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Bangladesh, with a population of 140 million, is crisscrossed with hundreds of rivers and their tributaries that drain into the Bay of Bengal in the south of the country. Fish and fisheries play an important role in nutrition, employment, foreign exchange earnings and the economy of the country. It is estimated that about 1.3 million people are directly employed in the sector, while another 12 million or more rural people earn their livelihoods from fisheries and related activities. The sector contributes about 5% of GDP, 18% of Gross Agricultural Product and 6% of export earnings. Fish provides about 60% of the total animal protein intake of the population.

# The WorldFish Center in Bangladesh



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The country has vast water resources that contribute to fish production: 4 million hectares of rivers, estuaries, lakes and flood-lands; 0.4 million hectares of inland waters suitable for aquaculture and over 16 million hectares of coastal waters. Fish production during 2001-2002 was estimated at 1.9 million tonnes – about 78% from inland waters (36% open waters and 42% from closed waters), and 22% from marine fisheries. The Bangladesh fisheries have a rich biodiversity with over 280 freshwater species, over 510 marine species and 12 exotic species so far recorded.

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## WorldFish Center

The WorldFish Center is an autonomous, nonprofit, international scientific and technical center established to conduct, stimulate and accelerate research on all aspects of fisheries and other living aquatic resources. The Center, established in Manila in 1977, became a member of the Consultative Group on International Agricultural Research (CGIAR) in 1992. In February 2000 WorldFish Center's headquarters moved to Penang, Malaysia.



WorldFish Center's program of work aims to resolve critical technical and socio-economic constraints to increasing production, improving resource management and improving equitable distribution of benefits in developing countries. It pursues these objectives in the fields of aquaculture, capture fisheries management, coastal area management, biodiversity conservation, genetic enhancement, socio-economic and policy research and information exchange through cooperative research with institutions in developing and developed countries.

### Partners in Bangladesh

- Bangladesh Fisheries Research Institute (BFRI)
- Department of Fisheries (DoF)
- Bangladesh Rice Research Institute (BRRI)
- Bangladesh Agriculture Research Institute (BARI)
- Bangladesh Agricultural Research Council (BARC)
- Bangladesh Jute Research Institute (BJRI)
- Sugarcane Research and Development Institute (SRDI)
- Bangladesh Agricultural University (BAU)
- Chittagong University
- Dhaka University (DU)
- Non Governmental Organizations (NGOs) – ranging from small local ones to the largest national ones

### Donors

The following donors have supported the collaborative research projects:

- United States Agency for International Development (USAID) (1989 - 2005)
- Danish International Development Assistance (DANIDA) (1990 - 1994)
- Ford Foundation (1987 - 1994, 1996 - 1999)
- International Fund for Agricultural Development (IFAD) (1990 - 1994, 2001 - 2006)
- Asian Development Bank (ADB) (1994 - 2001; 2004 - 2007)
- Department for International Development (DFID) UK (2000 - 2006)
- WorldFish Center core funds
- Bunderministerium für Wirtschaftliche Zusammenarbeit/Deutsche Gesellschaft für Technische Zusammenarbeit (BMZ/GTZ)



## History of WorldFish Center In Bangladesh

The WorldFish Center has been undertaking research in Bangladesh since 1987. It works in partnership with a variety of organizations including the Department of Fisheries, the Bangladesh Fisheries Research Institute, non-governmental organizations and a wide range of other research and development institutions. Research is undertaken for the sustainable management and development of aquatic resources and for improving the livelihoods of those who depend on these resources. Over the years the number of partnerships between the Center and Bangladesh organizations has grown rapidly and, in January 2000, the Center signed a Memorandum of Understanding (MoU) with the Economic Relations Division of the Ministry of Finance to provide a broad framework for collaboration with a wide range of organizations in Bangladesh over a ten-year period.

The WorldFish Center and its partners in Bangladesh have focused their research efforts

on sustainable aquaculture, genetic enhancement of aquaculture species, inland and coastal fishery resources management, social and policy issues, and networking and they have contributed to the capacity building of national institutions through:

- development and dissemination of sustainable aquaculture technologies;
- integrating aquaculture with farming in different agro-ecosystems;
- genetic enhancement of aquaculture species;
- assessing and monitoring impacts of aquaculture extension and technology transfer;
- coastal fish stock assessment and management;
- community-based fisheries management;
- policy research; and
- institutional strengthening and capacity building that includes:
  - training of scientists,
  - training of government and NGO extension workers as trainers,
  - organization of overseas training and study tours,

- assisting in participation in workshops and conferences,
- joint publication of scientific papers.

Projects specific to Bangladesh are managed from the Center's Bangladesh office, while multi-country regional projects that include activities in Bangladesh are managed from the Center's headquarters in Penang, Malaysia.

### Impacts on Collaborative Research

**Development and dissemination of sustainable aquaculture technologies:** Working since 1989, WorldFish, in collaboration with BFRI and with funding support from USAID, has developed a number of low-input technologies for seasonal and perennial pond aquaculture. These technologies have been and are being disseminated to over 7 000 farmers every year through a large number of NGOs. Adoption of new technologies has resulted in increased fish production from fallow seasonal ponds/ditches to over  $2.5 \text{ t}\cdot\text{ha}^{-1}$  in 4-6 months, and from  $300 \text{ kg}\cdot\text{ha}^{-1}$  to  $3\text{-}5 \text{ t}\cdot\text{ha}^{-1}$  in the case of perennial ponds. About 40-60% of the participants in the NGO programs are women, and income from their ponds is helping to empower them within rural communities. The consumption of fish in farming households has substantially increased, along with their household incomes.

Studies undertaken with funding support from DANIDA and IFAD to assess the adoption of aquaculture technologies and the efficacy of different aquaculture extension methods, have revealed that even five years after the completion of the project, farmers continue to obtain fish yields of about four times the level of production before the adoption of the new technologies. Aquaculture has now spread into much of Bangladesh; participants of various aquaculture projects not only follow better practices but also produce more than other farmers.

**Integrated rice-fish farming:** Integration of fish culture with rain-fed and irrigated rice farming has resulted in fish production of up to  $1 \text{ t}\cdot\text{ha}^{-1}$ . In addition, rice production has increased by about 10%, while the cost of rice farming has been reduced by 10%. There has also been less use of pesticides and insecticides as a result of integration, leading to a better environment.

**Integration of fish culture with deep-water rice ecosystem:** Research, undertaken with BFRI, Proshika and BRRI with funding support from IFAD, on group managed rice-fish systems in deeply



flooded ecosystems has resulted in cultured fish yields of  $600 \text{ kg}\cdot\text{ha}^{-1}$  when grown as a single crop after dry season rice, and  $400 \text{ kg}\cdot\text{ha}^{-1}$  when grown with monsoon rice. Integration did not result in a decline in yield of small indigenous wild fish or rice, while costs of rice farming were reduced.

**Genetic enhancement of aquaculture species:** Collaborative research by BFRI has resulted in an improvement in growth of silver barb (*Barbonemus gonionotus*) by 28% after three generations of selection. The improved strain is being disseminated widely by BFRI to farmers.

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Bangladesh is a recipient of the GIFT strain of Nile tilapia, genetically improved by WorldFish Center and its partners in the Philippines. The improved strain has shown 85% faster growth than local strains, and continued research by BFRI has resulted in a further improvement in growth by 10%. The strain is being cultured by thousands of farmers.

**Coastal fisheries management:** Collaborative research with the DoF to assess the status of coastal fisheries and develop management strategies has resulted in the development of a database and an assessment of the status of fisheries resources.

Social and bio-economic analyses quantified the effects of conflict between small-scale fishers and the trawl fishery, showing that workers in the marine fishery benefit little from trawling, and that there is excess effort in shrimp fishing. The legal and institutional issues and constraints affecting coastal fisheries management have been reviewed with Bangladesh Environmental Lawyer's Association (BELA), pointing to a number of areas where regimes need to be clarified.

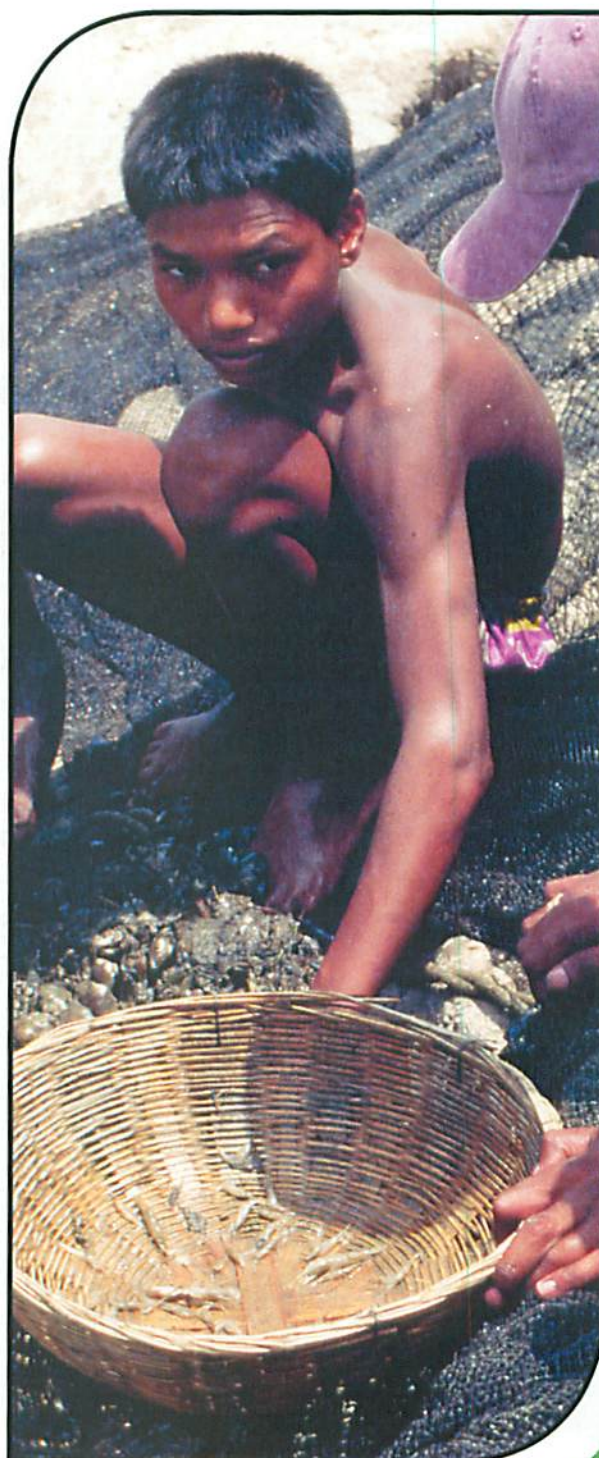
**Participatory inland fisheries management:** Action research undertaken since 1987 in collaboration with the DoF and a range of NGOs with funding support from the Ford Foundation focused on improved management of the inland fishery and has resulted in: (i) the establishment of community-based management of beels (seasonal and permanent lakes), floodplains and rivers; and (ii) generation of information on fish catches, fish consumption, household impacts and institutional frameworks for the management of open-water fisheries.

As a result of improved management strategies, such as the establishment of fish sanctuaries, closed seasons and stock enhancement in some lakes, fish catches have increased, while benefits to leaseholders and middle-men have fallen relative to the share of returns to professional fishers.

With funding from the Department for International Development, UK (DFID), – the WorldFish Center, Centre for Natural Resources Studies (CNRS), Banchte Shekha, the Bangladesh Center for Advanced Studies, Caritas, Newcastle University, Durham University, and the University of Portsmouth worked together to develop methods for consensus building for management of common property resources. A participatory process, used to bring forth the interdependencies between

stakeholders, was shown to change the opinions of stakeholders and to result in agreement on win-win changes in water and fisheries management. This method is being used in current projects in Bangladesh and Vietnam to improve floodplain resource use by all stakeholders.

**International Network on Genetics in Aquaculture (INGA):** BFRI is a member of INGA, a global network for genetic improvement of





aquaculture species coordinated by the WorldFish Center that has been involved in research on genetic enhancement of cultured species and capacity building among national institutions.

**Research prioritization:** The WorldFish Center, in consultation with various stakeholders involved in the use and management of aquatic resources, has been assisting the Government of Bangladesh in identifying constraints and prioritizing its research.

### Capacity Building

The WorldFish Center is committed to developing the scientific capacities of its partner institutions in Bangladesh and to this end, it has:

- conducted training programs for scientists, extension workers and farmers;
- produced scientific publications, training manuals and technology brochures; and
- supported and supervised a number of studies

by Bangladeshi graduate and postgraduate students and examined M.Sc. and Ph.D. theses.

### Current Projects

**Development of sustainable aquaculture (2000-2005):** BFRI and 35 partner NGOs, with financial support from USAID, are collaborating with the WorldFish Center to develop and disseminate sustainable, low-external input integrated aquaculture practices that fit into the farming systems of Bangladesh. A large number of partner NGO extension workers are being trained for dissemination of these technologies to farmers. Annually around 7 000 demonstrations of the low-input technologies are being organized through partner NGOs, and the impact of the adoption of the technologies on production, household incomes and nutrition is being monitored.

**Community-based fisheries management (2001-2006):** DoF, Banchte Sheka, Bangladesh

Environmental Lawyer's Association, BRAC, Caritas, CNRS, Femcom, Proshika and others are working with the WorldFish Center – with support from DFID – to improve the management of inland fisheries by:

- developing and testing community-based fisheries management approaches in over 130 water-bodies with up to 25 000 fishing households and assessing impacts,



- sustainability and potential for expansion;
- identifying, testing and assessing co-ordination and administration mechanisms for local community management over large fishery-wetland systems (co-management arrangements);
- informing fisheries policy stakeholders of the impact of these improved management approaches and influencing policy to move towards pro-poor sustainable systems.

**Genetic improvement of aquaculture species (1997- ):** BFRI is participating in a regional project coordinated by the WorldFish Center for the genetic improvement of aquaculture species. BFRI is continuing studies on the genetic improvement of silver barb (*Barbodes gonionotus*) and catla (*Catla catla*).

**Assessment of supply and demand for fish (2001-2004):** In order to prepare strategies and policies for the management and development of aquatic resources, it is essential to have information on the supply of and demand for fish. In view of this the WorldFish Center, with funding support from the Asian Development Bank and in collaboration with DoF, Bangladesh Agricultural University and Chittagong University, is reviewing current technologies and policies in aquaculture and fisheries management in order to provide projections of fish supply and demand for the next 15 years that will assist in the development of fisheries policies and formulating strategies.

**Recommendation domains for aquaculture development:** This global project with BMZ/GTZ funding and involving Bangladesh as one of four case study countries, will estimate the most likely areas for development of a range of aquaculture technologies. The likely gains in fish production, income and supply as well as the required enabling factors and supporting policies will be determined.

**Networks:** BFRI continues to be a member of the International Network on Genetics in Aquaculture (INGA) and is involved in genetic improvement of aquaculture species (silver barb, catla and GIFT tilapia).

Eighty scientists from Bangladesh are members of the Network of Tropical Aquaculture and Fisheries Professionals (NTAFP), an information network coordinated by the WorldFish Center. The network assists fisheries scientists with information and database searches, analysis and interpretation of

data and publishing research findings. Two hundred Bangladeshi research and development workers in Bangladesh receive *NAGA*, the WorldFish Center quarterly magazine.

### The Future

The WorldFish Center will continue to work in partnership with national and international institutions for the sustainable management and development of aquatic resources and towards improving the livelihoods of the people of Bangladesh.

Aquatic resources will continue to play a major role in the lives of people of Bangladesh. Increasing demand from a growing population, combined

with declining catches from natural waters as a result of increasing fishing pressure and habitat degradation, will put additional stress on already depleted resources. To date, the research undertaken by the WorldFish Center in collaboration with national institutions has resulted in developing and disseminating aquaculture technologies and development of models for improved management of open inland waters through community participation. The WorldFish Center is committed to continue its research partnerships with national institutions by continuing on-going research and identifying new research areas through stakeholder consultations and implementing projects to address the constraints that impinge on the sustainable management of aquatic resources.

