Better Options for IFM: Uptake Promotion
NRSP Project R8306

Final Technical Report

Annex A

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November 2005

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This document is an output from 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 DFID.

1. Introduction

1.1 Background

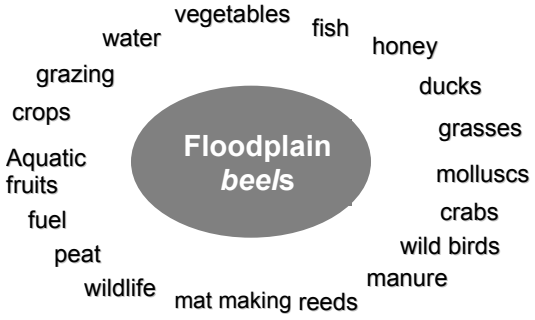
1.1.1 The floodplains – biophysical environments

Bangladesh is a floodplain deltaic country formed by the deposits of three major river systems, the Ganges, Brahmaputra-Jamuna and Meghna Rivers. It is considered one of the largest inland aquatic ecosystems, rich and diverse in its extent and resources. There are around 700 rivers in Bangladesh stretching over 24,140km, thousands of canals, floodplain depressions (called *beel*s), and huge area of seasonal flooded land that collectively form the floodplain ecosystems (Akanda, 1989 and Khan, et. al. 1994). According to various estimates, more than two-thirds of the country is classified as wetlands in the monsoon when rivers, canals, and low-lying depressions (*beel*s) are flooded and unite to form vast sheets of water. More than one third of the country, which remains under water every year for 4-6 months during rainy season, is defined as the seasonal flood land. The floodplains, when under water, are highly productive, rich in fish food and various nutrients, and are excellent feeding, breeding and nursery habitats for fish (including shrimps, crabs) and other aquatic organisms, offering opportunities to the rural people to fish for food and income. In dry season, water is retained in depressions (*beel*s), river pools, and oxbows, thus most of the floodplain land becomes dry and goes under cultivation of crops, mainly rice.

The highly productive floodplain wetlands of the country, supporting rich and diverse fisheries comprising of over 300 species of fish and shrimps, are the richest in the world. Recent taxonomic study recorded 265 finfish in the inland waters of Bangladesh (Rahman 2005). Its changing seasonal features, which transform from aquatic ecosystems in monsoon to terrestrial ecosystems in the dry winter, characterize the floodplain ecosystem. These changing features have made the floodplains more dynamic and productive ecosystems, endowed by a range of resources over the seasons. Floodplain fisheries production depends on habitat creation, diversity of habitats and connectedness among the habitats, offered by annual flooding in the riverine floodplain ecosystem (Grift, 2001). The floodplains are so resource-full that, apart from fish and crops, there are other aquatic resources (aquatic vegetables and fruits, grasses, molluscs, reptiles, birds, and mammals) that are used by the local people to varying extents as fuel, fencing, thatching, food, medicine and others.

1.1.2 Floodplains and rural livelihoods

Figure 1.1: Floodplain and livelihood resources



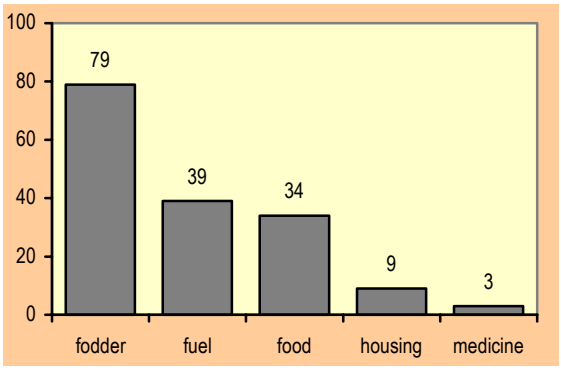
Source: Group works (4 groups), CBFM-2 training session on IFM, December'03

Being that land and water based activities govern the economy of the country, fisheries and agriculture play a vital role in the livelihoods of the millions of rural poor that subsist, for the most part, on a range of floodplain resources over the seasons. Studies revealed that 4 out every 5 rural households living close to wetlands have some degree of dependency on floodplain wetlands for their livelihoods over the seasons. The FAP-16 (1995) survey in four floodplains areas found that 85% of rural households are engaged in some form of fishing over the year. The survey also revealed that of the fishing households in Tangail, Sadar Upazila (adjacent to the Charan *Beel* pilot site), 85% are involved in subsistence fishing for family consumption. The farming communities are also dependent on fishing for

food and income; as observed over 60% of all (categories of) farmers reported some participation in fishing (FAP 17 1995).

In Bangladesh, fish are second only to rice as a source of food, and are the primary source of protein for the poor (FAP-16, 1995). Fish are also the most important source of protein for pregnant and nursing women, and for children over two years old. Rural households, on average, eat fish 3.5 days per week, compared to 2.1 days for pulses and 0.5 for meat (FAP 16, 1995). Fish alone contribute 70% of the total protein in the diet of Bangladeshi people (BBS, 2000). Floodplain fisheries supply 90% of the fish consumed by rural people. The diversity of floodplain fish species contributes to the diet of rural people; as found, they consume between 56 – 82 varieties of species over the season (FAP-16, 1995, Minkin, et.al. 1997, Thompson, et.al. 2005).

*Figure 1.2: Distribution (%) of households by use of aquatic vegetation (*Hakaluki *Haor*



The floodplains also provide various non-fish products through which the poor households make part of their livelihoods for at least part of the year. CNRS (2002) study on wetlands in the northeast shows that people use aquatic vegetation for various purposes e.g. fodder, fuel, food, thatching and as medicine (Figure 1.2).

However, in general, fishing and farming are the major livelihood strategies of the communities of all social and occupational categories living near wetlands.

1.1.3 Modification of floodplains and land use changes

Although it is recognized that the floodplains have been supporting the livelihoods of millions of rural people over centuries and have a cushioning effect on the pressure of increasing rural poverty, much damage has been done to the floodplain ecosystems, mainly through interventions aimed at increasing food (rice) production. The floodplain environments in Bangladesh have been remarkably modified since the 1960's, with a view to increasing rice-based food production, whilst ignoring the rich floodplain fisheries that support people's diet and income, especially for poor and fishers households. The focus of national policy has been on increased food production, not considering the value of floodplain fisheries. Thus, vast floodplains have been empoldered by the construction of dykes and regulators (sluice gates) to make areas flood free to protect rice crops.

Under the so-called "grow more food" programme massive flood control, drainage, and irrigation (FCD/I) projects were built throughout the country. According to estimates, a total of 653 FCD/I projects have been implemented with the construction of 13,000 km embankments and 4,190 sluice gates/regulators across the country (Ali and Alam, 2005). About 5.5 million ha floodplains have been brought under the FCD/FCD/I projects and about 1 million ha of land have been lost due to the FCD/I projects.

The FCD/I projects benefited the farmers, providing opportunities to grow more than one crops within the FCD/I project areas, resulting in significant increase in crop production. However, several studies have revealed that the FCD/I project have had a tremendous negative impact on inland open capture fisheries, which were ignored when designing the "grow more food" policy and launching the 'green revolution' aimed at rice production (Mirza & Ericksen 1996). The MPO has summarized the long-term impact of FCD/I projects as:

The major constraint to the maintenance or increase in open water fisheries is the flood control, drainage, and irrigation activities. Open water fisheries production potential has been

reduced, and is being reduced every year, as more and more fish production areas are removed and/or altered for food grain production. Removal of water or production areas in one location will not only reduce local fish production but will also harm fish production in all the components of the system from rivers to *beel*s to the estuaries to the sea (MPO 1985,17).

Floodplain habitats are essential for the ecological functioning of riverine ecosystems, characterized by flood pulses that facilitate fish migration, enhance primary productivity, and maintain the structure of habitats (Grift 2001). Almost all species use floodplain habitats during some parts of their life cycle to perform biological functions whether spawning, nursing, or growth.

Major impacts on floodplain fisheries are due to reduction in habitat, obstruction of fish migration between rivers and floodplains, and degradation of habitats. The impacts are visible through their effects on the fisheries production and species diversity (FAP17 1995). The impacts of FCD/I varied by scheme, management, and location. The effect of full flood control projects on species diversity is more severe, and has resulted in a reduction of 33% in the total number of species (FAP17, 1995). However, the effect on migratory species could be just as serious, with up to 95% reduction in full flood control areas and 29-45% in controlled flooding projects (FAP 17, 1995). Halls et al (1999) reported reduction in annual fish yield of up to 50% inside FCD/I and absence (or scarcity) of 25 species inside FCD/I schemes compared to outside. The species affected due to FCD/I are mostly migratory whitefish, which use both river and floodplain habitats in their lifecycle. Studies established that the migration obstruction due to the FCD/I project has been the major cause for reduction in fish yield and species diversity within the modified floodplains (Halls et al 1999 and 2001).

Apart from the fisheries impact, the FCD/I project and “grow more food” campaign have affected the diversity of crops grown in Bangladesh’s floodplains. Now, agricultural production is predominantly rice based whilst cultivation of pulses, oilseed, wheat, and other *rabi* crops have reduced considerably in the country as whole, and within the FCD/I projects in particular. The conventional economic criteria of cost-benefit analysis have indicated that many FCD/I projects are not viable if fisheries losses are considered alongside the gains from crop production (Asaduzzaman 2002).

The country’s once simple floodplain land use pattern of *aus/aman* and jute in kharip-1 season (pre/early monsoon) to fishing and *aman* (deep water, rain fed) in kharip-2 season (wet monsoon), and diversified crops in the *rabi* season (dry winter) has changed, to predominantly rice, to *aus*, transplanted *aman*, and *boro* respectively. Monsoon fishing in open waters within FCD/I has reduced significantly as major haor areas have been substituted to cropland and there is serious reduction of wetland habitats within FCD/I project areas.

1.1.4. Declining fisheries production

The rich and robust floodplains fisheries in Bangladesh are under serious threat due to various natural and anthropogenic reasons, of which habitat degradation, alteration & encroachment, increased fishing pressures, shortage of dry season water, and water pollution, are the most significant. It is speculated that the negative effect on floodplain fisheries (even agriculture) associated with these factors will continue to increase due to rapid urbanization changes in the physical environment, including water regimes, and global environmental challenges. Fisheries production and species diversity are therefore in continuous decline. It is, however, difficult to quantify, or at least reliably estimate, the declining trend due to the lack of a reliable time series database at national level. The

fishers', who make their livelihoods from fishing, however, are well aware of the declining availability of fish, as well as reduced numbers and size of species.

Recent estimates by national and international fisheries professionals indicate a 0.9% annual decline in inland capture fisheries, and recommended maintaining the current levels, highlighting the complexity, and management constraints, associated with land and water use, urbanization, agricultural intensification, and social pressure on poor communities (Fisheries Sector Review, 2003). The review also recognized the livelihood dependence of the poor communities on floodplain fisheries, and thus emphasised maintaining current levels of output from this sub-sector through community-based or co-management practices.

1.1.5 Resource use conflicts

Traditionally, fish and crops were the major floodplains products, on which the communities subsisted. There are thousands of fishers households who, at different times of the year, become involved in fishing, in different types of water-bodies, under various access arrangements (either through formal leasing, sub-leasing or enjoy open access) depending on the ownership and control of water-bodies. The *khas* (government owned) water-bodies are under formal leasing, centrally managed by the Ministry of Lands (MoL) and administered through the district and upazila representatives, the Deputy Commissioner (through ADC Revenue) and the UNO (through AC Land) respectively. Leases are given through an open bidding system, with the highest bidder gaining use of a water-body for fishing for 5 years.

The traditional fishers usually represent the poor (and landless) households, and as such, were often excluded from formal leasing. However, they sometimes become associated with richer non-fisher groups who use their *samity* (fishers' cooperatives) documents; needed to qualify for lease bidding. In this arrangement, the fishers get minimum scope under various arrangements, e.g. they only get conditional access to fishing in a defined area of the water-body at a certain time of year, or they sell their catch at pre-fixed rates to the leaseholders. Therefore, the fishers cannot reap any significant benefit from fishing in floodplains for their livelihoods, particularly those living around leased water-bodies and thus conflicts between the leaseholders and fishers are a common feature, as evident in most cases.

Currently, *boro* rice (irrigated winter rice) production in the dry season has been the major land use practice as can be seen in floodplain lands all over the country. In the past, before the introduction of *boro* rice, very low lands including *beel*s (mostly perennial low basins), used to provide habitats for fish to attain maturity over the winter, to then spawn with the on-set of rains in the pre/early monsoon (May–June), thereby contributing to maintaining fish stocks. Over the last two decades, however, these winter habitats have often been drained after flood drawdown (*Poush* – November/December) and used for *boro* rice production. This expansion of irrigated *boro* rice has placed great demands on dry season water sources, whilst simultaneously encouraging delayed and controlled flooding inside FCD/Is through sluice gates (Halls, 1999).

Conflicts between farmers and fishers (or in other words rice vs. fish) relating to use of dry season water are a common feature in most floodplain basins in the country. The farmers, who are wealthier and more influential, often triumph, whilst the poor and landless, who make a substantial part of their livelihood from floodplain resources, lose. Ironically, this issue has been discussed quite often at both local and national levels over the last decade but an effective solution is yet to be found. A DFID/NRSP project (R7868) on "Maximising joint benefit from rice and fish in Bangladesh floodplains" targeted the agriculture and fisheries sectors jointly, to find ways to balance use of dry season water and meet the demands for both fish and crops (Shanker et. al. 2004). The issue of balanced use of surface water is critical for the development of fisheries is also emphasised by all concerned (Asaduzzaman M. 2002).

The suggested IFM approach focuses effort towards minimising resource use conflicts between the fishers and farmers through integrated management interventions using Participatory Action Plan Development. These could maximise floodplain production whilst at the same time benefiting the poorer members of the communities. The IFM options were expected to create an opportunity to build consensus among the various users of floodplain resources to protect and enhance the open capture fisheries upon which the poor are most dependent, because farmers could also potentially gain through adopting alternative crop management practices that are fish friendly. The IFM options could also ensure higher benefits, in terms of net returns, to the farmers from alternative *rabi* crops, which have no risk of flood damage as they are harvested early. Increase fisheries production due to IFM is beneficial for farmers, who also fish for food and income at times of the year.

1.1.6 Participatory Action Plan Development

PAPD (Participatory Action Plan Development) is a participatory method for building consensus among multiple stakeholder groups on the sustainable management of natural resources. PAPD uses different participatory tools to reach consensus amongst the community on actions that area needed to improve the management of natural resources. The method recognizes the many stakeholders involved in the management and use of natural resources and ensures that all stakeholders' views are represented. PAPD encourages community participants to respect others' concerns and appreciate their dependency on the NRs.

In the PAPD processes, participating stakeholders identify problems relating to natural resources within their locality and prepare a consensual plan of solutions through analysing each of the prioritised problems. An action plan is then developed with the participation of all stakeholders' (both primary and secondary). The method requires active participation of stakeholders from different occupational groups and classes as and creates an opportunity for their opinions and concerns to be discussed and recognised. A strong plus side of PAPD is that it can potentially reduce conflict during project implementation and if a situation arises, it assists the local people with resolving it. Through this process, the local users of certain resources can understand the importance of their participation in all the stages of a project (starting from identification of problems, deciding upon solutions, preparing a work plan and in implementation). This enables them to feel a sense of ownership and play a more effective role during implementation of solutions. (R7562: Consensus Building and R8223: Development of PAPD Facilitators guide).

1.1.7 Demand for the research

Much research has been carried out in Bangladesh targeting poverty reduction and improved natural resources management in the floodplain environment [e.g. FAP studies] but most of the research results are not effectively communicated to the relevant agents. In most cases, the research recommendations are presented at end-of-project workshops to a group of stakeholders who may not be in a position to act on the recommendations. There are, however, some successes in the uptake and use of some research outcomes which, have been possible due to the commitment of partner organisations (for example, the use and promotion of Participatory Action Plan Development (PAPD)) has extended well beyond the life of the initial research project (R6756, R7562 and R8223).

Experience suggests that substantial work is needed to ensure the technical viability and social acceptability at the levels of user communities, intermediaries, and policy stakeholders before promoting a technology or a method for wider application. This project was felt necessary to ascertain how IFM fits in with current floodplain-production systems' management at the community level, matching current knowledge and skills of intermediaries to carry forward the messages to communities, and the policy planners' attitude to IFM as a package for pro-poor and pro-environment approach, for wider

promotion. The project was designed to respond to the need for communicating relevant messages and up-take promotion of findings and recommendations to the target stakeholders' through field piloting and testing the viability of the options in the real world, and associated learning that would be instrumental for the stakeholders intending to carry forward IFM for wider application.

By the end of the project, reported here, information on improved IFM recommendations and methods that make use of actual experience of participant communities and illustrate the beneficial impacts (particularly on poor men and women) will have reached key policy stakeholders and practitioners through appropriate media and especially personal interaction with the research project activities and team. This will, it is expected, change their views and work approaches respectively.

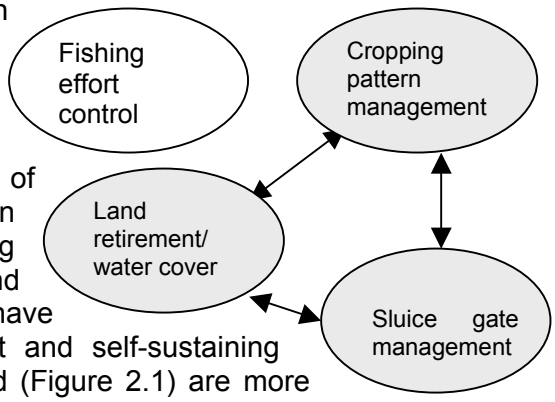
2. The IFM Options for uptake promotion

Integrated floodplain management (IFM) is a holistic approach to resource management aiming at maximising joint benefits of fish and crops through a balanced management of water in floodplains as opposed to the traditional sectoral approach that targets either fish, or crop, management. The production systems and sub-systems in floodplains ecosystems are very closely and inseparably inter-linked and water, as the base, plays a crucial role in influencing the production of fish and crops alike. Human activities relevant to resource use are also dependent heavily on water regimes, spatial, and temporal, dimensions. For example, if water recession is delayed in the post-monsoon, farmers cannot grow mustard crop as an extra before *boro* rice, whilst the fishers get further fishing opportunities in the increased water area due to late recession of water.

The floodplain production systems management should also be looked at in an integrated manner with the key focus on water regimes and more particularly the volume and extent of dry season water, when competing uses of scarce water (for crops and fish) are peaked. Therefore, managing floodplain resources includes managing water usage, with due consideration to various production systems and human resources use - particularly of the poor. In doing so, it is quiet difficult (or impossible) to manage one system ignoring the others. Unfortunately, the management focus and practice in Bangladesh until recently has been on fish production (DoF projects) or HYV crops (DAE, LGED, BWDB).

With consideration to the systems problems in understanding, a previous NRSP project (R7868) recommended a four-pronged option package on IFM for piloting and promotion in Bangladesh (Figure 2.1). However, the project used the data and information from the findings of various other projects and modelled the data, generating options with evidence in support of each option. The options are; cropping pattern management, sluice gate management, land retirement, and fishing effort control.

Figure 2.1: Improved IFM options



The options evolved based on the understanding of the systems problems of floodplain management in Bangladesh that underpin the issue of competing dry season water use (for *boro* rice and fish) and over-fishing in the fragile fisheries, some of which have crossed the threshold levels for self-recruitment and self-sustaining fisheries. The interlinked three options as outlined (Figure 2.1) are more integrated and related to water and crop management while the fourth option addresses fisheries management - also influenced by the patterns of local hydrology and farming practices.

2.1 Cropping pattern management

The cropping pattern management option suggests diversifying *rabi* crops in floodplain basins instead of *boro* rice. *Boro* is recognized as a 'water hungry' crop, needing irrigation 3 to 4 times higher than alternative *rabi* crops (potato, maize, wheat). This causes the problem of excess abstraction of surface water to irrigate *boro* rice during the dry season, affecting the fish seriously through acute shortage of dry season water in floodplains (in their dry season refuge). *Boro* is also vulnerable to damage just before harvesting in late April/May due to flash floods and drainage congestion while other *rabi* crops can be harvested 3-4 weeks earlier than *boro* rice and could thus avoid floods.

Rabi crop diversification would ensure increased water coverage (in terms of both volume and area) in the dry season, which would support fish growth, enabling fishlings to attained maturity in *beel* habitats. Therefore, the fisheries gain can be substantial from increased dry season water extent through *rabi* crop diversification in *beel* basins.

Rabi crop diversification also permits planting of deep-water *aman* rice in the wet season, which can improve the habitat conditions for varieties of fish. It is noted that the deep water *aman* in wet season, when submerged, provide substrates for growing natural fish food organisms and also for many fish to breed (especially for those that lay sticky eggs). Unfortunately, the deep-water *aman* variety is no longer grown in many areas and groups of farmers of Bhanga upazila of Faridpur district ranked non-availability of suitable deepwater *aman* seed as a major problem (Petrra 2000). The cropping pattern management option therefore, suggests alternative *rabi* crops in the dry season and deep-water *aman* rice in wet season to maximise joint benefit from fish and crops.

Table 2.1: Key features of the cropping pattern management option

Issues	Recommended actions
▪ *Boro* rice is a water hungry crop - it requires 10,000 cubic meters of water to irrigate a one hectare *boro* field; ▪ It requires early drainage of wetlands in the post-monsoon and to prevent early flooding in the pre-monsoon, both negatively affect fisheries;	▪ Depending on the hydrology and land type, diversify out of *boro* rice with alternative *rabi* crops (potato, garlic, maize, wheat, onion, vegetables) with lower water requirements; ▪ Cultivate deep water *aman* rice in wet season to maximise benefits from crops

2.2 Sluice gate management

Sluice gate management is particularly important as the gates are used to favour rice production (*boro* rice in the dry season) at the cost of fisheries - upon which majority of poor depend for their livelihoods. *Boro* rice is planted post monsoon (December-January) thus farmers prefers to free their lands from flooding by end of October and open the sluice gates to facilitate early drainage. Thus, habitats for fish are reduced and fish production suffers. Again in the early monsoon (April/May) when fish migrate from river to floodplains for spawning and growth at the onset of monsoon rains, farmers keep the gates closed to delay flooding until *boro* harvesting is complete in late May/early June. Thus, although sluice gates have the potential to enhance fisheries inside modified floodplains *boro* cultivation is a key obstacle.

Table 2.2: Key features of the sluice gate management option

Issues	Recommended actions
▪ Sluice gates obstruct fish migration from rivers to floodplains inside FCD/I projects ▪ Reduce and shortened fish habitats inside FCD/I projects ▪ Affect fish production and species diversity	▪ Allowing entry of water in the early monsoon to facilitate fish migration. ▪ Late monsoon, retention of more water to facilitate fish growth. ▪ Agreements not to catch fish migrating through sluice gates ▪ Adoption of short duration dry-season *boro* rice varieties

2.3 Land retirement

Land retirement is suggested to target farmers to retire very low land and low-lying pockets of floodplain basin (*beel* area) for fisheries instead of cultivating *boro* rice, which puts further pressure on dry season fish stocks - already vulnerable due to high natural and fishing mortality due to water shortages. Further, *boro* production on very low land is of minimal benefit compared to the extra fish production that could be achieved if the land is left for fish to grow. However, this is a most difficult option to implement as the farmers intend to cultivate rice (or other crops) on whatever land is available in floodplains, even high-risk plots on very low land.

Table 2.3: Key features of the land retirement option

Issues	Recommended actions
▪ *Boro* crops in very low land (*beel* bottoms) are at high risk of flood damage due to early rains/flash flood. ▪ Rice yield is poor in very low land compared to low and medium-high lands ▪ Rice in very low land also demands irrigation water, which often comes from surface sources, further reducing dry season fish habitat.	▪ Identify along with communities the marginal very low lands where crops have risk of flood damage ▪ Aware farmers on IFM and benefit of land retirement in achieving holistic benefits from fish and crops ▪ Motivate farmers and communities to leave the very low land to maintain a minimum water extent for fish in the dry season.

2.4 Fishing effort control

The fishing effort control option relates to addressing the problem of over-fishing, which has reached such a high level that the fisheries might collapse if no effective management measures are taken urgently to reduce the excessive fishing effort. The effort control options suggested include practicing closed areas and closed seasons in floodplain management units to reduce fishing pressure, and thereby ensure that a healthy stock of fish survive, guaranteeing a sustainable level of fisheries in floodplains.

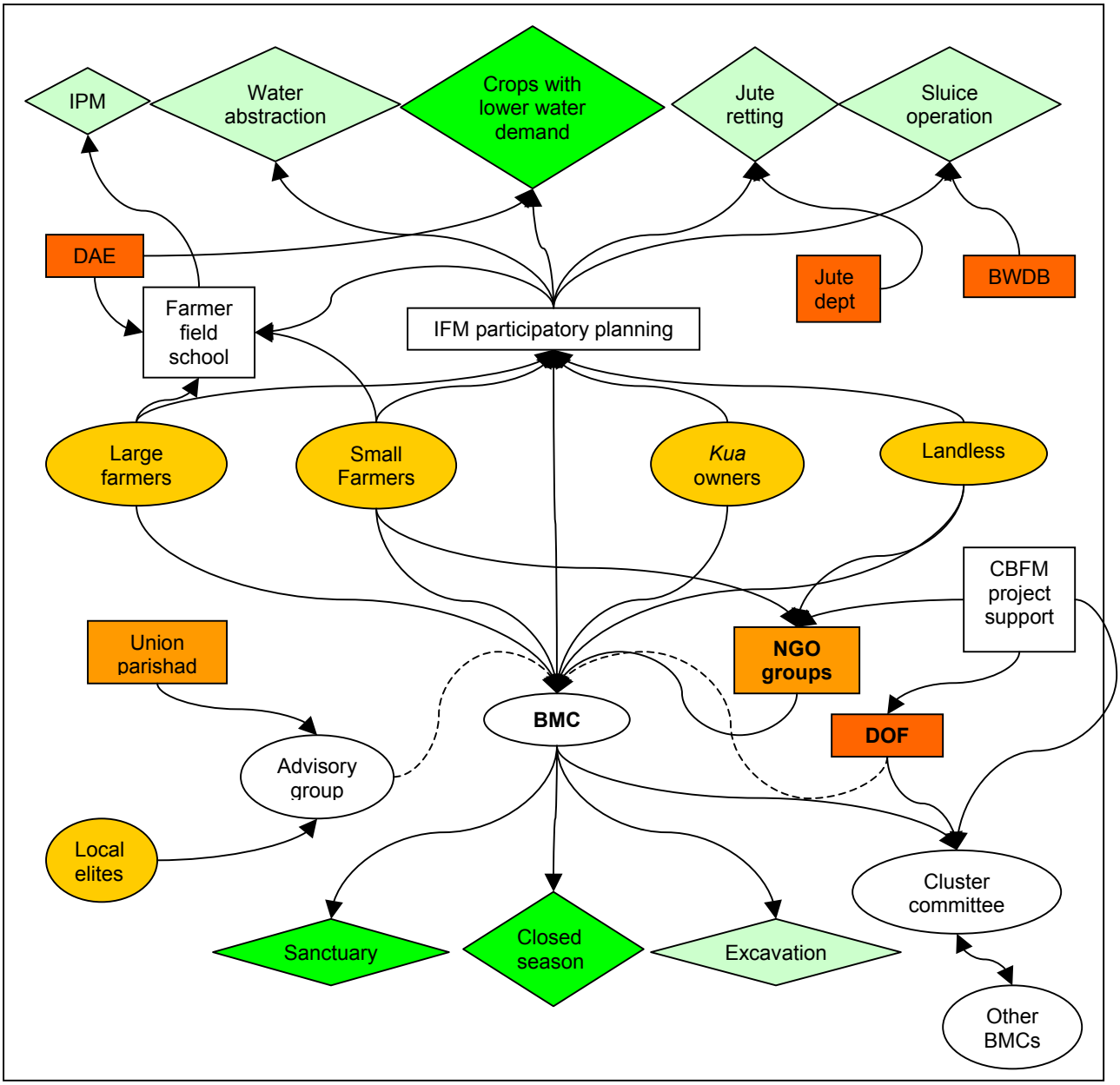
Table 2.4: Key features of the fishing effort control option

Issues	Recommended actions
▪ Bangladesh floodplain fisheries are under serious threat of over fishing and destructive fishing ▪ The fishing pressure is so that less than 2% fish can survive at the end of each year ▪ If current fishing efforts continues, the fisheries would likely to collapse	▪ Closed area: declare certain areas that retain water year round as fish sanctuary. ▪ Closed period: declare a certain period (days, weeks, months) for no fishing. Usually 1-2 months in the early monsoon is enough for fish to breed. ▪ Selective gear restriction: identify and restrict certain gears (e.g., *moshari jal, current jal*), which are harmful – can be for a certain period or in certain locations. ▪ Ban destructive fishing: stop or reduce fishing by complete dewatering and barriers that block completely migration routes.

Therefore, the IFM options target entire communities in resource management, whether fishers, farmers, wage labourers - who at times of the year are involved in fishing, sharecropping, or are employed as agriculture labourers in floodplains for their livelihoods.

2.5 IFM and Linkages between System Components

Figure 2.2: Linkages between stakeholders, institutions, and IFM options



The IFM approach recognizes the floodplain as a system where the amounts and uses of surface water in the dry season and monsoon critically affect the two main components of products used by people – crops and fish, and where interactions between these uses and activities are important. This involves both private and common pool resources within the same area. Since the community depends on both agriculture and fishing, a common interest in increasing the overall returns from the floodplain system was found. Alternative dry season crops can reduce water demand while maintaining farmer income, in this way more fish can survive to breed in the next monsoon, and this is further enhanced if the dry season crops are of shorter duration and therefore not at risk from early floods, enabling sluice gates to be opened earlier.

During the project, inter-linkages were found not to be limited to these. Changing to alternative *rabi* crops combined with farmer's interest in growing rice for household food security plus the community building of a small sluice meant that more early monsoon rice

(*aus*) was grown, fish can grow undisturbed by fishing among this crop. This further potential benefit was, however, counteracted by the same conditions, plus favourable market prices encouraging the growing of jute in the same early monsoon season. The disadvantage of this is that retting of jute in the floodplain results in water that has insufficient oxygen for fish to survive in. Recognising that this trend could not be prevented by stopping farmers from growing the crop, the project team created linkages with the local Jute Department officers who helped train the community in retting methods that are expected to reduce the loss of water quality. It is too early to tell if this last activity has been successful. One further linkage deserves mention – that pesticide and agro-chemicals can have adverse effects on fisheries, especially when fish and surface water are concentrated in the dry season. This issue did not need to be addressed through additional IFM activities as integrated pest management (IPM) was so successfully adopted in the area through the farmer field school, especially as the IFM project continued the activities of the field school beyond the three months of DAE support. Agricultural surveys undertaken for IFM confirmed negligible use of pesticides in the area.

Besides system linkages, stakeholders and institutions are also interlinked in the efforts of resource use and management as emphasized in the diagram and the approach discussed in this report (Figure 2.1). One of the main achievements of the IFM project, as recognized by the stakeholders, has been to introduce system thinking to them, and to facilitate discussions and linkages between community members and with government agencies and officials. Thus, the piloting of alternative jute retting is largely due to the initiative of the local extension officers, once they were sensitised to the problem. This has brought increased confidence in the community that they can raise problems and expect service, advice and help from officials. For example, the farmers raised the problem of poor quality seeds in their meetings with officials, and DAE has agreed for the 2005-06 dry season to help arrange access to better quality seed – this is the first time the community has experienced DAE staff volunteering to support the community in problem solving. The farmers also requested that DAE test their soil quality to advise and help them adjust their fertilizer use, but DAE locally has no equipment.

An important impact has been the acceptance and wider understanding of practices and linkages promoted through the IFM approach. This has been achieved through demonstration and participation processes in the pilot sites, and inviting people from neighbouring *beel*s and local officials and extension workers to observe and attend meetings. Interest from local officials and media has developed, for example, local extension workers have promoted the approach and their activities in newspaper articles. As a result of media coverage, IFM was discussed in the District Coordination Committee and the involved government agencies (DoF and DAE) are now advocating the IFM approach.

There are further floodplain resource linkages that can be addressed, and may already be coming into the thinking of the community taking the IFM system approach. For example, as noted earlier, snail populations have declined, and with them, the incomes of women collecting snails, with also possibly negative impacts on water quality in the *beels*. The increasing cultivation of *aus* paddy may help to reduce collection of snails (as farmers do not allow access to flooded fields of *aus* paddy), but an issue for the community is what level of snail collection is best. Other aquatic resources such as water lilies are also scarce, but may not have sufficient value for the community to change their practices or reintroduce them.

There remains scope to test and demonstrate other *rabi* crops in the area, and to work on adjustments in sluice operation as cropping changes to permit more fish to enter in the early monsoon. Hopefully, the IFM committee will be able to encourage testing of options and comparison of the results, and can continue the initial successes it has had in coordinating and encouraging cooperation among the *beel* community and with government service providers.

3. Research Purpose and Activities

3.1 Purpose of the research

The purpose of this research project as defined in the logical framework is:

> *"Methods for implementation of management opportunities relevant to the poor, including community participation in integrated sustainable management of terrestrial and aquatic floodplain resources, developed and promoted".*

However, having been analysed, the key words embedded in the defined purpose suggest that the project underpins the necessity of promoting floodplain resources management in a wider perspective. It indicates that the management options or methods to be promoted are already developed to an extent that qualifies them for promotion. The purpose also highlights the necessity of developing appropriate methods for implementation of management options (not developing any new management option or technology) required for promotion of the technology (e.g. methods for promotion). This gives an impression that the appropriate technology is already available but the methods for implementation of the technology are not readily available. Therefore, there is a necessity for further work (research) to develop suitable methods for implementation of the technology in a real world situation. The purpose also highlighted that the approach should be pro-poor and sustainable, meaning the poor households would be willing and able to adopt the technology, and that the benefits derived of the approach will adequately reach the poor. It also emphasized that the communities, including the poor, should perceive that the technology will not cause any harm to the local environment and social functions, and will be sustainable beyond the project end.

In summary, it is primarily a communication project with the aim of promoting improved IFM options that will benefit the user communities including the poor, through development of suitable methods, which the poor can adopt and are able to benefit from through sustainable and improved management of floodplain resources. With this backdrop, the purpose of this project was pursued by undertaking pilot testing of IFM at two sites – Charan *beel*, Kalihati, Tangail and Goakhola-Hatiara-Maliat *beel,* Narail could be further elaborated as follows:

- Adaptive testing of the options in field situation to prove efficiency, suitability, and acceptability to the user communities and intermediaries. Note that the IFM options aimed for promotion have been developed by NRSP project R7868 from computer-based modelling using data from secondary sources; thus, field-testing of the options was deemed necessary.

- Communicating relevant messages (lessons and learning) that already exist or are available from completed research projects, as well as lessons from piloting of options in the field under this project, to the target audience, including communities, intermediaries and policy stakeholders through developing appropriate communication media and tools

- Document and communicate the institutional learning systems associated with the piloting and communicating the IFM to the relevant stakeholders.

3.2 Activities and methods

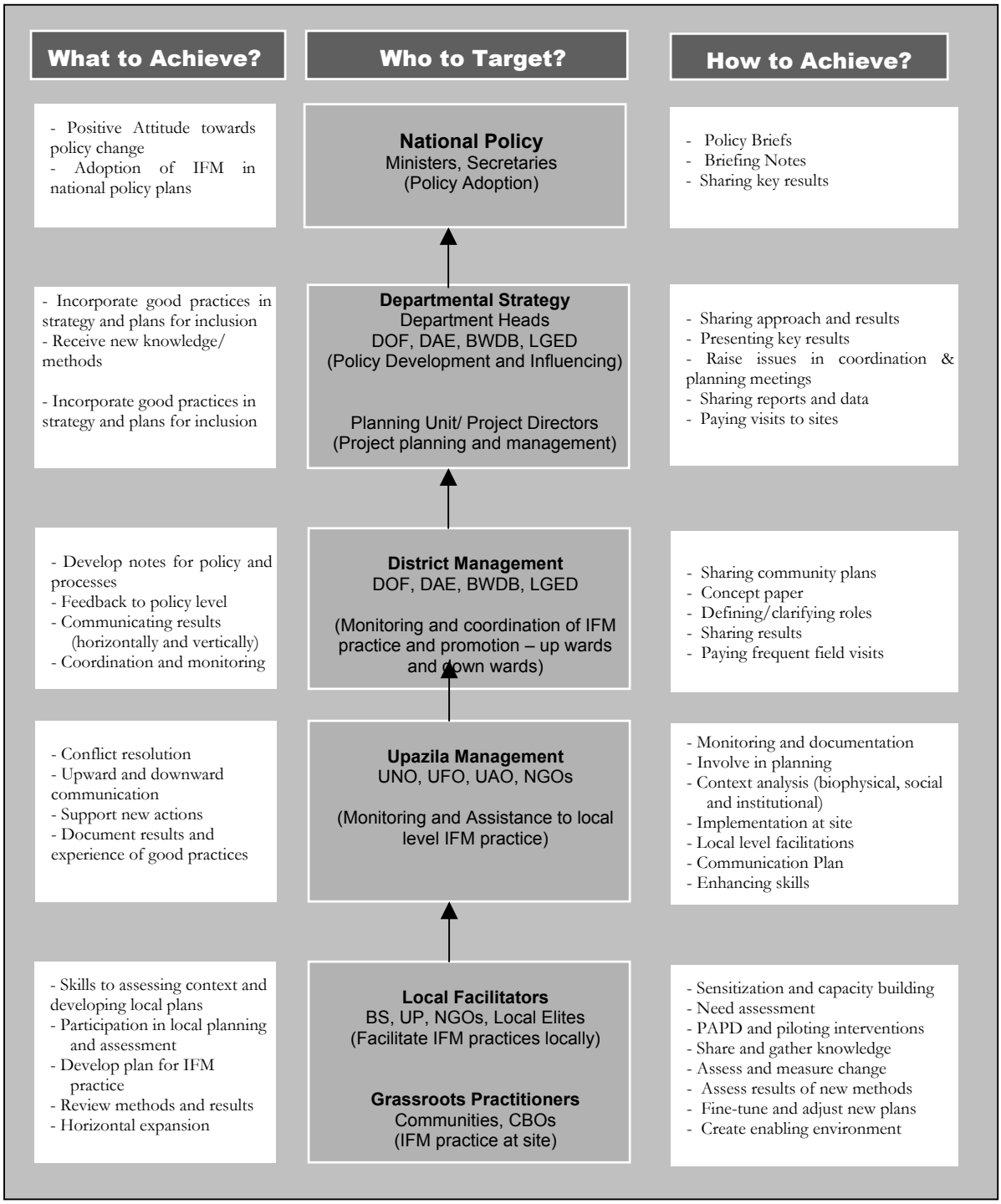
The project team adopted a comprehensive methodology in attainment of the desired outputs, to achieve the purpose of the project. The methodology followed is briefly described in Table 3.1.

Table 3.1: Detailed Research activities and methods

Activities	Methodology
Output 1: Improved IFM options successfully piloted in different environments	
Site selection	Discussion with DoF and BS – Partner NGO and communities Review of project reports Field visits during PD phase
Site characterization	RRA and map review and mapping Crop survey Hydrology information and data sourcing
Community mobilization	Sensitisation events viz. group discussions, folk drama, court yard meetings using awareness/information materials like posters and hand outs
Community planning	PAPD with focus on cropping pattern, sluice gate and water management Micro level planning by farmers/fishers and respective actions
Knowledge enhancement	Motivation/exposure visits to *rabi* growing areas Skills training on IFM
Field piloting/trial	Crop diversification (Year-1) - demonstration in small area with various *rabi* crops to assess performance of individual crops Crop diversification (Year-2) - piloting in more areas with selected *rabi* crops as per farmers choice jointly with local DAE Fishing effort control measures (closed area and closed seasons) already in place by CBFM-2 – data used from CBFM-2 and BMC monitoring Sluice gate management – BMC jointly operate slice gates with BWDB Jute retting and associated water pollution issue taken up with BMC and DAE and provided training on improve techniques
Institutional	IFM committee formation focussing on farmers involvement
Output 2: Tools for effectively communicating IFM recommendations and methods/options to reach target audiences (including policymakers, intermediaries, and community practitioners) developed.	
Communication strategy	Developed based on communication needs assessment survey done in PD phase
Knowledge, attitude and practice	KAP survey at community, intermediary and policy levels on IFM
Revised communication strategy plans	Assessment and review of communication activities and interim needs
Tools developed for communications	Community - posters, handouts, billboards, drama scripts, TV spots Intermediary - one page message on IFM, fact sheets, training module, power point presentation, TV spots Policy - policy briefings, one page message on IFM, TV spots
Methods/approach adopted for communication	Community - court yard meeting, knowledge sharing sessions, exposure visits to good *rabi* areas, PAPD, training, and broadcasting TV spots Intermediary - training, power point presentation, visiting pilot sites, workshops, organizational/project planning meetings, and TV spots Policy - briefing workshops, exposure visits, and broadcasting TV spots
Output 3: Institutional learning systems in relation to IFM assessed.	
Process documentation	Process diary maintained by the project team at site level
Monitor institutional capacity	Report/score cards maintained by the BMCs and IFM committees
Revised plan of action	Assessment and review of year-1 performance and learning
Document learning from IFM piloting	Reflective learning sessions with participating communities and local stakeholders (UP, DAE, DoF, NGOs)
Exit strategy	Assessment and review of performance and learning and making future plan beyond the project

The project team adopted a systematic approach to reach the government target Institutions more regularly, particularly the DoF and DAE, as they are the primary government agencies that undertake development activities in floodplain areas. The approach adopted by the project team for communicating the messages to relevant government agencies for promotion of IFM is presented in Figure 3.1 below.

Figure 3.1: Approach adopted for promotion of IFM targeting Government agencies



3.3 Tools for measuring change

In addition to the above, monthly process diaries were used to capture the significant changes during the course of IFM uptake promotion work at the sites level. At the project sites, the teams primarily concentrated on *rabi* crop diversification (as the fisheries management part of the project is covered fully under the CBFM-2) with the main objective of reducing dry season irrigation water demand. The diary reporting thus focused on positive developments and breakthroughs relating mainly to “acceptability and participation”.

However, the diary also incorporated the broader range of IFM options, and considered fisheries related developments under CBFM-2. In addition, the team was careful to record the level of interaction between the project-formed IFM committees and external stakeholders, such as the BWDB.

3.3.1 The Diary

The interface between the project and participants (the IFM committees) provided a convenient basis for diary type reporting. This interaction was expected to form the core part of process monitoring but was also to be supported with field officer observations outside the meetings. In this last respect, it was agreed that the Field officer should recall "unusual events" that fall outside of the meeting and outside of the reporting criteria outlined (see below). Early in the project, the Field Officers were keeping records but the objective of the diary was to order these records and ensure staff observe key attitudinal and social changes (adoption or rejection of IFM options, adaptation etc.).

Four overlapping and key areas were identified for the diary format – Acceptability & Adoption, Participation, Learning, and Communication. The over-arching factor is Acceptability & Adoption and this was to complement the KAP survey.

In addition to monitoring the outcome and attitudes of project participants it was important that impacts on less involved stakeholders (labourers or fishers that fail to meet the membership criteria of the *Beel* Management Committee (BMC), for instance) and their attitudes towards IFM options was somehow gauged. The Knowledge Attitude and Practice (KAP) survey was intended to systematically target other villages in this respect but the diary reports left room for the facilitator to consider the relevance of IFM beyond the active participants (see later). This has obvious relevance to the potential for horizontal spread of IFM options with or without facilitation.

The diary format was intended to develop the strategy adopted by ITDG in Project R8103. Here the emphasis had been to aid the field team recognise institutional linkages when they occurred and to think analytically and critically when they did not. Rather than attempting to quantify institutional and social change, the emphasis was on tracking the direction of any social and institutional trends and attempting an explanation.

3.3.2 Report Cards

The IFM committees drafted report cards, themselves. Indicators were presented pictorially and were based on proxies for "good" institutions and institutional performance identified by floodplain stakeholders themselves (an output of R8195).

3.3.3 Data recording

In order to detecting change, a number of research activities were undertaken in the pilot sites under the IFM project. The IFM sites selected are also ongoing CBFM-2 sites[1] thus project avoided duplication in data collection. Data collection envisaged that it must be rationalized to ensure that, as well as being possible, social and institutional dimensions are covered. Summary of data collection by sites is shown in Table 3.2

Table 3.2: Data collection and recording systems

Type of data	Charan site	Narail site
Quantitative		
Households baseline and impact survey, covering all of their plots – land	124 farm HHs, 2003-04	Early 2003: 50 farmers (around the *khal* - 365 plots); early 2004: 620 farmers (all

[1] Indeed, the sites were selected primarily because of their ongoing involvement with CBFM-2, implying that the interventions under this project (R8306) at the field level were exclusively agriculture based.

Type of data	Charan site	Narail site
characteristics, crops grown, inputs and outputs		landowners within area)
Irrigation units/pumps	Census (LLP 8 and STW-105) locations, mapped, monitored for water use (by crop) and operations 2003-4 and 04-05.	Census (86 pumps, mostly STW), locations, mapped, monitored for water use (by crop) and operations in 2003-04
Sluice operation	Not Applicable	2005: dates operated, decisions on operation
Pilot plots - crop input and output data	2003-04 (3 acres, 3 farmers), 2004-05 (45 acres, 85 farmers)	Early 2004: About 3 acres,
Farmer KAP, baseline and impact	60 (Primary level respondents both project and non-project villages), 50 (intermediary and policy level respondents- DOF, DAE, LGED, NGOs, etc.)	59 respondents, before and after folk drama show on IFM
Water level	BWDB - from 1998 (daily data) and project monitoring from 2004 (twice a week)	Weekly by CBFM/project staff since 1998
Fish catch and efforts	CBFM-2 monthly monitoring	CBFM-2 monthly monitoring
Hydrological regime and GIS	1. Identification of water flow systems and characterization of wetlands (November 2004). 2. Water area mapping. 3. Digital elevation modelling (DEM) in August 2004.	1. Identification of water flow systems and characterization of wetlands (November 2004). 2. Water area mapping. 3. Digital elevation modelling (DEM) in August 2004.
Deepwater *aman* variety trial with BRRI.	Trial carried out in two cycles (year1-2004 and year-22005) in Charan site.	Not applicable
Qualitative		
Workshops/feedback/PAPD with stakeholders	Planning workshop late 2003, modified PAPD Mar 2004, crop demonstration planning July 2004 (for 04-05)	Planning workshop late 2003, modified PAPD March2004
Field staff diaries of events and changes	Adopted diary method to document the process and change from May 2004.	General diary since Mar 2004, structured monthly reports from Jan 05
Report cards for CBOs	From Jan 05	From Jan 05
FGD to measure livelihood impacts	September 2005 - separate with fishing households, farmers, landless non-fishers, women using aquatic resources	August 2005 - separate with fishing households, farmers, landless non-fishers, women using aquatic resources

Overall, the project took the view that it needed substantial biophysical, economic, and social data, linked together, to providing evidence from the pilot sites. It is noted that uptake promotion and influencing key decision makers in target institutions, whether NGOs or at the (government) policy level needs clear evidence and impact based messages combining narrative, user opinions, and sound data.

Fishery data used in this report has been collected by CBFM-2 project. To make use of any production figure as an indicator, yearly data, and seasonal variations is needed – thus water level information was collected and analysed against fish catch data. Agriculture data was collected covering one baseline, and two impact, seasons.

In 2005, the monitoring emphasis was given to documenting the adoption of, and changes in, practices in the pilot areas, and apart from these, emphasis was given to collection of more qualitative information for better understanding of the processes and community views considering two following areas:

- The participating communities and individual resource users in the two pilot sites participated in the review and learning workshops in 2004 & 2005 and the diary and report card methods were introduced in late 2004. A series of focus group discussions were organized with separate stakeholders' interests to assess changes in livelihood capital and to generate lessons relevant beyond their areas, as well as to help guide local institutions for the greater sustainability of the pilots beyond the projects lifespan (which includes how local CBFM and government institutions interact with or incorporate IFM institutions).

- With target institutions, it had been assessed how and why IFM has been taken up, and what monitoring systems are appropriate when it is taken up. Of course, any findings depend on the target institutions incorporating IFM messages, approaches/understanding, and solutions into their programmes. Method included relatively simple diagnostic monitoring that was used by the managers of these targets institutions and the local community institutions that implement IFM. The package that the project developed to promote IFM is a combination of modified PAPD for planning (site level), process diary monitoring summarised into the most significant change framework (target institution level), and end of season focus group discussions for participatory assessment (site level).

3.4 Description of pilot sites

The IFM options were piloted in two different hydrological environments of the country in conjunction with the DFID assisted by CBFM-2. The sites are Goakhola-Hatiara floodplain in the Narail district, geographically southwest, and Charan *Beel* floodplain located in the north central part of Bangladesh. The sites have been selected jointly with the World Fish Center and in concurrence with the DoF – the executing agency of CBFM-2. It is noted that in both the sites previous NRSP projects have been implemented, R6756, R7562 and R8223 in Charan *Beel*, and R7562 in Goakhola-Hatiara.

3.4.1 The Charan Beel site

The Charan *Beel* site is located in the Bonshi-Pungli floodplain in Kalihati Upazila, under Tangail district in Central Bangladesh. This site includes diverse wetland habitats including *beel*s, rivers, canals, and a large amount of seasonally flooded land. The Charan *beel* complex covers six *mouza*s (lowest revenue boundary of Bangladesh) in two unions. In the wet season the extent of the *beel* is around 4.78 km2, reducing to less that 1km2 during the dry season. The *beel* is directly connected to distributaries of the Bangshi River via a canal, on which there is a non-functional regulator gate set in a breached low embankment. Thus, *beel* hydrology is closely related to peak river flows in the Bangshi distributaries.

In the Charan Beel area, recession of *beel* floodwater in the late monsoon varies spatially as well as temporally depending on the extent of flooding and rainfall. Of 600 acres of cultivable land, there is a 100-acre (approx) perennial water body, which is not suitable for cultivation due to water cover. The land type is predominantly medium-low land, requiring less irrigation than high and medium high areas, suitable for various *rabi* crops, although not as predisposed to *boro* cultivation as agriculture in Goakhola-Hatiara.

Table 3.3 Land type classification of Charan Beel

Land type	Area (ha)	Area (%)	Remarks
Medium high (F1)	205.82	49.19	Mustard followed by *boro* depending on water receding
Medium low (F2)	87.54	20.92	Mustard followed by *boro* depending on water receding
Low (F3)	50.91	12.17	Suitable for *boro* and perennial *beel*
Very Low (F4)	74.11	17.72	Perennial part of *beel*, not under farming
Total	418.38	100	

The soil type of the crop fields around the three villages varies. The soil type of Badda village is predominantly clay. During dry months, without adequate irrigation, it is not possible to grow any crop with desired yields. Aside from *boro*, this soil is suitable for growing potato, and maize, followed by jute. The soil of Ag Charan is loam, suitable for growing any crop with minimum irrigation, whilst the soil of Pachh Charan is loamy sand, also suitable for growing any *rabi* crops but requiring preparation. The soil of Pachh Charan is less suitable for *boro* cultivation because water retention in the soil is low, thus higher irrigation is required. As similar pattern to Goakhola-Hatiara Beel was observed where areas of high land suffered from lower soil quality and increased dependence on chemical fertilizers to achieve desired productivity.

This site was selected primarily due to its involvement in the Community Based Fisheries Management Project Phase 2 (CBFM-2), which is now being implemented in partnership with the WorldFish Center, the Department of Fisheries (DoF) of Government of Bangladesh, and a number of NGOs, in selected water bodies around the country. The Center for Natural Resource Studies (CNRS) being a NGO committed to conserve the country's natural resources through community-based approaches has been working in a numbers of water bodies of different ecosystems under the umbrella of CBFM-2.

The goal of CBFM-2 is to improve the livelihoods of poor people dependent on inland aquatic resources by developing, testing and assessing arrangements for user based fisheries management across a diverse range of inland fisheries in Bangladesh. For successful implementation of user based fisheries management activities, identification and involvement of all users of a resource system in the management regime is required. It is now recognized that if the actual users of a resource system are excluded, it is not possible to manage and conserve a resource system in a sustainable way. Therefore, sustainable fisheries management implicitly dictates that stakeholders are considered and involved in the planning, management, and implementation process.

Under the current project, fisheries management aspects are being carried out under the umbrella of CBFM-2 activities currently being carried out in Charan Beel by CNRS. Thus, the NRSP/IFM component focuses exclusively on agricultural aspects, the promotion, and implementation of changes in farming practices, and crop diversification.

3.4.2 The Goakhola-Hatiara Beel site (Narail site)

In Narail Sadar Upazila, Narail District, southwest Bangladesh two adjacent and connected floodplain *beel*s (seasonally flooded depressions or wetlands) were selected for piloting IFM activities: Goakhola-Hatiara Beel and Maliate Beel. The primary reason for their selection was again that the *beel*s are under the DFID supported Community Based Fisheries Management Project phase 2 (CBFM-2), however, in addition Goakhola-Hatiara Beel was under the first phase of CBFM (CBFM-1) from the end of 1996.

The IFM project's purpose is to develop and promote improved pro-poor methods for the implementation of integrated floodplain management (IFM) for which the main elements are

community participation (inclusive of the poor) and integrated attention to both the land and water components of floodplain resources.

Goakhola-Hatiara Beel is a seasonal *beel* generally regarded as covering, at its maximum extent, around 250 ha. The *beel* is connected by Goakhola *Khal* to Afra *Khal* (a secondary river), which connects to Bhairab River some 3 km downstream of the *beel*, but local rainfall is the main source of water in the *beel*. All of the land in the *beel* is private and is cultivated mainly with paddy. A large part of the area is under up to 1.2-1.8 m of water for 5-6 months of the monsoon each year.

A flood control embankment constructed by the Bangladesh Water Development Board in 1994 protects the *beel*. The water level in Goakhola-Hatiara and the adjoining *beel*s is now controlled by a sluice gate located at the mouth of Goakhola *Khal*, which is used to prevent high flows in Afra *Khal* entering the *beel*. Maliate Beel is a similar seasonal floodplain of about 100 ha immediately east of Goakhola, in high flood year's water between the two *beel*s merges.

Goakhola-Hatiara Beel has typical floodplain features and is mostly low-lying land that experiences relatively deep inundation each year. More than 60% of the land area falls under low and very low land categories (Table 3.4). In the monsoon, all the land becomes flooded whether categorised as high or medium high. However, the water level remains lower in the high land and after the monsoon, water recedes from these plots, whereas in other areas the water stands for a longer period. Because the high land dries up quickly, there is greater need for irrigation (almost everyday in the dry season) if they are to grow *boro* paddy. The medium high land has similar characteristics to high land. At the opposite extreme, about 10% of the low land remains fallow in the *kharif* season as the water level in these plots remains too high, for too long, for crop cultivation.

Table 3.4 Area of land by level and soil type in Goakhola-Hatiara Beel.

Land characteristic	Number of plots	Average plot size (dec)	% of total area
Land level			
High (F0)	167	24	7
Medium high (F1)	678	29	33
Low (F3)	1,013	33	56
Very low (F4)	118	22	4
Total	1,976	30	240.83 ha

The use of high amounts of chemical fertilizer, low content of organic matter in the soil, and monoculture, has reduced soil fertility in the high land. Although the area remains under water for about 4 months of the year, natural silt deposition is low as it is protected from the river system by an embankment. During February-March, clay soil splits and paddy crops die if irrigation is not provided, so more irrigation than average is used in these plots. Some alternative crops, such as *khesari* (black gram), form vegetation cover that retains water for longer, but these crops are no longer popular in the area. About 20 years ago, a variety of *rabi* crops were cultivated in the area as the paddy crop was uncertain and dependent on rainfall and early flooding (mechanical irrigation was not used). Since they started to use irrigation and grow paddy as a mono-crop they have been reluctant to grow these alternative crops. Only in a small area near the riverside that is sandy loam, have farmers continued to grow other crops.

4. Factors influence IFM practicing

Implementation and promotion of any management interventions or options face some challenges at all levels, from grassroots communities to the higher-level policy stakeholders. While piloting IFM options at field sites and communicating stakeholders in the efforts of uptake promotion, the project team faced some challenges (or barriers) - termed here as "critical factors". Despite the critical factors, the team also experienced enabling situations that paved the way of promoting the IFM options at all levels - termed here as the "enabling factors". It is important to highlight both the barriers and opportunities for the audience who are likely to take the role of "drivers" and carry out the work in future for further promotion of IFM at macro level.

4.1 Critical factors influence IFM practicing

4.1.1 Complex hierarchy of farming communities

Floodplains in Bangladesh are under two major uses in two different seasons, crop farming in the (dry) winter, and fishing in the (wet) monsoon. Cropping pattern change for IFM is predominantly a dry season intervention and thus farming communities are the major targets. The farming communities cover broad and complex hierarchical categories of people with different stakes in land use, in both the wet and dry seasons, and can be categorized in to different hierarchies based on their ownership of land, influence over farming decisions, and involvement in farming activities. While piloting IFM options under the project (R8306), it was observed that the farming communities have strong influence on decision making in the planning and implementation processes, of not only cropping pattern issues, but also other development interventions in floodplain environments including fisheries management (Table 4.1).

Table 4.1: Hierarchical attributes relevant to farming communities and their role in decision making

Hierarchy	Farming relevance	Role in decision making
Landlords (Own huge quantity of land - over 3 hectares)	- Share out all land, or - Share out a part of the land and farming in parts engaging wage labourers, or - Farming in all own land engaging wage labourers	- Less involved in farming activities - More involved in local decision making and politics, trading, service, leasing of water-bodies - Strong influence locally, good linkages with UP, upazila and district authorities
Landowners (Own moderate quantity of land – below 3 hectares)	- Share out all land, or - Share out a part of the land and farming in parts engaging wage labourers, or - Farming in own land hiring labourers	- Some involvement in farming and farming decisions locally - Good influence and linkages with UP and upazila - Involve in leasing of water-bodies, trading, pump owners
Owner-farmers (Own small quantity land - 0.2 – 1 hectare)	- Share out a part of the land and farming in parts with hired labourers, - Farming own land with family members and wage labourers or, - Farming in own land hiring labourers	- More involved in farming and farming related decisions, - Can influence local farming practices, pump owner - Some influence locally
Mainly Share-croppers (Own a minimum land)	- Mostly farming in shared in land including own land	- Less influence locally - Farming is major occupation
Exclusive share-croppers (No own land)	- Exclusively farming in shared land	- Farming decisions depends on land owners - No influence locally
Tenant farmers (May or may not have own land)	- Farming own land as well as in leased land (lease taken on annual contractual basis), or - Farming exclusively in leased in land	- Take own farming decisions for the leased-in land - No or less influence locally

4.1.2 Farming decisions are not easy

Farming decisions largely, and to some extent exclusively, remain limited to the landlords, landowners, and owner-farmer hierarchies. If they feel *boro* farming is better in the *rabi* season then they set conditions with sharecroppers to continue *boro* farming and do not make changes unless a major shift is felt, due to changes in water regimes, or other factors be they natural, climatic, anthropogenic or market.

Landowners involved in other occupations outside, and thus not staying locally, are defined as absentee owners, who share or lease out their land under certain conditions prevailing in the locality. The absentee farmers/owners have minimum association with the activities of sharecroppers in their land and have little or no influence in decision-making about crop selection and farming practices; rather they prefer to get an agreed amount of money from the sharecroppers. In case of the Charan Beel site, it is usually a quantity of rice (i.e. 20 mounds of rice per 56 decimals of land per season). Here the farming decisions are taken solely by the sharecroppers and are usually in line with prevailing farming practices. It is usually *boro* rice during the *rabi* season, which the majority of farmers cultivate. However, sometimes, the local agents of absentee owners (family members, associates, or relatives) influence the sharecroppers on crop choices and farming practices on behalf of the owners.

There are landowners that stay locally but do not farm their land themselves, usually sharing or leasing their land based on locally prevailing conditions. They however, have a large influence on sharecroppers' selection of crops and farming practices. This decision is also usually in support of locally prevailing cropping pattern, which is *boro* rice cultivation in the *rabi* season.

Sharecroppers, who are poor and often landless, have little say about crop choices and changes in cropping pattern independently. They however, have to decide about crop varieties (whether BR28 or BR29) and intercultural practices (extent of fertilizer) but this is usually inline with local farming practices. The tenant farmers, however, have more freedom about crop choices and intercultural practices as they pay the rent for the land they lease and landowners have little or no say as to farming decisions of tenant farmers. Although tenant farmers also follow the local cropping pattern, as other factors directly or indirectly influence them, this group has the greatest potential for uptake of IFM crop management practices.

Land use largely depends on owners/owner-farmers decisions, choices, and prevalent local farming practices. Thus, any cropping pattern changes need strong external facilitation with clear evidence in support and illustrating the benefits of intended changes.

4.1.3 Prevalence of *Boro* Cultivation

The farmers prefer to cultivate rice over other crops unless they have valid reasons for switching to other crops. During *rabi* season, *boro* is thus far the main and most common crop in most floodplain basins in the country. The reasons for prevalence of *boro* cultivation can be attributable by the following factors:

Rice as a staple: In Bangladesh, rice is the staple food, thus for poor farmers growing rice gives them a sense food security beyond the economic value of the crop.

Deferred costs: Although *boro* rice cultivation is costly, the costs are distributed over the seasons with low initial cost. The seed cost for rice is low compared to other *rabi* crops, and good quality rice seeds are available locally. Although irrigation costs very high, farmers usually pay this cost in kind (25% of the rice produced) after the rice is harvested.

Government policy: The Government's focus, motivation, and extension efforts also support rice production, particularly HYV rice varieties, with the aim of achieving food security and sufficiency in food production, to the extent that it is considered the efficiency index of the DAE (Directorate of Agriculture Extension) and the government as a whole.

Habituation: Farmers are also not willing change their practices unless they are compelled to do so as they feel comfortable with rice cultivation, which they feel matches their capacity and manage skills.

Historically, rice has been the dominant crop of Bangladesh in all three crop seasons, *rabi* (November-March), Kharip-1 (April-June) and kharip-2 (July-October). Thus, in general, Bangladeshi farmers have acquired better knowledge and skills in rice production than other crops, and so feel more confident about growing it. In addition, some alternative crops (e.g. potato) are more technical and sensitive than rice, contributing to farmer's reluctance to grow them.

Market conditions: As produce is sold in the local market, farmers were worried that there would be insufficient demand for the new crops, such as maize, which is completely new to the area (to the extent that farmers reported during piloting that people stole cobs from the fields just to see what it was). This is a rational concern, and affects farmers' decision making when planning what crops to grow.

However, the market for rice is very sensitive and unpredictable and often the farmers, as growers, do not get a desirable price due to the influence of racketeers that control the rice market, especially during the harvesting period, when poor farmers tend to sell rice. Locals are well aware of this feature of rice markets in the locality and are adjusted to the situation, and thus feel it less risky than marketing a new crop in their locality.

LLP operators: Water is the main determining factor in *rabi* season cropping whether it be *boro* rice or any alternative crop. Based on local situation, basin characteristics, and water availability, farmers adopt their water use regimes. The LLP operators make an agreement with the cultivating farmers about compensation for watering the plots over the *rabi* (*boro*) season. The agreement, as observed at the pilot site, is that the farmers are to pay 25% of their produce to the LLP operators at the time of harvesting for the whole period of watering the *boro* rice (land preparation to harvesting). The farmers thus do not need to pay any cash for watering and the sharecroppers, and farmers, find it a suitable arrangement. In this case, the LLP operators are to ensure supply of required water for each of the farmers' plots within the command area of that LLP or STWs (shallow Tube Wells).

The LLP operators are usually landowners who can afford to organize LLPs and STWs and can also influence and establish control over farming communities so that their share is ensured at the end of the farming season. It is observed that a 25% share of crops for watering is profitable and thus they want to maintain this sharing system and prefer that the farmers should continue *boro* farming. Therefore, LLP operators, being locally influential, induce farmers not to change a cropping pattern that to them, is profitable.

Collective actions – block farming: *Boro* rice requires 3-4 times more irrigation than any other *rabi* crop and at times, flooding irrigation is required to maintain the level of water demanded by the rice. Conversely, irrigation demands for alternative *rabi* crops (maize, wheat, potato, onion and garlic) are much lower and they do not require flooding irrigation.
Cultivating alternative *rabi* crops in isolated small plots within a *boro* command area is not practicable as the water from *boro* plots would affect the adjacent alternative *rabi* plots and hamper achievement of desired (potential) yields. Therefore, alternative *rabi* cropping need collective agreement between farmers in wider blocks, where they all cultivate alternative

rabi crops so that excess water from adjacent *boro* plots does not affect the performance of alternative *rabi* crops.

Sluice gate operation: Sluice gates play an important role in influencing cropping patterns in modified floodplains. The sluice gates (regulators) are built and operated with the target of protecting crops from flooding and drainage congestions. However, in many cases, the gates/regulators do not function properly, thus the water management demands of alternative crops cannot be met.

4.1.4 Land retirement is not a suitable option

Communities in both the sites showed reluctance to the land retirement option. The tendency of the people (farmers whether poor or rich) is to bring whatever land available under farming and thus are not willing to sacrifice even very low land for fisheries benefits. There is also issue related to land tenure and de facto use of land in low-lying areas where crops are under risk of flood damage. Therefore, the project team decided not to work on the issue rather emphasized on keeping more water in the *beel* in the *rabi* season so that fish could get shelter and the people could not cultivate crops at the edges

4.1.5 Lack of pro-poor access and use of fisheries

The current management of fisheries in the country is neither pro-poor nor sustainable due to various policy and regulatory issues. The fisheries are being exploited rather than managed and the access of poor to fishing is constrained due to lack of proper processes that enable fishers/poor to gain access and benefits from fisheries.

Access to fisheries: Fishing in *khas*[2] wetlands (*jalmohal*s[3]) is managed and controlled by the Government of Bangladesh through the Ministry of Land (MoL). Under the current policy, *jalmohals* are leased out for 3-5 years to the highest bidder for fishing purposes. Although the policy has provisions that "fishers associations" should get priority in this bidding process, in reality, there are many instances of local elites obtaining the leases and employing fishers to catch fish, under various exploitative, and highly profit-oriented, terms and conditions. Under the system, leaseholders seldom consider investing any resources in conservation and resource management aspects, instead aiming to maximise benefit within their tenure of lease, using destructive and unsustainable practices.

The lease of Charan Beel (*jalmohal*) was controlled by a group of local elites who set strict rules & systems for access, with fishers paying very high tolls for using specific gears. Thus, CBFM-2, in its initial stages, faced many difficulties in organizing and establishing fishers' rights of access and the practicing/piloting of management norms.

Exploitation rather conservation: There is an absence of resource conservation and management practices in floodplain land use practices as whole, whether it is a *jalmohal* or private floodplain. The general behaviour of the fishers and farmers (whole floodplain communities) is to exploit, and maximise their own benefits at the cost of the resource base (the Tragedy of the Commons[4]). Thus, although the majority of the communities support it in theory, conservation and sensible use of resources is not practiced. The attitude that has developed among the users over long period hinders testing and adoption of improved floodplain management (IFM) options in real world situations.

[2] Government owned lands (wetlands, croplands, fallow and forest lands)

[3] *khas* (government owned wetlands) which are leased out to highest bidders for fishing purposes are defined by the Ministry of Land as *jalmohal*s (water estates)

[4] J. Hardin's 'Tragedy of the Commons' (1963) theorises that for a given common pool resource, open access will lead to an inefficient outcome as each individual will attempt to maximise their own benefit at the cost of all other users, and the resource base.

Encroachment and illegal occupation: Floodplain agriculture, particularly *boro* cultivation in *rabi* season (dry season) has been further accelerated due to siltation, degradation of wetlands, and weak execution of relevant laws. Local landlords and influential people take the opportunity to encroach on the floodplain wetlands, especially in the dry season, and extend their land in *beel* beds, that surface due to siltation. These people often have strong influence at local level and stand against any development projects targeting the rights and access of poor and fishers and pro-poor natural resources management.

4.1.6 Week Institutional response

BWDB: The BWDB (Bangladesh Water Development Board) has the mandate to build, operate, and maintain sluice gates, but keeps little association and involvement once the sluice gates have been built. Post construction operation and maintenance is often ignored, thus the purposes of building gates are seldom realized in the true sense, despite which, BWDB appear unwilling to take effective action. This creates problems in fair and balanced use of water for fish and crops in modified floodplains as observed at the Narail pilot site.

Reluctance of DoF: On the issue of making the sluice gates operations and facilitating fisheries, there is need for institutional negotiation and joint action. To this end, DoF, on its own (in non-project condition), seldom takes any initiative to create dialogue with local BWDB officials and resolve the issue related to the adverse impact of sluice gates on fisheries and any measure that can be taken to enhance fisheries inside modified floodplains.

Fish unfriendly sluice gate operation: Sluice gates are built and operated with the aim of protecting crops, with no focus on fisheries management. Being members of gate management committees, farmers and local elites dominate sluice gate operation and they hardly consider the issue of fisheries, impact of FCD/I projects, and operation of sluice gates for benefiting fishers. Therefore, the gate management committee showed reluctance when the issue of fish friendly sluice gate operation was discussed at the local level.

Non-functional fishers association: There are thousands of registered fishers association in the country, organized with the aim of facilitating access to *jalmohals* for the improvement of their livelihoods. Unfortunately, for various reasons, most of the fishers associations are currently non-functional. In theory, the fishers association should act as the platform for adoption of fisheries management options. CBFM-2, in its start-up stage found the Charan fishers association non-functional and being led by non-fisher lease controllers. The project faced difficulties in motivating the fishers and organising them towards resource management.

4.2 Enabling factors facilitate IFM practicing

4.2.1 Maintaining ecosystems

Attitude to maintain wetlands functions: Communities living in the pilot sites have strong relationships with, and dependence on, various floodplain natural resources available from the interchangeable terrestrial and aquatic environments for their livelihoods. Communities, both farmers and fishers, have overlapping occupational hierarchies relevant to floodplain resource use patterns over the season. In the wet season, when farming is not a viable option due to flooding extent, the dominant livelihood strategies of many farming households are skewed towards fishing, while in the dry season, fishers' livelihood strategies become more dependent on farming floodplain land.

In the wet season, poor households often collect various wetland products (aquatic vegetables and fruits) for consumption and selling. Thus, the communities as a whole still

have strong associations with the floodplain's natural resource base for diversified livelihood outcomes. This created an enabling situation for project team to initiate testing of IFM options in pilot sites and CBFM-2 project activities have been instrumental in organizing communities around bringing a positive attitude towards conservation of wetland resources.

Attitudes to prevent encroachment: In common with other parts of the country, wetlands in the pilot sites are in the process of degradation due to natural and anthropogenic causes. The key natural process is increased siltation that raising the wetland beds reducing depth of dry season water and thus affecting the fisheries productivity.

Besides this, the land at the shallow edges of wetlands, exposed due to siltation, are targeted by large farmers who wish to establish ownership rights and eventually settle the land. Because of their influence, the poor often remain non-reactive to this illegal occupation of wetland, even though they are the victims of such occupation, as it shrinks the wetlands extent and reduces the common area that the poor use for their livelihoods.

The poorer communities were proactive in the project team that demarked the wetlands and took development initiatives with the aim of stopping illegal encroachment and protecting land from the influential land grabbers. The project team assessed this attitude as a sign to initiate IFM piloting at the field site.

Declining fisheries production: The communities, as a whole, are concerned about declining fisheries production and loss of species diversity in their floodplains. They are also aware of the factors affecting the floodplains and its resources. However, there was a lack of collective thinking and interaction between different floodplain user groups (mainly fishers and farmers) and thus no plan of action was thought of as a measure of remedy. The project team, while involving the communities in the planning process, based on identifying the key problems they encounter, found them very enthusiastic in participation and their action plans. Therefore, the community's concern about declining fisheries and its impact on their livelihoods facilitated the project team to get them on board in piloting IFM.

4.2.2 Positive features of alternatives to *boro* rice

***Boro* rice not profitable**: During PAPD, sharecroppers assessed that the *boro* rice is not profitable for them and in some years, if the rice price is low, it is even loss making. However, being sharecroppers, they have hardly any option to switch to other crops that may be profitable.

The participating farmers assessed the cost benefit of various *rabi* crops as against *boro* rice and found that many other crops may be more profitable than *boro*. Piloting data also shows that net return from *boro* is only 63% over investment while in comparison, potato, maize, and wheat, are more profitable. The project team disseminated messages made the farmers aware of the issue, which led them to become interested in testing alternative *rabi* crops.

Land suitability for cropping pattern change: Suitability of land is an important factor in defining the cropping pattern of any area. The pilot sites were found suitable in this regard. Land elevation, soil quality, and water regimes, in both the pilot sites were found suitable for cultivation of some alternative *rabi* crops.

The soil of Charan *Beel* basin is sandy loam, loam, and clay loam, at different elevations and locations. These soil types are suitable for various alternative *rabi* crops. Consequently, the communities were confident that there would be no failure of crops due unsuitable soil quality.

Evaluation of Past scenario: People of Charan *Beel* in general, at all discussions and knowledge sharing events, recalled the past. The elderly people depicted the *beel*, then the largest perennial *beel* in the Tangail District, as rich in diverse fisheries, varieties of water birds, full of various aquatic fruits and vegetations, and a good water reservoir in the dry season. Diverse *rabi* crops were cultivated and people of the area had more dependence on Charan Beel resources for their livelihoods. They assessed that the natural and anthropogenic factors that negatively affected the natural resource base of the site, and the past scenario is almost completely changed. The introduction of *boro* rice and development of infrastructure (roads, dykes, sluice gates) has changed the situation for the worse.

A positive feeling was felt among the people for taking any measures that would protect the *beel* environment and its diverse resources. The experience of elderly farmers helped others to become interested during trend analysis in the planning workshops, and that helped the project team to initiate IFM piloting.

4.2.3 Women have better potential for participation

To some extent women from within the communities are already involved in CBFM-2, dealing with fisheries management planning and in implementation. Women can play a better role in farming activities and decisions over open water fisheries. In both the project sites, women participated in planning and field activities in alternative cropping patterns. Women from both the sites paid exposure visits to distant areas to learn about alternative *rabi* crops as well as attended planning workshops (PAPD). Besides homestead vegetable gardening, many women are actively involved in cultivation of field crops in both the sites. Apart from cultivation of crops, many poor women were given the opportunity to work in processing of wheat and maize and earn income and fuel (wheat straw) for cooking. Thus, there is potential that IFM is accepted at family level where both men and women have their niche and role to play in practicing IFM.

4.2.4 Enabling Market situation

The farmers were worried about the market demand for the alternative *rabi* crops, especially for the new crops like maize. The first year's maize demonstration in small plots showed that the entire produce was consumed locally, mostly by poultry and fish farms. The local people also showed interest in maize as a food item and thus it was sold directly in local bazaars. The market situation indicated that there exists a huge capacity for expansion in the local maize market, through the establishment of more fish and poultry farms. This was the reflection in the second year's piloting, when many farmers grew maize and all the produce was sold locally at a reasonable price.

Land fertility and wetland productivity: The issue of mono cropping of *boro* rice in the *beel* area during *rabi* season and its negative effect on the soil fertility became a point of disharmony, often raised by the farmers during planning sessions, although no alternative was planned. The project correctly highlighted the ecological benefits of IFM and its effects towards mitigating fish/farm fertility problems in a convincing way, with evidence as extracted from previous projects (R7868). The farming and fishing communities responded favourably to address the fertility/periodicity issue, availability of dry season water, and maintaining wetland functions for sustained yields. Thus, an enabling environment has been created in favour of IFM piloting.

4.2.5 Partnership and security of backstopping

Service from local DAE and DOF: Farmers were initially worried about their incompetence regarding technical aspects of cultivating new crops. The project guaranteed technical support, through the relevant government offices, and has received assurances from the Department of Fisheries (DoF) and the Department of Agriculture Extension (DAE) that this

will be provided. The project also ensured regular technical support from local DAE and DoF at the upazila and district levels.

Better understanding between partners and communities: CNRS, BS (Banchte Shekha an NGO) and WorldFish have been working since the early nineties with the communities in pilot sites, implementing different projects including previous natural resource SP/LWI projects. Having worked over a long time and dealing with the common problems and issues, an understanding and trust has developed between the communities and the project partners. This association and understanding helps communities to come forward and encouraged them to test the IFM options, which they perceived would not harm the local environment and social and economic functions.

Support with quality seeds: Agricultural inputs and necessary technical support would reassure the farmers: farmers of Charan normally use inferior quality local seeds and had no linkage with any technical persons / institutions related to crop production, prior to the project. CNRS developed linkages between farmers and experts, also managing to provide quality seeds for demonstration.

Farmer's cooperation: Farmers' Field Schools (FFS), organized earlier in the Narail site by DAE, were very helpful and acted as a platform for testing and adopting the cropping pattern and sluice gate management options. Formation of a new farmers association (IFM committee) in the Charan Beel site allowed farmers to discuss their common issues and encouraged them to come up with micro-level planning of improved cropping pattern management. CBFM-2 project largely deals with fisheries management issues with fishing communities in floodplains, with due consideration of surface water issue. IFM covers both the fish and crops, for which a balanced use of surface water has been the prime focus that attracted the whole communities, especially the farming households who are stronger and more influential than other occupational groups in rural settings.

Farmers' attitudes, in general, were positive towards the project due to the fact that it differed from traditional projects, that usually had sectoral focus (either fish or crop of water). Rather, IFM focused on water management as a core and addressed the entire land use issue to maximise joint benefit of fish and crops, and thus fishers and farmers in the area. Farmers' positive attitude was in part due to the projects purpose and scope making the farmers taking proactive role in piloting IFM at site level.

Presence of CBFM-2: The IFM options were piloted in two ongoing CBFM-2 project sites (Charan Beel being implemented by CNRS and Narail site by BS – Banchte Shekha) and thus the communities were already organized and sensitized around fisheries and water management and were aware of environmental, social and livelihood issues relevant to the floodplain production systems in their respective areas. The BMCs (*beel* management committees) formed under the CBFM project have some institutional strength that facilitated IFM piloting. The orientation and understanding of the area as well as the rapport that was already in place with the organizations and the communities facilitated piloting IFM options at the site level.

5. Attainment of outputs

The project aimed to achieve the following three outputs:

Output 1:	Improved IFM options successfully piloted in different environments.
Output 2:	Tools for effectively communicating IFM recommendations and methods/options to reach target audiences (including policymakers, intermediaries, and community practitioners) developed.
Output 3:	Institutional learning systems in relation to IFM assessed.

The objectively verifiable indicators of achievement for these outputs included:

Output 1. OVIs

- At least 2 IFM piloting activities established by November 2003.
- At least 4 categories of primary stakeholders plus secondary stakeholders successfully engaged and participating in piloting activities by end of 2004.
- Adequate data collected to assess the IFM options and their acceptability to participants by end of project.
- By Jul 2005, pro-poor impacts detected (for both men and women) as a result of implementation of pilot improved IFM.

Output 2. OVIs

- At least 10 key decision makers from different institutions participate in developing the communications strategy by end of 2003.
- At least 2 different media types identified and tested for awareness raising in IFM by end of 2003.
- At least 50 decision makers from different types of institutions reached by IFM awareness raising events/ materials by end of project.
- At least 600 community practitioners reached by IFM awareness raising events by end of project.
- A draft resource pack for IFM planning is available by September 2005.

Output 3. OVIs

- By end of project, success factors in the project's promotion of IFM to secondary stakeholders at district (government) and programme (NGO) levels are identified.
- By end of project, at least 2 target institutions have started testing IFM monitoring.
- By end of project, at least 1 target institution has appropriate training related to IFM in place.
- At least two community groups undertake reflective learning activities in relation to IFM, by end of project.
- By end of project, at least one third of participants in groups formed around the operation of IFM give indications, in their reflective learning discourse, of some institutional and livelihood capitals gains (particularly social and human).

5.1 Output 1

This output has been achieved in full through successfully piloting IFM options in two sites located in two different geographical locations of the country, initiated in October 2003 at the site level. The piloting activities, including assessment of learning, continued in the Narail site up to September 2005, while the activities in Charan Beel continued up to November 2005 as the harvesting of deepwater *aman* rice, trailed jointly with BRRI, ended in late November '05 (Annex-B1 and B2). The *aman* trial data is with the BRRI researcher and the report is expected be available by end of December 2005.

The piloting activities targeted and involved different primary stakeholders groups; owner farmers, sharecroppers, fishers and women. The fishers and women have been involved through the CBFM-2 project in fisheries planning and management activities (effort control

option). The farmers and sharecroppers have been largely targeted through the project (R8306) and involved in cropping pattern management option. The project also engaged farmers and fishers in sluice gate and water management options along with CBFM-2. The project also involved women effectively in planning and management of cropping pattern and effort control options (Annex – B1 and B2 Chapter 3, PAPD).

Besides, the primary stakeholders, the project also targeted and involved a range of secondary stakeholders in IFM piloting activities in both the sites, from planning, to implementation and assessment. The secondary stakeholders represented local government officials viz. DoF, DAE, BADC, BRRI, BWDB, (upazila, district and national levels) and UP, and NGOs (Annex-B1 and B2).

The project collected all relevant data and information necessary for analysing and interpreting the piloting results (detailed data collection records in section 3 (Table 3.3) of this volume. In addition, data collection methods and outputs can be seen in the relevant sections of Annex, B1 & B2, B3 (process monitoring report), and Fisheries modelling report (Annex-G)

Pro-poor impacts of IFM have been assessed along with the participating communities and stakeholders at the site levels. Relevant findings are reflected in Annex B1 & B2 (reflective learning sections) as well as in the achievements of Output 3 (Annex-C) process monitoring report) and are summarised below in Section 6.

5.2 Output 2

The second Output has also been achieved in full, through fulfilment of each of the five OVIs. A comprehensive communications strategy was developed at the outset of the project, based on the findings of the communications need assessment survey conducted during the PD phase (PD124). During the course of the development of the communication strategy as well as while it was in use, senior levels officials from various relevant institutions/projects contributed in enriching it and giving a practical nature to the strategy and development plan. The institutions, involved in developing and improving the communications strategy included the DoF, DAE, IUCN (SEMP), FFP, WFC, Caritas, Proshika, BRAC, BELA, MACH project, SIPP.

The project developed and tested two media types at the outset of the project, soon after developing the communications strategy. Based on practical experience and communication needs assessment findings, a poster was drafted and tested in the field. After testing, some changes in the design and contents were incorporated in the finalised poster. However, later, on based on recommendations from the different stakeholders (trainees of DoF-CBFM-2, communities, NGO staff), four more posters were developed and distributed on importance of and processes for IFM practice to target institutions for wider dissemination.

The other popular media type was folk drama. Folk drama performance and its impacts in raising awareness of mass people have been well established in Bangladesh in different development project sites (GOLDA, CBFM, MACH, FFP, SEMP). CNRS and BS developed local folk talent groups to perform folk dramas in their respective local areas with support of CBFM project. In both the pilot sites, the folk groups, with assistance of project staff, developed drama scripts on IFM (some additions and changes in CBFM script – that was more fisheries focused). Folk drama shows on IFM were staged in all the project villages in both the sites during the year-1 planning (Narail and Charan sites) and year 2 experience sharing (Narail site).

In addition, a billboard was designed, tested, and mounted at the project sites. The messages highlighted dry season water use and the benefits of *rabi* diversification. Initially this was not planned; however, based on the recommendations of communities, government and NGOs officials that paid visits to the pilot sites, the project team designed and mounted the billboards in public places at the site level.

The other communication material developed was a series of policy briefs on IFM. This had been strongly recommended by all intermediaries and policy level officials, and while the project team had interaction and knowledge sharing sessions (workshops, meetings, presentations). Initially, one comprehensive policy brief was developed incorporating all relevant messages in it. This was circulated among the stakeholders (including NRSP) for comments and improvements. The brief was then finalised incorporating comments and suggestions received from stakeholders. Later, three more briefings were developed (on effort control, cropping pattern management and sluice gate management) based on the understanding gained from various workshops and interaction the team had with intermediaries and policy stakeholders. Therefore, four policy-briefing notes have been developed for targeting policy or senior government and NGO officials.

In terms of reaching the decisions makers from different institutions, the project reached over one hundred of such officials in both government agencies and NGOs. Dissemination and sharing workshops, and meetings with DoF headquarters (including the DG-DoF, DAE head quarters, DoF-FFP senior staff and PNGOs, BWDB, CBFM-2, LGED-CBRMP, IUCN, ITDG, and government district level officials) were well communicated through workshops and field visits. Selected officials from these institutions also contributed in developing the policy briefs and IFM posters.

The awareness raising events at both sites, reached more than 1,000 community practitioners about IFM issues, and experiences of piloting results, by the end of the in September 2005. These communities not only included the sites' non-participating communities (farmers and fishers), but also include community members from other area and other projects. The communities visited the sites and interacted with piloting farmers / fishers from IC-LEAF project, SEMP in Sunamgonj and Moulvibazar district in the north east, MACH project CBOs from Sherpur and Kaliakoir and CBOs from CBFM-2 project from Magura, Kishoregonj, FFP CBOs from Magura (Section 7 of this report).

As defined in the project's log-frame OVI, a comprehensive resource pack has been developed on IFM. The pack included all relevant facts, issues, and processes relevant to IFM. The contents are designed in three forms; fact sheets, posters, and policy briefs. The contents of the resource pack have been designed based on initial recommendations received from selected stakeholders and experience the team gained while interacting with different stakeholders on different occasions. The resource pack includes fact sheets on related topics require to gain a clear understanding of the issue and implementation processes and thus includes messages from similar NRSP projects viz. IFM promotion (R8306), consensus building on IFM (R8223) and better IFM institutions (R8495). Note that relevant messages from FMSP project R8486 on sluice gate management have also been incorporated in resource pack and policy briefing.

5.3 Output 3

This output was mostly achieved with some lacking in certain OVI areas. To address the OVI 3.1, success factors for the promotion of IFM at government, NGOs and community levels have been identified through reflective learning sessions, FGDs and workshops. The issue was discussed elaborately at the Dhaka workshops with DoF and DAE and some key factors and issues were identified by the participants relevant to uptake promotion of IFM at

government levels (Section 7.2 Feedback and learning from IFM dissemination). It is mentionable that some of the IFM options (effort control) are already in place at the field level as well as in the national plans (DoF). In discussion sessions held during and after the exposure visits to pilot sites by government and NGOs staff, the issues of enabling factors for further uptake and promotion of IFM by their institutions were discussed at length. The success factors for the promotion of IFM at community level were also discussed with the CBOs that visited pilot sites along with respective project staff (MACH, SEMP and CBFM-2 project from other areas).
Some of the key factors raised and marked as important during the course of project implementation for promotion of IFM are noted below:

Collective action – there is need for clear understanding at the concept level. The focus should be placed on the integrated nature of floodplain resource systems instead of traditional sectoral focus that often isolate or divide the communities. The focus should thus be on floodplain communities working together (not the fishers alone or the farmers). The approach should be wider – the whole resource user community (fishers, farmers, sharecroppers, LLP operators, other resource collectors/users) should be targeted and involved in resource management planning and implementation.

Joint benefits – wider focus - There is need for change in understanding of the definition of food. The policy makers and intermediaries in Bangladesh often emphasize on increased food production as the priority action. The floodplain development planning is thus heavily biased on rice production with the target is to “grow more food”. However, it is emphasized by this that to have an enabling situation for promoting IFM options to maximise joint benefits, the stakeholders need to conceptualise that “grow more food” does not necessarily mean “grow more rice”.

Micro level planning – because of the wide variations in land elevation, flooding regimes, small to large river network systems, the variation by catchments or floodplain basins are also wide. Two *beel* basins in same floodplain may vary widely due to land elevation and flooding regimes and thus nature and extent of fisheries and farming practices may vary accordingly. Therefore, IFM promotion requires attention at the micro level and thus basin wide planning is considered as key success factor rather than region wide planning (where there are remarkable variations among basin in same floodplains)

Water management first – water is the key determinant of floodplain production systems and thus the whole issue of water management should get priority in planning IFM. The stakeholders, at the policy and at different levels of the government should clearly understand the issue of balanced use of water in the dry season for the production of fish and crops in floodplains as opposed to the traditional focus on increased fish or rice production with little or no consideration of necessity of water for other resources.

Systems focus – IFM is a holistic management of floodplain resources it addresses fish and crop production system whilst recognizing water is the key factor that influence floodplain production systems. Therefore, it is emphasized that the IFM promotion should consider the systems approach as opposed to sectoral approach to manage either fish or crops.

In response to the OVI 3.2, it can be mentioned that IFM testing has been initiated at four different institutions/projects level (Box 5.1). It is however, noted that the promotion at institutional level will be slow, the major reason being that the institutions and their projects have pre-defined objectives and activities where importing IFM options require time, with exceptions where they have flexibility in the program and activities.

Box 5.1: Target intuitions/projects testing IFM

- USAID assisted MACH project already started cropping pattern option at one of the three project sites after visiting the pilot site and discussion with participating communities and staff. The project team also helped them collecting good quality seed for their farmers.
- The CBFM-2 project of the DoF making plans to disseminate the option in other sites in the next year. However, other CBOs of CBFM Kalihati area started testing cropping pattern option in 2005-06 *rabi* season, dissemination from Charan pilot site.
- LEAF (Livelihood Empowerment and Agro-Forestry) project of IC started testing cropping pattern in this year (2005-06) option after paying visits and promotional efforts of the project in the Northeastern haor area. It is noted that IC along with BRRI and CNRS already had a field trial on short duration *boro* rice in the haor area in 2004-05.
- SEMP of project being implemented by IUCN/CNRS (UNDP/MoEF) started testing cropping pattern option in the haor area of Sunamgonj this year (2005-06) after paying visits at the pilot site.

The OVI 3.3 relates to incorporation of IFM in a TI's training programme. This indicator was achieved well enough as the CBFM-2 project of the DoF has already incorporated IFM in their central project training module and a numbers of training programmes already conducted targeting the DoF field level staff as well as staff of partner NGOs including WFC where IFM project personnel (from CNRS) facilitated the sessions (see section on training 7.1.4.2). There is potential for further achievement in this area with SHOUHARDO project of CARE and MACH project to incorporate IFM training in their project-training module and to achieve this, CNRS would take the initiative being the technical and implementation partners.

Although the BMCs formed by the CBFM-2 and are functional but dealing largely with fisheries issues, the project felt it necessary to target farmers around IFM for holistic resource management in coordination with BMCs. The farmers are thus organized to form IFM committees in both the pilot sites with specific management targets of cropping pattern and water/sluice gate management activities. These two CBOs formed at the outset of the project at field sites have been instrumental in accomplishment of all relevant activities associated with piloting options. By end of the project (August and September 2005) these two groups undertake reflective learning sessions on IFM events, activities and related experience gained over the last two years (Annex B1 and B2) in both the sites.

The participating communities (fishers, farmers, sharecroppers, women, LLP operators) in their reflective learning sessions evaluated all the activities undertaken in their respective sites around IFM and rated various livelihood capital gains and organizational learning areas. The participants also identified the strengths and weaknesses of IFM piloting and promotional efforts (Annex B1 and B2). The very basic learning of the project can be said that the project's endeavour of integrating various floodplain resources under a holistic management has successfully integrated the different occupational groups (primarily the fishers and farmers) together to plan and solve their problems based on enhanced knowledge and skills (human capital) through mutual discussions and sharing of common issues (social capital).

6. Findings and achievements

This section of the report relates to the log frame out put[1] (Improved IFM options successfully piloted in different environments) of the project and describes findings and achievements in the efforts of piloting recommended IFM options at grassroots level along with the participating communities and other relevant secondary stakeholders. The descriptions highlight the achievements in the form of results that have been found over the course of piloting IFM in two different sites.

This section includes the findings and achievements of IFM option piloting at field sites in order, starting from cropping pattern management, fishing effort control measures and sluice gates management options in both the pilot sites. Note that there is no sluice gate in Charan Beel site and thus no intervention on this option was taken there.

6.1. Cropping pattern management

6.1.1 Crop selection for promotion

The first years piloting was focussed more on the participatory trail of alternative *rabi* crops in local situations rather than extension of *rabi* crops. To this end, several *rabi* crops were demonstrated with selected farmers at both the pilot sites. As many as over 20 different *rabi* crops were tested, following an extensive media campaign highlighting the benefits of crop (*rabi*) diversification. The crops chosen were:

Tomato[1]	Chilli[1]	Onion[1]
Maize[1]	Egg plant[1]	Radish[1]
Wheat[1]	Garlic[1]	Long-yard bean[1]
Red spinach[1]	Motor shuti[1]	Cucumber[1]
Kalai[1]	Lentil[1]	Datta[1]
Potato	*Khesari* (black gram) [2]	Seasame[2]
Bush bean[1]	Water melon[1]	Gourd (sweet/bitter) [1]
NB: [1] only demonstrated at Charan site and [2] only at Goakhola-Hatiara site (Narail)		

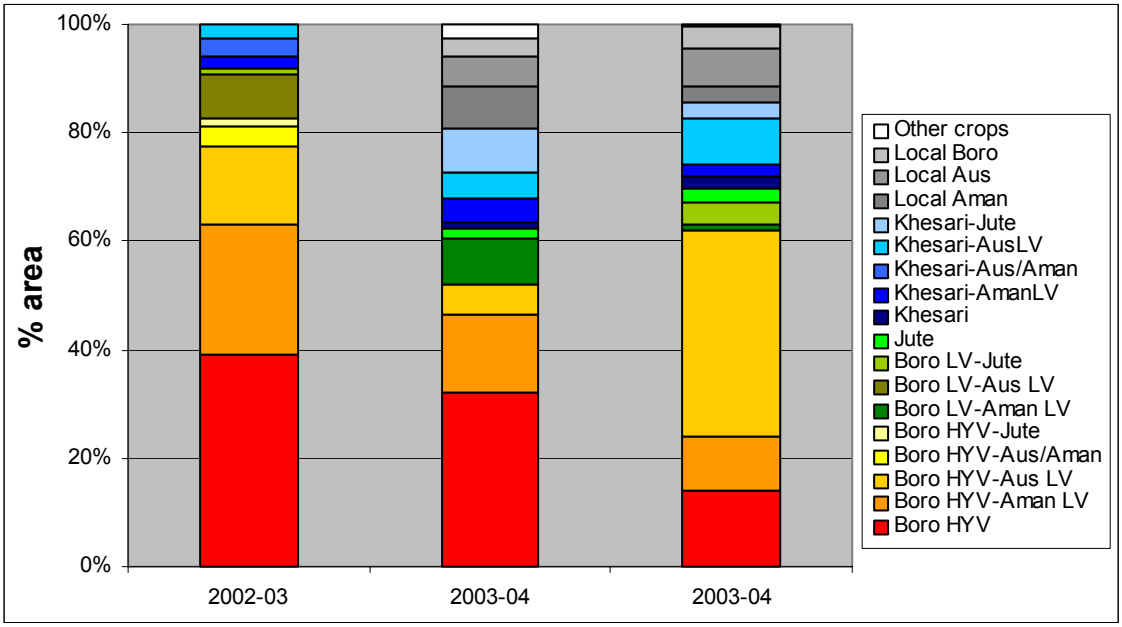
Of the above, only onion, bush beans and water melons failed to grow at least fairly well, however, after consideration, farmers at the Charan *Beel* site chose wheat, maize, potato, garlic for extensive field trials in the 2nd year (October '04 - March '05). At the Goakhola-Hatiara site, the farmers chose Sesame, *Khesari*, *Motor-shuti* and Potato as trial crops. At both sites vegetables were also grown, and at Charan *Beel* an increase in vegetable cultivation was observed, however this took place mainly in the homestead for subsistence consumption, and thus has not been included as part of the study.

It should be noted that at the Charan *Beel* site, the focus was on *rabi* crop diversification as flooding meant that no cultivation took place there in the *kharif* season except deep water *aman*. In Goakhola-Hatiara, local paddy varieties were encouraged reducing dependence on HYV *boro*, during both the dry and wet seasons.

6.1.2 Cropping pattern Change

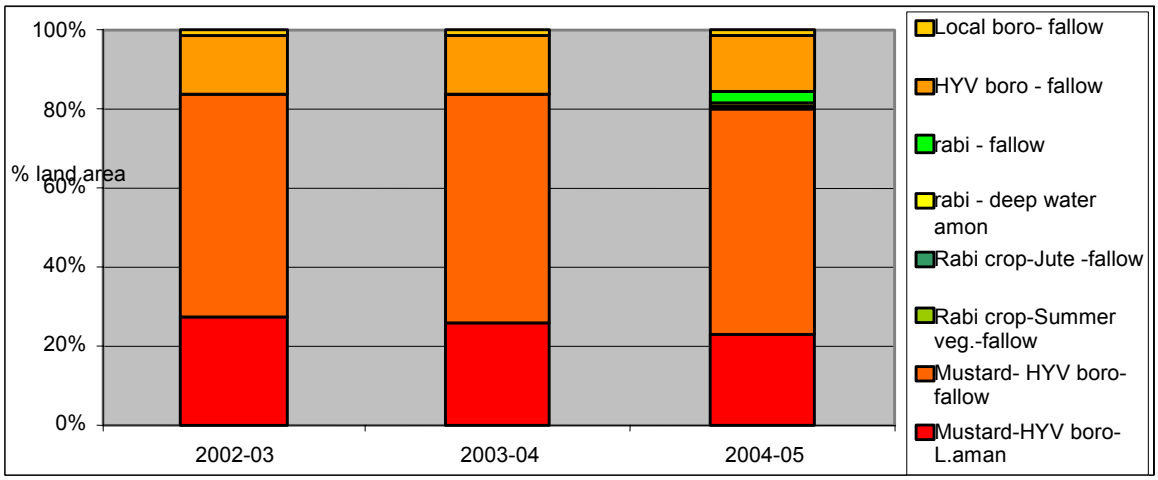
In Goakhola-Hatiara, the major change in cropping pattern was a reduction in *boro* cultivation (combining local and HYVs), more land switched to growing local *aus* after HYV *boro* or after *khesari* (Fig. 6.1). According to the farmers, in the last 20 years, they never were able to harvest *aus* properly and because of this, were reluctant to invest more in cultivating monsoon crops. In 2004, they excavated a small canal and built a flap gate sluice with the support from local community and project people. This has changed the cropping pattern during the monsoon in about 26 ha of land that was remaining fallow.

Figure 6.1 IFM Cropping Pattern Changes in Goakhola-Hatiara



In 2005 farmers have adopted new short duration paddy for which the project has initiated the idea and helped with the technical assistance and linkages to the DAE. This short duration crop has facilitated growing another early crop such as mustard. Mustard has low input costs and can be cultivated along with other *rabi* crops. However, cultivation of *aman* paddy has reduced drastically in the three years. The reason that the farmers mentioned is that *aman* needs almost six months to grow and do not have enough time to cultivate *boro* paddy after *aman*. Instead an *aus* paddy variety, '*ratul*', that is resistant to high water levels and has a good yield has been adopted.

Figure 6.2 Cropping Changes in Charan Beel



Although there appears to be little change in the cropping pattern, this is most likely due to slow uptake of alternative cropping patterns. Farmers in the Charan *Beel* area are only able to plant one rice crop per year (for the most part) and are thus proportionally more dependant on the dry season *boro* crop than farmers in other parts of the country (and indeed in Goakhola-Hatiara). However, that is not to undermine the changes that have taken place. The 5% uptake in alternative *rabi* crops represents a starting block from which others, seeing it's success, will be inclined to start production. Indeed, between years 1 and 2 there

was a significant increase in uptake and discussion with farmers has indicated that they wish to increase production next year.

Table 6.1: Total crop production (MT) in Charan beel site

Crop	2003	2004	2005
Winter/dry season			
HYV *boro*	2176.38	2244.40	2377.01
Local *boro*	22.21	21.51	21.51
Mustard	308.83	284.54	264.00
Wheat			10.69
Maize			9.64
Potato			23.42
Garlic			3.36
Monsoon			
Local *aman*	121.80	2.60	115.72
Jute			3.44
Rabi Vegetables			0.24

In Goakhola-Hatiara, the total production of HYV *boro* paddy increased due to an increase in per hectare yield. In 2004 farmers did not get any *aman* paddy as the entire crop was damaged by heavy flood. In 2005 cultivated area decreased, but total production increased due to normal flood. It is mentionable that the overall production status is good across the country in the current year.
In terms of a analysis of the change in cropping pattern at Goakhola-Hatiara, it can be seen that the expected total paddy production, including estimated production of *aman* paddy, plus reported actual production of *aus* paddy, should be close to the 2003 level, having fallen by 11% in 2004 (Table 6.2).

Table 6.2 Total crop production (MT) from Goakhola-Hatiara Beel

Crop	2003	2004	2005
Dry season			
HYV *Boro*	901.1	220.2	476.5
Local *Boro*	269.5	633.8	423.1
Khesari	2.4	28.9	41.4
Other pulses		0.2	0.3
Oilseeds		0.9	1.0
Potato		12.8	16.8
Vegetable			13.3
Total paddy	1170.6	854.0	899.7
Monsoon			
Aus Local	169.9	220.8	338.5
Jute	20.9	29.1	28.6
Local *Aman*	145.1	197.4	174.3
HYV *Aman*	0.0		62.5
Aus/*Aman*	96.2	130.3	14.2
Total paddy	411.1	548.5	589.5
Total paddy	1581.7	1402.4	1489.2

This has been the result of changes in areas cultivated (notably the adoption of alternative *rabi* crops and consequently of *aus* paddy being influenced by the IFM approach). It has also resulted from changes in yields (Table 6.3). For example in 2003, damage due to flooding resulted in very low yields of *aman*. It would appear that *boro* paddy yields have been

increasing, possibly as higher yielding varieties and hybrids are adopted. It is also notable that two of the main alternative *rabi* crops - *khesari* and potato had higher yields in 2005 when they were adopted on a larger scale than in 2004 when they were largely grown on demonstration plots with IFM support. This suggests that there are good prospects for continued expansion of their area.

Table 6.3 Crop yields (MT/ha) in Goakhola-Hatiara Beel

Crop	2003	2004	2005
HYV *Boro*	6.25	3.96	5.76
Local *Boro*	4.49	5.13	5.72
Khesari	1.25	1.29	1.88
Other pulses		0.6	0.34
Oilseeds		1.55	0.54
Potato		12.96	16.21
Vegetables		16.05	10.03
Local *Aus*	1.85	2.74	2.43
Jute	1.41	2.5	2.54
Local *Aman*	0.87	2.73	2.63
Aus/*Aman*	0.74	2.61	2.61

Changes in reported gross returns (value of crop) per hectare (Table 6.4) reflect the yield increases and increasing prices for crops during the project period. This indicates that actual cash returns from *boro* paddy have more than doubled on average in three years. It also indicates that despite reports to the contrary from the demonstration farmers, *boro* is still profitable (although the sample farmers had not grown potato or vegetables, which appear to give as good a return as *boro*).

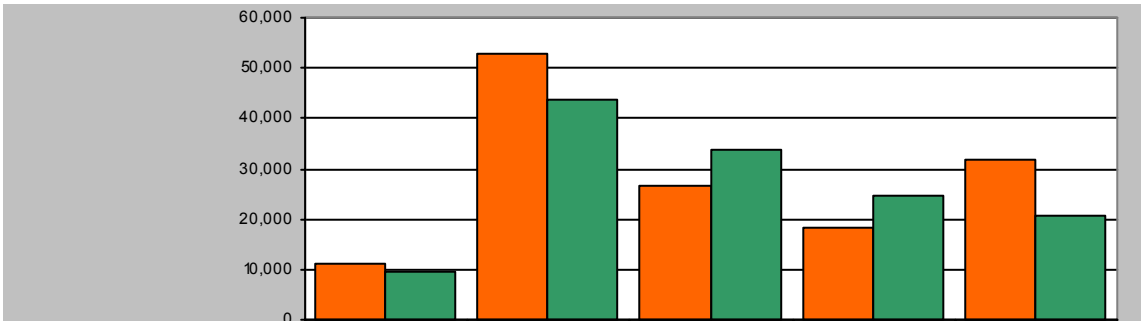
Table 6.4 Total return from the sample household's crop cultivation (Tk/ha) in Goakhola-Hatiara

Crop	2003	2004	2005
HYV *Boro*	34,056	21,883	53,888
Local *Boro*	21,287	29,466	74,692
Khesari	15,674	25,533	28,748
Other pulses		25,556	13,413
Oilseeds		15,792	18,748
Potato		36,697	
Vegetables		.	70,341
Local *Aus*	13,626	16,594	25,538
Jute	13,953	15,558	40,828
Local *Aman*	7,791	12,050	23,028
Aus/*Aman*	7,829	21,123	20,570

Comparing the cost and returns of all *rabi* crops demonstrated in Charan *Beel*, it is possible to draw much clearer results about the relative profitability of alternative *rabi* crops. Figure 6.3 shows that the gross returns of potato, in absolute term of Tk.43,573/ha, was the highest. However, the initial investment needed for potato was also the highest (Tk. 53,045/ha). Although the gross return from potato was high, the net return was 82% of the investment (6.4). Thus, one has to invest relatively more money to cultivate potato.

After potato, garlic produced the second highest return, Tk. 33,678/ha. The cost of production of garlic was Tk. 26,600/ha, higher than both wheat and maize. However, in case garlic the net return over investment was 126.61% indicating profitability.

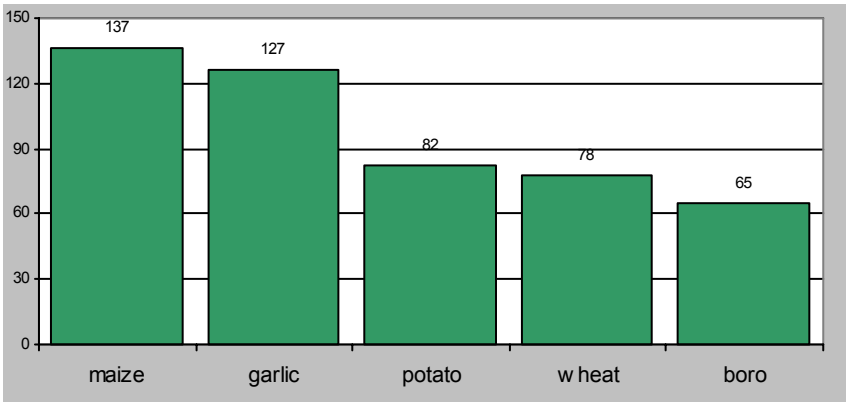
Figure 6.3: Costs and net returns from different alternative rabi crops and Boro rice



	wheat	potato	garlic	maize	boro
Production cost (tk/ha)	11,300	53,045	26,600	18,172	31,772
Net Return (tk/ha)	9,345	43,573	33,678	24,819	20,689

Comparing all *rabi* crops, the highest return over investment of 137% was recorded for maize crop where Tk.24,819/ha was the net return against an investment of Tk. 18,172/ha. Wheat produced the least return in absolute terms (Tk. 9,015/ha), and although the investment in wheat was very low (Tk. 11,300/ha), return over investment was 78%, similar to that of potato (82%) and higher than that of *boro* rice (65%). Thus, wheat can be considered as, with relatively low costs, this can be grown. The advantage of wheat, and indeed potato is that despite low returns, farmers can easily cultivate an extra crop after harvesting the wheat (see below, 'Jute as a Follow-on Crop').

Figure 6.4: Net return over investment (%) for different rabi crops



As observed, in terms of income, *boro* is not that bad. Although the investment in *boro* is higher than many *rabi* crops (except potato) the net return was found nearly double that of wheat and near to maize. However, due to the income/investment ratio *boro* should not be the first choice for farmers. Figure 6.4 shows that the net return over investment in *boro* was 65%, lower than all other *rabi* crops. It should be stressed that the above data are averages for the entire project area, and that there was a degree of regional variation in the results. In Ag Charan, for example, returns to wheat were above 100% (compared with 78% on average), and in Badda, returns to potato were 133% over investment (Annex-B1 Charan Piloting Report). This is clearly because certain soil types and elevations are particularly suited to certain crops, and it can thus be concluded that site based evaluation is necessary before making generalised recommendations.

Based on the production performance and analysis of cost-benefits of different *rabi* crops, it can be concluded that all the four major alternative *rabi* field crops demonstrated are suitable for the Charan *Beel* site. Therefore, depending on land elevation and soil quality, farmers can continue cultivation of these *rabi* crops profitably along with *boro* rice.

6.1.3 Jute as a Follow-on Crop

Jute is not a *rabi* crop but the practice of alternative *rabi* cultivation provided an opportunity for the farmers to grow jute as an extra crop and thereby increased the overall income (*rabi* plus jute together) many-folds compared to cultivating *boro* rice alone.

Previously, jute was not cultivated in Charan *Beel* area, as the farmers did not get the opportunity to sow jute after harvesting *boro* rice in April/May. Late sowing in mid or late April (best sowing time of jute in Charan should be late March or at least early April) would lead to damage of jute at a premature stage due to flooding in July. The IFM farmers cultivated jute from mid-April and had to harvest it in mid-July due to floods when the fibres were not full-grown. However, those who grew jute in higher elevations got better yields.

Some farmers also took the opportunity to cultivate short duration vegetables (ladies finger, red amaranth, and Indian spinach) after harvesting *rabi* crops. The main *rabi* crops were harvested by March and the flooding time in Charan *Beel* area is late June onwards in higher land and thus around two months were available for cultivating crops with minimum investment in vegetables.

Average production of jute from 16 farmers plots was 1.52 t/ha. The average production cost of jute was Tk. 14,359/ha while the gross return was Tk. 41,894/ha. Thus on an average, net return from jute was Tk. 27,535/ha. This is was an extra income made possible only due to cultivation of alternative *rabi* crops that were harvested earlier than *boro* rice and allowed the farmers to sow jute in April. It can be seen from the above that the net returns to jute are 192% over investment.

Unfortunately, despite its profitability, experiences in the Goakhola-Hatiara site found that many locals there believe that jute retting (the process by which jute fibres are freed from the plant) is cause water pollution, contributing to fish mortality. Jute retting in both open and stagnant water is responsible for this situation. Usually when stems of jute are put in water for retting, two stages of changes are observed. In the first stage, the organic matter in the green plants is dissolved and it produces plenty of nutrients for the growth of microbes. In second stage, the microbes start using up the DO of the water. As a result, the BOD level increases (Haque et al. 2002).

In the 2004 monsoon through the IFM project some farmers in Goakhola-Hatiara were influenced to cultivate *dhaincha* or sesbania (Sesbania cannabin) instead of jute and the demonstration plots were shown to other farmers. Sesbenia is a leguminous crop that fixes nitrogen in the soil, works as green manure and provides sticks, which can be used for fuel (home use or sale), but it does not produce any fibre. The demonstration plot owners said that they had sold the sticks to betel vine farmers at a high price, as sesbania sticks are very strong and durable.

Another initiative pursued to address the problem of jute retting, was to try an improved retting technique. Ribbon retting is a new technique that requires less water, less space for retting a bigger volume of jute fibre. Four training sessions were run in two jute-growing seasons (2004 and 2005) with about 200 jute farmers. In a feedback session, the participants agreed that the alternative jute retting process was easier, fibre stronger and the price received higher (about 25% more than the traditionally retted jute fibre).

The trained farmers will try the technique next year with a larger volume of jute, and farmers from other areas reported interest in using the technique now and in future. Staffs from the Department of Agricultural Extension and Jute Research are able to provided technical support and are willing to help the farmers further in future.

6.1.4 Dry Season Water Usage

Since 2003, dry season water use in Goakhola-Hatiara has reduced due to reduced *boro* cultivation. Integrated floodplain management options such as alternate crop cultivation as well as dry season water conservation for fish in the canal attracted farmers who have to pay 25% of their irrigated paddy crop production to the shallow machine owners. The irrigation pumps run by diesel, the price of which increased and hence the cost of irrigation increased. The sharecroppers and small farmers, who were highly affected by this system, are switching to other less water demanding crops.

The estimated total water abstracted to irrigate *boro* and *rabi* crops was 11% less in 2005 than in 2003 (Table 6.5). Considering the area of crops irrigated by LLP and by traditional means, the amount of surface water abstracted in 2005 may have been less than one third of the amount abstracted in 2003, leaving more water for fish to grow in the dry season.

Table 6.5 Changes in water abstraction for dry season irrigation in Goakhola-Hatiara.

Year	Water abstracted from different sources (m3)	Potential area for irrigation (ha) if irrigation water utilized properly	Actual area covered (ha)	Surface water abstracted (m3)
2003	2,192,400	219.24	206	117,611
2004	2,129,760	212.98	209	86,947
2005	1,962,720	196.27	161	33,105

It is mentionable that at Charan *Beel*, during the 2004-2005 dry season, project initiatives saved over 84,000m3 of water. Without saving the average standing water volume would have been 2,961,603m3 and saving resulted in 3,045,989m3 (3% more water). Projections indicate that there would have been 97,390 kg of fish if the water had not been saved. However, there should be 104,328 kg of fish caught in 2005-06 because of water saving. It seems there could be an increase in yield by around 7,000 kg due to water saving.

6.1.5 Summary

Concerning cropping pattern management, the reaction to the options was positive, and the stakeholders, although initially sceptical, became enthusiastic about testing IFM options once the benefits became apparent. It was seen early on, however, that farmers were unanimously against the land retirement option, despite the fact that land suggested for retirement was low-lying and prone to early flooding. The main reason behind this is that there is a great shortage of land in Bangladesh, and as such, people are keen to cultivate crops wherever possible, regardless of risk. As such, it is likely that this option will prove unworkable across the country.

In Goakhola-Hatiara, the major change in cropping pattern was a 20% reduction in *boro* cultivation (HYV) between 2002 and 2004, and more land switched to growing local *aus* after HYV *boro*, or after *khesari*, due to the introduction of an *aus* paddy variety, 'ratul', that is resistant to high water levels and has a good yield. At the Charan *Beel* site, where the focus was on alternative *rabi* crop production, the 5% uptake of alternative *rabi* crops does not tell the entire story. In the first (trial) year, only 3 farmers took part in the piloting experiment, despite incurring no costs and being guaranteed reimbursement for the loss of *boro* production. In the second year, by contrast, 85 farmers experimented with alternative *rabi* crops, despite only being offered subsidised seed. This year, it is expected that over 150 farmers will participate. It is apparent, from the results at both sites, that confidence and habits are major factors in determining uptake. In Goakhola-Hatiara, where the focus was on alternative wet season rice varieties, uptake was fairly rapid, whilst at Charan *Beel*, where new crops were introduced, uptake has been markedly slower. What has been amply demonstrated at Charan *Beel*, however, is the greater profitability of crop diversification, and it is this, ultimately, that will determine its uptake and distribution.

6.2 Fishing effort control

6.2.1 Effort control measures

At both of the pilot sites, there are a number of interventions taking place in relation to fisheries management (Table 6.6). These are the operation of a closed season, the establishment of dry-season fish sanctuaries (closed area and close season), and the ban/restriction of certain fishing gears (current and *ber jal*). In addition, fisheries stakeholders were educated as to the negative effect of dewatering of *beel*/*kuas* for the sake of catching fish, a practice that has now stopped/reduced through voluntary agreement. These effort control measures have planned and enforced by the BMCs formed under the CBFM-2 project along with DoF and partners NGOs through consensus building among the range users.

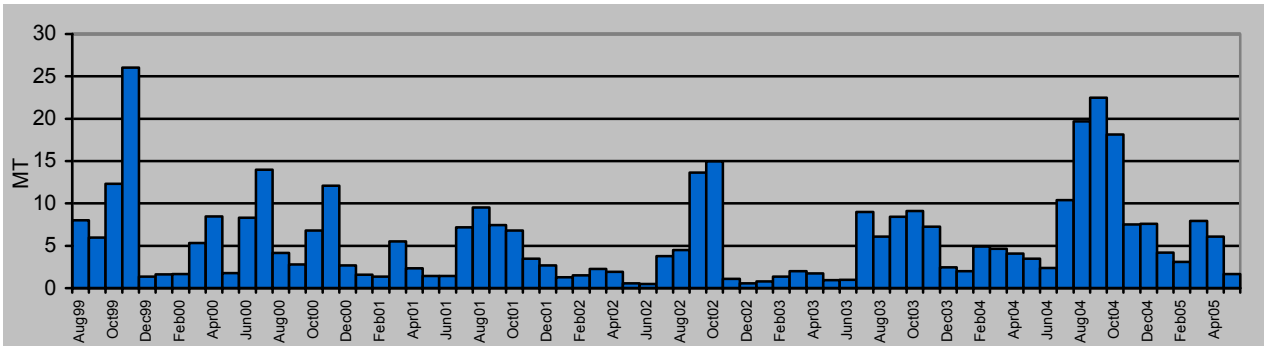
Table 6.6: Fishing effort control measures in place in pilot sites

Pilot sites	Effort control measures	Remarks
Charan *Beel*	Closed area - a permanent sanctuary of 2.5acres established in the middle of the *beel* in 2002/03 through excavation Closed season – fishing by ber *jal* and current *jal* is banned from mid-April to Mid-July from 2002/03 onwards	BMCs along with fishers set these management norms in theory. However, in practice, fishing is reduced in closed period but not completely stooped in both the sites. Noted that in both the sites, subsistence catch is allowed year round.
Goahkhola-Hatiara *beel*	Closed area – 5 *kuas* managed as dry season sanctuary from 1998 to 2001. From 2003 onwards, the *khal* designated as fish sanctuary for the entire dry season to up to the on set of early monsoon rains Closed season –each year from mid-April to mid-July there is fishing ban in place with no fishing permitted in *beel* and *khal*.	

6.2.2 Catch trend

Estimated fish catch in Charan *Beel* was 72.5 MT during the first year (August 1999 to May 2000 - adjusted) of monitoring (Figure 6.5) and declined gradually until the fourth project year (June 2002 to May 2003) to 45.89 MT. Catch increased following CBFM-2 interventions in place from fifth year of monitoring (June 2003 to May 2004) and reached 111.12 MT in the sixth year. As can be expected, fish catch was highest in October/November and low during the dry season.

Figure 6.5: Fish catch trend in Charan beel (1999-2005)



Catch per unit effort (CPUE) of various gears varied depending on the size and nature of gear, such as active or passive, traps or nets, etc. Major fishing took place using ber *jal*s in Charan *beel*. As expected, CPUE decreased in line with total catch up to June 2002 – May 2003 and then increased until last year (Table 6.7).

Table 6.7: Catch per unit effort (CPUE) of major gears, Charan Beel

Gear	CPUE (kg per unit effort)					
	Aug'99 - May'00	June'00 - May'01	June'01 – Apr'02	June'02 - May'03	June'03 - May'04	June'04 - May'05
Ber *jal*	23.977	47.145	30.653	21.327	23.500	50.923
Current *jal*	0.226	0.192	0.163	0.320	0.278	0.373
Daon borshi	0.021	0.006	0.004	0.007	0.022	0.029
Deul jal	4.854	4.523	5.437	2.514	11.859	8.823
Doar	0.082	0.048	0.055	0.063	0.100	0.066
Jhaki jal	1.533	1.223	2.233	1.778	3.359	2.962
Kathi borshi	0.004	0.005	0.007	0.010	0.015	0.011
Thela jal	1.284	1.492	1.197	1.458	1.527	1.328

From the catch monitoring surveys in Goakhola-Hatiara, seven complete years of data are available. This indicates a total estimated fishing effort and fish catch in 2004 that was similar to that in 2000, but much lower than the unusually high catches reported in 2001 and 2002 when catch rates were high especially from lift nets in the Goakhola *khal*.

Table 6.8 Fish catch and effort (excluding kuas) from Goakhola-Hatiara Beel.

Year	Catch (kg)	Effort (gear days)	CPUE (kg/unit day)
1998	11,074	2,852	3.88
1999	9,102	3,743	2.43
2000	12,822	4,667	2.75
2001	36,969	6,395	5.78
2002	26,082	6,812	3.83
2003	19,493	7,723	2.52
2004	12,501	4,188	2.98

A major part of the fish catch, usually about a quarter of the total catch, comes from the many *kuas* in the floodplain of Goakhola (and Maliat) *Beel*. Before the introduction of IFM *kua* catches fluctuated by around 50 kg per *kua* (water area of just over 7 decimals. *Kua* catches increased in 2002 in line with the increase in fish population and catches experienced from 2001 (the *kua* harvest takes place in the first months of the year and involves fish left over in the ditches from the previous monsoon). This increase continued up to 2004, in 2005 to conserve some fish no *kuas* were harvested three times and a few were left un-fished, but the catch remained higher than in the years before IFM (Table 6.9).

The total estimated fish catch from the *beel* remained above 20,000 kg in 2004, but the *kua* owners enjoyed a relatively greater share of the catch (42%). This trend may be set to continue in 2005 since the *kua* catch was relatively high and the catch in the early monsoon up to August 2005 was lower than in the previous two years.

Comparison with Soluar *Beel* (a similar seasonal *beel* in Narail Upazila and also under CBFM-2 project) suggests that the change in fishing in 2005 monsoon was due to local factors (only traps being used because of crops in the fields), but also indicated that in 2004 there was more intense fishing in both *beel*s than in 2003. This trend continued with high catches in the 2005 monsoon in Soluar *Beel* where there was more open water. In theory, this should be compensated in Goakhola later in 2005 when fish have grown to a larger size.

Table 6.9 Fishing effort, catch and CPUE in Goakhola and Solua Beels in July-August 2003-2005

Beel	Gears	2003	2004	2005
		CPUE (kg/gear day)	CPUE (kg/gear day)	CPUE (kg/gear day)
Goakhola	Gill net		0.9	0.8
	Seine net		4.1	
	Large lift			
	Cast net	1.2		
	Trap	0.8	1.1	0.7
	Long line	0.9	1.1	0.5
	Hook & line	0.4	1.0	
	Total	0.8	1.1	0.7
Soluar	Gill net	0.9	0.9	1.8
	Large lift	0.8	0.7	3.3
	Cast net		0.6	1.8
	Trap	0.7	0.8	1.9
	Hook & line	1.2		
	Spear		1.9	
	Total	0.8	1.0	2.0

6.2.3 Fishing intensity

Various types of gear have been used for fishing in the Charan *beel*. Multiple fishers operated ber *jal*, *deul jal*, *doar*, current *jal* etc. while single fishers operated *jhaki jal*, and *thela jal*. Fishing intensity considers the number of gears operated in the habitat. Fishing intensity increased following project interventions (Table 6.10).

Table 6.10 Fishing intensity of major gears, Charan Beel

	(Number operated during the period)					
Fishing gears	Aug'99 - May'00	June'00 - May'01	June'01 - Apr'02	June'02 - May'03	June'03 - May'04	June'04 - May'05
Ber *jal*	1,393	658	791	1,417	1,378	1,056
Current *jal*	34,048	55,489	59,654	26,371	39,360	88,949
Daon borshi	21,140	38,220	81,900	7,650	55,450	54,242
Deul jal	784	882	154	45	154	377
Doar	57,015	76,503	62,573	15,906	32,706	92,094
Jhaki jal	770	861	651	631	1,486	1,685
Kathi borshi	309,680	493,850	304,136	52,629	250,697	322,130
Thela jal	7,469	3,689	1,687	2,649	2,317	2,637

In Goakhola-Hatiara fisheries data was recorded by month, but comparing the estimated effort in gear days for April through to July (four months) in each year shows that up to the start of the IFM project activities (in the field in July 2003), effort was gradually increasing in this period. This was despite the BMC and community in theory having adopted a closed season. In 2004 and 2005 fishing effort dropped in this period indicting better compliance with the ban (and the effect noted above of the increase in *aus* paddy cultivation in 2005)

Figure 6.6: Fishing Effort in April to July, Goakhola-Hatiara Beel

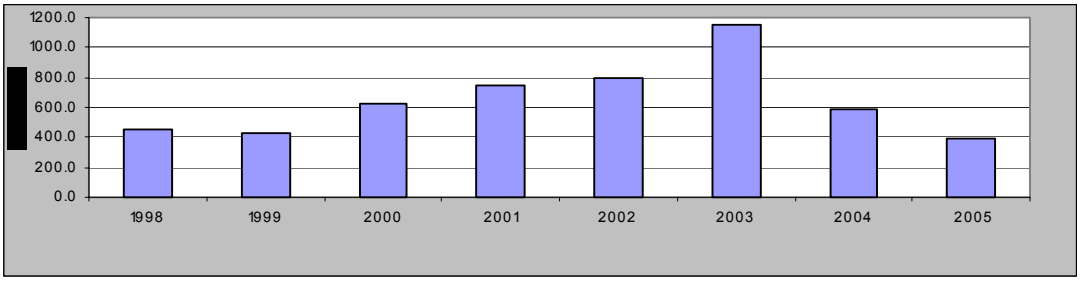


Figure 6.7: Fishing Effort in Closed Season, Goakhola

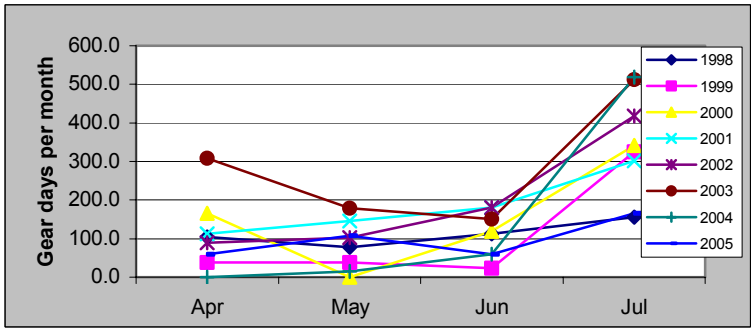
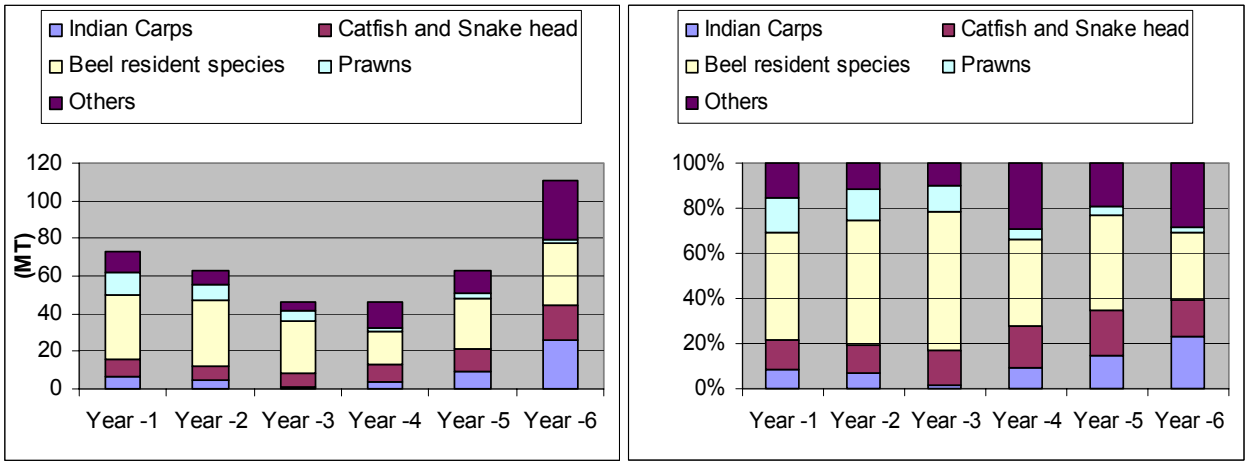


Fig 6.7 confirms that in two months of the ban period – May and June – fishing effort has generally been very low, but quickly rose during July in all but 1998 and 2005. Over the whole year traps and gill nets are the main gears used followed in some years by cast nets when there is more open water such as 2001

6.2.4 Fish species composition

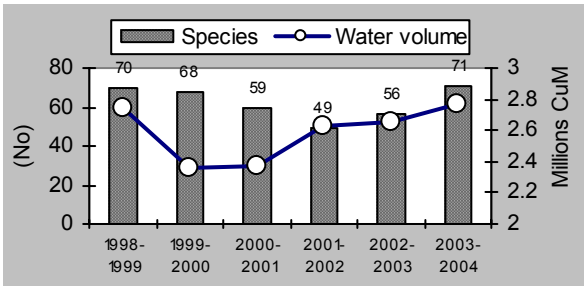
There is a visible difference in the catch composition in Charan *Beel* with and without project interventions. From the beginning of monitoring until the project interventions, Indian major carps were decreasing in the catch composition while prawn was maintaining a higher contribution. After project interventions, Indian major carps increased and prawn decreased significantly, which indicates improvement of habitat (Figure 6.8). Before the interventions *beel* species dominated while the catch composition became more or less homogeneous among all categories of fishes following the interventions indicating healthy habitats and species richness.

Figure 6.8: Catch Composition, Charan Beel



Species richness was decreasing until the fourth year of monitoring (from 70 to 49) and increased thereafter, to 71 by the 6th year, indicating revival of species richness (Figure 6.9:). Data reveals that there was a correlation between fish catch and species diversity. The correlation value was 0.73.

Figure 6.9: Fish species richness in Charan Beel



Sample catch monitoring (excluding *kuas*) and from household monitoring of fish consumption by local women monitors throughout the period does not show any clear pattern for Goakhola Hatiara *Beel* – annual species diversity probably does not differ greatly, but the species recorded have varied between years. Although in 2004 a record number of species were recorded from catch monitoring, the trend for more

species in that year was repeated in the other two *beel*s (Table 6.11). This trend was not shown for species recorded being prepared for cooking by monitored households which appeared to decline over time in Goakhola (although some are caught in neighbouring *beel*s and the number of household days monitored was reduced from 2002 affecting the species counts. Overall, just over 60 fish species have so far been recorded in Goakhola-Hatiara *Beel* and on average just over 30 species are caught in the *beel* in a year.

Table 6.11 Fish species count by water body by year, Goakhola-Hatiara

Water body	Year	Species recorded: catch monitoring	Species recorded: consumption monitoring	Local wild species: consumption monitoring	Wild species only recorded this year
Goakhola-Hatiara*	1997*	30	58	45	3
	1998	26	53	38	2
	1999	29	57	42	3
	2000	33	54	40	1
	2001	35	47	35	0
	2002	34	48	37	5
	2003	30	42	29	0
	2004	40	39	28	1
	Cumulated	62	81	65	15
Maliate *Beel*	2002**	na	38		
	2003	21	32		
	2004	36	32		
Shuluar *Beel*	2002***	23	44		
	2003	36	41		
	2004	47	43		

* data from consumption monitoring is from last 4 months of year only
** data from consumption monitoring is from last 6 months of year only
*** data from consumption monitoring is from last 5 months of year only

The estimated total quantities of different species caught have changed greatly between years (Fig. 6.10). For example large quantities of *beel* resident predatory snakeheads (*taki* and *shol*) were caught in the high catch years along with their small fish prey such as *jatputi*. From this it is difficult to discern yet any trend in species composition of catch that might be associated with either CBFM or IFM.

Overall, there was an obvious jump in the value of the fish catch in 2001 when it more than doubled due to both a major increase in catch and an increase in price. Fish prices have increased further in 2004 and consequently the value of the fishery during the IFM period in 2004 has remained close to Tk 1.5 million a year (Table 6.12), which equates on an average to around Tk 4,300 per household. The fish yield has been of the order of 90-160 kg per ha per year since 2001, which is substantial considering that there is so little water in the dry season. In theory, there may yet be a substantial incremental gain from increasing the amount of (protected) dry season water through IFM support.

Table 6.12: Estimated value of Goakhola-Hatiara fishery.

Indicator	1998	1999	2000	2001	2002	2003	2004	2005
Average fish price Jul-Dec (Tk/kg)*	30.47	30.03	33.92	41.01	37.33	47.22	67.85	
Catch except *kuas* (kg)	11,074	9,102	12,822	36,969	26,082	19,493	12,501	Na
Fish catch *kuas* (kg)	3,506	na	5,016	3,597	5,820	6,097	9,100	6,643
Total catch (kg)**	14,580	12,348	17,838	40,566	31,902	25,590	21,601	
Estimated value of total catch (Tk mill)	0.44	0.37	0.61	1.66	1.19	1.21	1.47	

* Most of year's catch is in these six months, data from CBFM-2 records, some months missing

** for 1999 no *kua* census was done, for total catch the average ratio of *kua* to non-*kua* catch of 1998 and 2000 was used.

6.3 Sluice-gate Management

6.3.1 Sluice gate, water and land use in Goakhola-Hatiara *Beel*

Goakhola *Khal* connects Goakhola Beel with the Afra River. The *khal* has been set-aside as a fish sanctuary during the dry season by the community since 2003. An embankment built in the early 1990s separates the *beel* from the river, controlled by a flap-type sluice gate. There is a tidal range in this river, and the sluice gate is supposed to close automatically when water is rising, to keep out saline water, and open if the water level inside the *khal* is higher than the river (draw down), draining water from Goakhola floodplains and the connected surrounding *beel*s. Sluice operation is important because:

- it directly affects water levels and volumes in the *khal* and in the *beel*,
- it affects migration of fish from river to *beel*s and from *beel*s to river,
- it affects the fish catch within the *khal*
- it affects the volume of water available in the *khal* for irrigation.

Fishing activity is most intense in post-monsoon when water is draining out of the *beel* through the sluice gate. The effectiveness of the *khal* as a fish sanctuary is questionable giving the reported intensity of fishing along its course; however, it is believed that it would be impossible to restrict fishing activity in post-monsoon, since this is the main fishing period and one of the prime fishing locations. The *khal* effectively acts as a closed season sanctuary for the latter half of the dry season and rising water period, when little fishing activity occurs due to low fish density and high demand for agricultural labour in this period.

Surface abstraction of water from the *khal* occurs during dry season by means of LLP (low lift pumps (diesel) of varying capacities. Four pumps operate from Goakhola *Khal*, the largest of which is used to irrigate 40 ha of *boro* paddy on a daily basis for 3 months between December and March. Apparently, this abstraction is replenished by occasionally opening of the sluice gate when water levels outside the gate exceed those inside.

The sluice management committee intended to operate the sluice to ensure fish could migrate into the *khal* and *beel*. However, this has proved difficult since fry and juvenile fish occur in the river outside the sluice in April-June when the gate is closed for the benefit of *boro* paddy crops. In June-July, when it is safe to open the gate, there are fewer fish moving nearby. Moreover, the community believe that most of the fish entering the *khal* swim through seasonal *beel*s further upstream.

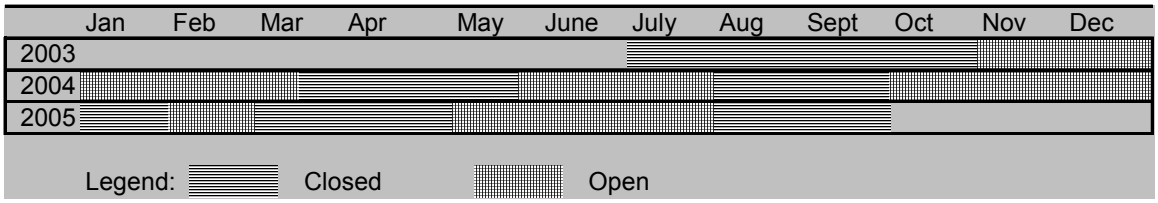
6.3.2 Decisions Made by Community and Their Implementation

Until 2004, one large farmer was responsible for operating the sluice gate and took decisions in the interests of crop needs, after consultation with other larger farmers. In early 2004, discussion on operation of the sluice gate as part of IFM related activities started, and in May 2004, it was agreed that farmers would include the IFM committee in discussions before sluice gate operation. Through IFM, small farmers became interested in cultivating shorter duration paddy in some of their lands, allowing fish to enter the *beel* earlier and early monsoon (*aus*) paddy to grow with that water. It was agreed that in 2005 the sluice gate should be opened earlier, in May.

6.3.3 Sluice Operation Records

Since the start of the project in mid-2003, the status of the sluice gate was recorded each week. Figure 6.10 summarises the operation of the gate. As can be seen, in 2004 it was opened earlier in the post monsoon to allow water to drain out, but was then kept closed for longer in the dry season (first four months of 2005), which might have helped to retain water in the *khal*. Moreover, it was opened a month earlier in 2005 than in 2004, and it is hoped that this will permit more migrant whitefish to enter in the *beel*.

Figure 6.10: Change in Sluice gate operation



6.3.4 Additional Sluice made by Community

The communities of Goakhola-Hatiara including Mandiarchar village proposed a small canal leading to the river with a small pipe and flap gate to drain excess water in the dry season and early monsoon from 26 ha land, so that they could grow 2 crops there and retain water afterwards to conserve fish. They had the necessary resources, but work was not done due to lack of coordination, initiative, and lack of trust. The IFM committee excavated the canals and built a flap gate in Mandiarchar in the dry season of 2004. Subsequently, in 2005, they cultivated *aus* paddy with a harvested of approx. 225 MT.

6.3.5 Impact on Crops and Fish

Although the immediate impact of the extra pipe sluice on crops are apparent, the overall impact of that structure and of changes in sluice operation in 2005 will not be apparent until fish catches from the last three months of 2005 are available. However, it is expected that there would be positive impact on fish catch and species diversity due to additional sluice ate and fish friendly (open gates in early monsoon) operation of existing sluice.

6.3.6 Summary

Fishing effort control, which has been running at both sites for a number of years, under the CBFM-2 banner, is now relatively well established. The operation of a closed season, the establishment of dry-season fish sanctuaries (closed area and closed season), and the ban/restriction of certain fishing gears (current and ber *jal*) are all now planned and enforced by the BMCs formed under the CBFM-2 project, with the support of DoF and partners NGOs. In addition, fisheries stakeholders were educated as to the negative effect of dewatering of *beel*s / *kuas* for the sake of catching fish, a practice that has now been stopped by voluntary agreement. The interventions have seen marked increases in catch (weight) and species diversity at both sites, whilst fishers mention that the fish they are now catching are far larger (and therefore more profitable) than those of the previous years – a direct result of the interventions.

At the Goakhola-Hatiara site, sluice-gate management was also piloted under the IFM banner (note that this was not done at Charan *Beel* as there are no effective sluice gates at the site). It was agreed, through IFM, that the sluice gate should be operated in a more fish-friendly manner, and as of 2005 it was opened earlier, in May; it is hoped that this will permit more migrant whitefish to enter the *beel*. In addition, farmers proposed building a new pipe-and-flap gate to drain excess water from 26 ha land, so that they could grow two crops there and retain the water to conserve fish. The overall impact of that structure, and of changes in sluice operation in 2005, will not be apparent until fish catches from the last three months of 2005 are available.

7. Uptake promotion of IFM

This section of the report relates to the log frame output 2 (Tools for effectively communicating IFM recommendations and methods/options to reach target audiences (including policymakers, intermediaries, and community practitioners) developed.) of the project and describes findings and achievements in the efforts of uptake promotion of IFM at all levels. The descriptions highlight the achievements in the form results that have been found over the course of promotional activities at grass roots level (pilot sites) as well as at district and national levels.

7.1 Promotional Efforts

The purpose of the project is to promote the "Better Options for Integrated Floodplain Management (IFM)" to the relevant stakeholders at grassroots to policy stakeholders. The piloting was carried out at two project sites, one in Charan Beel, Kalihati, Tangail and the other in Goakhola-Hatiara *Beel* at Narail. Promotional activities were implemented from the site level, to the Upazila, District and (policy stakeholders) at the national levels. Potential participants from CBOs (farmers, fishers), NGOs and GOB officials from various relevant different were covered in promotional activities.

7.1.1 Target Institutions

This is an uptake promotion project and thus aims at informing the relevant target institutions for future use and application of IFM options in their policy, plans and projects. The IFM largely involves the issue of rational water management for sustainable production of floodplain resources, mainly the fish and crops as well as maintenance of ecological functions of floodplains ecosystems.

Based on the mandate and scope of works of different government agencies, the project targeted the Department of Fisheries (DoF) and the Department of Agriculture Extension (DAE). These two government agencies are directly involved in floodplain natural resources management and working with fishers and farmers and thus considered as the main TIs (Target Institutions). The project also targeted the LGED and BWDB as TIs as they work more related to water management as well as fisheries and agriculture (LGED). These two TIs are constantly kept in contact through dissemination of IFM messages for their future use and application of IFM options.

Besides, the project considered BRRI (Bangladesh Rice Research Institute) as TI with a view to establish link between the researchers and farmers for joint collaborative research and sharing of field level problems and issues. BADC (Bangladesh Agriculture Development Corporation) also targeted as TI for linking the government seed suppliers to farmers/CBOs and partners so that participating farmers can gain access to quality seeds.

Among the international organizations, collaboration and contacts were maintained with IUCN, ITDG and IC (inter cooperation – a Swiss development organization). Noted that has partnership with these organizations in implementing natural resources management initiatives.

Table 7.1: Target Institutions for IFM uptake and promotion

Target Institutions	Extent of contacts/collaborations
▪ Government development agencies DoF, DAE, BADC, LGED, BWDB	▪ DoF - working through CBFM-2 project at pilot sites, FFP & other senior staff on IFM uptake. Sharing data and results, training of staff ▪ DAE, working closely with upazila and district officials, contacts with head quarter on sharing information and results, imparted training to IFM farmers ▪ BADC- working closely at the district and head quarter level, sharing information and results and quality seeds for IFM farmers ▪ LGED - regular contacts with the project director at head quarter and projects managers at district levels on IFM issues ▪ BWDB –sharing issue/event based information on IFM, both district (mostly) and head quarters levels
▪ Government (national research institutes) BRRI, BARI, BARC	▪ BRRI - working jointly on deep water *aman* variety trial at Charan *beel* site with farmers, imparted training to IFM farmers ▪ BARI – Linking with IFM farmers to ensure quality seeds, improved varieties and technical support and training/resource materials
▪ International NGOs IUCN, ITDG, IC	▪ IUCN- messages, exposure visits, uptake of cropping pattern in SEMP project site in Sunamgonj district ▪ IC- Informing messages on IFM, uptake of cropping pattern in the haor area of Sunamgonj district ▪ ITDG- Informing messages, exposure visits
▪ National NGOs Caritas, Proshika, BRAC, TARA, NACOM, ERDA, CRED, IDEA, ADI	▪ Regular interactions through CBFM, SEMP projects, information sharing and IFM messages, materials development, training of staff.

In addition, the project also targeted the NGOs working with government agencies (specially DoF) as partners in implementing different projects (mostly on floodplain fisheries) in different parts of the country. The main target NGOs included the partners of CBFM-2, FFP and SEMP including the IUCN (implementing SEMP). The project also involved the local government institutions (LGIs), particularly the UP Chairmen in various events and occasions of the project viz. PAPD, community awareness programmes, folk drama, conflict resolution, so forth.

At the site or community levels, the target institutions of the project were the CBOs and individuals (farmers and fishers) organized and motivated under different projects. For example, CBOs of CBFM-2 at different locations, CBOs of SEMP in haor area in the northeast.

7.1.2 Target Individuals

The project team emphasized reaching the policy stakeholders and intermediaries relevant to use and future uptake of IFM in the country. The team defined policy stakeholders as the people working at the upper hierarchy but not sitting at the top of any organization or agencies. The experience dictated that reaching the head of any organization or agency viz. the DG, DoF is difficult and time consuming and time given the head of the organization is not enough to clearly explain topics and issues. Moreover, the whatever concepts and issues are discussed with the head of the organization, he or she always take decisions after discussions with the people at the next hierarchy of the organization. For example, the Directors, Project Directors, Head of Training are the people with whom the head of the organization share and discuss issue for taking decisions.

Therefore, the project team decided to target those people who could better influence or motivate the head of the organization through their regular interactions relevant to organizational decision-making. The project also targeted the district and upazila level actors of those TIs so that they also give feedback to their upper hierarchies of the facts and issues as well as these field level people, who can contribute to creating an enabling situation while piloting the IFM at the field level.

Among the NGOs the project coordinator of fisheries related project and the FO officers were targeted so that the PCs could better incorporate and the options either in their on going programmes or in their projects to come in future. The PCs could better feed their heads of organizations (Executive Directors and Directors) about a new issue that can be incorporated in their programmes. Among the CBOs, the targets included the active members (fishers and farmers) can influence others in their respective groups on new issue of IFM.

7.1.3 Media and tools developed for IFM promotion

In carrying out the promotional activities, different methods and media were applied, the knowledge and experience gained through piloting processes and from previous projects were synthesized as key messages. The methods applied included workshops, discussion meetings, training, exposure visits, and motivational visits.

The tools and materials developed for communicating messages to audiences included TV spots, street folk drama, posters, policy briefs, year planner, fact sheets, billboards, training module with handouts, and power point presentation.

7.1.4 Activities to target policy and intermediary stakeholders

In devising the activities to communicate the IFM messages to the target audiences at policy and intermediary levels, the project team followed the communication plans developed under the project as well as experience gained in carrying out similar activities in the past. To this end, the project team under took four major areas of activities, which include:

- Dissemination workshops and discussion sessions
- Exposure visits
- Training
- Distribution of resource materials

7.1.4.1 Workshops and discussion sessions

Workshops and knowledge sharing meetings have been identified as one of the effective means for dissemination of new knowledge, technology and findings among the target audiences and it is the popular method that in place in Bangladesh. Therefore, the project team took the opportunity and emphasized on sharing and disseminating IFM messages and experiences through organizing and participating in workshops of different nature. The project team also took the opportunity to participate in any relevant workshop organized by others (e.g. DoF, FMSP) and made presentation on IFM options, messages and findings from piloting.

Besides, the project organized various workshops from grass roots level to district and finally at the national level targeting different levels of audiences from relevant TIs. At the national level, policy stakeholders or the people involved in policy formulation were targeted. Table 7.2 summarizes the dissemination workshops/meetings conducted during the course of project implementation.

Table 7.2: Workshops and meetings conducted during the project life

Date	Events	Target Institutions
19-21 January 2005 at Sreemongal,	Sharing the IFM concept and planning for piloting	DOF planning team involved in developing national open water fisheries strategy
7 June 2004, DoF, Dhaka	Sharing IFM with FFP, DoF and planning	FFP staff including DoF, TA and PNGOs
5 February 2005, DAE, Dhaka	Sharing IFM options and experiences	15 DAE senior personnel in head quarter
23 February 2005, Charan Site office, CNRS	Sharing IFM options and experience from piloting	19-member team of Tangail district and upazila level officials from DoF, DAE, BADC, BWDB, Livestock, and Upazila level DoF and DAE staff
19 March 2005, Charan Site office, CNRS	Sharing IFM options and piloting experience	Staff from 12 NGOs involved in fisheries and resource management projects at Charan *Beel* CNRS
March 2005 at, District Head quarter, Narail	Sharing IFM options and piloting experience	DC Narail and local officials where IFM committee presented experience and findings and requested support to address remaining issues
30 March 2005, DoF, Dhaka	Sharing with IFM options and experience from piloting	16 DoF senior level personnel with DG, and Director, DoF
3 May 2005, BRAC Center, Dhaka	Sharing with IFM options and experience from piloting and communication	National workshop - Wider audience from DoF, DAE, LGED, BARC, BWDB, NGOs, Scales, MRAG, IIED
8 August 2005, BIAM Auditorium, Dhaka	End of piloting IFM presentation at national fisheries workshop	National workshop – Wider audience from DoF, DAE, LGED, BARC, BWDB, NGOs, and private sectors

7.1.4.2 Exposure visits to pilot sites by the policy and intermediaries

The project organized exposure visits for the target individuals from the TIs to pilot sites where IFM options are in implementation under the project in association with CBFM-2 (Table 6.9). The exposure visit schedule included a short briefing of the site, activities in place and the approaches being followed including the problems and issue and the way these were mitigated followed by a visit to wetlands to see the fisheries, cropping pattern and sluice gate management activities in a 'real world' setting through observation and interaction with the communities. Finally, the day ended with a sharing and feedback sessions with project and participating communities. The project team used a power point presentation on IFM issues and site level activities.

Most of the workshop participants, many of the CNRS partners and associates, project participants, CBO members, and farmers from different CBFM areas showed their interest in seeing the practicalities of the IFM activities at the site level. They were interested in practical observation of the field activities, exchanging ideas with the participants, farmers, fishers and other stakeholders to learn their interest and attitude towards the new approach and activities, performances of the selected alternative crops in floodplain areas etc. Besides, they were also interested to know the implementation and motivational process.

7.1.4.3 Horizontal up scaling of IFM

Many participants of CBFM-2 and other projects visited the pilot sites and received training/awareness materials on IFM. They showed keen interest in practicing integrated floodplain management options, especially the farmers, who are interested in alternative rabi crops followed by an additional crops (like Jute, vegetables) to get higher returns compared to get only *boro* rice as single crop in the rabi season.

Coverage around piloting sites

In Kalihati, Tangail (under CBFM-2 project) 96 farmers cultivated wheat, maize, garlic, potato and some winter vegetables in an 18.11 ha area. These farmers are from 9 different floodplain clusters within the Upazila, and close to Charan beel. They frequently visited IFM farmers and their crop fields at Charan beel, and discussed technical issues with the farmers there, whilst the project helped provide them with quality seeds. Many of the farmers in the area, including Charan beel, are interested in Jute cultivation as a follow-on crop. CNRS has taken an initiative to help them to collect quality seed based on a local demand of 150 kg Jute seed.

In Magura area, many farmers are interested in ribbon retting of Jute, which they first saw practiced at the Goakhola-Hatiara site. The method is important for Jute and water quality improvements. This year (2006), 2 farmers in the area will trial this - practically, many neighbouring farmers are interested in observing the results and adopting it the following year. Two farmers are cultivating garlic as an alternative *rabi* crop, in a separate CBFM-2 project site.

Coverage in distant sites

In Sherpur, a MACH project (a USAID supported project) site, 27 farmers cultivated garlic on a test basis on 27 plots totalling 1.68 ha. MACH project arranged an exchange visit for these farmers to Charan beel and Chalan beel, where they got the opportunity to see and discuss alternative rabi crop cultivation directly with farmers. Later the project helped them to collect quality seed. The 27 plots covered 4 floodplain beel areas of the district. Most of the plots have provided very good yields, with a few partially damaged due to water seepage from adjacent *boro* rice plots. The farmers are planning for block cultivation of garlic next year, on the basis of this year's performance. The farmers are interested in other crops too, a reflection of which may be seen in coming years.

In Jamalganj, Sunamganj under SEMP (UNDP/DAE) and LEAF (IC-SDC) projects 25 farmers cultivated potato on 6 acres, 2 farmers cultivated garlic on .5 acres, and another farmer cultivated mustard on .11 acres of land. All these farmers visited Charan Beel to see all these crops and discuss with the farmers there. The project helped them to collect quality seeds. Many farmers in Kishoreganj area under CBFM-2 project cultivated wheat after visiting Charan beel.

Table 7.3: Policy and intermediary stakeholders paid exposure visits to pilot sites

Date	Place	Target audiences	Key results
16 February 2005	Charan *Beel*	Six senior level DAE officials visited the site	Ensured support to IFM and okayed the visit of their district team to pilot site
23 February 2005	Charan *Beel*	19-member team of district and upazila level officials from DoF, DAE, BADC, BRRI, Livestock	- Enhanced support from DAE/DoF field staff - BADC ensured quality seed to farmers
19 March 2005	Charan *Beel*	CBFM-2 partner NGO coordinators and Executive Directors of ERDA and TARA, officials from IUCN and ITDG (12 NGO staff)	Showed interest to get the piloting result and
27 February 2005	Charan *Beel*	7 staff from MACH Sherpur site	Project approved *rabi* piloting; asked CNRS help them getting quality for garlic seed
30 March 2005	Charan *Beel*	Four senior level (2 DoF and 2 expatriate consultants) of the FFP, DoF	Asked CNRS to present IFM at DoF head quarters; also to present in national workshop on fish fortnight
10 May 2005	Charan *Beel*	Cabinet Secretary, Minister, Textile and Industry, PD-CBFM-2, D. Director, DoF, DFO, Tangail visited the sanctuary	Key government officials at Tangail district get an insight of IFM and fish sanctuary
10 July 2005	Charan *Beel*	Chief Scientific Officer, Bangladesh Rice Research Institute, visited the site	Assured continual work an support on deep water *aman* trial and follow up work at Charan and other CNRS area
16 –17 November'05	Charan *Beel*	3 field officers of MACH project visited the site along with 23 CBO members	Interest of other projects on IFM - Result of other MACH site staff visit
August 2003	Narail site	District and upazila level officials of DoF, DAE and BWDB	Assured assistance to IFM piloting
February 2004	Narail site	District and upazila level officials of DoF, DAE and BWDB	Jute retting training, sluice gate management and crop diversification
August 2004	Narail site	DAE and CBFM-2 NGO staff on improved jute retting techniques	DAE facilitated skill training to staff/farmers
March 2005	Narail site	Reflective CBFM-2 and FFP staff on reflective IFM learning session	Skills of staff on documenting lessons and change
July 2005	Narail site	DAE, CBFM-2 and FFP NGO staff from Narail, Magura and Tangail on improved Jute retting techniques	DAE facilitated skill training to staff/farmers

7.1.4.4 Training on IFM

Training has been an important activity carried out to sensitise and educate the TI members from both government and NGOs on IFM. DoF was targeted as the key recipient of the training and thus the training was jointly conducted with the FFP and CBFM-2 projects of the DoF. The DoF field level staff (UFOs and AFOs) and PNGO staffs directly involved in implementation of DoF projects (FFP and CBFM-2) were trained.

WorldFish together with DoF developed a residential training module for 3-5 days on floodplain fisheries management for the CBFM-2 staff (World Fish, DoF, and partner NGOs) which started from 2003. In the training module, IFM options were incorporated and the project leader and senior staff of R8306 facilitated the sessions during each of the training programmes. Detailed power point presentation on IFM goals, approaches, issues, and relevant facts and figures were used to facilitate sessions.

Besides of IFM options, site level special issue based training programme were also conducted. For example, the communities raised the issue of water pollution due to jute retting and consequent death of fish in wetlands in Narail site. To address the issue, training programmes were conducted with DAE on improved jute retting procedure (ribbon retting) that would reduce (or avoid) the problem where both the communities and project staff received attended.

Box 7.1 Staff trained on IFM by CBFM-2

DoF (SUFO/UFO)	: 60
DoF (AFO/CBFM staff)	: 87
Partner NGOs/WFC	: 134
Total staff trained	**: 281**

281 staffs from DoF, partner NGOs and World Fish Center working for CBFM 2 project were trained 10 batches during December 2003 to January 2005 (Box-7.1). Training also conducted for 15 project staff of CNRS, IUCN and other NGOs involved in floodplain resource management. The feedback from the trainees indicated that the IFM sessions facilitated with facts and figures relevant to practical field situation successfully created a change in the thought process of the participants about the resources and its wider management areas. Besides, the 35 DoF and PNGO staffs of FFP were also trained on IFM in August and September 2003.

7.1.4.5 Resource Materials developed and disseminated

Information and resource materials on IFM were developed based on the messages from relevant previous natural resource SP and FMSP projects for sensitising and educating the TIs. Note that the resource materials were developed through a participatory process where the selected members from TIs contributed to enrich and shape the materials so that these could be effective in sensitising and educating people on IFM. The communities were also consulted and their feedback incorporated in developing some of the materials targeted for wider audiences (viz. billboards, posters) on awareness building on IFM issues.
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TV Spots

Two TV networks BTV and ATN – have prepared two TV spots on IFM piloting that covered the field level activities on options and interview of participating fishers and farmers and project team. The BTV (Bangladesh Television) documented and aired the spot through its popular agriculture related “Mati-o-Manush” (people and soil) programme and the private TV channel ATN-Bangla aired through its “Sonali Deen” (golden days) programme. The TV spots covered problems and issues, IFM concept and options and participants and other

people's attitudes towards IFM activities very precisely and clearly. Millions of TV viewers are expected to have observed both the programs.

Video clips
CNRS video team has prepared a 30 minutes video document on the overall process of implementation of the IFM activities. However, this needs editing to finalize the spot.

Street folk drama
Local folk talent (trained under CBFM-2 project) at both the project sites developed folk drama scripts for IFM, based on the local socioeconomic and ecological conditions, under the guidance of the project team. The teams performed street drama in common places at the out set of field demonstration of IFM options.

The contents of the drama highlighted the past scenario of floodplain resources in the area compared to the present situation. Also highlighted was the way the situation is changing and how the resources are degraded over time, mainly due to anthropogenic causes. Also shown, were ways that the communities could jointly practice IFM options to restore and conserve the wetland resources and improve their livelihoods; the major focus of the street drama.

Posters
Six posters were prepared on IFM concepts, approaches, options, and field level experiences from piloting. In preparing the posters, representatives from selected TIs participated and contributed to improve the posters. The illustrations of the posters made the concepts easy to understand even to the illiterate persons. The posters were distributed among the TI and communities for their use to build awareness and use in training and discussion sessions.

Policy briefs
Three policy briefs have been prepared on integrated floodplain management targeting policy level stakeholders (viz. the ministries, government departments) and intermediaries (national and international agencies and relevant development projects). The policy briefs were tested with the target audiences and positive feedback received on them as found useful and effective.

PowerPoint presentation
A PowerPoint presentation has been prepared on floodplain systems, its problems, solutions, and alternatives along with some experimental and piloting findings. The presentation is being extensively used in training, workshops, policy dialogues, and other occasions.

Training session guide and handouts
A set of training guide and handouts were prepared to provide training initially to over 300 DoF, CBFM-2 and FFP project staff (including World Fish and PNGOs). These materials can be used for conducting training for project participants and staff of other projects in other areas.

Fact Sheets
Eighteen fact-sheets were developed as promotional materials on floodplain problems and issues, better-

Box 7.2: Contents of fact sheets on IFM

- Wetlands are important natural resources
- Ecological value of wetlands
- Socio-economic importance of fisheries
- Status of floodplain fisheries resources
- Value of wetland forests
- Endangered wetland fish species
- Fish versus *boro* rice issues
- *Rabi* crop diversification
- Fish migration
- Obstacles to fish migration
- Fish friendly sluice gate operation
- Dry season water inside embankment
- Fishing effort control
- Fish sanctuary
- Periodic ban on fishing
- Reintroduction of rare fish species
- Restoration of fish habitats
- Watershed management

integrated floodplain management options, their rationale, and impacts. The fact-sheets were prepared in both Bangla and English, with relevant photographs and illustrations. It is hoped that they will play an important role in developing conceptual understanding of IFM, and different options for better-integrated floodplain management among the interested readers. Fact-sheets have been made on 22 areas (Box-7.2).

7.1.5 Activities to target communities

7.1.5.1 Exposure visits

Main thrust was given to the exposure visits for the CBOs and community members from other floodplain fisheries projects to IFM pilot site so that they could observe the IFM activities accomplished in the field and could get an insight of the whole program through sharing with the participating CBOs and project team at the field level. To this end, several exposure visits were facilitated for the CBOs of different project viz. CBFM-2, MACH, SEMP and FFP to both the pilot sites over the course of project life (Table 6.10).

Table 7.4: CBOs and community stakeholders paid exposure visits to pilot sites

Date	Place	Target visitors/TI's members
22-24 February 2004	Charan *Beel*	20 CBO members from Narail to see new *rabi* crops
2 March 2005	Charan *Beel*	12 CBO from CBFM-2 Magura site
12 February 2005,	Charan *Beel*	28 representatives from 14 CBOs in Kalihati
27 February 2005	Charan *Beel*	27 members of CBOs from MACH project, Sherpur Site
16 March 2005	Charan *Beel*	10-farmer team from Jamalganj, Sunamganj. SEMP
5 March 2005	Charan *Beel*	14 CBOs from CBFM-2 Pakundia, Kishoregonj
13 March 2005	Charan *Beel*	18 CBO members from SEMP from Hakaluki Haor, Moulvibazar,
August 2003	Narail site	CBOs from other CBFM-2 sites in Narail area
February 2004	Narail site	CBOs from other CNBFM2 sites in Narail area
March 2005	Narail site	CBOs from FFP and other CBFM sites in Narail and Magura areas
July 2005	Narail site	CBOs from FFP from Narail and Magura area
July 2005	Narail site	CBOs from CBFM from Narail, Magura and Tangail area
16-17 November 2005	Charan *Beel*	23 CBO members from MACH, Kaliakoir site

7.1.5.2 Training

Training has been a regular activity of the project through the project team as well as involving the upazila level relevant government officials. Fisheries management training sessions were facilitated jointly with the SUFO (Senior Upazila Fisheries Officers) and project teams. The Jute retting training was facilitated by the UAO (Upazila Agriculture Officer) of DAE while the cropping pattern training was conducted jointly with UAO and project agronomists.

The researchers of BRRI conducted trainings on improved cultivation of deepwater *aman* rice variety at field sites. Besides, the field level extension agents of DAE viz. BS (Block Supervisors) regularly paid field visits and discussion sessions with the participating farmers and project field teams.

7.2 Feedback and Learning from IFM dissemination

7.2.1 Feedback and Learning from Policy and intermediaries

There has been positive feedback received on IFM goal from all quarters as the approach addressed the holistic floodplain management issues and pin point the key areas of interventions. However, some key areas of concern raised by the different stakeholders those are important to address. Analysing the feedback and comments received from stakeholders at policy and intermediary levels, following inferences can be made that need attention for mainstreaming IFM:

Although the problems and issues related to floodplain fisheries (natural resources) production systems are broadly known, the complexities of systems linkages and integration in floodplain production systems (and sub-systems) under a more complex resource use dynamics by a range of stakeholders at different hierarchical positions are not well understood by the relevant stakeholders both at policy and intermediary levels.

The floodplains, though being recognized as multiple production systems that attract multiple users with overlapping interests and occupational identities (farmers in dry season become fishers in wet season and fishers in wet season become farmers in dry season) over the seasons, the management focus from the policy and intermediaries is still sectoral than holistic.

The sectoral policy and management focus contributing negatively at the community level and further widening the gaps among various floodplains resource users that accelerating rapid resource degradation and increasing poverty. Ironically, having broadly aware of the issue by the policy stakeholders, effective action or initiative has yet to be taken place. Thus implementation of IFM as a holistic measure to address issue would continue to face challenge largely due to lack of inter-departmental coordinated approaches.

IFM as an effective and holistic approach to achieve sustainable and consensual management of floodplains received attention and appreciation from all concerned parties at the policy and intermediary levels, a positive indication for future incorporation in national programme planning. However, more time will be required in reducing the gaps in knowledge and understanding of issues and devising the comprehensive and coordinated approaches that would create an enabling platform for the parties to work together to execute IFM.

The issue remains as the key as to which government agency should be the focal point in floodplains management and play the role of a champion within the government system to carry forward the IFM in the central planning process.

IFM would face a major challenge in the debate of increasing production focus versus pro-poor wise use focus aiming at conservation and sustainable management floodplains production systems maintaining its ecological integrity.

The current leasing policy of wetlands (*jalmohal*s) is neither pro-poor nor favouring the conservation and sustainable management of resources rather encouraging exploitation and degradation thus unless a pro-poor and conservation focused leasing or access policy is in place it would remain as a far-reaching endeavour to achieve the goal of IFM.

7.2.2 Key issues raised by stakeholders on mainstreaming IFM

Policy and govt. agency level stakeholders all are agreed that practicing IFM options is an utmost requirement for Bangladesh. They have pointed out many reasons in favour of their stands, such as:

- About 40 years back, Bangladesh (than East Pakistan) was the largest jute exporter in the world while presently, the position of Bangladesh in regards to jute production is not significant. One of the main reasons is that farmers cannot grow jute after HYV *boro* cultivation. Jute is a cash crop harvested in the monsoon, while farmers suffer from cash flow problems during the lean season. Jute cultivation can improve fish habitat quality (particularly for some black fishes). *Rabi* diversification can support reviving the jute cultivation in floodplain.
- Every year, in many areas, *Boro* rice is damaged by flash flood and early monsoon rains. Harvesting of other *rabi* crops is 15-40 days prior to that of HYV *boro* thus it can reduce chances of crop damages.
- Diversified crop can generate more employment opportunities in the rural areas during peak lean season/ poverty period.
- *Rabi* diversification needs less irrigation water, meaning it can support dry season fish refuges and contribute in minimizing fisher - farmer conflict on dry season water sharing.
- This also supports fish friendly operation of sluice gates that can allow early ingress of water in the floodplain and late drainage, which can prolong water coverage in the floodplains, facilitating production of biomass.
- Land retirement is a sensitive issue. Cultivation in the low-lying areas happens under private ownership, and even though giving up such lands for fish would generate benefits for common pool resources, farmers are not willing to give up such lands. However, cropping pattern change (low extraction of surface water for irrigation purposes) coupled with sluice gate management (early ingress of water and late drainage) would indirectly make the land retirement option a success.
- Practice of mono crop (HYV *boro)* in the winter season negatively impacts soil fertility and biodiversity while practicing IFM options support in increasing soil fertility and biodiversity.

They have also pointed out the slow process of policy changes and the barriers prevailing in the government system, with regards to internalizing the learning and implementation of IFM options at the national scale. They have mentioned following reasons/ barriers in favour of their statement:

- As a food grain importing country, government has a policy to grow more food grain at any cost. Thus, most of the government departments are biased in favour of grow more rice.
- Implementation of IFM options needs integration of sectors (e.g. fish, crop, water, etc.) and coordination among the government agencies (e.g. DOF, DAE. BWDB, etc.). Previous effort in this regard failed several times, due to a government system that is highly sector biased and professionals who are biased on their own discipline.
- Prior to internalize the IFM messages at the agency level (as a national level mandate), project approach is required to pilot the options in different environment and eco-systems (so that department can develop a generic guideline for it's extension worker), extensively training for field level officials and generate further evidences for wider section of policy stakeholders. These efforts would help in developing common understanding of the concept among the departmental officials and increase level of awareness among a wider section of policy stakeholders, to bring it to the national level.

However, the key issues related with the IFM are as follows:

Key issues

- Farmers' practices are directed by the DAE where floodplain fisheries and environment issues are not considered, how this can be streamlined with IFM goal and approach?
- DAE emphasize vertical production approach (in line of national policy), would DAE change their focus in favour of IFM (joint benefit from fish and crop – more on resource management than increased production)? Moreover, if so how? and how long would it take?
- Attitude of BWDB has changed in favour of fish and crops but it took long time (more than 20 years), would the floodplain fisheries sustain if we wait another 20 years to get the DAE onboard?
- Would policy facilitation change the attitude of DAE in favour of IFM? And who would do this?
- Is the relevant information and database enough to sensitise the DAE and government about the environment consequence of HYV (loss of wetlands, ground water recharge, loss of biodiversity, impact on poor, etc.) and production focus?
- How could the impacts be documented and used to correct the programmes? There is weakness in documenting and communicating the social and environmental implications of development programmes to concerned government agencies.
- Wetlands are being converted to aquaculture, how the natural production systems can be preserved and maintained?
- How the planning commission could be targeted for communicating the messages (impacts and new approaches)?
- How CBOs in all floodplain projects be targeted around IFM – each project has different focus and approaches, how these can be streamlined?
- The IFM piloting results are positive, but how these lessons can be institutionalised? And who can do this?
- There is need for joint programming approaches with relevant agencies in floodplain (LGED, DoF, DAE, and BWDB) but who will take the lead?
- IFM was piloted in two sites with strong spatial variations. Are the piloting results adequate for national level promotion, or is more data required for standardisation?
- It is key to educate the policy stakeholders, need collective approach but who would take the lead?
- No measures have been taken to protect *khas* land in floodplains (these are being converted and encroached) – there is no inventory of wetlands and no land use policy. Would it be possible to maintain floodplain ecosystem unless there is an inventory and land use policy in place?
- Mainstreaming IFM could be a big challenge, need to agree where to start, what would be the scale –micro and macro levels? or start at micro and then push upward – meso to macro?
- There is need for a third party to act as facilitator in collaborating/bridging the gap between government agencies like DoF and DAE, but who should take that role?
- IFM should be incorporated in the national open water fisheries strategy – some issues are incorporated.
- What would be the role of different organizations working in the floodplains, and how can all these be brought together under a common platform to work on IFM?

7.2.3 Feedback from CBOs on IFM visits

It is proven from the piloting activities that the practiced IFM options are good for both farmers and fishers. It can earn more benefit compared to present practices. However the production benefit is not always the determining factor for practicing a good alternative

because there are a lot of social and equity issues prevailed in the system. Some examples would be worthwhile to mention here to gain an insight in this regard. It is experienced that absentee farmers own much of the land in floodplains, with sharecroppers cultivating these lands. In the *boro* rice cultivation, there are clear cost and benefit sharing norms evolved over time and followed by both the parties. Sharecropper who experienced/observed benefit of *rabi* diversification are interested in adopting this alternative farming while many land owners are not in favour of this. Sharecroppers view in this regard is that they give half of the produced rice to the landowners because landowners bear half input costs. But in *rabi* diversification, input costs is much less, moreover, farmers are to pay more attention and input for *rabi* diversification thus landowners should not deserve half of the produced crop. As a result, many landowners did not agree to further extension of sharecropping agreement. Another example is that most of the farmers in Bangladesh have many small pieces of farmlands scattered across a floodplain. Some pieces of lands are suitable for *rabi* diversification some are not (may be suitable for *boro* rice). Farmers may switch to *rabi* diversification in the suitable land, but they are still dependant on pump owners for irrigating rest of their *boro* lands. Pump owners are few in number but powerful. They have their own syndicate. *Rabi* diversification hampers their business thus they may unwilling to supply irrigation water to the rest of the land. It is also experienced that if suitable land for *rabi* diversification in a floodplain is not switched to *rabi* diversification in a block, a single piece of land cannot adopt *rabi* diversification as seepage of irrigation water from adjacent *boro* plots can damage the *rabi* crops. Community people have given the following feedback regarding piloting of IFM options:

Feedback from CBOs

- The way the Charan BMC and IFM committee (farmers) piloted IFM options and overcome the obstacles and finally achieve the results
- Observed benefits and advantages of alternative *rabi* crops in place of *boro* rice
- The alternative crops cultivation and comparative benefits with *boro* rice found convincing and thus made them interested in diversifying out of *rabi* crops
- Get an insight on Integrated Floodplain Management and to identify the possibility to replicate the better options in their areas.
- These farmers were mainly interested to learn what farming options could better complement floodplain management and what was most suitable for their area.
- Besides fisheries management in floodplain management, they would emphasizing on growing diverse *rabi* crops in their areas
- Garlic – no tillage is needed and it can be planted soon after monsoon water recedes with mulching to restore soil moisture. The cost effective analysis by both garlic farmers and the visiting farmers came to the conclusion that garlic is more profitable than paddy and suitable for the project area. The participants were encouraged to cultivate garlic in their high and medium high land. They would have to do some soil treatment with green manuring and then cultivate crops.
- Watermelon may not be suitable for the kind the soil in the project area. But some farmers might still try
- Along with the main crop other minor crops can be cultivated in *rabi* season
- An initiative can be sustained if majority of the beneficiaries of an area participate collectively and thus BMC or IFM committee should be strengthened
- Diversification of the activities provides a higher income compared to *boro* rice
- The experience gained should be communicated to other people through different media
- Strong leadership is the key for sustainability and transparency of the committee can keep up trust and respect

7.3 Institutional learning in promotion of IFM

7.3.1 Learning and Communication around IFM

Despite the local emphasis on technical success, the team did manage to record evidence of autonomous modification or planning around IFM. For instance, there was evidence that other local stakeholders (non-listed farmers) were exploring *rabi* options and were concentrating on specific crops – especially potato – and were successfully source their seeds independently of project team (Charan site) (see Annex C: Social and institutional uptake of IFM options – observations derived from process documentation).

Of particular interest from a social and institutional perspective, was evidence that "listed" participants and others outside the project was engaging with relevant secondary stakeholders such as the UAO and the BS independently of the project. Farmers started to commission their own soil tests direct from the Agriculture Office, for instance.

An additional institutional development related to the linkage with markets. A local trader agreed to buy and distribute all maize produced in the project villages and this indicates a level of support for crop diversification beyond the village level but outside formal institutional (government) or project facilitation.

The level of understanding of *rabi* appeared to improve as the project progressed. When mistakes and problems had occurred, project staff addressed the issues. The diaries highlight the case of at least 5 farmers that failed to continue the *rabi* experiment due to "lacking skill or funds" but the general indication was that people were willing to learn of new options and attend the various training activities organised by the project. There is demand placed to the project field offices for training for the new farmers for *rabi* diversification in 2005-06 (even after the project) indicates enthusiasm about *rabi*.

The field staff noted that discussion of *rabi* between listed farmers and others occurred informally and that farmers invited non-participants to inspect their plots and discuss *rabi*.
There was diary evidence of local initiative associated with IFM options and this was linked with the work of the committee rather than autonomous uptake on the fringes of the project (as had seemed to be the case at Charan). These observations related to calls for BWDB advice, the establishment of an IPM school and general planning for the new culvert, rather than the modification of *rabi* techniques (Narail).

The majority of the interaction between local stakeholders and service providers as secondary stakeholders was facilitated by the project (such as the district level workshop and exchange visits with Charan), but the demand for the IPM school and the request for technical BWDB advice indicated increased IFM awareness and the prospect of new links with existing institutions.

Table 7.5: Social and institutional features of IFM – Charan Beel (observations from selected diary reports)

	Acceptability & Participation	**Learning & Communication**
June 2004	+ve: good response to demos and committee (35 *rabi* farmers over 25 acres – *chamara* & *rabi*). Appreciation of CBFM early monsoon fisheries control. -ve: early conflict between pump-owners and farmers	+ve: evidence of technical (IFM) & institutional (committee purpose) knowledge. Project-facilitated links to BS, UFO, UAO & BRRI.
July	+ve: demand for ad hoc IFM (*rabi*) committee 3 villages participate in meeting for seed distribution & use of urea.	+ve: farmer-farmer discussion & farmer-officials communication
August	+ve: 80 residents agree to *rabi*, farmers want additional potato seed to buy independently of project.	+ve: 2 farmers outside Charan take up maize. Trader agrees to buy all maize.
September	+ve: Formal committee requested. Farmers preserve their own seed. A list of 9 representatives established.	Soil test available to all from Agriculture Office. CNRS office visited regularly by individuals.
October	+ve: Residents praise *rabi* and 2 extra request memberships. Committee increase form 20-36 plus 6 women. "List" increases form 15-80. -ve: some trials sabotaged but resolved in autonomous meeting.	*Rabi* success in non-listed groups & larger groups suggested (modification). Farmer-farmer and tea-stall discussion increases. -ve: some believe all insects are detrimental.
November	+ve: additional farmers attend meetings, 5 farmers' neighbours interested and list expands to 85.	+ve: IFM committee talk regularly to CNRS & other farmers. -ve: Some farmers remain stubborn.
December	+ve: 3 farmers from neighbouring villages express interest. 2 IFM meetings this month. Frequent BS & UAO interaction. 3 of 4 pump owners stop their operation & request involvement.	+ve: farmers recognise *rabi* significance via cross-visit
January 2005	-ve: 5 *rabi* farmers fail (money & skill). One farmer's family ruins wheat crop.	Farmers inspect each other's crops. Training with BS & UAO. Farmers contact CNRS office.
February	+ve: farmers from outside contact CNRS & BS. -ve: 6 farmers drop out (replace *rabi* with IRRI), 1 pump owner refuses to stop irrigating land (conflict with CNRS).	
March	+ve: 3 villages decide to grow *aman*, jute & sesame. People decide to register committee & start bank account.	
April	+ve: farmer-CNRS interaction high due to seed problem. Committee invests in thresher.	
May	+ve: Committee consolidated & engages with farmers. CNRS-farmer link close due to ongoing irrigation advice. Farmers will cultivate *rabi* next year.	
June	+ve: People want to join committee. Jute becomes more popular due to market produce (research price themselves).	
July	+ve: Jute becomes more popular (price rises) and farmers are prepared early for *rabi*.	

Table 7.6. Social and institutional features of IFM – Goakhola-Hatiara (observations from selected diary reports)

	Acceptability and Participation	**Learning and Communication**
May 2004	+ve: 3 farmers take up jute.	+ve: CBFM committee members & Agric. Officers present at jute training.
June	+ve: CBFM committee destroy fixed engines.	
July	+ve: IFM committee of 13 formed.	+ve: committee plan extra drainage outlet.
August	+ve: good interest in Dhaincha versus Jute (good price).	+ve: IFM committee consult BWDB engineers & decide to take action.
September	+ve: *Aus* and *aman* is popular. Committee believe new culvert will increase *rabi* by 100 acres in 2004.	
October	+ve: IFM committee want registration & prepare plan. They create a fund; arrange a visit & training & commit to tell others of *rabi*.	
November	+ve: evidence of revenue management.	
December	+ve: *rabi* adoption due to committee.	
January 2005	+ve: *rabi* increase, *boro* declines. LLPs decrease by 2. 2 new members on committee -ve: STWs increase by 1.	+ve: Committee members communicate with BWDB for sluice management. Committee request loan from Banchte Shekha. Committee request soil training.
February		+ve: exchange visit with UAO, UFO & committee sharing experiences.
March	+ve: 5 new farmers attend meetings, Savings system working. 2 fish sanctuaries established.	+ve: District level workshop held.
April	+ve: Jute increases & *ghers* increase as shrimp buyers arrive.	+ve: Committee request IPM school.
May	+ve: Jute popular as price increases. BMC warn poachers. -ve: Dhaincha decreases.	+ve: all committee members commit to recruiting 10 new recruits (committee share purpose with others).

7.3.2 The focus and experiences of the project teams

7.3.2.1 The *rabi* cropping focus

Both local teams placed special emphasis on any apparent change in uptake of alternative cropping. In part, this relates to the project design, which targeted the introduction of these options at sites with CBFM-2 experience and committees. Issues of direct fisheries relevance were to have been addressed with the local communities in past project activity.

At Charan, the water issue of main concern to the field staff appeared to be the stance and behaviour of the LLP owners and their impact on the potential for *rabi*. The emphasis on *rabi* was complemented, however, by efforts to discuss fisheries impacts by LLP operation and by the inclusion of CBFM-2 participants at some of the committee meetings and training. In this way, the team did stress the linkage between the agriculture and fisheries systems.

7.3.2.2 The role of institutionalisation

At Goakhola-Hatiara, great emphasis was placed on the development of a formal and structured IFM committee (over half the content of the diary reports was concerned with the status of these efforts). A similarly structured committee was developed during PAPD at Charan and movements towards registration and financial independence were being made towards the end of the project (Figure 2).

However, it is important that IFM facilitators are aware of less formal mechanisms of institutionalisation and the role of independently established linkages between local stakeholders, IFM practitioners and supportive agencies and markets. In this regard, “institutionalisation” of IFM should be seen as process that depends on the stance of local practitioners to IFM. The way these attitudes are distributed within communities will dictate to what degree management changes take place and may reflect the extent to which they are pro-poor.

7.3.2.3 Observations on the IFM committees and the use of PAPD

The Charan IFM committee appeared to be an important interface between the project staff, participants and potential participants. The focus was to engage with large numbers of “listed” farmers and encourage the uptake of *rabi*. Meetings were sometimes called without CNRS facilitation but the main objective was to instruct people on *rabi* techniques and to correct misunderstandings. In this last regard, the meetings apparently went some way to resolving obstruction from the LLP operators.

The Goakhola-Hatiara IFM committee was apparently involved in broader planning issues with other stakeholders to make room for the *rabi* IFM option - the hydrology of this site required these changes for wider uptake. As with Charan, the committee functioned as an interface between the community and service providing institutions such as Banchte Shekha (a loan for *rabi* was requested from the NGO), the UAO, UFO and the BWDB. The role of the committee here was less as a forum to deliver instruction but rather a platform to enable representatives to plan to accommodate IFM options in future.

Both teams facilitated the establishment of quite complex IFM committees and PAPD provided an opportunity to devise acceptable and representative structures (these structures are outlined in the Charan and Goakhola-Hatiara reports). Once again, the diary and timeline reports indicate that the committees at both sites were seeking registration and were attempting manage their own committee funds. The institutional structures represented by the IFM committees were developed after the teams had decided to apply PAPD at the two sites.

The application of PAPD was intended to “explore the multiple perspectives of different primary floodplain stakeholder groups in order to set priorities for sustainable agricultural

practices" (PAPD – IFM Uptake Promotion, March 2004). However, because the field teams focused on promoting *rabi*, rather than crosscutting activities to emphasize an integrated perspective on alternative floodplain management, the stakeholders selected for the PAPD workshops were drawn from farming interest groups. The strategy adopted here assumed that ongoing CBFM-2 activities and project-specific local planning (fish sanctuaries, gear bans etc.) were working in parallel to achieve IFM. There may have been an opportunity here to emphasise once again the inter-connectedness of the farming and fishing systems with the broad range of local stakeholders.

PAPD was designed to break down perceived differences in management objectives between the various floodplain users. The workshop process gradually merges the interests of all groups in order to demonstrate prospects for "win-win" interventions that suit all stakeholders. In the context of uptake of IFM options, there is an obvious role here with respect to bringing fisheries and farming stakeholders together to demonstrate the significance of new fisheries management and agricultural options, and how they can work to enhance the performance of one another.

7.3.2.4 Observation of fishers on *beel* (fisheries) management

The Charan BMC has been managing the fisheries in Charan *beel* since its formation in 2002. Each year, the project team (CBFM) implemented a fisheries management plan in conjunction with the BMC.

The BMC members and other non-BMC fishers in the area expressed their satisfaction with the management initiatives undertaken by the project. They reported an increase in fish production; reappearance of some locally lost fish species and increase in fishers' income.

They also made the following observations:

- The sanctuary was established with required excavation work, properly protected with tree branches and bamboo, and guarding contributed conserving fish stock as well as biodiversity;
- The 3 months fishing ban during mid-Baishakh to mid-Shraban (mid-April to mid-July) contributed fisheries production by allowing spawns and fingerlings to grow bigger. Fishers described it as an effective measure for fisheries conservation and increased production and biodiversity;
- Although the use of current *jal* and ber *jal* is banned for a selected period, some fishers are continuing to use them during the ban.
- Fishers are happy with the reintroduction of carp and other local species under CBFM-2
- Communities suggested banning other harmful gears as well (fishing trap), as their number are increasing rapidly
- Another threat to management is trapping of fish in some pockets of the *beel* during recession of water, by non-fishers on their land, which is depriving fishers who are paying rent to the government for fishing.
- Increased water area during critical dry season due to alternative *rabi* cultivation in place of water hungry *boro* rice will certainly contribute in increasing fisheries production.

7.3.2.5 Feedback on IFM from informal discussions with the participants

Near the end of the project, the opportunity arose to discuss the impact of IFM with local farmers, fishers, and women. They made a number of insights into IFM and their opinion was overwhelmingly positive. The highlights of the exercise, and key issues and points raised, are noted below.

Farmers

How did you get to know about IFM? Did ever you think about it yourself?
We never thought about such kind of activities. In fact, we got this type of thinking from CNRS. CNRS personnel, especially Dr. Matiar Rahman discuss crop diversification as an IFM option with us several times. He advised us about demonstration of rabi crops. He told us to manage some plots for alternative crops demonstration. According to his advice, we organized and managed some plots on lease basis. As it was a new thinking, we were afraid of loss so, we did not agree to establish demonstrations our selves. Therefore, we arrange some plots on lease basis. However, we demonstrated 18 species of rabi crops in the first year, 2003-'04. Time to time we followed up the crops, most of the crops grown well. Seeing these crops, we became interested in cultivating the alternative rabi crops. Then through PAPD we organized a farmers committee and made a elaborate planning for crop diversification. Later on, in the second year (2004-'05), Dr. Matiar Rahman suggest us to visit some rabi crops growing area to learn more on the new crops from the farmers and we agreed to his proposal. We visited Dhunat, Gurudaspur at Natore and Munsiganj; and saw maize, garlic, and potato cultivation practices. We got the opportunity to exchange our views directly with those farmers. We learnt the benefits and cultivation methods of those crops from them. Due to the visiting program we were more confident to grow rabi crops and thus we became involved in these activities.

Are you (farmers) benefited by IFM? How?
Yes, we are. We cultivated different rabi crops by the help of CNRS IFM project. We did not cultivate these crops before and our benefit from potato, garlic and maize were more than *boro* rice. Again, after harvesting rabi crops we cultivated kharif-1 or kharif-2 crops like Jute, vegetables, *aman* rice etc., this gave us a extra earning. By cultivating rabi crops, we could harvest some crops before *boro* rice, which supplemented income and food security in the food shortage period. By selling some of our crops, we earned some money, which supported us in the lean period.

How do fishermen benefited from alternative rabi cultivation?
As we cultivated rabi crops instead of *boro* rice in the last rabi season, water abstraction from beel has been reduced, which benefits fish production.

Where did you go for help before becoming involved with IFM?
In the past, we did not correspond with any resource persons / officials in this regard. CNRS introduced us with these officials.

Garlic is grown without tillage. Have you share your experience with CNRS or with other farmers? Has CNRS taken any initiative based on this idea?
It is known by most of the farmers now, because CNRS arranged visits to Chalan Beel and we learnt these things from the farmers there. After learning from there I have cultivated garlic with zero tillage in my plot. I have also shared my experiences with CNRS staff and they have visited my plot. I think, CNRS will take the initiative next year to expand this technology.

By this, are you implying that farmers adopt technology rapidly after seeing a demonstration?
Yes, it is true that farmers do not agree to take any risk for a new technology, first, they want to observe the result of a technology, and if the result is positive, they adopt it.

What happened when production was less than expectation?
In some cases, we did not get produce as per our expectations, because our soil became compacted / cracked by cultivating *boro* rice crop for years. It is not possible to regain the

soil productivity within a short period of time. It takes 3-5 years for reclamation of soil fertility as well as productivity but we are hopeful.

Do you inform other farmers, after identifying the major causes responsible for lower yield?
Yes, we organized a feedback session in this regard where we discussed the success and failure stories of the cultivated crops. The main weaknesses were as follows-

- Low soil moisture that hampered seed germination
- Improper tillage
- Lack of intercultural operations

What did you learn from IFM?
The major learning from participating in IFM activities are as follows:

- Increased our crop management skills.
- Increased communication skill: farmer-to-farmer, farmers to GO officials, farmer to NGO etc.
- Increased organizing capacity. . We have understood that farmers could establish their legal rights through farmers group. We learned about comparative benefit – cost analysis of different crops.

Are other local farmers interested in rabi crop diversification?
Yes, local farmers are very much interested in carrying out such activities. They want to be included with IFM group.

How do you market your products? How will you market when you produce a huge amount?
There is a big local bazar nearby in Bolla. Normally we sell our products in this local market. Moreover, the transportation system of Charan with capital city or any other cities is good. Marketing is not a problem here even for large-scale production. There are lots of poultry farms in Kalihati, so there is also a good local demand for maize.

Is there any bad impact on the poor of IFM implementation?
No, there is no bad impact of alternative rabi cultivation on the poor. As we see this beneficial for them in terms of selling their labour. Because in *boro* labour demand is at a time but in alternative rabi crops labour demand is time to time. More over there is an opportunity to cultivate another crop after harvesting these alternative rabi crops like vegetables or Jute this doubles the labour demand, which is not possible with *boro* rice. Another benefit we experienced this time that, as wheat was harvested much earlier than *boro* rice, many of our poor neighbours/ relatives took wheat as loan during a lean period.

Fishers

What are the benefits for you of observing closed season?
It has both merits and demerits.

- As it is helpful for increasing fish production and we are depended on fish for our livelihood, it is of benefit for us.
- Nora feka (fingerling of katla) got scope for growth and also increased in number.
- On the other hand, many of the fishermen are very poor. They live entirely on fishing. Normally they could catch fish in the month of Magh, Falgoon, Chaitra and Baishakh. Closed season is observed from mid-Boishakh to mid-Srabon. In this long period (from Magh to mid Srabon) they have no alternative income source for their livelihood. Therefore, they have to pass their days in miserable condition.
- Some fishes like Chapila, kachki, Chanda etc. entered in to the beel with new flood water (month of Ashar). If we do not catch these fishes at that time, they leave the beel within few days (within one month). But we could earn good money from these fish, because in

this period market price of fish remains high and we get more money selling fewer fish. Thus, we are deprived from this income.
- As far as we know, that fisherman in some places have got financial help from government sector for observing close season, but we have not.

What are the benefits of sanctuary, which already you have observed?
In the current year we have already observed some benefits:
- Overall catch has increased.
- Some fishermen caught big size (6-7 kg) Karpeo fish.
- Some fishermen caught Ruhita (4-5 kg in size).
- Boal fish increased significantly in the beel.
- Huge increase in Tengra fish population observed from before.

Did you observe those species of fishes, which were about to become extinct? Do you think the NRs remain stable as before?
Yes, we have observed changes in species of fishes, other wildlife and plants as follows and we believe that the NR is becoming more stable.
- Now we see some species of fishes to an extent, which were about to become locally extinct. These species are: Foli, Pabda, Kalkini, Rani , Koi, Shing(Giol), Guji air, Shol, Gojar, Tatkini etc.
- Small increased in extent of different species of birds like Khoira egret (grey egret), Cormorant, white egret, pond heron, Nairalla bird, Dahuk, Kura, little grave, Huttiti, Huda and many other unknown birds.
- Increased Crabs, Tepa, Molluscs, Dora snakes etc.
- Different aquatic plants like Poura, Doal, Keocala, Shapla-Shaluk, Algae also increased.

Do you think this project have been made change in your livelihood? What changes have been occurred in your livelihood by CBFM-2?
Four to five year ago, fish production in Charan beel reduced significantly. As a result, some of the fishermen changed their occupation to weaver, van puller, fish businessman (raw fish and dry fish) etc. At present, fish production has increased but at the same time, the number of fishermen has increased too, so the change is not that significant which could have been much more unless otherwise. However, for the involvement with CBFM-2 project now we are more conscious about our wetland resources and hopeful. They expressed:

- We pass our days in peace.
- Our children go to school.
- Our daily income has been increased. In the past, we earned Tk.70.00 per day, where as at present our daily income is Tk.100.00-120.00 per day.
- Increased our purchasing capacity.
- Increased in our food habit and dwelling place.
- We can purchase good clothes for our children.

Is there any change in the community/society by which you could establish your legal rights?
We are empowered now. Three years back Charan water bodies remained in the grip of local musclemen. In the past, local leaseholders (of course, they are musclemen) leased the beel from government authority. Fishermen could not catch fishes from the beel freely. They had no access to catch fish without high toll. Sometimes they used to torture the fishermen both physically and mentally. However, at present we regain our legal rights. Now we (fishermen) are organized. We ourselves have taken lease of the beel, so we can catch fish freely. Local musclemen cannot torture us. Now we are empowered. We can confront any kind of hindrance/risk/evil power together.

In the past elite persons ignored them. They had less importance in the society. They were negligible person in the society. They always deprived from all sorts of facilities in the

society. But at present they are known to all walks of life. All local officials like UNO, AC land, Fisheries Officers, Agriculture Officers, UP chairman and members know them and respect them as a BMC member. Now they can communicate with these persons directly as and when needed.

What is the thinking of community people about CBFM -2 project?
The response of the community people about CBFM-2 project is very good. They have taken it positively. Community people always help in project activities.

Do you know about the diversified cropping pattern around Charan beel? What are your comments about crop diversification?
BMC members of all beel know about the diversified cropping pattern and they are interested to adopt this pattern in their respective beels. Farmers could understand that crop diversification can contribute to retain sufficient water in the beel in dry season, which will ensure an increased shelter for fish in the beel.

Women

What kind of help did women get?
Women got some training such as Duck rearing, Poultry rearing, and homestead gardening etc. so that their contribution to their families is increased. Women produce vegetable in their kitchen garden from which they meet their family needs and earned cash by selling the surplus. Women are also participating in the IFM committee.

What changed of women?
Now women are more conscious. A few female farmers work with the IFM project directly in the field. They attend training and meetings, express their opinions, and take decisions. Most of the women cultivate different vegetables (bottle gourd, sweet gourd, bitter gourd, bean, red amaranth, radish, and okra) in their homestead garden. Sometimes they come to the CNRS office to take quality vegetable seeds too. This is certainly a good scope for the to be empowered.

Did any other women follow you? What did they do?
Yes, we gave some seeds to other women and they come to discuss with us, did like us too.

What steps should be taken to extend such kind of activities?
Playing folk drama in the community may extend it. Demonstration is also an effective method for extension of these activities.

8. Summary changes in Floodplains and Social Systems

The research envisaged bringing about some changes in the floodplain ecosystem and social & institutional systems. Information depicts that some changes occurred in the floodplain ecosystems at the local-level in both sites, where research options were piloted. Some changes in the social systems were also observed at different levels. These changes are described in detail in various different sections of the report. However, to gain an insight regarding the changes at a glance, a summary table is given below describing the major areas of change.

Table 8.1: IFM issues, interventions and results on ecosystems and institutional levels

IFM Issues/Area of change	Interventions/option measures	Changes/results
Fisheries[1] - Shortage of dry season water, lack of winter refuge for fish, declining fisheries - Fish migration obstruction, reduced yield and biodiversity, more inside FCD/I projects - No management, over fishing impacting sustainable fishery - High surface water irrigation, water pollution, encroachment - Declining of other aquatic faunal and floral diversity e.g. molluscs, snails, aquatic grasses, fruits, etc.	Effort control - Closed season 2/3 months April-July (breeding time) - Gear restriction (fine mesh seine nets) in May-July (protect brood and fish fry) - Closed area (fish sanctuary in defined area to protect brood, young and adults) Habitat rehabilitation - 2 acres in Charan *beel* (sanctuary area) - Re-excavated 2 link canals (fish migration) Reintroduction - Released locally threatened fish species Capacity building - Conducted training, awareness, exchange visits	- Fish production and species diversity increased in both the sites - Higher availability of large size fish - Floodplains have come under sustainable management - Habitat quality improved, dry season water extent (area and volume) increased - Depth of perennial water-body increased - Catch of white fish (riverine species) increased - Improved fish habitats conditions due to IFM cropping pattern change - Other faunal and floral biodiversity increased - Reintroduced fish species successfully colonized
Cropping pattern[2] - Mono cropping of “water hungry” *boro* rice in the dry season impacting fish due to shortage of surface water - *Boro* affects fish migration by closing sluice gates in early monsoon (peak fish migration time) and habitat area by draining water at late monsoon - Risk of *boro* damage due to rainfall/flash flood is high in early monsoon (April/May) - Reducing cropping diversity, soil fertility - High input cost, not profitable for sharecroppers	Cropping pattern change - Five acres demonstration of alternative *rabi* crops with six farmers at both the sites in year-1 (2003-04) with full project support - Over 150 farmers piloted alternative *rabi* crops in year-2 (2004-05) with partial support (only seed provided) - Deep water *aman* rice trail with BRRI in year-1 and year-2, farmers selected some good varieties - Water tolerant *aus* variety taken by farmers in Narial site - Training, awareness and exchange visits	- 20 varieties of *rabi* crops tested in year-1, farmers piloted six crops (potato, wheat, maize, garlic, kheshari, sesame) in year-2 - *Rabi* crop area increased from 5acres in year-1 to 74acres in year-2 - *Rabi* farmers increased to 127 in year-2 - Farmers income increased - Farmers adopted a follow on crop (Jute and vegetables) after harvesting *rabi* - Farmers planned for year-3 (2005-06) with less support (50% cost of seed only) - Visiting farmers/CBOs from other areas adopted cropping pattern options
Surface water[3] - Late ingress of water in the floodplains due to dykes/sluice gates, roads, encroaching link canals impacting fish yield and species diversity - Quick drainage of floodplain (for *boro* cultivation) resulting shortage of surface water impacting fish	Sluice gate management & other - Fish friendly sluice gate operation during fish migration with IFM committee and BWDB - *rabi* crops leave more water in *beel*s - 3 pumps stopped at one site resulted increased surface water - Improved jute retting techniques	- Water extent increased (area, duration and volume) suitable dry season habitat for fish - indirect land retirement effect - Reduced water pollution due to jute retting - Early ingress and late egress of water (good for fish) - High potential for uptake and use of

[1] FTR Annex B1 (Chapter 6) and B2 (Chapter 7)
[2] FTR Annex B1 (Chapter 5) and B2 (Chapter 5)
[3] FTR Annex G

IFM Issues/Area of change	Interventions/option measures	Changes/results
- Jute retting polluting water resulted in fish being killed	introduced (ribbon retting) with DAE and Jute Dept. - Awareness on indiscriminate snail collection effect on water quality	improved jute retting in future - Habitat quality of floodplain in the dry season improved due to more water - Soil quality should be improved due to alternative *rabi* cropping
Local Institutions[4] - Of the four tiers of formal institutions at the local level in Bangladesh, only one i.e. Union Parishad (UP) is partially functional - Local informal institutions like Samaj could not uphold values thus losing the trust of the community and control over the system	- Formation of IFM committees - BMCs involved in IFM - Meeting with relevant line agencies - PAPD and micro level land use planning - Training and workshops - Awareness campaign and materials (posters, folk drama, visits)	-IFM committees functional - take up issues with DoF, DAE, BWDB, UP and BMC - Coordination among the government agencies and communities increased - IFM committees measuring sustainability indices, resolved conflicts, open to involve women, making new plans - IFM committees are in the process of registration to have legal entity
National Institutions[5] - Highly sector biased - Lack of coordination - National priority on production increase (not resource management and livelihood security) - Weak policy implementation, review and change	- Series of meetings - Exchange visits - Workshops - Policy briefs - Conference/ seminar paper	- Memorandum of understanding between CNRS and DAE, BARI and BRRI - National inland fishery strategy included IFM options - DOF included IFM in training module for CBFM - MACH, SEMP and IC-LEAF projects initiated cropping pattern change - CBFM2 provided training of farmers on cropping pattern change for year-3

[4] FTR Annex C and B2 (Chapter 9)
[5] FTR Annex A

9. Conclusions

The purpose of this research project (R8306) has been to pilot methods for the implementation of management opportunities relevant to the poor, as well as the development and promotion of IFM options. This has been achieved through adaptive testing of options, documentation of the institutional learning systems associated with piloting, and communication of findings to relevant stakeholders at all levels. Adaptive testing of cropping pattern management, fishing effort control measures, and sluice gates management options, as better IFM options revealed and resulted in a number of issues and recommendations.

Fishing effort control, which has been running at both sites for a number of years, under the CBFM-2 banner, is now relatively well established. The operation of a closed season (closed season), the establishment of fish sanctuaries (closed area), and the ban/restriction of certain fishing gears (current and ber *jal*) are all now planned and enforced by the BMCs formed under the CBFM-2 project, with the support of DoF and partner NGOs. In addition, fisheries stakeholders were educated as to the negative effect of dewatering of *beel*s / *kuas* for the sake of catching fish, a practice that has now been stopped by voluntary agreement. The interventions have seen marked increases in catch (weight) and species diversity at both sites, whilst fishers mention that the fish they are now catching are far larger (and therefore more profitable) than those of the previous years – a direct result of the interventions.

At the Goakhola-Hatiara site, sluice-gate management was also piloted under the IFM banner (note that this was not done at Charan *Beel* as there are no effective sluice gates at the site). It was agreed, through IFM, that the sluice gate should be operated in a more fish-friendly manner, and as of 2005 it was opened earlier, in May; it is hoped that this will permit more migrant whitefish to enter the *beel*. In addition, farmers proposed building a new pipe-and-flap gate to drain excess water from 26 ha land, so that they could grow two crops there and retain the water to conserve fish. The overall impact of that structure, and of changes in sluice operation in 2005, will not be apparent until fish catches from the last three months of 2005 are available.

Concerning cropping pattern management, the reaction to the options was positive, and the stakeholders, although initially sceptical, became enthusiastic about testing IFM options once the benefits became apparent. It was seen early on, however, that farmers were unanimously against the land retirement option, despite the fact that land suggested for retirement was low-lying and prone to early flooding. The main reason behind this is that there is a great shortage of land in Bangladesh, and as such, people are keen to cultivate crops wherever possible, regardless of risk. As such, it is likely that this option will prove unworkable across the country.

In Goakhola-Hatiara, the major change in cropping pattern was a 20% reduction in *boro* cultivation (HYV) between 2002 and 2004, and more land switched to growing local *aus* after HYV *boro*, or after *khesari*, due to the introduction of an *aus* paddy variety, 'ratul', that is resistant to high water levels and has a good yield. At the Charan *Beel* site, where the focus was on alternative *rabi* crop production, the 5% uptake of alternative *rabi* crops does not tell the entire story. In the first (trial) year, only 3 farmers took part in the piloting experiment, despite incurring no costs and being guaranteed reimbursement for the loss of *boro* production. In the second year, by contrast, 85 farmers experimented with alternative *rabi* crops, despite only being offered subsidised seed. This year, it is expected that over 150 farmers will participate. It is apparent, from the results at both sites, that confidence and habits are major factors in determining uptake. In Goakhola-Hatiara, where the focus was on alternative wet season rice varieties, uptake was fairly rapid, whilst at Charan *Beel*, where

new crops were introduced, uptake has been markedly slower. What has been amply demonstrated at Charan *Beel*, however, is the greater profitability of crop diversification, and it is this, ultimately, that will determine its uptake and distribution.

There was evidence of the potential for horizontal spread of *rabi* beyond the direct project participants, however. Individual from neighbouring areas consulted local people, CNRS staff, and the Block Supervisors (BS), concerning uptake of *rabi* options in their villages. These conversations seemed to be the result of informal, "tea-stall chat" mainly rather than concerted efforts on the part of the project such as the cross-visits and training days with secondary stakeholders. Although such developments are encouraging from the perspective of sustainability and up scaling, it is not clear to what extent agriculture modifications offer pro-poor benefits and receive widespread acceptance. New *rabi* participants are self-selecting in that they are wealthy enough to be landowners, farmers or sharecroppers.

In a land scarce country such as Bangladesh, land retirement seems to be a difficult choice; people tend to cultivate as much land as possible. If, through reduction of *boro* rice area and fish friendly management of sluice gates, it is possible to increase the water level in the *beel*, some land will remain under water automatically. However, it is easier and more worthwhile to focus on the higher elevation plots first, since they have a comparative disadvantage in *boro* production, and hence they should be the prime targets for diversification.

Although, encouragingly, the IFM committee convened meetings independent of the project team (Charan Site) to resolve local disputes on several occasions, at least six farmers abandoned *rabi* and returned to *boro* rice, whilst relations with LLP owners remained poor. In retrospect, it would have been useful to attempt to deconstruct the types of interests groups attracted to the new IFM options in the reporting and how movement between fisheries and agriculture options relates to socio-economic status and occupation of other groups - e.g. how do wage labourers perceive *rabi* and how are these stakeholders affected by the implementation of IFM options?

The purpose of the project was to promote the "Better Options for Integrated Floodplain Management (IFM)" to the relevant stakeholders from the grassroots to policy level stakeholders. In this regard, the project took a number of significant steps, which have resulted in largely positive feedback regarding wider uptake of IFM. Aside from the above-mentioned informal dissemination, the project designed various media, arranged exposure visits, held workshops, and gave presentations, to promote the wider uptake of IFM options. The main target institutions were government development agencies (DoF, DAE, BADC, LGED, BWDB) and NGOs related to NRM in Bangladesh. Particular highlights include TV spots on ATN and BTV promoting IFM options, and a seminar on IFM arranged by DoF for its directors, following exposure visits by lower level DoF staff, after which they decided to change their policy focus away from open water restocking to better floodplain management and maintenance of open water resources. Also carried out were a presentation at Fish Fortnight, and a talk given to DAE senior staff.

Ongoing efforts to institutionalise IFM options can learn from the experiences of the teams and the way in which the processes were documented. Facilitators of such processes must treat platforms like IFM committees as tools for institutionalisation (changing behaviour and practice) rather than as an end-point in their own right. Ideally, these committees would work to "make normal IFM" and bring in new participants from the fringes of project-facilitated activities - most probably through informal and personal linkages with neighbouring communities or government agency staff. With respect to *rabi*, for instance, the institutionalisation process might see new participants forming their own relationships with traders, seed suppliers and service providers. There is evidence that this has occurred to an extent at both sites and it is important that this achievement of the project be acknowledged.

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