

organizations need to be established nearby cultivation areas to utilize the resources efficiently with greater profits.

Since it requires low inputs, and provides good returns and can employ many people seaweed culture is a good industry for coastal communities. The efforts in seaweed cultivation and its utilization through product and process development could help in meeting the food and nutritional security of Indian population as well as augmenting value of total fisheries export. Seaweed has a very important role to play towards betterment of coastal fishing communities and as a valuable foreign exchange earner. The need of the present hour is to train, encourage and promote coastal fishermen population at suitable sites, through combined efforts of respective State Governments, research institutes, seaweed industry, Marine Products Export Development Authority and local NGOs, to adopt commercially viable large-scale culture technologies, and to provide them with good marketing facilities through proper channels.

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# Shrimp harvesting technology on the south west coast of Bangladesh

S. M. Nazmul Alam, Michael J. Phillips and C. K. Lin

Shrimp farming is an ancient traditional practice along the southwest coast of Bangladesh. This kind of farming is a natural rearing process in its simplest form. The main species grown are the black tiger shrimp *Penaeus monodon* along with other finfish as by-catch.

The ownership patterns of extensive shrimp farming systems are complex and vary from area to area in Bangladesh. The major categories of shrimp farm ownership are:

- *Individual owner*: The land in the farm is owned and operated by one person. The landowner invests cash according to his capability and enjoys total returns from the farms.
- *Farmers group*: The land in the farm is owned by a number of persons who all pay an active role in operating the farm. They contribute land and money and do the farming jointly. They also share the returns on shrimp from the farm proportionate to their contribution of land, cash and physical labor. However during paddy cultivation each farmer in the group cultivate paddy singularly.
- *Outsider lease*: The land in the farm is leased out by owners to a person or persons living outside the Polder area. The outsiders provide capital, and usually set up shrimp farms taking most of the land from small and medium landowners. They usually ally themselves with neighboring medium landowners by taking their land and give them a share in the farm operations and income. This is done to gain influence over the land and control over the local people.

Shrimp farms are located in the inter-tidal range. Farm design is highly dependent on the characteristics of the site selected and there is no consistent design. However, most farms follow an open system with no treatment ponds.

The bottom of the ponds is generally irregular.

The farming period starts from February to the end of November with multiple stocking and harvesting methods. The different categories of shrimp farmers described above use almost the same type of management activities for pond preparation and grow out. However, the application rate of fertilizer, stocking density of post larvae, and water exchange rates vary from farmer to farmer.

The average water depth in the pond is 0.6 meters. Generally the depth is reduced around 10-15 cm at two-week intervals. 10-30% of the pond volume is exchanged during tidal regimes and farm outflows are discharged directly to the common flushing cum drainage canal.

The farms are usually rectangular or irregular with a large surface area. The actual farm size is highly variable. Shrimp farms under individual ownership are generally smaller in size (average 2.3 ha) than that of the farm owned by the farmers group (average 4.6 ha). The largest farms are occupied under outside lessee (19.6 ha) ranging from 10.8 ha. - 36.4 ha. Yields of *Penaeus monodon* are variable ranging from 109 kg/ha to 146 kg/ha.

Harvesting is generally carried out after 90-120 days of extensive shrimp farming. Harvest is usually done early in the morning and a number of different methods are used. The harvesting techniques also vary among farm owners. The harvesting usually takes place during full and new moon of a lunar cycle. A cycle consists of 5-7 days. The used water from the farm is partially drained out through the canal and fresh tidal water introduced into the farm. The shrimp become excited and start moving towards the entry point of the tidal water as shrimp by habit like to swim against the current.

The following methods are in practice for harvesting of farmed shrimp in the area.

### Gai method

A very small portion of the farm is converted into a rectangular shaped harvesting area. This area is prepared adjacent to the canal. The individual and farmer groups build the area with soil dikes all around. One wooden gate locally called tepata of varied size is placed in the inner dike of the area to control the flow of water from both sides. The outside lessees build the dikes and bottom with concrete materials to ease the harvesting process. Individual farmers place a bamboo fence laterally a short distance from the canal to prevent the escape of shrimp and fishes. Better off farmers operating either as individuals or in groups now use plastic pipes to make the fence as it is more durable and long-lasting. This fence is called main pata. Another 'V-shaped' bamboo made fence is set up to a little distance from the main pata. This fence is called pusti pata. The tail end of this fence is faced against the incoming water. This end has small vertical opening to allow shrimp to enter into the vacant area from the farm. The area in between these two fences is the catchment area and the total harvesting area is locally called Gai.

Shrimp enter the catchment area through a narrow passage of the fence, and cannot go back to the rearing area of the farm. When the inflow of the water has become stationary shrimp are caught with cast net. The outside lessee sometimes drags the cast net, as the bottom is smooth concrete. Lastly, the water of the catchment area is totally drained out and the last few pieces of shrimp are caught manually. The system is repeated during a lunar cycle.

### Trap method

Trapping is another way of harvesting shrimp. Some bamboo traps, locally called Aatol and measuring of various sizes (standard 60cm x 75cm x 60cm) are placed at 2.5-3metre intervals from the periphery to inside the farm. Fine meshed net is attached to each of the traps. These are set up in the deeper

area of the farm. During the flow of the tide the shrimp usually move towards the edge of the dike and happen to entry into the traps. The are checked at intervals, the shrimp removed and the traps reset. This system continues until the end of each lunar period. The Aatol is also placed at the attachment of the main pata of the Gai. The large shrimp farms, especially outside lessee usually set up the Aatol where shrimp are unable to move to the Gai because of the tide. All categories of shrimp farmer believe that the hatchery bred shrimp fry are not capable of moving to the Gai against a strong current. So the farm owners put traps out at intervals to harvest the shrimp.

### Net method

Cast nets are used for harvesting the shrimp when the farmer finds fewer amounts of shrimp is caught in the Gai or in the trap. The farm owner engages some cast net owners. The netters stand close to each other and cast together. Thus they move forward casting nets all over the farm and shrimp are harvested. This technique is particularly used by large farm owners (outside lessees) at the end of season.

### Market

A small size floor is constructed near the Gai and is called Chatan. This place is used for washing, sorting and selling of shrimp. A guardhouse made by nypa leaf is also constructed close to the Gai. The harvested shrimp are kept in different kinds of bamboo crates/coops. The shrimp are washed with saline water and placed in a heap at Chatan to make ready for sale at the farm gate. The Chatan is made of concrete by the outside lessees, but small individual and group farmers prepare the area with earth instead and place a piece of polyethylene sheet on it during selling time. The buyer comes to the farm gate, bargains and settles on the price. Sometimes selling through auction is takes place due to presence of a number of buyers. The bid winner occasionally shares the lot with other fellow buyers who came to bid to keep social harmony. The head-on shrimp are then taken into the local depot for icing and are forwarded to the processing plant within shortest



Earth made Gai mostly operated by individual or group farm owners



Concrete made Gai by outside lessee

possible time for beheading and onward dressing.

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- About the authors  
S. M. Nazmul Alam has recently completed M. S. degree on Integrated Tropical Coastal Zone Management from Asian Institute of Technology (AIT), Thailand. E-mail: smnazmul@bdonline.com. Postal: 169-West Agargaon, Shere Bangla Nagar, Dhaka-1207, Bangladesh. Tel: 880 2 8117258.
- Michael J. Phillips is an Environmental Specialist with Network of Aquaculture Centres in Asia-Pacific (NACA), Bangkok, Thailand.
- C. K. Lin is an adjunct Professor in Asian Institute of Technology, Thailand.