *Decreased disease incidence:*
- *Increased confidence in contract hatchery system*
- *Reduced cost production:* Through efficient use of feed (FCR of 1:1) and other resources, including reduced use of chemicals, all the farmers will achieve a very good profit for the first time in many years.
- *Production of safe shrimp:* No use of antibiotics. Seed, shrimp and other inputs have been screened for antibiotic residues and they were negative.
- *Motivated farmers in abandoned areas:*

Cluster farm approach helps:

- To reduce the risk of disease outbreaks and improve the production in shrimp farms.
- To organize the farmers under "Self Help Groups"/"Aquaclubs" for sustainable production and to quickly meet the growing market demands.
- To produce better quality shrimps in socially acceptable, environmentally sound and economically viable manner.

Implementing GPsare done by creating:

- Awareness and capacity building of primary producers
- Awareness and capacity building of other stakeholders in the supply chain
- Changing the attitude of key players
- Demonstrating the benefits of GP implementation

Approach followed can be by:

- Facilitation of collective approach (cluster farming)
- On-site programs to create awareness on GPs
- Assisting groups of aquaculturists to develop voluntary guidelines

- Facilitating participatory approach
- Providing regular technical assistance
- Linking to other stakeholders in the supply chain
- Monitoring compliance for adoption

Cluster Farming

Collective planning, decision making and implementation of crop activities by a group of farmers in a cluster through participatory approach in order to accomplish their common goal to reduce risks and maximize returns.

The dissemination of GPs can be done through:

- Farmers meetings
- Regular site visits
- Extension material
- Brochures
- Booklets