

Bangladesh Fisheries Research Institute: Powering New Technologies for Fisheries Development



Fish and fisheries are integral to the culture and heritage of Bangladesh, and play a significant role in nutrition, employment generation and foreign exchange earnings.

The Bangladesh Fisheries Research Institute (BFRI) was established in 1984. Its goals are:

- To carry out and coordinate research on fisheries and aquaculture in Bangladesh. A Board of Governors oversees execution of this mandate by providing policy and administrative guidance.
- To assist in the development of more economic and effective methods and technologies for fish production and eco-system management, and fisheries management.
- To provide training and research-based technology transfer.

BFRI serves as the national resource for technical information on fisheries. It generates and standardizes guidelines for country-wide extension of appropriate technologies in production and resource management. The extension is done by the Directorate of Fisheries as well as by other organizations within and outside government.

Though the Institute was established in 1984, actual operation started only two years later after staff got recruited and initial research facilities set up. The institute presently has some 80 scientists, half of whom have Ph Ds in aquaculture and fisheries disciplines

from universities in Bangladesh or abroad. The institute assists the country in achieving the goals of fisheries development set out in successive development plans.

Institutional set up

The BFRI's headquarters is located at the south-west corner of the Bangladesh Agricultural University campus in Mymensingh, some 120 km north of the capital, Dhaka.

Besides the headquarters, BFRI has five research stations — the Freshwater Station, Mymensingh; Riverine Station, Chandpur; Brackishwater Station, Paikgacha, Khulna; Marine Fisheries and Technological Station, Cox's Bazar;

and the Shrimp Research Station, Bagerhat. There are also five sub-stations – two dealing with freshwater, at Jessore & Sayedpur; and three riverine sub-stations at Rangamati, Santahar and Khepupara.

Freshwater Station (FS),

Mymensingh : This 40 ha station, attached to the BFRI headquarters, is the institute's largest. It has well-established and sophisticated carp and prawn hatcheries, as many as 118 drainable ponds — consisting of 20 mini ponds, 52 nursery ponds (0.1 ha each), 47 rearing ponds (0.25 ha each) and 16 grow-out/brood stock ponds (1.6-2.6 ha each).

Riverine Station (RS), Chandpur :

The 17.2 ha station is situated in the

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He has written four books and published more than 100 papers in national and international scientific journals. He is the founder-editor of the *Fisheries Newsletter* and the *Bangladesh Journal of Fisheries Research*.

His recent book "*Development of fisheries in Bangladesh: plans and strategies for increasing income and poverty alleviation*" is a significant contribution to fisheries development.

Dr Mazid has received the 20th Century Achievement Award from the American Biographical Institute. The BFRI under his leadership received a gold medal in recognition of its contribution to fisheries research and technology development in 1997.

riverine port city of Chandpur. It has 36 non-drainable ponds ranging in size from 0.12 to 0.37 ha each with a total water area of 8.6 ha. In addition, the station has one carp, one catfish and one prawn hatchery and specialized laboratories.

Brackishwater Station (BS), Paikgacha, Khulna : The only station of its kind in the country. It was established in 1987 to undertake R & D on various aspects of coastal aquaculture and fisheries management. The station is located at Paikgacha upzila under Khulna district and has an area of 30.56 ha. The station has 52 drainable experimental ponds of different sizes ranging from 0.05 to 1.0 ha, and an experimental hatchery for the production of prawn and commercially important brackishwater finfish seeds.

Marine Fisheries and Technology Station (MFTS), Cox's Bazar : This 4 ha station was established at Cox's Bazar in 1991. It is equipped with five specialized laboratories, an indoor cistern complex with 20 cisterns and an outdoor complex with 42 cisterns (200 m² each).

Research Achievements

Fisheries research has made a significant contribution to the growth of aquaculture by generating a number of economically viable, socially acceptable and environmentally compatible technologies. These are used by farmers large and small.

Highlights of BFRI's research achievements in aquaculture:

Breeding and seed production of commercially important fish, shrimp and endangered species : Research has been conducted to develop and refine the breeding techniques of commercially important fishes, and to disseminate techniques to the public and to private hatchery operators. Seeds are produced of four endemic major carps (catla, rohu, mrigal and calbasu), five major Chinese carps (silver carp, grass carp, bighead

carp, black carp, common carp) and an exotic barb (silver barb), using artificial seed production techniques.

Hatcheries contribute about 99 percent of the total seed production, natural sources only 1 percent. Artificial techniques of tiger shrimp and prawn breeding have also been developed by research and transferred to the field.

The BFRI has been conducting research on the conservation of fish biodiversity from 1994. It has successfully developed a package of technology for artificial breeding and seed production of some important threatened fish species using the technique of *in vitro* fertilization. Presently, live gene banks of 12 such threatened species – six carps (Mahseer, Olive barb, Rohu, Reba, Bata and Calbasu); five cat fishes (Pabda, Gulsha, Shingi, Magur and Guzi aor); and a climbing perch (Koi) have been established.

Genetic stock improvement of carp, catfish and tilapia: The BFRI has successfully initiated fish genetic research at the Freshwater Station (FS), Mymensingh since 1988. These generate better breeds and improved stocks for increasing fish production. Besides the institute's

own research programmes, a number of international agencies (ICLARM, ACIAR/ CSIRO and DFID-AFGRP) have come forward to support some fish genetic research projects for developing advanced technologies.

Outstanding achievements have been recorded in genetic stock improvement of three important aquaculture species:

- genetically improved strain of BFRI silver barb, *Barbodes gonionotus*;
- BFRI GIFT *i.e.* super strain of *Oreochromis niloticus* and
- BFRI rohu, *Labeo rohita*.

This was done through several generations of genetic selection, which showed a 32 percent, 35 percent and 10 percent superiority in body weight respectively over non-selected control groups of these species.

The improved strains are presently being disseminated in a large number of public and private hatcheries. The all-male population of GIFT is in tremendous demand throughout the country.

Development of pearl culture:

A total of seven freshwater mussel species namely *Lamellidens marginalis*, *L. corrianus*,

Scenic front view of the BFRI in Mymensingh, Bangladesh



L. phenchooganjensis, *L. jenkinsianus*, *Parreysia corrugata*, *P. favidens* and *Novaculina gangetica* were identified in lakes, rivers, ponds and other water bodies of the country for pearl culture. Tiny pearls have been produced in experimental ponds through mantle tissue-operated mussels.

The number of pearls depends on the inserted pieces of mantle tissues. In a single mussel, 5-20 pieces of pearl have been developed; image pearls have been formed with one thin permanent pearl layer (nacre); nuclei pearl did not show good results. The highest survival rate of about 80 percent was found in mantle tissue-operated mussel after two months among three types of operation.

Culture and fattening of mud crab:

Crab fattening is now a growing aquaculture practice in coastal regions of Bangladesh. Local fisher groups including women are active in crab farming. A stocking density of 10 000 crablings/ ha ensured better production. As regards crab diet, replacing 50 percent trash fish by slaughter house waste was found effective for culture, and replacement of 75 percent for fattening. On the other hand, it was found advisable to replace 25 to

50 percent of the trash fish by shrimp heads for culture and to replace 50 percent for the sake of fattening.

Research-based technology development

BFRI has so far developed more than 40 improved aquaculture and management technologies (including a number of biotechnology techniques) aimed at increasing aquaculture production. Those found viable in the farmer's field are :

- Monosex seed production and culture of BFRI super tilapia strain;
- Mass seed production technique of climbing perch (*Anabas testudinius*);
- Mass seed production and culture of riverine catfish (*Pangasius* spp.);
- Improved nursery management of carps, catfish, tilapia and prawn;
- Polyculture of carps and prawn;
- Integrated rice-fish and floodplain fish farming;
- Fish culture in pen;
- Improved extensive culture of shrimp in enclosure;
- Crab fattening, etc.

Impacts of technologies

All these technologies have been successfully transferred and disseminated to farmers and entrepreneurs in major areas of the country through training and demonstration and through distribution of extension leaflets, booklets and manuals. By adopting these technologies in suitable water bodies, farmers have contributed tremendously to aquaculture production.

The present average fish yield per unit area of water of various aquaculture practices is as follows: carp polyculture in perennial ponds 3 500 - 4 500 kg/ ha; monoculture of riverine catfish 30 000 - 40 000 kg/ ha; monosex culture of tilapia 12 000-16 000 kg/ ha; monoculture of climbing perch 8 000-10 000 kg/ ha; monoculture of silver barb 1 800-2 500 kg/ ha; integrated rice-fish culture 250-350 kg/ ha (only fish) and improved extensive shrimp culture 300-350 kg/ ha. As a result, aquaculture production has nearly doubled itself during the last 15 years.

BFRI has already fine-tuned its major aquaculture technology packages on the basis of regional need and agro-ecological suitability. The institute has been continuously extending newly evolved technologies in collaboration with the Department of Fisheries (DoF) and other GOs/ NGO partners.

It is hoped that the national objectives of food security and poverty alleviation, particularly in rural areas, will be achieved by massive transfer of these technologies all over the country with the help of GO and NGO agencies, and progressive farmers/ entrepreneurs.

The success of BFRI in generating aquaculture technologies and improved resource management practices paved the way for NGO participation in fisheries extension activities in 1988. Before that time, NGO involvement was limited to social service sectors like primary

Carps are bred in these happas



health care, child education, adult education, and family planning.

Research-Based Information Generation

The Institute attaches special importance to publication and documentation of aquaculture and management technologies for wider adoption. For this reason, extension manuals, leaflets, posters and handouts are circulated freely among government and non-government extension agencies, farmers, entrepreneurs, etc. Training manuals are also prepared on clients' demand. *Fisheries Newsletter* and the *Bangladesh Journal of Fisheries Research* are being published biannually to document the Institute's activities and research findings.

Working Linkages

The research, training and management activities of the Institute are carried out in close cooperation with various national and international organizations/agencies and NGOs. Feedback is obtained from them.

BFRI collaborates with national universities and maintains close liaison with them for fisheries R & D. International linkages include the World Bank, the International Development Agency, the IFAD, WorldFish Center, ACIAR/CSIRO, BOBP-IGO, NACA, DFID, and University of Stirling.

The main national collaborators are the DOF followed by Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), and the Department of Agricultural Extension (DAE). Joint R & D programmes are carried out with NGOs like PROSIKA, BRAC, CARE, Bachte Shikha, Jagoroni Chokra, etc.

Emerging Issues of Fisheries Development

While aquaculture has been making good progress through development of various technologies, some new



Harvesting of carp fingerlings for stocking

issues have cropped up. These must be dealt with seriously to maintain the current growth of the aquaculture industry. Some of these issues are:

- Broodstock management and dissemination of improved fish breeds;
- Genetic stock improvement of commercially important species;
- Improvement of aquaculture practices;
- Development of quality fish feeds;
- Conservation of aquatic biodiversity;
- Introduction of alien invasive species;
- Control of infectious fish and shrimp diseases;
- Improvement of quality of aquaculture and fisheries products; value addition and trade related issues.
- Degradation of the aquatic habitat.

The Next Steps

In recent years, inland and marine capture fisheries all over Asia have been declining gradually because of overfishing and deterioration of the aquatic environment. Aquaculture is seen as the most promising option for filling the gap in aquatic food supply.

The available inland closed-water resources of Bangladesh offer

excellent opportunities for culture of suitable fish species (both finfish and shrimp). Though aquaculture is still in its infancy, there is enormous scope to increase the present level of aquaculture production fourfold or fivefold through improved aquaculture and management technologies. Proper expansion of evolved technologies is expected to create job opportunities for one-third of the country's population.

The institute is conducting research for biodiversity conservation of threatened fish species like Pabda, Gulsha, Tengra, Koi, Shingi, Magur, Mohashol, Bheda, etc. and for popularizing the culture of small indigenous species. This will help conserve endangered fish species and increase the production of small fishes.

According to a poverty reduction strategy paper prepared by the government, BFRI's main research goal is to increase fish production threefold by the next 10 years through scientific fish farming and open water fishery management practices.

If technology transfer to the field is done right through massive extension, demonstration and training, aquaculture alone can meet half of the country's fish production by the next five years. This requires adoption of the right policy, programs and investment by all agencies concerned.