

**DISSEMINATION OF AQUAFISH INNOVATION LAB TECHNOLOGIES FOR IMPROVING FOOD PRODUCTION EFFICIENCY AND LIVELIHOODS OF THE PEOPLE OF BANGLADESH**

ASIA PROJECT: BANGLADESH

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Mitigating Negative Environmental Impacts/Activity/16MNE02NC

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**Objectives**

1. Provide workshops to disseminate promising technologies derived from AquaFish Innovation Lab research.
2. Produce brochures or leaflets as outreach documents for extending aquaculture technologies to local farmers and the general public.
3. Work with local university, government, and NGO representatives to provide these outreach opportunities to the general public to enhance sustainability of project impacts.
4. Improve food production efficiency in an environmentally sustainable way to enhance nutrient consumption, incomes and the livelihoods of the people of Bangladesh.

**Significance**

Bangladesh is one of the most densely populated countries in the world with many living in abject poverty. Many of the women and children are malnourished with 38-55% exhibiting vitamin or mineral deficiencies and most relying on cereals (rice) for their nutrition. Aquaculture and fisheries make up a large proportion of employment opportunities for a majority of Bangladeshis in rural areas. Aquaculture in Bangladesh is considered a high food security priority for enhancing dietary nutrition and improving the economic livelihoods for its poorest citizens. Sustainable aquaculture is particularly important in the coastal plain regions of Southwest Bangladesh, where poverty is exceptionally high and the region is plagued by frequent flooding, salt incursion, and extreme weather (e.g., cyclones, seasonal drought, high temperature fluctuations), which are linked, in part, to global climate change. Aquaculture production in these regions and throughout Bangladesh face significant problems, which directly threaten the lives and economic livelihoods of local farmers, including: limited production of nutrient-rich foods available for direct consumption, poor productivity and high mortality rates, excessive and costly feed inputs leading to poor economic return, poor pond management leading to low water quality and environmental degradation, and limited diversification of aquaculture products. Our research is aimed at remediating some of these issues. Here we will disseminate the most promising results of the proposed as well as our previous AquaFish Innovation Lab research in Bangladesh to farmers and their communities through a series of workshops and brochures.

The main goal of this extension and outreach activity is to promote significant improvements in management practices and new technologies that will allow farmers to enhance the efficiency and

diversity of seafoods they produce while increasing their incomes and accessibility to nutrient rich foods. These technologies incorporate practical methods for intensifying fish production in a sustainable manner while promoting production of fishes with high nutrient value. They also provide new ways to grow fish in environments impacted by global climate change, namely in water bodies afflicted by rising salinity. Among various projects, previous AquaFish Innovation Lab research shows, for instance, that incorporation of endemic, nutrient-dense small indigenous fish into gher-prawn farming coupled with pond dyke vegetable production provides farmers additional crops for home consumption as well as income from market sales, all while improving production of the prawn cash crop. Reducing daily ration of feed or feeding on alternate days can dramatically reduce costs and increase incomes for farmers without impacting overall yield of the cultivars produced. This research along with other studies indicate impacts of fish culture on environmental water quality and fish stock health can be improved through better management of feed inputs and by the incorporation of semi-intensive and polyculture production practices.

Workshop topics according to regions where the promising technologies were developed:

### ***Mymensingh***

1. Reduced feeding strategies to improve growth and production efficiency and incomes for tilapia farming.
2. Polyculture with major Indian carps combined with reduced feeding enhances total fish production and profitability of farming tilapia.
3. The high value Shing catfish, an air-breathing fish rich in iron, can be grown in semi-intensive pond culture conditions, reducing environmental impacts of intensive practices. Incorporating major Indian carps into Shing culture and reducing feed inputs can enhance income opportunities by 85%.
4. Polyculture of the air-breathing climbing perch (Koi) with carps represents another profitable polyculture technology that can be adopted by farmers. One of the proposed studies will evaluate the feasibility of growing Koi, Shing, and carps together as an additional polyculture technology for enhancing production of high value crops and income for farmers.

### ***Barishal***

5. *Pangasius* catfish grow as effectively in brackish waters as in freshwater ponds, providing a new livelihood alternative for farmers impacted by rises in surface water salinities. Incorporating less costly, locally made formulated feeds, provides additional cost benefits and improves returns on investment for culturing *Pangasius*.
6. Incorporation of tilapia and Koi into polyculture with *Pangasius* in brackish (hyposaline) waters could prove more profitable than *Pangasius* monoculture, providing additional income and diversity of fishes for farming in Southern Bangladesh. This, along with establishing whether Koi can be produced in hyposaline brackish waters will be tested in one of the investigations outlined in this proposal.

### ***Khulna***

7. Incorporating *Mola*, a small indigenous fish species with high nutrient value, or carps, or both into current prawn-gher farming practices does not adversely impact, but in fact enhances the production of prawn. Farmers in utilizing these practices can consume additional nutrients from domestic consumption of *Mola* while improving production of prawn as a cash crop.
8. We also established that pond muds derived from prawn-fish polyculture in gher are more effective than soil in producing vegetables on pond dykes, providing an additional source of nutritional food for consumption or sale. We will take this integrated aquaculture-agriculture system and evaluate the types of fertilizers that might enhance prawn-*Mola*-carp culture while

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also assessing if different pond mud treatments can further enhance production of fruity vegetables.

A major purpose of these workshops is not only to inform farmers, but to disseminate the new technologies to other relevant extension organizations and stakeholders. This way the impacts of the research and adoption of improved aquaculture management practices will have a higher probability of continuing should the AquaFish Innovation Lab activities in Bangladesh come to an end.

In the proposed activities, we will provide a series of workshops complemented by production and distribution of leaflets that outline the most promising aquaculture findings to the farming community in three major regions of Bangladesh where much of the research was demonstrated in ponds of local farmers or at university field sites.

### **Quantified Anticipated Benefits**

1. Provide six workshops or training sessions for farmers, government fisheries extension agents, NGOs and other stakeholders to disseminate valuable fish and shellfish culture technologies for improving food production efficiency and sustainability while increasing household incomes and fish consumption, thereby contributing to greater food security in the region.
2. Brochures and leaflets (n = 3-5) will be produced outlining the improved culture technologies, the number dependent on the outcomes of Investigations 1-4. These will be supplemented by those already produced for extension of previous research findings.
3. Approximately 150 individuals will benefit from direct training on ways to improve aquaculture production efficiency, household income and nutrition, and management practices for environmentally sustainable farming.

### **Research Design and Activity Plan**

#### ***Location***

Workshops will be provided in each of the 3 major regions of Bangladesh where improved aquaculture management practices and new technologies continue to be developed as outlined in the proposal. They include the greater Mymensingh, Khulna, and Barishal regions. The workshops will be held at local universities, *i.e.* Bangladesh Agricultural University, Khulna University, and Patuakhali Science and Technology University) and/or community centers within each area.

#### ***Methods***

We will work with local university, government, and NGO representatives, extension agents and officials who will attend, promote, and contribute to the outreach activities given to farmers and other stakeholders. This will aid in disseminating information in the best and most accepted methods in these areas. We will develop the materials and presentations and organize the workshops. Brochures or leaflets outlining the improved management practices and aquaculture technologies will be developed and produced by the PIs in the local language and distributed by them, local extension agencies, and NGOs in the relevant areas.

Two 1-day workshops will be presented in each of the three regions of Bangladesh: Khulna, Patuakhali, and Mymensingh (a total of 6 workshops). Presentations will focus on the aquaculture developments that came from research in each of the regions (see below). For each workshop, it is anticipated that members of 30+ farming households will be trained on the new technologies. We will also target and assist women in the farming community on better aquaculture practices, as these are the individuals often garnered to take care of food crops and provide nutrition to their children. We will invite farmers with whom we have worked and who actually benefited from the AquaFish Innovation lab research. This will have the effect of introducing other farmers to the real-world benefits of the new culture technologies, increasing the

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likelihood that others might incorporate the new practices into their operations. Our participant farmers could also serve as liaisons to other farmers in the area should they want to adopt new practices.

Provisions for transport to workshops will be provided to those who require it. Lunch, snacks, tea, and soft drinks will also be provided for the day's events.

Some of the topics for the workshop extension activities will include:

1. Reduced feeding strategies for tilapia monoculture and polyculture with major Indian carps.
2. Hyposaline culture of *Pangasius* catfish and use of formulated diets to reduce costs and improve production efficiency.
3. Potential for tilapia-Koi-*Pangasius* polyculture in brackish water as a livelihood alternative for coastal farmers impacted by salinity contamination of freshwater farming systems
4. Addition of *Mola* and dyke cropping to traditional gher-pond freshwater prawn culture for production of nutrient rich fish and vegetables for home consumption.
5. Semi-intensive polyculture of Koi and Shing with Indian major carps as a new technology for sustainable production of the high value, nutritious fishes.

### **Trainings and Deliverables**

- 3-5 factsheets/leaflets or brochures will be produced for distribution to the farming community, government, and NGO agencies, and other stakeholders that outline the new aquaculture technologies developed by the AquaFish Innovation Lab in Bangladesh. The 3-5 brochures produced will include those produced as deliverables under Investigations 1-4.
- Six workshops or training sessions (listed below) for farmers, government fisheries extension agents, NGOs, and other stakeholders will disseminate valuable fish and shellfish culture technologies for improving food production efficiency and sustainability while increasing household incomes and fish consumption in Bangladesh.
- The workshops will provide training to an estimated 150 individuals from 2-3 villages within each of 3 different regions of Bangladesh, thereby contributing to the opportunities to improve food security and household income and nutrition throughout Bangladesh.

Six workshops planned on the following topics & locations:

1. Mymensingh: Topics related to reduced feeding strategies and/or polyculture
2. Barishal: Topics on *Pangasius* culture in brackish water
3. Khulna: Topics associated with incorporating *Mola* polyculture and integrated aquaculture-agriculture systems

### **Schedule**

March 2016 to April 2017: Develop and produce workshop presentations and brochures based on aquaculture technologies previously tested and those being assessed in the first year of the proposal.

May 2017 to December 2017: Conduct workshops in the 3 regions of Bangladesh

January 2018 to February 2018: Write technical report.