TECHNICAL BULLETIN

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Production Enhancement of Aquaculture through Innovative Technologies in Cage Culture System in *Haor* Areas

In Bangladesh, haors and floodplains, are traditionally used for capturing natural stocks of fish, but are rarely utilized for aquaculture. These natural fish habitats, characterized by inundation with flood water for 5-6 months in the wet monsoon season and formation of deep narrow pits or canals in the dry season, can be comfortably managed for boosting fish production in the country.

Cage culture could be the most suitable aquaculture technique to optimally utilize the floodplain water bodies in the rainy monsoon season. The present average fish yield in the floodplains including haors in Bangladesh is very low, only about 500 kg/ha, which can easily be increased to 2 to 5 t/ha using community based operation of cage culture of fast growing, popular fish species.

The Sutarpara Haor in the Sutarpara union of the Karimganj upazila of Kishoreganj district is potentially important for seasonal catch of hoar fishery. A huge number of poor fisher families living in the adjacent villages earn their livelihood from this haor.

A community based aquaculture approach for fish production round the year based on mono-sex tilapia cage culture followed by nursing, rearing and over-wintering of spawn, fries and fingerlings of other fast growing fish species in hapas, pens and cages to supply seeds round the year can cause a manifold increase in fish production and improve the livelihood of the fisher families.

This can be used as a model system for other floodplain areas for substantially increasing aquaculture production in the country. Adequate post-harvest handling and marketing of fish catches can reduce post-harvest loss, shorten the value chain, enhance profits and ensure alternative incomes and general well being for fisher families. It is, therefore, worthwhile to

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develop a model cage culture system for the Sutarpara Haor for raising fish during monsoon and nurse or rear/over-winter fingerlings in pens, hapas and cages to ensure the availability of quality seeds for year round culture.

The specific objectives of the project were to empower the Ujandhanu Nadi Jolmohal fishery stakeholders for innovative floodplain aquaculture based on cage culture system and develop their skills, develop improved cage culture for floodplains with mono-sex tilapia, develop improved spawn and fry nursing and fingerling rearing /over-wintering of mono-sex tilapia and carps in hapas, pens and cages in floodplains and promote business entrepreneurs of cage culture, improved fish handling and marketing and up-scaling of technologies.

The cage culture innovations were addressed by three collaborating partners: BAU Faculty of Fisheries (BAU-FF), Krishibid Fisheries Ltd. (KFL) and Organization for Rural Advancement (ORA). The Department of Fisheries (DFO of Kishoreganj and SUFO of Karimganj) were involved in facilitating technology adaptation, monitoring and evaluation, regulation, law enforcement and compliance improvement process. The local administration facilitated access to water resources, monitoring and law enforcement.

A model cage culture system for floodplains was developed through community based operation and management involving primary resource users of Ujandhanu Nadi Jolmohal (Chong Noagaon Matsayajibi Somobay Samiti) and Raijanidai Jolmohal (Sutarpara Matsyajibi Somobay Samiti).

Cage culture groups (CCGs) led the innovation process facilitated by NGO, BAU-FF, KFL and DoF. This initiative placed all partners at the same level, with the aim of increasing fish production and at the same time, improving the livelihoods of poor resource users involving women, mostly coming from a disadvantaged ethnic low-caste Hindu and Muslim fisher communities of Chong Noagaon and Uttar Sutarpara of Sutarpara Union, Karimganj. Two PhD and 3 MS students conducted the field and lab research.

The cages were jointly operated by the project and HH families of the target community, on a one cage one HH cost-sharing basis. In addition to cage construction, maintenance and management including surveillance, 20% of the cost of seed and feed were borne by the target community.

Experiments were conducted in nursery ponds, hapas, cages and laboratory aquaria with specific targets and statistically sound designs. Chemical and microbiological quality analyses of fish samples were done.

Results and Outputs

Cage culture of mono-sex tilapia in haor water was found to be very profitable. Nursing and over-wintering for fries and fingerlings of tilapia, common carp and Vietnamese koi, along with their cultures in cages under mono- and poly-culture were also found to be profitable. An innovative fry nursing and over-wintering technique was developed, where fish fries were

nursed in hapas set inside the cages, due to the scarcity of ponds in the haor areas. There was a huge growth of tilapia in cages in haor water within a growing period of 4.5 months. The fish attained an average weight gain of 600 g showing an FCR of 1.1 for CP feed. It was a record growth and FCR so far in Bangladesh for tilapia cage culture venture.

An improved fish handling and marketing system was developed for the cage-raised tilapia and other fish. To compare the shelf life and quality of tilapia raised in different ecological conditions, a new quality index method (QIM) was developed. QIM was found to be a functional tool to determine quality and shelf life, as well as the source of tilapia. In term of shelf life and quality, pond raised tilapia was better compared with cage raised tilapia.

The efficiency of an essential amino acid, DL-methionine, on the growth of mono-sex tilapia in aquarium conditions was tested. Results showed that complete replacement of fish meal by DL-methionine gave significantly better growth of fish with feed cost reduced by Tk.4/kg. Based on the results, a new low-cost feed for tilapia in cages was developed.

Several entrepreneurs were developed from among the beneficiaries for cage culture, fry nursing, hapa nursing and improved fish trading. Since tilapia farming was found to be profitable in cages in Karimganj Haor, many interested entrepreneurs from Mithamain, Austogram, Nikly and Tarakanda haor upazilas received training on cage culture from the project beneficiaries. Several private entrepreneurs set new cages at different haor and since then have been independently operating tilapia cage culture making good profits.

A drama highlighting the benefit of cage culture innovation in haor waters and a documentary film narrating the entire cage culture ventures were prepared. The drama has already been launched in air through BTV and being telecasted about 4 to 5 times every day.

Benefits and Outcomes

Farmers were directly involved in cage construction, cage repair, fry nursing, hapa construction and set up in cages, pond preparation, feeding, nursing, over-wintering, fry transportation and trade, cage and hapa management, harvesting, handling, transportation and sale of fish. Thus, they acquired hands on technical know-how.

This greatly improved their management skills. Moreover, many new enterprises were developed where the CCGs operated several fishery related business like fry nursing, fry transportation and selling, hapa nursery, cage culture, fish marketing. Moreover, many new cage culture enterprises have been developed by the secondary beneficiary groups. Primary beneficiaries trained the secondary adopters from at least 5 nearby haor upazilas of Kishoreganj.

Recommendations

- The technologies developed should be made available to all haor areas
- Policy makers and regulatory bodies should come forward to assist interested fishing communities to set up cages in haor water bodies in terms of facilitating access to water bodies through short-term and log-term leasing and protecting them from vested interests

Expected Impacts

Successful cage culture innovations have come up as a complete aquaculture package in hoar areas with many forward and backward linkage opportunities, viz., spawn/fry nursing and rearing, over-wintering, fry transportation and trade, fish handling, transportation and marketing, value-addition in fish, etc.

The innovations have brought about tremendous changes in the attitudes and activities of the haor people in Karimganj and nearby upazilas.

Cage culture as a possible aquaculture has opened up opportunities for the haor people for work and incomes during the lean period of the year and for boosting up fish production and improving nutrition.

This bulletin has been prepared on the basis of technical information available from a completed CGP project of KGF, the details of which are given below:

Project code and title: TF 13-F: Production enhancement of aquaculture through innovative technologies in cage culture system in haor areas of Karimganj, Kishoreganj; Principal Investigator: Dr. A K M Nowsad Alam, Prof, Dept of Fisheries Technology, BAU, Mymensingh; Project duration: December 2013 to December 2016

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