



## Sustainable production of small fish in wetlands of Bangladesh



RESEARCH  
PROGRAM ON  
Aquatic  
Agricultural  
Systems

### Summary

Bangladesh is rich in aquatic resources with extensive seasonal and perennial water bodies throughout the country. In the past, the expansive floodplains, oxbow lakes, *beels*<sup>1</sup>, and *haors*<sup>2</sup> were home to a vast range of fish species. Of the 260 fishes found in the inland waters of Bangladesh, 150 grow to a small size (maximum length of about 25 cm), and these are found in the wetlands.

Small fish, for example, mola (*Amblypharyngodon mola*), darkina (*Esomus danricus*) and dhela (*Osteobrama cotio cotio*) are rich in vitamin A, calcium, zinc, and iron, providing a vital source of micronutrients for pregnant and lactating women, and young children. The re-establishment of these species in wetland areas through stock enhancement can increase fish production and provide micronutrients to local communities living in the floodplains and the population at large. Mola also commands a high market price, and is a popular fish in markets.

Over time, a significant number of these species have declined. Yet, 30% of total fish production comes from these water bodies and supply vital income and food for the country's rural poor.

In an effort to repopulate and sustainably manage the stocks of micronutrient-rich small fish, such as mola, a set of sustainable low-cost technologies has been developed. These technologies can significantly increase fish production from *beels*, *haors*, ditches and floodplains.

This brochure provides an introduction to sustainable, low-cost technologies that can increase the production and productivity of mola and other small fish species in wetland areas of Bangladesh.

### Production of micronutrient-rich mola

#### Preparation of water bodies

Medium-sized *beels* of a water area of about one hectare or ditches (*kuas*)<sup>3</sup> of 5 decimals<sup>4</sup> in the dry season (January–February) can be used for restocking of mola and other small fish. Water bodies must be prepared before stocking mola by removing predatory fish by repeated netting or drying out. Lime should be spread on the bottom of the dried area and then water added. Seven days later, fertilizer should be applied to promote the growth of natural food.

#### Collection, transportation and stocking of mola brood

Mola brood should be collected from nearby ponds, ditches, canals and *beels* to avoid stress on the fish because of long distance transportation. Before the brood stock is collected, the fish must be conditioned by repeated netting and releasing, once per day, over five days. The mola brood should be caught using a seine net and transported in oxygenated plastic bags or earthenware or aluminum containers. Mola must be transported early in the morning or late in the evening when it is cool, to ensure minimum mortality of the fish. The mola brood should be released slowly into the water body after making sure that the temperature in the carrying container and water body are the same.

Endangered and critically endangered small fish species, as well as mola, darkina, dhela and other species with high micronutrient content should be given priority for stock enhancement.

#### Sustainable management of water bodies

All fishing should be prohibited in the water body after stocking. This should be enforced through awareness building campaigns, meetings and discussions with community members and fishers living around the water body. District and *upazila* fisheries officers, local government department officers and elected representatives should support and participate actively in these awareness-building initiatives.

<sup>1</sup> A *beel* is the deeper parts of the floodplains, *haors* and oxbow lakes.

<sup>2</sup> A *haor* is a wetland ecosystem in north-eastern Bangladesh.

<sup>3</sup> A *ku* is a deep ditch in the wetlands, usually 2–10 decimals.

<sup>4</sup> 1 decimal = 40 m<sup>2</sup>; 10,000 m<sup>2</sup> = 1 hectare.

The following common destructive practices must be understood and measures to stop them must be adopted by all:

- drying out of water bodies during the winter season
- excessive use of chemicals in the crop fields
- overfishing of brood fish and fish fry
- use of monofilament nets (*current jal*) and seine nets with very small mesh size.

In the monsoon season, rainwaters and flooding inundate the *beel* or *kua* and the restocked mola and fry disperse throughout the water body. Implementation of fisheries regulations, including restrictions on the catching of fry and brood fish and the use of monofilament nets at this stage must be exercised at this stage.

#### Fish harvesting

Harvesting of fish from the wetlands should begin 2 to 3 months after stocking of mola. Fish should be caught using a net of such mesh size that only large size fish are trapped, and juvenile fish can escape and continue to grow, ensuring a plentiful supply for future harvests.

### Conservation of small fish

#### Establishment of fish sanctuaries

In the bodies that are stocked with mola or other micronutrient-rich small fish, an area of deep water must be declared as a sanctuary in order to increase fish production and fish species diversity. Tree branches and bamboo rods should be placed over the sanctuary to create shelter for fish and restrict fishing there. The sanctuary will ensure an abundant food supply, and serve as a nursery for young fish and a refuge for brood fish in the winter season.

As water level rises with the influx of the monsoon flood waters, the fish larvae and adults will disperse throughout the wetlands.

#### Restoration of fish habitats

Many canals, small rivers and catchment areas have become silted, restricting the movement and breeding of brood fish and reducing the nursery grounds for juvenile fish. Restoring these vital habitats will enhance fish breeding – contributing to the conservation of fish biodiversity – and increase overall fish production from water bodies.

#### Establishment of fish passes and fish-friendly structures

The construction of flood control embankments, polders and unplanned earthen roads restrict the movement of fish throughout the floodplains and prevent them from reaching their breeding grounds. Fish passes and fish-friendly structures should be constructed in strategic locations to allow fish to migrate and breed.

### Other production technologies for wetlands

In addition to stock enhancement of micronutrient-rich small fish and their conservation, a range of fish production technologies have been developed for the rural poor who live close to wetland areas. These technologies can be implemented through community-based approaches to alleviate stress on natural water bodies, generate income and increase household fish consumption.

#### Production of fish in cages

At the onset of the monsoon, villages in the *haor* areas become inundated, and large amounts of small fish are caught. The bulk of these catches are fish fry and freshwater prawn juveniles. These can be stocked in 1 m<sup>3</sup> or larger semi-submerged cages at a density of 200–300 fry per m<sup>3</sup> cage for 3–4 months. The cages should be made from mosquito net and bamboo frames. The fish should be fed with rice bran and mustard oil cake at a ratio of 2:1 and at a rate of 3% feed per body weight of fish. After 3 to 4 months, the adult fish and prawns can be used for household consumption and sold at the market.

#### Hapa system

During the monsoon season, households living in the *haor* areas can form groups and establish *hapas* in the surrounding flooded areas. *Hapas* are cages made with mosquito net tied to a bamboo frame, and can be used to grow small fish and carp fry for a 3 to 4 months. The size of the *hapa* may be between 10 m<sup>3</sup> (5 X 2 X 1 m) and 60 m<sup>3</sup> (5 X 8 X 1.5 m).

#### Kua system

Families living around the wetlands can use *kuas* to rear a variety of small fish species over a period of 6 to 8 months.

During the winter season, at least 1 m of water should be maintained in the *kua*. Selective fishing gear should be used to harvest the adult fish while leaving behind some brood fish. These brood fish will breed in the *kua* in the monsoon period and ensure sustainable harvests in the future.

#### Fish production in pens

Floodwaters enter the *haors* during the monsoon period and vast areas of land are submerged. A pen can be made alongside the extended *haor*, by using the edge of the *haor* as one side and nets or bamboo fences to close off the other sides in the *haor*. These pens can range from about 10 to 100 decimals and can be used for rearing high market value small and medium sized fish for a 4 to 5 months.

### Acknowledgements

This document was prepared through financial support of the South Asia Food and Nutrition Security Initiative (SAFANSI). SAFANSI was established as a multi-donor trust fund by a joint undertaking of the World Bank, DfID and AusAID. SAFANSI is supported by both AusAID and UKaid from the Department for International Development; however, the views expressed do not necessarily reflect these departments' official policies.

## With communities, changing lives

This publication should be cited as: Thilsted, S.H., Wahab, M.A. (2014). Sustainable production of small fish in wetland areas of Bangladesh. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Brochure: AAS-2014-07.

The CGIAR Research Program on Aquatic Agricultural Systems is a multi-year research initiative launched in July 2011. It is designed to pursue community-based approaches to agricultural research and development that target the poorest and most vulnerable rural households in aquatic agricultural systems. Led by WorldFish, a member of the CGIAR Consortium, the program is partnering with diverse organizations working at local, national and global levels to help achieve impacts at scale. For more information, visit [aas.cgiar.org](http://aas.cgiar.org).

© 2014. WorldFish. All rights reserved. This publication may be reproduced without the permission of, but with acknowledgement to, WorldFish.



Contact Details:  
WorldFish  
House 22 B, Road 7, Block F, Banani Dhaka 1213, Bangladesh  
[www.worldfishcenter.org](http://www.worldfishcenter.org)

Photo credits: Front cover, Finn Thilsted.



RESEARCH  
PROGRAM ON  
Aquatic  
Agricultural  
Systems

Led by  
  
WorldFish