Scaling up Integrated Floodplain Management through Adaptive Learning Networks

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ABSTRACT

A set of innovations developed in Bangladesh form the "Integrated Floodplain Management" (IFM) approach. It recognises the floodplain as a system where the uses and amounts of surface water in the dry season critically affect the main products – crops and fish. Innovations include fish sanctuaries, crops with reduced irrigation demand to preserve surface water in the dry season, and adjustment in sluice opening to permit fish passage. A precondition is the existence of community-based organisations (CBOs) with rights and responsibilities to coordinate management of floodplains. Since 2007 and 2008, two projects have been scaling up IFM. About 250 CBOs are involved in testing the elements and overall approach of IFM. The process is an adaptive learning network that operates through a cycle of workshops among CBO leaders to coordinate and share experience, lessons, and plans. Each CBO then plans and adjusts its management practices using better informed and more participatory processes. This paper traces the experience of adaptation and innovation, reports initial impacts, and draws some lessons.

Key words: adaptive learning, fisheries, water management, Bangladesh

INTRODUCTION

Floodplains cover about half of Bangladesh. Large areas of private farmland become seasonal common fisheries when the land is inundated for up to half the year. They are connected by a complex network of rivers and channels (*khals*), and contain depressions known as *beels* that hold water all year. These fertile lands support one of the highest densities of rural people in the world, averaging 885 people/km^2, who traditionally have depended on rice and fish.

The amount of surface water in the dry season drives the productivity of a system in which water is overabundant in the wet season. Conflicts between farmers and fishers (or in other words rice vs. fish) over dry season water are a common feature in floodplains (Shankar *et al.* 2004). The farmers, who are wealthier and influential, most often win the game. The poor, who depend on floodplain common pool resources for a substantial part of their livelihood, lose. Development support has exacerbated this through a bias towards interventions that favour rice cultivation.

This paper shows how a 'systems approach' can produce win-win outcomes and how an adaptive learning framework is being used to link many community-based organisations (CBOs) to innovate in improving their management of floodplain resources. It shows how communities that have already organised to improve agriculture, water use or fisheries, can coordinate their actions in using floodplain resources to complement rather than compete with one another, increasing joint benefits from floodplains. Known as Integrated Floodplain Management (IFM), this approach recognises the floodplain as a system in which the uses and amounts of surface water in the dry season critically affect the two main products – crops and fish.

INNOVATION HISTORY

Overview

The IFM approach and related innovations have gradually emerged. This is not a single well-defined product or practice, such as a new crop variety. Key elements of this process were a series of research projects in Bangladesh under the Land-Water Interface component of the Renewable Natural Resources Research Strategy (RNRRS) of the UK Department for International Development (DFID), which from the start took a holistic view of floodplain resource management. Other important innovations came from project and community initiatives in fisheries management, and from DFID's Fisheries Management Science Programme. These are complemented by "environmentally friendly" agricultural innovations and wider institutional innovations. Elements of innovation have clustered around: participatory planning, activities that fit within a system framework (e.g. IFM options), institutions to enable collective action, and, most recently, an adaptive learning process (Figure 1).

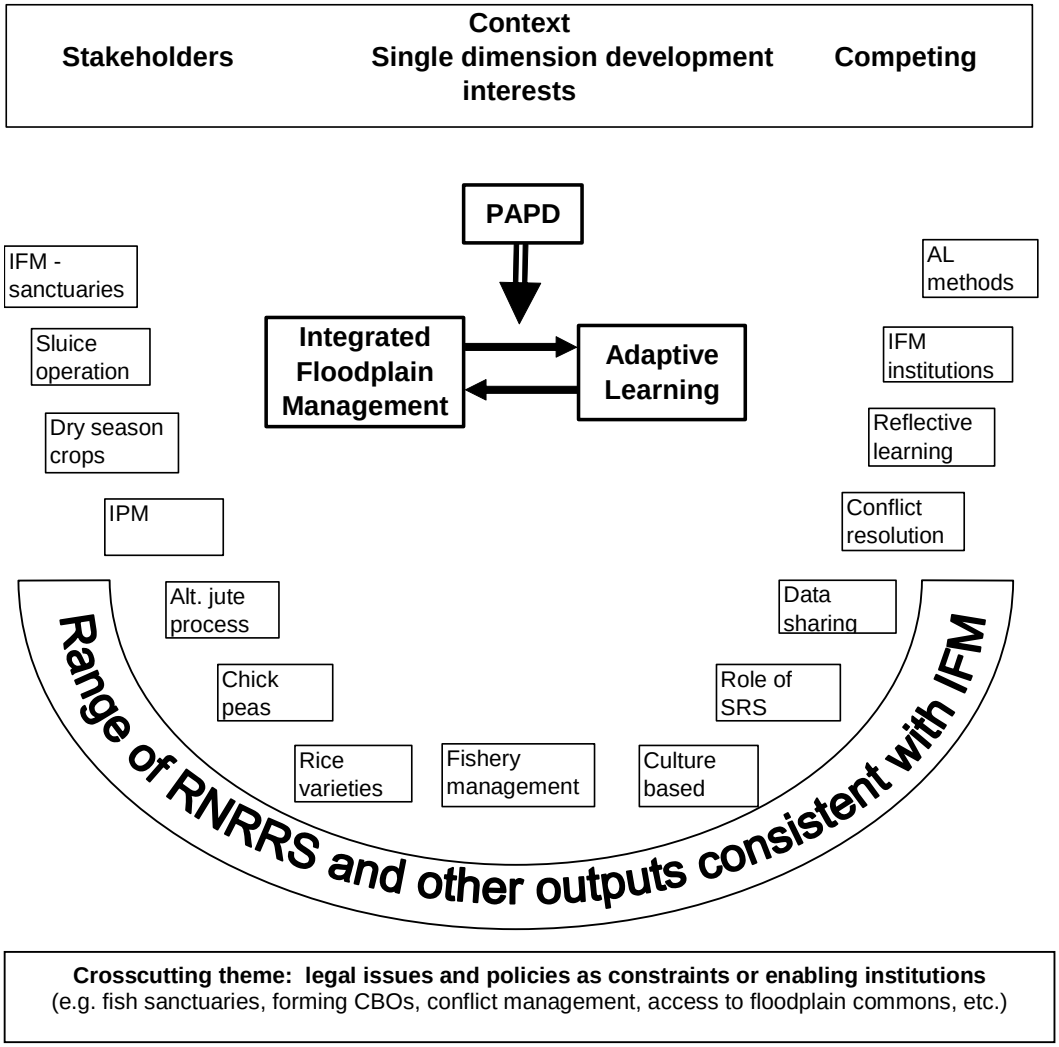

Figure 1 Innovations that contribute to the IFM approach

Participatory Action Plan Development

Participatory planning is not a new idea, but research into the diversity of stakeholders in Bangladesh floodplains led to a series of projects that developed, tested and promoted a process for consensus building that aimed to be pro-poor and inclusive. The design was influenced by research and participatory practices in other countries. The process evolved through experience with local communities into "Participatory Action Plan Development" (PAPD). This involves a series of linked

local workshops in which different stakeholders participate separately and together to develop a management plan for the common floodplain resources they use (Sultana and Thompson 2004). The process is designed to ensure that poor people's interests are voiced and represented at least on an equal footing with more powerful stakeholders.

The core PAPD sequence comprises of: problem census and prioritisation along with solution identification by separate stakeholder groups; a plenary among these stakeholders to finalise overall priorities; analysis of possible solutions and their implications with separate stakeholders; and a final plenary with primary stakeholders and local officials to review the outcomes and gain support for a plan of most feasible actions. PAPD has been used in a range of situations in Bangladesh. Moreover, PAPD has been shown to be effective in terms of prompter adoption of a greater range of resource management activities, reduced conflict and greater compliance, comparing fishery management CBOs that were formed with or without PAPD (Sultana and Abeyasekera 2008).

Community organisations and institutions

Community organisations that manage floodplain resources have arisen from two parallel pathways, both founded on international trends for community-based co-management, participation and devolution of responsibilities to local institutions (Pomeroy and Rivera-Guieb 2006). From the early 1990s several projects supported a shift from piloting individual licensing of fishers in Bangladesh to organising poorer fishers into CBOs to manage well defined oxbow lakes (*baors*), larger open *beels*, and rivers. Although it was not the original objective, whether working with just fishers or the wider community, the most effective arrangement that evolved has been to form CBOs that are registered with the government as legal entities, and that receive reserved rights to manage public waterbodies (Thompson *et al*. 2003). Separately, public participation has been emphasised in water management since the early 1990s, leading to formal guidelines and a policy by the early 2000s of transferring ownership of smaller water control infrastructure to specially formed CBOs.

Fisheries management

The key fisheries management innovations that are an essential component of IFM arose from NGO led projects in the 1990s. When the government tried earlier to declare fish sanctuaries, compliance was poor. But attempts by CBOs showed that sanctuaries were a preferred visible action, valued and easily implemented by communities (Thompson *et al*. 2003). Existing local practices of using brush piles and ditches to aggregate fish for capture were adapted to make some of these year-round sanctuaries. Meanwhile, the Center for Natural Resource Studies successfully piloted excavation to restore habitat and connectivity for fish migration in the mid 1990s (Rahman *et al*. 1999), and this was expanded by the MACH project (see Table 1), which also tested reintroduction of locally rare species.

Integrated Floodplain Management

Initial modelling and research investigated the scope to maximise floodplain productivity and returns by taking an integrated view of the resource base to better balance agriculture with fisheries, and that could at the same time benefit the poor who depend more on a common pool of resources (Shankar *et al.* 2004). Based on this, IFM components were identified, such as dry season refuges for fish, closed fishing seasons in the early monsoon, adoption of shorter duration and less water-hungry alternate crops to conserve more dry season water, and opening sluice gates earlier in the pre-monsoon so as to allow fish to migrate and spawn.

IFM options were tested in representative floodplains (CNRS *et al*. 2005). Piloting in 2003-5 in a 350 ha seasonal floodplain in southwest Bangladesh brought together, in a central committee, existing separate institutions involving fishers, farmers, and sluice operators. Farmers gradually replaced 20% of dry season irrigated rice with pulses, potatoes, and garlic. These crops were profitable and left more surface water in the dry season, which the community protected as a fish sanctuary. This enhanced fish survival and reproduction, resulting in higher fish catches. The systems approach was expanded to include Integrated Pest Management (IPM), and the community accessed government extension services for techniques to reduce water pollution from processing jute fibre.

This pilot built on existing local institutions and CBOs. There was already a CBO managing the floodplain fishery, which had protected ditches as sanctuaries and established a closed season. There

was a local committee to operate a sluice gate that connects the floodplain with a river (although it was not functional). Also, there was a farmer field school that had promoted IPM. IFM brought together these institutions into a common platform where they could coordinate actions based on an understanding of the links and potential gains from adjusting water management and agriculture in ways that would enhance returns from crops and help to restore the fishery. In addition, this was achieved by poor women taking an active role (Sultana and Thompson 2008), indicating that active participation of women might bring greater benefits as women showed a strong interest in joint action based on community level interests. This project helped identify pathways for scaling up.

ACTIVITIES FOR SCALING UP

IFM is being scaled up through two linked projects: Adaptive Learning Networks supported by the Canadian International Development Research Centre (IDRC) and Integrated Floodplain Management supported by DFID's Research Into Use programme. Implementation is by a partnership of the Bangladesh Environmental Lawyers Association, Banchte Shekha, the Center for Natural Resources Studies, the Flood Hazard Research Centre, MRAG, and 250 CBOs. The innovations comprise IFM options, PAPD, and adaptive learning.

IFM is based on collective action. It was concluded from earlier experience that rather than forming new CBOs, scaling up would be more rapid and cost-effective by working with existing CBOs. In Bangladesh there are already many CBOs managing floodplain natural resources. They were formed by projects that typically focused on one of fisheries, environment, or water management in a defined area. These CBOs were mostly facilitated by NGOs through externally funded projects. The CBOs are registered as legal entities and the government has recognised their rights and responsibilities. The members of each CBO come from those villages using a floodplain or waterbody and range from under 50 to over 400 households. Some limit access and benefits to their members, while others try to manage resources in the common interest of the wider communities that they represent. Since the original projects ended, however, each CBO has operated in isolation, continuing its original activities and trying within its capacity to maintain or improve productivity.

The first step in the IFM-adaptive learning approach was to identify CBOs that might be invited to participate. Lists of CBOs were obtained from seven major projects that had established CBOs managing floodplains and waterbodies (Table 1).

Table 1 Projects that established CBOs managing floodplain resources

Project	Description
AqDP[1]	Aquaculture Development Project. Supported by IFAD. Established CBOs in 9 closed beels in southwest. Ended 2005.
CBFM[1]	Community Based Fisheries Management projects. Supported by Ford Foundation, UK DFID and IFAD. Established 107 CBOs in different types of waterbody. Ended March 2007.
FFP[1]	Fourth Fisheries Project. Supported by World Bank and UK DFID. Established 46 CBOs in 40 waterbodies (started in 79 waterbodies). Ended June 2006.
MACH[1]	Management of Aquatic Ecosystems through Community Husbandry project. Supported by USAID. Established 16 CBOs in three large wetlands. Ended June 2007.
OLPII[1]	Oxbow Lakes Project phase II. Supported by Danida and IFAD. Established 22 CBOs in closed beels in southwest. Ended June 1997.
PBADP[1]	Patuakhali-Barguna Aquaculture Development Project. Supported by Danida. Established 128 CBOs, but 100 are shrimp enclosures. Project ended, but continued programme support.
SSWRDSP[2]	Small-Scale Water Resources Development Sector Project. Supported by ADB and Dutch government. First phase established 262 CBOs in floodplains in northwest and southwest, ended 2003. Second phase established about 200 CBOs to date.

[1] under the Department of Fisheries [2] under the Local Government Engineering Department

From over 200 fisheries-related CBOs and over 450 water management-related CBOs, we identified CBOs that had "graduated" from project support, were still active, managed floodplain resources, and were interested to improve their activities. About 150 CBOs are covered by the IDRC project, while the RIU project added another 100 CBOs and extended IFM support to the original 150. Some projects, such as MACH, CBFM-2 and FFP, had assessed the CBOs and their expected sustainability. There were no recent documented assessments of the other CBOs, so the concerned government officials were consulted to categorise the CBO capabilities and performances

subjectively. The weakest CBOs were not included. Some districts were excluded for logistic reasons, and some water management CBOs that store water to irrigate relatively dry areas were excluded.

Eventually, 265 CBOs were invited to initial workshops (allowing for some deciding not to join the process). Some CBOs or their leaders chose not to join meetings, possibly not anticipating any benefits, but others hearing about the project contacted the team and joined. Through the workshops, follow up visits and CBO responses, 255 CBOs have shown a continuing active interest in adaptive learning and IFM (see Table 2 for some overall characteristics).

Table 2 Characteristics of participating CBOs in 2008

Indicator	ALN (IDRC)	IFM (RIU)
Number of CBOs	154	101
Average wet season water area (ha)	388	363
Average dry season water area (ha)	76	34
Average number of households using floodplain	2,467	1,066
Average number of members	194	220
% of CBOs with women members	70	94
% of members who are women	14	21
% of members who are poor	67	53
% of CBOs that consult with poor non-members	33	39
% of CBOs with fish sanctuary	74	31

Source: IFM project baseline, ALN project mid-term assessment

ADAPTIVE LEARNING FOR IFM

Adaptive learning network

Adaptation is about systematically using the results of management and monitoring to test assumptions (Margoluis and Salafsky 1998) and thereby improve interventions. If an intervention did not achieve the expected results, it is because either the assumptions were wrong, the intervention was poorly executed, the conditions at the intervention site had changed, or some combination of these problems. Adaptation involves changing assumptions and interventions to respond to new information obtained through monitoring. Learning is about systematically documenting the process that was followed and the results that were achieved.

In management through adaptive learning the existence of uncertainties is not only accepted but made a focus of management efforts that seek to reduce the uncertainties at the same time as managing the resource. Learning and reducing uncertainties about the resource system becomes an integral part of management. Our view of adaptive learning is a three stage process comprised of generating, sharing, and using information. This follows Garaway and Arthur (2002), but the method has changed to reflect the complex and diverse interests of floodplain CBOs compared with a more limited focus such as improving management of culture based fisheries. In experiential learning, each CBO only learns from its own experience, but the adaptive learning network involves coordinated learning and trial activities among many CBOs. This is expected to result in more rapid improvements in floodplain resource management and generalization of key findings.

A two-stage process of workshops was adopted with 150 CBOs in 2007. One representative from each selected CBO was invited to a workshop for each environment and region, making eight workshops. Based on the gaps and lessons identified and discussed by the CBOs in each of these workshops, they were requested to prepare for a second round of three workshops; one each for floodplains, rivers, and closed waterbodies. In these larger workshops, the CBOs presented their ideas on lessons, best practices, and options that they wanted to test or adopt, and received feedback from their fellow CBOs. This process was quite detailed and lengthy, but it was clear that further review of CBO plans would be needed from the research team. An additional round of workshops by region (combining environments) was held, with a focus on reaching agreement among CBOs on suitable impact indicators, also updating and coordinating adaptive learning pilot activities, and helping CBOs within each region to exchange experiences.

Originally, a set of annual workshops (one per environment) was expected to be sufficient to enable CBOs to learn from one another and coordinate testing IFM actions. Experience in the last two years,

however, has shown that CBOs need more frequent face-to-face exchange to maintain momentum and to adjust in a continual process. An annual cycle of adaptive learning network links evolved (Figure 2) and includes two rounds of workshops involving all CBOs in each region (more cost effective), plus a round of smaller reflective learning workshops where CBOs from a particular region and environment can compare in detail their experience with each specific IFM intervention. The addition of 100 more CBOs in 2008 expanded the network and a fourth region was added. Smaller workshops were held with the additional CBOs to identify gaps and lessons learned so far before joining with the CBOs already engaged in the network.

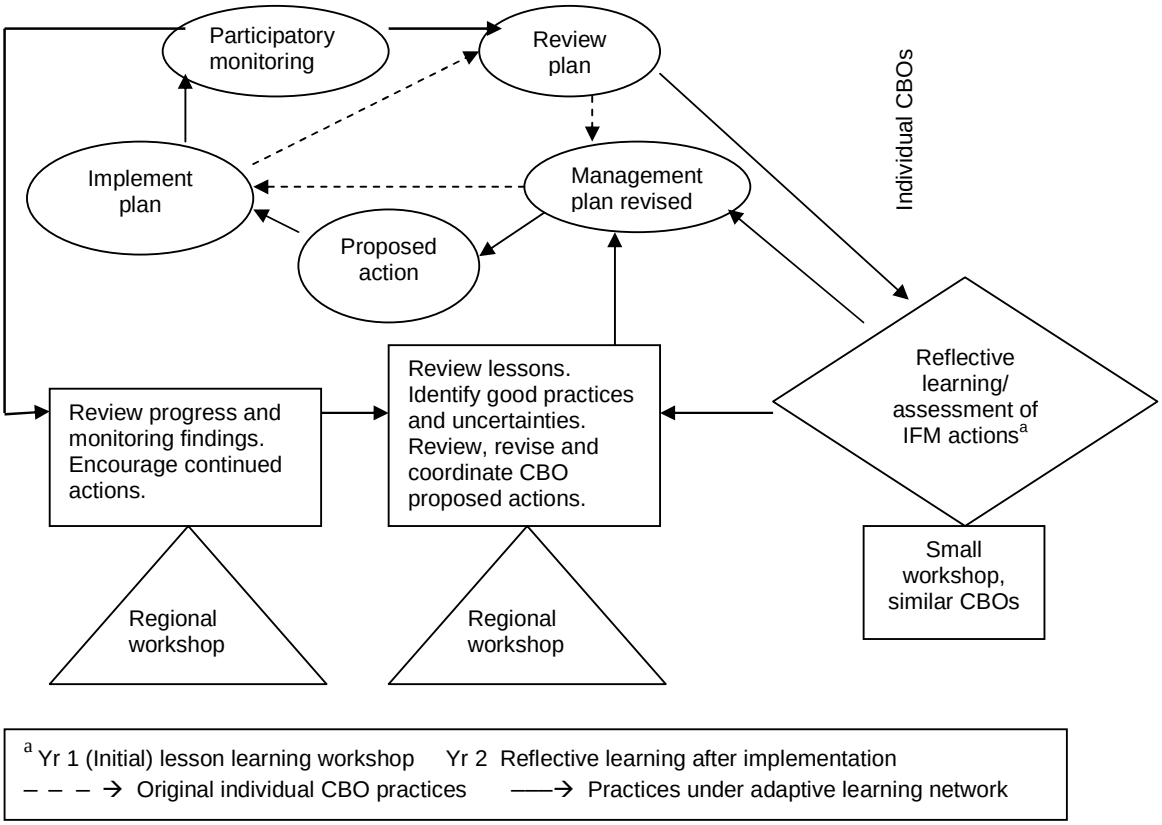

Figure 2 Adaptive learning network among floodplain CBOs

PAPD

Some CBOs were found to have a narrow perception of their management scope and weak governance that did not sufficiently reflect the interests of poorer floodplain stakeholders, so PAPDs were facilitated in these sites. Because CBOs with management plans already exist, PAPDs have been adapted and shortened to focus with each stakeholder group on reviewing problems, revising management plans, and encouraging CBOs to be accountable and responsive to the wider community they serve.

IFM scheme preparation and review

The two projects support the CBOs to test lessons and options identified in the workshops. The research team made rapid assessments of the feasibility of proposed actions (schemes) in the field to verify physical features and discuss the plans with the wider CBO membership. Through this process, agreements have been made with CBOs on those trials that could be implemented, and support (in kind where possible) was provided to the CBOs. Table 3 shows the first round of IFM pilot activities.

Table 3 Adaptive learning pilot activities for floodplain management in 2007-08.

Activity	Learning opportunity identified by CBOs	CBOs testing
Sanctuary improvement	Test materials that are better for fish aggregation.	43
New sanctuary	Test sanctuaries in sites that lack them, and effect on catches and diversity of native fishes.	29
Tree planting	To reduce soil erosion, test different species.	21
Community centre improvement	Poor condition or lack of community centre inhibits CBO activity and community cohesion.	19
Alternate rabi crops	Crop viability and to reduce abstraction of dry season water.	10
Bee keeping	To generate income to reduce fishing pressure.	9
Duck farming with fish	To add an income from waterbodies.	8
Boat	To reduce poaching in larger waterbodies.	7
Fish re-introduction	Find out which lost fish species recover.	5

Others: Aquatic plant reintroduction (planed not implemented); Awareness raising; Composting water hyacinth; Fish culture; Embankment/grill to reduce fish escape; Training women, and Ecotourism.

Exchange visits

Exchange visits were arranged so that all CBOs could visit CBOs with successful demonstrations of key IFM options and that follow good governance practices. Particularly for the additional CBOs, discussion with the host communities about the pros and cons of innovations has helped their understanding and planning for IFM.

Indicators for adaptive learning

In the additional round of workshops, CBO leaders divided into smaller groups according to their trial activities and identified expected impacts and possible indicators that they could use in generating lessons. Through plenary sessions a set of common indicators was identified and agreed, and the CBOs are collecting this data with advice from the research team.

Reflective learning sessions

Small group sessions have been used to review innovation experience. CBOs implementing the same innovations in one environment-type exchange their views on problems, opportunities, capacity enhancement, causes of success and failure, and cost-effectiveness, compared with earlier experience. Through these comparisons, pitfalls in implementation or innovation design are identified, along with improvements. The CBOs are preparing revised management plans on the basis of these lessons.

IFM INNOVATIONS AND THEIR EFFFECTIVENESS

Here we report on experience with IFM options based on participatory monitoring and the experiences reported by CBO leaders during reflective learning workshops.

Alternative crops and enterprises

In the 2007-08 dry season, 62 farmers tried three alternative crops (garlic, potato and mustard) rarely or not previously grown in their areas. On average, all three crops proved profitable (Table 4). Although garlic was the most popular crop tried, potato gave the highest net return on investment and per acre, but it also has a high investment cost and its expansion is limited by the availability of cold stores. The costs and risks for mustard were low, but so was the profit.

Table 4 Costs and returns from some innovations in floodplain resource use

Initiatives	Number[a]	Cost per initiative (BDT)	Gross benefit (BDT)	Net benefit (BDT)
Crops (figures are per acre)				
Garlic	41	19,840	32,470	12,630
Potato	6	18,160	61,420	43,260
Mustard	15	3,430	8,510	5,080
Other (figures are averaged per site)				
Duck rearing (farm with 100 ducks) year-1	6	37,000	55,000	18,000
Bee keeping (starting with 2 boxes/hives each)	8	2,000[b]	3,200	1,200

[a] For crops individual farmers, for others CBOs.
[b] Excludes training
Note: USD 1 = Bangladesh taka (BDT) 69 in 2008

Five floodplain CBOs where garlic cultivation was demonstrated in 2007 kept records of the number of farmers and areas cultivated in 2008. This shows a spontaneous expansion of the practice among farmers who tried the crop with their own resources (Figure 3). If the trend continues it will contribute to reducing abstraction of surface water for irrigation.

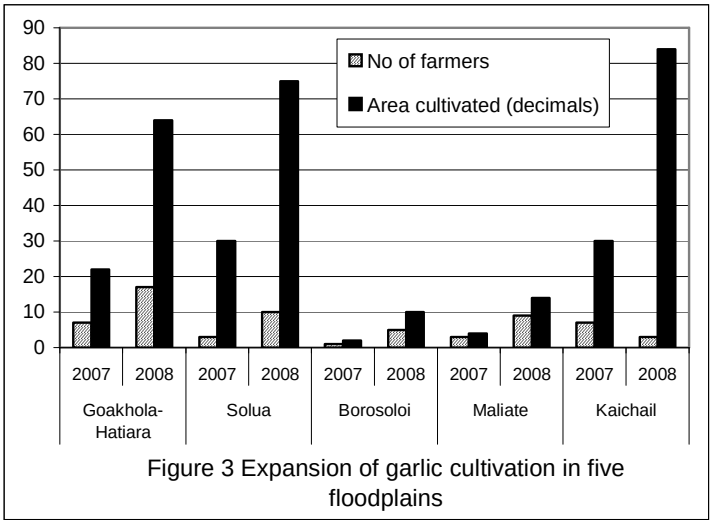

Figure 3 Expansion of garlic cultivation in five floodplains

The participants have raised several issues, and further adaptation and innovation is planned:

- Obtaining sufficient good quality seeds of alternate rabi crops has been a problem. The CBOs concluded that seed purchase needs to be planed well ahead of planting, germination needs to be tested before planting, and government supplied seeds are not reliable.
- Farmers agree they can save irrigation and tillage costs by switching from rice to alternative rabi crops, which need minimal fertilizer or pesticide.
- Although increasing numbers of CBOs are willing to try (upscale) innovations, horizontal expansion among farmers within a floodplain takes time and is dependent on stable and sufficiently high prices for the products.
- Crop yields decline when they are grown using farmer retained seeds for over three years.
- The relative merits and limitations of HYV and hybrid rice varieties were discussed. It was reported that many farmers who grew hybrid varieties had started to grow short duration HYV rice in the irrigated dry season (which should enable them to save seeds and to open sluice gates earlier).
- Labourers reported they were better able to bargain for higher wages and a standard working day, partly because fewer people are seeking work. For example, share croppers said they now have enough production and work in their fields and so do not go for day labouring.

Group duck rearing was profitable eventually. Initially, relatively large ducklings were bought from government duck farms, but survival was poor. Participants switched to buying 1-day old ducklings locally and raising them carefully, which reduced losses.

Although bee-keeping has so far given low returns, it has very low costs and may become more profitable as expertise and the scale of operations increases. Bees need food throughout the year, however, few plants flower during the rainy season, so these CBOs decided to plant different flower bearing trees. Also, the CBOs report that wild bee populations have been declining, with negative impacts on fruit production, so bee culture is becoming an essential part of the farming system.

Fishery management

Out of 72 CBOs that established new or improved sanctuaries, 46 reported that natural fish catches and species diversity increased by mid 2008. Moreover, five CBOs tried re-introducing rare or locally extinct fish species and report positive results.

Sanctuaries have had the most marked impacts in *baors* (oxbow lakes) in the south-west that practice annual stocking with carps but had not used sanctuaries previously. In late 2007 to early 2008 seven *baor* CBOs introduced sanctuaries and kept records of fish catches. Diversity of native fishes increased in the second half of 2008 (Figure 4). The average catch per person day of CBO members who fished individually (not targeting stocked fish) increased from 1-2 kg/person/day to over 4 kg/person/day in the monsoon and at the end of the year, when falling water levels made fish easier to catch.

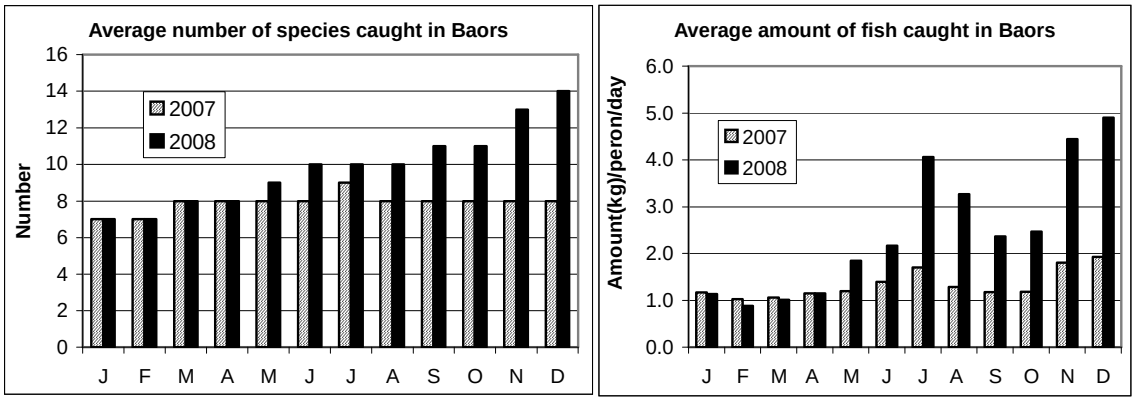

Figure 4 Impacts of fish sanctuaries in seven baors.

Some key findings including outputs from reflective learning are:

- Completely draining water for rice cultivation has stopped after calculating the income from fish in the same area.
- CBOs have started to exchange fish for release in the wild to restore locally extinct or rare species.
- Locally available tree branches are used as sanctuary materials. The best tree species, firstly Hijal (*Barringtonia* sp.) and secondly Shaorah (*Streblus* sp.), have been over-exploited and are now rare, so less preferred trees are used. Even so branches are expensive. CBOs have started to collect a branch from each member to reduce expenditure and increase community ownership.
- Further research is needed to find ways to conserve locally rare/extinct native fish species.

LESSONS AND ISSUES

IFM and the process through which it is spreading are not fixed innovations. They are dependent on the interactions of a large number of CBOs – with their members and communities, with one another, with local agencies, and with the project teams. So far some lessons and issues can be drawn that may be of wider relevance to innovation practice:

- The learning process itself has changed through interaction with the CBOs.
- A registered federation of CBOs has been formed, creating a platform for CBOs to raise issues and initiate dialogue with policy makers.
- Regional and central representatives of the federation have joined the project steering committee, and immediately raised concerns over future policy regarding access to waterbodies.

- CBOs, and therefore the members of the federation, are scattered throughout the country. Close coordination needs frequent interaction and this needs funds for meetings, visits, workshops, and an annual convention.
- CBOs have inherited objectives from the projects that formed them. Injecting new ideas such as IFM, even through a learning process between CBOs, needs time before CBO leaders and members understand and change their management plans.
- Those CBOs that never prepared annual plans have adopted this practice to systematically record the activities they want to continue and new things they want to try.
- CBOs are now recruiting women to their committees as women have shown they can better manage some IFM activities.
- Initial subsidies through CBOs to test IFM innovations are leading to wider adoption within those communities and endorsement by the CBOs.
- Multiple enterprises can be complementary and reduce overall risks.
- More time is needed for individual CBOs to establish all of the key components of IFM within their areas, to strengthen the capacity of the federation to coordinate adaptive learning and testing of IFM innovations, and to achieve policy changes that better enable IFM.
- CBOs need to access externally generated technologies, as well as innovations tested and adapted by CBOs. For example, jute retting resulted in insufficient oxygen in water for fish in some south-western floodplains. The project linked CBOs with government agencies that could offer a simple alternative processing method that minimises loss of water quality. The benefit to fisheries was an incentive to try this process.
- Linkages with local government agencies were reportedly difficult initially. Links have much improved especially with the Department of Agricultural Extension, Department of Fisheries, and local government institutions after CBOs were introduced to these service providers through workshops and after these service providers came to know what the CBOs are trying to do.

ACKNOWLEDGEMENT

This document is an output of research funded by the International Development Research Centre (IDRC) and the Research Into Use Programme, managed by NR International, a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of IDRC, DFID or NR International.

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