policy brief

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Integrated floodplain management

Can we operate sluice gates in way to enhance fisheries inside modified floodplains?

Embankments and sluice gates seriously affected fisheries inside the floodplains resulted in livelihood insecurity for poor fishers.

Which is better? Fish unfriendly fish-pass, or fish friendly sluice gates operation?

Putting research knowledge into practice

FCD/I schemes, floodplain fisheries and livelihoods

There are about 13000 km embankments and 4190 sluice gates constructed under 653 Flood Control, Drainage and Irrigation (FCD/I) schemes in Bangladesh. These FCD/Is are built to protect rice crops in floodplains, and communities, against extreme flooding. However, sluice gates and embankments have severely reduced species diversity and fisheries production of 5.5 million ha of floodplains. As a result, these schemes affected livelihoods of millions of peoples, including fishers, as well as degrading the natural wetlands environment.

Whilst the benefits to farmers are significant, the fisher communities suffer lower fish catch and species diversity. Reduced access of migratory whitefish species is largely responsible for these losses.

What are the major problems?

1. **Obstruction to fish migration:** Fish migration to and from these wetlands is either completely or largely stopped. Generally, three types of structures are built under FCD/I schemes.

a. **Embankments along rivers** to protect overspill of water from the river to adjacent crop fields, floodplains, and beels.

b. **Closed canals** to prevent river water entering the floodplain beels through canals.

c. **Regulators built** at the mouth of canals/distributaries to regulate entry of water to the adjacent floodplains beels.

2. Catching migratory fish:

a. Catching migratory fish in canals: With the onset of monsoon when fish start to migrate, people begin catching fish at the mouth of canals/small links that are used as their migratory routes.

b. Catching migratory fish at sluice gate: As mentioned, there are numerous sluice gates in the FCD/Is. When fish try to enter into the floodplains through these sluice gates, people set nets and different gears to catch fish that escaped capture in the canals.

3. Reduction in habitat: Due to aforestation and unplanned land use, landslide and erosion has increased in the hills and uplands resulting in siltation of the canals and small rivers. Consequently, water flow through them has either stopped completely, or reduced significantly, hampering fish migration. The silted up canal between Juginee Beel and Laohajang River at Tangail District is a good example, where fish production in the beel reduced suddenly as the connection was disrupted and no fish could enter into the beel from the river.

4. Water quality: Pesticides and other agrochemicals mix with the stagnant water inside the embankments, polluting it and harming the aquatic life, especially during dry season.

Sluice gates operated in a fish friendly manner allowing limited fish migration and is possible without hampering rice production

Studies revealed that 50% of migrating fish are caught before they even reach the entrance of sluice gates

When is sluice gate management important?

Whilst fish catches tend to increase from June to reach a maximum during the ebb flow (October), average fish size is comparatively bigger at this time. Thus, the **numbers** of fish (e.g. **potential recruits**) per unit biomass is much higher in early flood phase meaning:

- 1 ton of immigrating bele fish (*Glossogobius giuris)* = ~ 1 million individuals in July,
- While 1 ton of bele fish = 125,000 individuals in October.

In other words, the number of fish migrating during the early flood may be **10 times** greater (whilst catches may seem smaller, numbers of fish are very high) than that of the ebb flow. Most fish spawn in May-July **before** ebb flow.

During the early flood (June-July) immigrating fish largely comprise of small juveniles but are also accompanied by sexually mature individuals that have either recently spawned or will spawn imminently.

Sluice gates should be operated to ensure fish eatery in to FCD/I schemes during **early flooding prior** spawning to maximise recruitment

Facts relevant to fish friendly operation of sluice gates

Rising floodwater and fish migration: Very large number of juveniles and spawning adult fishes can enter FCD/I schemes via sluice gates with inflowing water. Maximizing the inflow of water during the rising flood period will help to ensure that more fish can enter FCD/I schemes. This will improve both catches and biodiversity.

Frequency of gate opening: Biodiversity and fish production benefit from more frequent gate openings, particularly during the rising flood period. Turbulence, if occurs in front of sluice gates can act as an obstacle to the induction and smooth passage of fish through gates.

Response of migrating fish to ebb flows: Large numbers of juvenile and spawning fish can successfully migrate through sluice gates with inflowing water during the flood period. Chances of successful passage of larger but less numerous fish through sluice gates during the ebb floods can be achieved by ensuring that ebb flow velocities do not exceed the maximum sustainable swimming capacities of inwardly migrating fish and/or by creating ebb flows that attract the most fish towards the sluice gate.

More dry season water within FCD/I: Studies have shown that rising average dry season water levels by as little as 25cm brings significant benefit to fisheries inside FCD/Is. This improves the survival of fish during the dry season, and increases spawning successes during the start of the rainy season.

Migrating fish and fishing along channels: More than 50% of migrating fish can be caught before they even reach the entrance of sluice gates. Controlling fishing activities along channels connecting gates to main rivers is therefore very important, particularly in circumstances where gates remain permanently open.

Alternative rabi crops and fish inside FCD/Is: Switching to alternative rabi crops such as wheat, maize, onion, potato that require less irrigation (less frequent and smaller applications of water) could help reduce pressure on dry season water resources that provide critical habitats for resident fish population.

Controlling fishing activities along channels connecting the gates to main rivers is likely to be as important as the fine-tuning of sluice gate operations.

Conclusion from sluice gate studies

Specific recommendations, made from the findings of a sluice gate study conducted under FMSP project (R8486) helping improve the catch and diversity of fish species inside FCD/I schemes, requires neither the construction of costly fish passes, nor any structural changes of existing sluice gates. Instead, fish friendly operation of the sluice gates can easily be implemented with the help of local stakeholders aiming to benefit fisheries inside the schemes, with minimum impact on farmer's well being

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Policy Recommendations

- Ensure operation of sluice gates to maximize the flow of water (and therefore fish) into the flood control schemes during the rising flood period.
- Ensure sluice gates are open as frequently as possible and attempt to minimize the turbulence of water outside sluice gates during the rising flood period.
- Encourage closing sluice gates during the ebb flood to retain more water within FCD/I schemes in dry season.
- Ensure control on fishing along channels connecting the sluice gates to the main rivers and at mouth of the gates.
- Encourage alternative cropping strategies and retirement of marginal low-lying lands from cultivation that is more prone to early flood risk.

Reference and Further reading

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This policy brief is prepared based on research findings of various projects aiming at improved floodplain resources management.

Further Information

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