

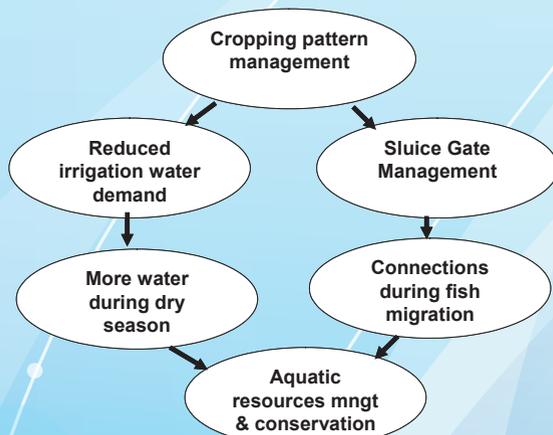
# Improving Floodplain Management: Benefits of an integrated approach

- There are competing uses of water and complex interactions in use of natural resources in floodplains that often hinder each other. Considering the overall productivity of the system, there are opportunities to balance resource use and benefit all.
- Integrated Floodplain Management favours more sustainable practices, such as reducing pesticide use to protect fish, and results in greater resilience to climate change. For example, when communities cooperate more surface water can be maintained for fisheries by adopting in some areas high return but low irrigation demand rabi crops.

“Improving Floodplain Management through Adaptive Learning Networks” is undertaken by Bangladesh Environmental Lawyers Association, Middlesex University Flood Hazard Research Centre, and Banchte Shekha, with support from the Canadian International Development Research Centre. “Integrated Floodplain Management” is undertaken by the same three partners plus Center for Natural Resource Studies and MRAG, with support from the UK Department for International Development’s Research Into Use programme. The projects work with about 250 existing Community Based Organisations (CBOs) formed by previous projects for fishery or water management, to facilitate networking and a structured learning process between CBOs. The CBOs have identified and tested a range of measures to improve their management of natural resources, and have also improved governance and participation.

## IFM Concept

Floodplains are complex systems where private land becomes a seasonal commons when flooded, and where people make use of a multitude of natural resources, all interlinked in an ecosystem connected through water. Bangladesh has ample water in its floodplains in the wet season, but the limited amount of surface water in the dry season drives productivity. Past agricultural development focused on rice production, abstracting water to irrigate crops in the dry season, and using drainage and flood control to protect crops in the monsoon. The poor in particular depend on aquatic common pool resources, such as fisheries, but these have been declining as a result.



The set of innovations to improve agriculture, water use and fisheries management in ways that complement one another is known as Integrated Floodplain Management (IFM). Arising from several earlier research projects mostly supported by DFID, IFM takes a system-based approach to resource management. It incorporates:

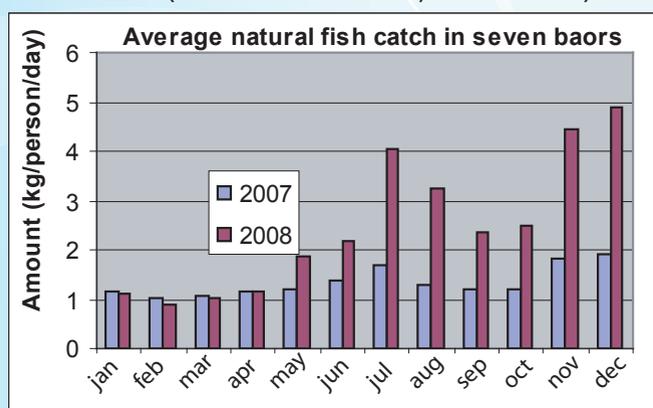
1. Profitable dry season crops with lower water demand than irrigated rice to conserve water for fish.
2. Natural fishery management using sanctuaries, closed seasons, and reintroduction of scarce species.
3. Shorter duration rice varieties to enable earlier sluice gate opening to facilitate fish migration.
4. Measures to improve water quality and ecosystem health (e.g. integrated pest management).
5. Excavation of canals to restore water for fish and crops.

Local institutions for collective action are a precondition for IFM. These Community Based Organisations (CBOs) have recognised rights and responsibilities for management of defined floodplain and waterbody areas. This brief is based on evidence from 133 existing CBOs spread across Bangladesh that have adopt IFM approaches and components, out of 155 CBOs involved in adaptive learning since 2007.

## Lessons And Evidence

### Fish

During 2007-2009 56% of participating CBOs took actions to improve fisheries management. The most important measure has been fish sanctuaries supported by a local ban on fishing in the spawning season (early monsoon). A sanctuary is part of a waterbody which the community protects year round as a "fish bank" and where they improve habitat using brushpiles. By 2009 about 75% of 149 CBOs managing areas that retain dry season water had a fish sanctuary. On average 6% of dry season water is reserved in sanctuaries (4% in closed beels, 8% in rivers).



A study of sanctuaries in nine waterbodies where the communities set aside on average 6% of dry season water area (range 0.5-13%) found that by 2008 compared with before sanctuaries on average five more species are caught. Catches of 70% of the original species were reported to have improved, and catch per fisher per day increased by 37%.



Sanctuary in seasonal floodplain ditch

CBOs managing closed beels and baors (oxbow lakes) invest each year in releasing carp fingerlings which do not reproduce in the waterbody and are harvested after growing to a marketable size. After hearing the experience of other CBOs,

the CBOs managing seven baors made sanctuaries for the first time, which proved very successful by increasing the diversity and catch of wild fish for a small cost and with no adverse effect on carp production (see graph).

Six baors that had kept reliable records of stocking and harvesting for 2-5 years shared this to draw lessons. Production and income vary greatly between years and baors, but smaller baors are more intensively managed. On average the harvest of fish is 3.7 times the weight of fingerlings stocked. Stocking larger fingerlings does result in higher catches, but the relationship is not strong.

Participatory monitoring of fish catches by 27 CBOs when compared with their management practices indicates that fish catches are higher where the CBOs banned dewatering. Fish reintroductions had not yet impacted catches or species diversity, since CBOs with low species diversity have tried this. All of these CBOs have sanctuaries, and variation in the narrow range of proportions of water protected did not affect catches. Of some concern is the dispersal of exotic fish, on average three exotic species were caught per river site, which is similar to closed beels managed through stocking.

Outcomes and lessons:

1. Once CBOs calculate the income from fish in their area, they try to convince the community to stop completely draining water for rice cultivation.
2. Networking between CBOs creates an opportunity to exchange fish for release in the wild to restore locally extinct or rare species.
3. Further research is needed to understand how to conserve locally rare/extinct native fish species.
4. Fishers recommend that branches from Shaora, Hijol, Tetul, Mango and Babla trees are best for sanctuaries and those of Nim, Sajna, Jiga and Akashmoni should be avoided.
5. Tree branches for sanctuaries are expensive. CBOs have started to collect a branch from each member to reduce expenditure and increase community ownership. They also started to grow trees.
6. Fish sanctuaries are beneficial in all types of waterbody and management system.

Crops	Water demand (mm)	No farm	Net return (Tk/ha)	Benefit – cost ratio
Grasspea	90-100	10	33,000	4.6
Garlic	150	32	63,700	3.4
Mustard	160	41	24,000	2.9
Mungbean	180	28	24,000	2.5
Wheat	200	10	11,500	2.2
Maize	240	16	12,143	2.7
Sunflower	300	29	49,000	3.7
Potato	350	10	99,970	2.3
HYV rice	835-1000	9	19,700	2.1

Sources: water demand IFM project; other data – farmers' field trials

## Crops and water

Climate change predictions point to a warmer world, with increased hazards of floods and drought within the next 50 years. This trend is increasingly being supported by 'on-the-ground' measurements. Moreover the increasing population results in high demand for freshwater for competing needs of crops, fish, environment and daily human use. Bangladesh with limited adaptive capacity and resources is highly vulnerable to climate change. Freshwater scarcity in the dry season, increased salinity, and siltation of canals are some of the problems that will adversely affect floodplain production systems and the livelihoods of the poor.



Mustard cultivation also offers benefits for bee keeping

In the dry season to conserve surface water there is scope to adopt low water demand alternative cash crops such as grasspea, mung bean, wheat, maize, garlic, mustard, potato, sunflower. As noted below these have a much lower water demand than irrigated HYV boro paddy in the dry season, yet the returns are in most cases substantially higher than for rice.

Adoption of alternative rabi crops where those crops were not cultivated before is slowly increasing as the farmers see they are profitable and more resilient to the changing climate. Although farmers are more comfortable growing paddy for food security in the dry season using groundwater irrigation, the high returns and benefit-cost ratio of other crops is now encouraging the farmers to rethink their cropping patterns. When this reaches a critical mass, even over a modest part of a CBO's floodplain, it can help conserve important amounts of surface water for fish. In 2007 only six CBOs tried new crops, but by 2009 the number increased to 76, and the number of farmers adopting these crops increased 21-fold (from 18 to 384). For example, the number of farmers who are cultivating sunflower for oil increased by 800%.

### Case study of farmer innovation: intercropping

In Goakhola Hatiara beel in the southwest region farmers tried cultivating turnip with garlic and mustard with grasspea. The yield of garlic remains the same but turnip added Tk 8,000 to the total income per hectare. Grasspea and mustard intercropping can add Tk 7,000 per hectare to the net return from separate cultivation of grasspea or mustard.

Some rabi crops, such as no-tillage garlic and mustard, need very little water and are grown in higher lands. However, if one farmer cultivates crops that do not require irrigation and on other adjacent plots the farmers grow irrigated HYV paddy, then the rabi crop farmers risk losing their crop. CBOs have raised this issue, and could facilitate synchronised coordinated cultivation of crops with similar water demand on adjacent plots in higher land.

Not all crop trials by CBOs have succeeded. They found that sandy soil in higher land is not suited for wheat as it retains insufficient moisture. Theft of maize cobs and sunflowers has been encountered. Parakeet attacks affect sunflowers, but can be avoided by using nets and making noise. New opportunities have also been identified by CBOs: mung bean can be cultivated after harvesting mustard. Intercropping of turnip with garlic and mustard with grasspea increases overall returns. Also mung bean helps restore soil moisture and can be followed with Aus rice.

## Sluice operation

“Fish-friendly” operation of sluices involves opening sluices in the early monsoon (to permit fish to migrate to spawn and to allow spawn and fry to enter floodplains), and closing sluices earlier after the monsoon (to retain more surface water). This requires a high level of coordination at the CBO level, and among fishers so that concentrations of fish are not all caught, and among farmers of lower land to grow shorter duration rice crops. About 30% of open beel-floodplain CBOs report that they consider fish in operating sluices, but further action research is needed to determine how far they can adjust opening dates and the benefits.

## Other aspects of integration

CBOs have successfully tested a wide range of innovations to expand IFM. Wider adoption depends on CBO interest to provide a safety net where the poor share in collective enterprises with the CBOs and cope with risks.

Traditional jute retting results in insufficient oxygen in water for fish in some floodplains and rivers. “Ribbon retting” where fibre is stripped from the sticks before soaking in ditches and containers avoids open waters but depends on a simple stripping mechanism.



Stripping jute fibre for ribbon retting

## Further reading

CNRS, WorldFish, ITAD, and MRAG. (2005) Better Options for IFM: Uptake Promotion. NRSP Project R8306 Final Report. Center for Natural Resource Studies, Dhaka.

Shankar, B., Halls, A. and Barr, J. (2004) Rice versus fish revisited: On the integrated management of floodplain resources in Bangladesh. *Natural Resources Forum* 28: 91–101.

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CBOs report that wild bees are declining with negative impacts on crops and fruit. Where integrated pest management is adopted to reduce pesticide use and improve fish survival, there is also scope for CBOs and poor members to jointly adopt bee keeping. Based on experience of 13 CBOs, success depends on the skills and interest of participants.

When surface water is maintained, CBOs can take up duck rearing, which even helps fertilise water where fish are cultivated in pens. At first larger ducklings were bought from government farms, but survival was poor. CBOs gained skills, bought 1-day old ducklings, improved their care, reduced losses and achieved profits.

## Policy Recommendations

Integrated Floodplain Management does bring benefits: collectively in terms of overall productivity of floodplain-waterbody systems, and for poorer people who depend more on fish and other aquatic resources and who also can take up environment-friendly enterprises.

Expansion of IFM requires a change in mindset in government agencies. IFM is not firstly about each technology, it requires agencies responsible for water management, fisheries and agriculture extension to cooperate and coordinate and not focus just on their own area of technical expertise.

Expansion of IFM also requires the development of CBOs that represent all of the stakeholders in the system, where necessary with sub-committees for different key areas. Effective local participatory planning that draws together the linkages between problems in floodplains and potential of IFM is vital. CBOs and agencies should facilitate coordination among farmers in crop choice and demonstrate the viability of low water demand crops.