

## POLICY BRIEF



### **Dissemination of innovation in Bangladeshi aquaculture: The importance of targeted approaches based on farm characteristics**

Climate change, flooding, disease and lack of proper governance are creating unforeseen challenges for aquaculture development in Bangladesh. Identifying the various characteristics of the aquaculture production systems and designing approaches based on those characteristics can be valuable in identifying and disseminating innovative solutions to the newly arising problems in Bangladeshi aquaculture.

#### **HIGHLIGHTS**

- “One size fits all” approach is not appropriate for Bangladesh as several different types of stakeholder groups exist
- Targeted approaches for each group are necessary to solve the various issues faced by different groups
- Additional studies are necessary to recognise key characteristics of different farm groups for effective identification of specific problems and their solutions
- Farmers should be involved in all steps including identification of the problems as well as development of innovative solutions for sustainable development of aquaculture in Bangladesh

## WHAT'S AT STAKE?

Bangladesh is recognised as one of the world's most suitable countries for aquaculture practices, because of its promising agroclimatic conditions and favourable biophysical resources. Aquaculture plays a critical role in the economy of Bangladesh, contributing to food, nutrition, sustainable livelihoods, income and export earnings.

Fish contributes to 3.50% of gross domestic product (GDP), 25.72% of agricultural GDP, and 1.23% of export earnings. For instance, in 2018–2019, Bangladesh earned 4,250.31 crore taka (approximately USD 390 million) by exporting 73,171.31 tonnes of fish and fishery products (DoF, 2020). Moreover, in terms of nutrition, fish accounts for 60% of nationwide animal protein consumption (Rahman et al., 2021).



Considering its importance for livelihoods and food security, the aquaculture sector has attracted the attention of policymakers and other stakeholders such as international organisations and NGOs, encouraging them to implement policies and interventions to address the emerging issues as well as driving the future development of the sector, especially among small producers.

## AQUACULTURE CHALLENGES IN BANGLADESH

Despite its importance, aquaculture in Bangladesh has recently faced challenges due to climate change. Aquaculture is vulnerable to a combination of climatic factors, such as global warming, rainfall variation, flood, drought, temperature fluctuation, and salinity change (Rahman et al., 2021). Other issues such as diseases are also a concern (Butcher et al., 2021).

Human-related factors such as insufficient knowledge, lack of coordination between stakeholders, lack of appropriate governance and supportive policies, as well as limited technical support and training are also barriers in the development of aquaculture in the country (Deb et al., 2021; Dey et al., 2013; Hu et al., 2019; Selim et al., 2021).

Employing innovative methods to overcome these challenges will contribute to the sustainable development of the aquaculture sector in Bangladesh, while

directly providing many benefits to the local population.

## **INNOVATIVE SOLUTIONS**

### **Climate Smart Aquaculture**

As various problems arise in aquaculture, so do innovative solutions. A study in Shyamnagar identified that poor coastal residents suffer more from the effects of environmental change compared to the wealthier social groups (Selim et al., 2021). The study examined the impact of high levels of saltwater intrusion into coastal lands, and recommended innovative brackish water aquaculture (BWA) including integrated multi-trophic aquaculture (IMTA) as crucial adaptation options to the expanding marine waters



Another study focuses on tilapia farming as a strategy for climate change adaptation. Considering that tilapia is a very adaptable fish and tilapia farming is possible in a wide range of water environments, including freshwater,

brackish water and saltwater conditions, appropriate tilapia culture strategies with institutional support and collaboration with key stakeholders can lead to successful adaptation (Rahman et al., 2021).

With the decline in wild fish due to environmental changes, an innovative climate-smart technology known as the integrating floating cage aquageoponics system (IFCAS) was designed to ensure regular supply of tilapia and vegetables to farming households for home consumption. With IFCAS in place, participating households were consuming more fish and vegetables and the system displayed a promising cost- benefit ratio (Haque et al., 2015).

### **Disease management**

One study focusing on disease management in the aquaculture hatchery sector highlighted how the multifaceted socioeconomic and biological elements of hatchery production combine to create a weak innovation and investment environment (Butcher et al., 2021). The study advocated for the development of models that combine social and technical analysis for the purposes of assessing the viability of new technology and improving the prospects of successful implementation.

Another study examined various farms in the Sylhet district and found that smaller farms spent less than larger farms on disease prevention, but enjoyed higher production. It found that the farms used



many traditional and commercial chemicals and medicines to treat diseases, and overall, public farms with well trained and experienced managers seemed to have better farming conditions than private farms (Deb et al., 2021).

## Governance

Innovation can come from various areas, including how the aquaculture systems are managed. A study examining rice-fish systems showed that concurrent rice-fish systems, alternating rice-fish systems, and collectively managed systems offered considerable potential for increasing productivity and farm incomes in Bangladesh (Dey et al., 2013). It was also noted that while innovation in these rice-fish systems is being driven by households and communities, there was a need for more supportive government policies and investments to enable further innovation.



An earlier study stressed that planning is as important as the operation of the farm (Dey et al., 2010). Assessing governance dimensions also yields practical insights into opportunities for

transforming the institutions that constrain resilience in local livelihoods (Ratner et al., 2013).

Community-based fisheries is a governance approach that can be considered traditional as well as innovative at the same time. One of the principles behind community-based managed fisheries is to improve the democratisation of fisheries governance, so that all those involved can manage their resources more efficiently over the long term (Shamsul Kabir et al., 2013).

Case studies also reveal that local people are key functionaries in the sustainable management of land and water. Local communities are able to regulate water use and provide a forum for resolving conflicts, thereby playing an important role in formulating relevant policies at the local level (Islam et al., 2010). It was also found that more collective and local power has a positive impact on financial and relational governance (Prodhan et al., 2023).

A study in Matiranga Upazila proposed that community-based aquaculture was ideal to overcome the present challenges such as high feed cost, lack of stakeholder linkage, lack of capital, and insufficient knowledge (Rana et al., 2022). According to the study, such an approach may help to expand aquaculture and thus improve the livelihood and socio-economic status of the people of the hilly areas of Bangladesh.

## POLICY INSIGHTS

### Identify characteristics of various aquaculture production systems in use in Bangladesh

A study was conducted to test whether clustering, and thus economies of agglomeration with implied lower transaction costs, encourage and facilitate farmers to innovate (Hu et al., 2019). According to this study, being in an area with a high clustering index is associated with a higher probability of farmers using more modern inputs and growing non-traditional commodity fish species, controlling for farmers' other characteristics as well as proximity to cities.

**A characterisation study, which identifies the various characteristics of the aquaculture production systems in operation throughout Bangladesh, and classifies these systems according to their common characteristics is the first step towards efficient innovation dissemination.**

Another study demonstrated that the total factor productivity (TFP) and technical efficiency (TE) of a farm are significantly affected by environmental characteristics, with geographical variation in water availability, colour, and plants, as well as variations depending on feed types and culture systems (Mitra et al., 2020).



In addition to the environmental and geographical characteristics mentioned above, there are various other characteristics that influence the operation of an aquaculture farm. These characteristics can differ based on their level of commercialisation, their scale of operation, the intensity of operation, revenue and assets, the type of labour employed, the species of fish in use as well as the type and source of fish feed. These characteristics not only define the operation of an aquaculture production system, but they can also be used to identify innovative solutions to the emerging problems.

As mentioned earlier, different types of aquaculture farms face their own distinct problems, so universal solutions may not apply. In addition to the varied challenges, the production and profitability of the farms also differ based on the farm characteristics. For instance, the challenges faced by a large tilapia farm with high operation costs will be unlike the issues faced by a small carp farm with low commercialisation (Karim et al., 2020).

Consequently, innovations designed for the former may not be applicable for the latter, and vice-versa. Considering this, WorldFish is currently undertaking an important study in Bangladesh to identify the various significant features of aquaculture farms in Bangladesh and group farms according to their characteristics. This will streamline the application of correct innovations to the appropriate farms and make the process more efficient.

### **Involve farmers in identifying problems and designing innovative solutions with targeted approaches**

Once the characteristics of the farms have been identified, the farmers should be involved in identifying the

problems, creating innovative solutions, and disseminating them.

As has been experienced on many occasions in Bangladesh, aquaculture farmers themselves come up with innovative solutions to the challenges they face. Considering that it is farmers who are the most knowledgeable about the characteristics of the aquaculture they practice, they should be involved in the process of designing targeted approaches for dissemination of innovation.

Additionally, dissemination of information through training programmes and extension services provided by local stakeholders could help farmers improve productivity and efficiency, thereby helping provide food and improving livelihood conditions (Mitra et al., 2020).

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