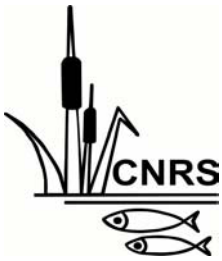
Better Options for Integrated Floodplain Management in Bangladesh: Uptake Promotion
NRSP Project R8306

Final Technical Report
Annex B-1

Piloting of IFM Options:
Charan, Kalihati, Tangail Site

November 2005



WorldFish Center

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.

TABLE OF CONTENTS

Chapter 1: Background and Context

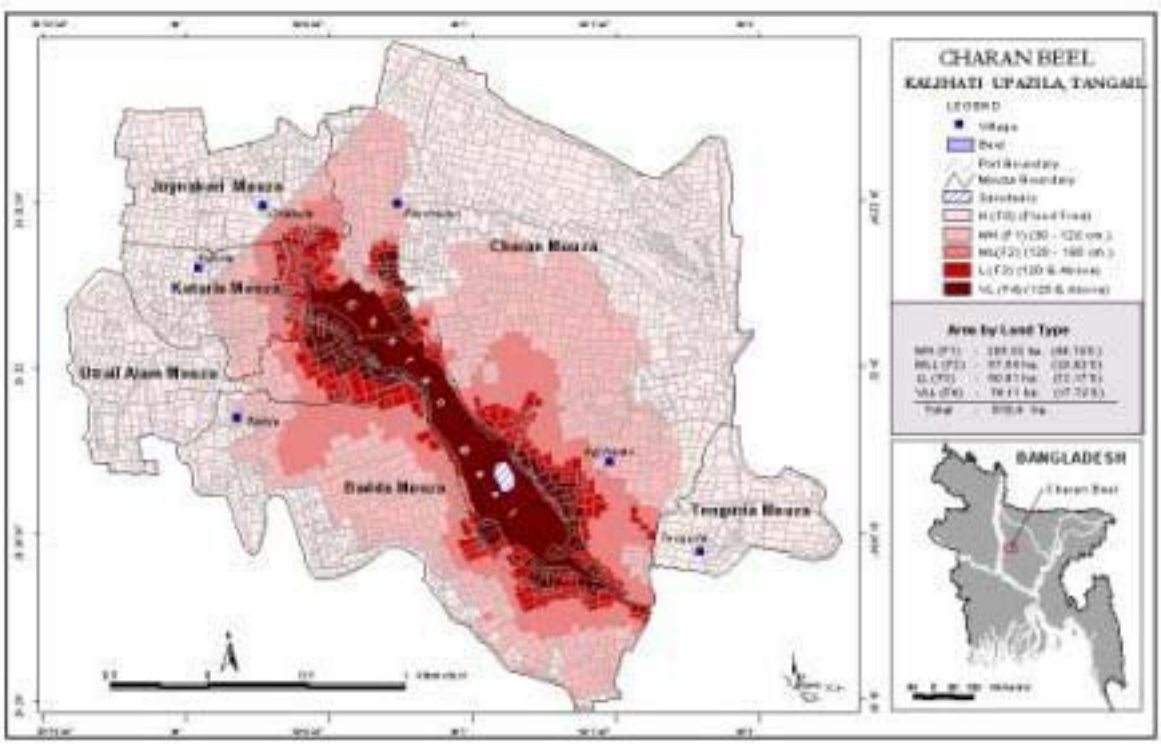
M. Mokhlesur Rahman and M. Anisul Islam

1.1 Choice of Location

The purpose of the project was to develop an implementation methodology for wider practice of IFM options at diverse floodplain situations in Bangladesh through adaptive testing of improved integrated floodplain management (IFM) options with the participation of user communities and related stakeholders. To this end, Charan Beel in Kalihati upazila of Tangail district was selected as one of the two sites for piloting the IFM options.

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 beels, rivers, canals and a large amount of seasonally flooded land.

This site was selected primarily due to two reasons, first, its involvement in the Community Based Fisheries Management Project Phase 2, which is now being implemented through a partnership of WorldFish Center, the Department of Fisheries (DoF) of Government of Bangladesh and a number of NGOs in selected water bodies around the country. Center for Natural Resource Studies (CNRS) being a NGO committed to conserve the country's natural resources through a community-based approach has been working in a numbers of water bodies of different ecosystems under the umbrella of CBFM-2. The other reason was that three pervious NRSP/LWI projects (R6756, R7562 and R8223) were also implemented in Charan Beel, thus there is a previous relevant database available that could be potentially used for the project.

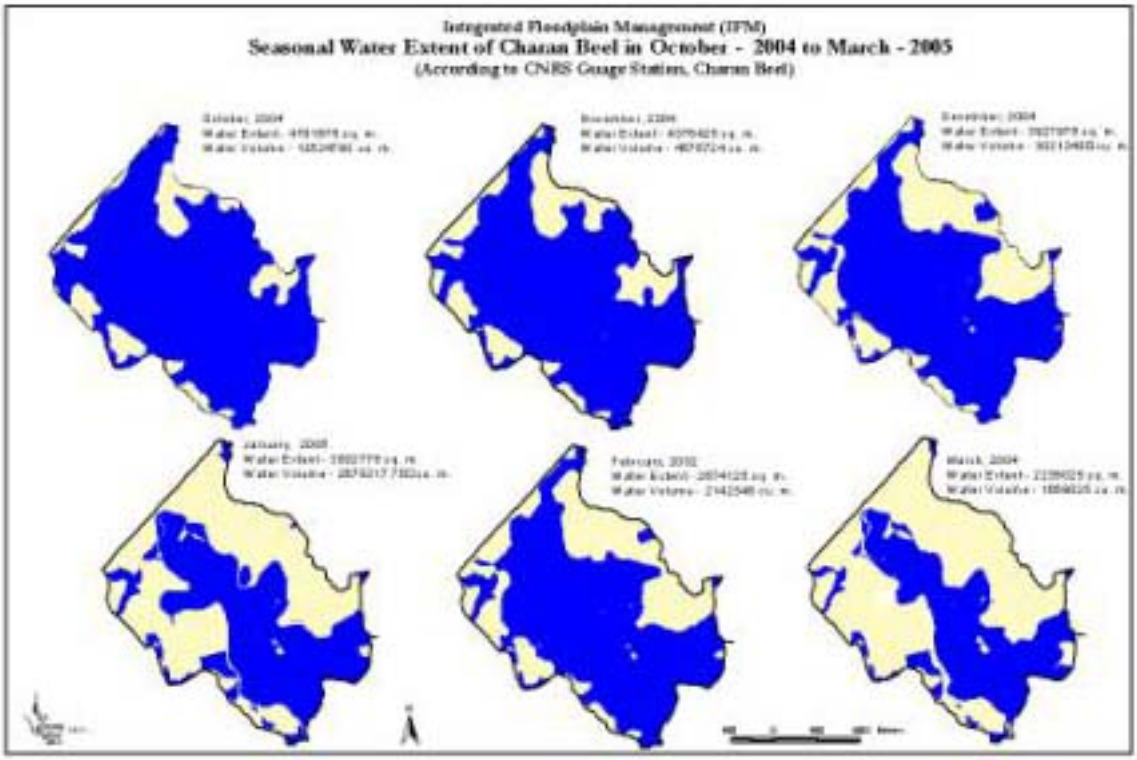


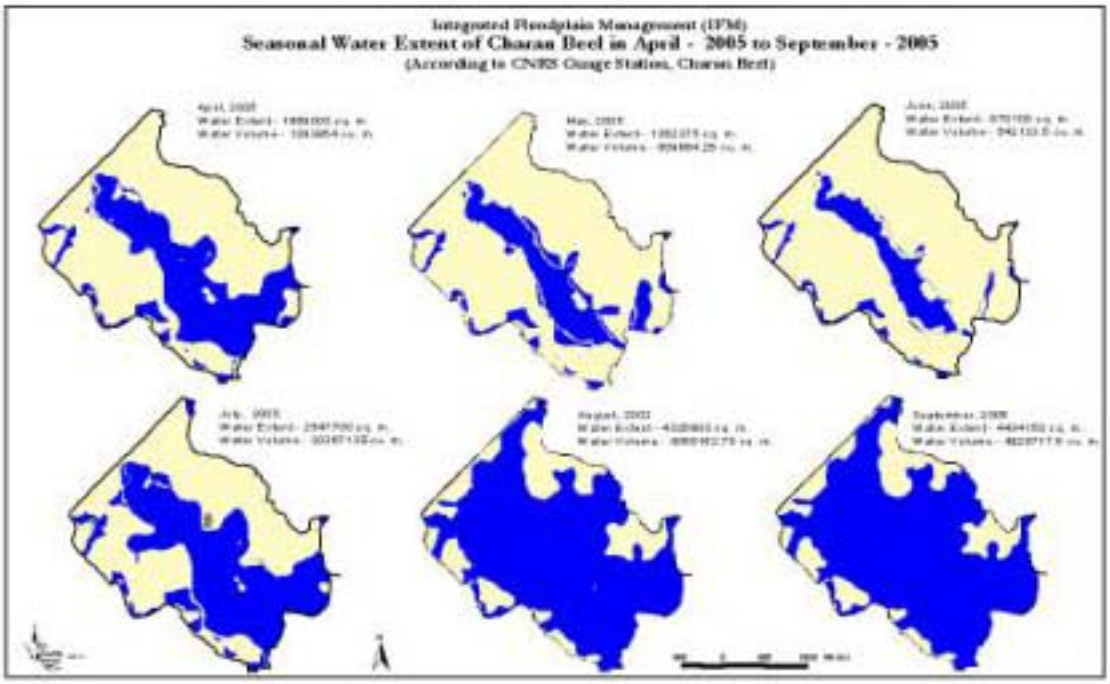
The goal of CBFM-2 is to improve the livelihoods of poor people dependent on inland aquatic resources by developing, testing and assessing arrangements for user based fisheries management across the diversity of inland fisheries in Bangladesh. For successful implementation of user based fisheries management 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.

1.2 Physical Characteristics

Charan Beel floodplain complex administratively is in Kalihati upazila, Tangail district and geographically is northwest of Dhaka near the Jamuna River. The complex covers six mouzas (lowest revenue boundary of Bangladesh) in two unions. In the wet season the extent of the beel is around 4.78 km^2, reducing to less that 1km^2 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





1.3 Socio-Economic Characteristics

In the Charan Beel area, the population is roughly evenly split by gender (Table 1.1) and average family size is 4.4 members. Literacy data for the area suggests that 70% of all households have at least one literate member, which is surprising considering the extent of poverty in the area.

Table 1.1 Literacy (by household)

Literate (HHs)		Illiterate (HHs)		Male		Female		Average Family Size
No.	%	No.	%	No.	%	No.	%	
1086	69.3	480	100	3486	50.4	3420	49.6	4.4

The landless classes make up approximately 70% of the population (Table 1.2), with 50% of the population being Landless-I (those with no cultivatable land). Thus, it can be presumed that for many of the landless, fishing and labouring are the only means by which they sustain their livelihoods.

Table 1.2 Landholding

Landless-I		Landless-II		Marginal		S / M / L	
No.	%	No.	%	No.	%	No.	%
817	52.2	291	18.6	209	13.3	249	15.9

Note: For the purposes of this study, Government of Bangladesh DAE landholding classifications are used, such that Landless-I are defined as those with no cultivatable land, Landless-II are defined as those with less that 50 decimals (0.2 acres) of cultivatable land, marginal are those with between 50 and 150 decimals of land (0.2 – 0.6 acres), small farmers have 150 to 250 decimals (0.6 – 1 acre), medium 250 – 350 (1 – 1.4 acres), and large, over 350 decimals (1.5 acres +) of land

In terms of occupation, labouring is the predominant occupation, accounting (in its various forms) for 30% of primary occupations, whilst farming makes up 22%. Sharecropping is practiced by a further 10% of households, as is fishing (Table 1.3).

Table 1.3 Main Occupation of households.

Occupation	No	%
Farmer	346	22.1
Fisher	158	10.1
Business	116	7.4
Service	162	10.3
Skilled Labour	195	12.5
Unskilled Labour	150	9.6
Share-Cropper	170	10.9
Agri Day Labour	70	4.5
Non-Agri Day Labour	17	1.1
Agri Small Industry	26	1.7
Other / Unemployed	156	10

In light of the above data of landholdings, it is surprising that fishing makes up only 10% of primary occupations, although the predominance of labouring as an occupation is in keeping with the large number of Landless-I. Data on fishing, however, completes the picture. Although fishing accounts for a relatively small percentage of primary occupations, over 55% of households fish part-time or for subsistence (Table 1.4). This would suggest that fishing in the area is a largely seasonal activity, when labouring opportunities are scarce.

Table 1.4 Fishing involvement by households

Fulltime		Part time		Subsistence		Do not fish	
No.	%	No.	%	No.	%	No.	%
186	11.9	117	7.5	765	48.9	498	31.8

1.4 Recent Trends in Livelihoods

The agriculture pattern in Charan, before the start of the project, is known due to extensive data collection during LWI project R6756, and further processing of the data in R7868. The information is slightly dated, since R6756 collected information in 1997-98 (Table 1.5). However, no major changes have taken place in the site's agriculture over the years, and the existing information is very much usable for this project. Plot level information is available on land heights, cropping patterns, soil classification, water cover, and irrigation status. Fisheries data collected under the CBFM project are available since 1999 including monthly estimates of catch by species and effort by gear.

Table 1.5 Cropping pattern information from 1997-98

Cropping Pattern	Broadcast Aman Fallow boro	Broadcast Aman Mustard boro	Fallow Broadcast Aman boro	Fallow Fallow boro	Fallow Mustard boro	Mixed Mustard boro	Transplant Aman Fallow boro	Transplant Aman Mustard boro
Total	2.95%	13.92%	2.11%	27.85%	45.99%	0.42%	0.84%	0.84%

Source: R6756

As can be seen, in the Rabi season, boro rice is almost exclusively cultivated in all lands. There is very little diversification out of rice in the winter. In plots where floods recede early enough, mustard precedes the boro. The sale of the mustard crop enables purchase of inputs for the expensive boro crop.

Even in the medium and medium high lands, where profitable and water-saving alternative crops can be grown, boro is currently being grown and boro cultivation extends into the very margins of the beels, and into the beel itself.

The farmers can be described as reluctant to grow anything other than boro in the winter. Partly this is because low land is ideally suited for boro, because rice is their subsistence crop, and returns from rice are good, and most importantly, stable. But also this is because of their competence in rice production and lack of expertise and confidence in growing alternatives.

There are 91 functioning tube-wells drawing underground water for irrigation in the area. However, there are also 7 high capacity low-lift pumps situated on the margins of the beels. Farmers use the low-lift pumps for two purposes: first, by drawing water from the beel, they dry up some beel land for planting local boro. Second, water is extracted directly from the beel for irrigating the surrounding rice plots. Some of the water abstracted from the LLPs even irrigates higher elevation plots some distance away.

Sluice gate management to maximise the recruitment of whitefish into the site area or to retain more water during the dry season is not a relevant option in the Charan site, simply because the sluice gate is damaged and non-functional.

Water abstraction from the beel is significant, and potentially quite damaging to the fishery. Thus the retirement of parcels of land on the beel and beel margins currently drained and/or irrigated by the LLPs is a viable option that will be explored. Options for closed seasons and areas (sanctuaries) to control the timing and level of fishing mortality are relevant and will also be explored.

With boro being grown on all lands, irrespective of height and suitability, Rabi diversification is also very viable. However, with farmers being reluctant to diversify immediately, a programme of farmer-led demonstration likely best pursued this option.

1.5 Stakeholders and Institutions

Various government agencies and non-government organisations (NGOs) and CBOs are involved in IFM related activities and thus all could be the target institutions (TIs) for the project. However, for better participation and achievement of project purpose, we would consider limited numbers of target institutions both from government and non-government sector including the CBOs. In selecting the TIs we would consider the key government agencies that have resources/projects to implement the IFM options as well as can play a key role in the use and promotion of improved IFM.

Based on the contacts made, we considered the DOF (Department of Fisheries), LGED (Local Government Engineering Department), BARC (Bangladesh Agricultural Research Council), DAE (Department of Agriculture Extension), DoE (Department of Environment), WARPO (Water Resource Planning Organisation), Department of Youth, BWDB (Bangladesh Water Development Board) to be the key target institutions for the project from the government sector.

Among the NGOs, ITDG, Caritas, Banchte Shekha, Nobolok Parishad in Khulna region (south-west, involved in DOF projects), are the potential TIs of the project.

Chapter 2: Piloting Methodology

M. Mokhlesur Rahman and M. Anisul Islam

The project carried on various activities in parallel to achieve the purpose of developing the methodology for implementation of improved IFM options along with the participating communities and promoting the IFM strategy with various relevant audiences including the policy stakeholders, practitioners, and users. The activities under three different outputs complement and supplement each other, and the project team members worked in an interdisciplinary fashion.

2.1 Crop Diversification

The cropping pattern management part of integrated floodplain management activities was carried out with farmers and, from time to time, exchange of ideas with fishers. The plan for cropping pattern management is given in Table 2.1.

Table 2.1 Cropping pattern management plan

Activity	Objective	Implementation	Expected Outcomes
1. Sensitization, October 2003	Mainly to create awareness and consensus among the community and secondary stakeholders on the importance and need for cropping pattern management as part of IFM	Focus group discussion, awareness meetings, individual contacts.	Farmers will become aware of the need and participate in crop diversification activities.
2. Field trials, *rabi* season 2003-2004	To build farmers confidence on possibility of profitable cultivation alternative *Rabi* crops in Charan Beel floodplain	A few selected farmers established trial plots of several alternative *rabi* crops.	Farmers confidence of cultivation of alternative *rabi* crop will be developed and they will participate in cultivating some of the crops based on performance and individual interest
3. Motivational Visits, *rabi* season 2003-2004	To allow farmers to gain knowledge on intercultural operations and cost-benefit of some crops through direct interaction with practicing farmers in different areas of the country	Charan Farmers visited wheat, maize, garlic and potato growing areas and directly interacted with the growers.	The interested farmers will gain further detail knowledge on intercultural operations and cost benefit of the selected crops
4. Elaborate Planning through PAPD	To develop consensus among the farmers for an organized effort by the farmers and develop an informed and inclusive action plan.	A tailor made PAPD will be conducted.	Process organized effort and an action plan has been developed by the participant farmers.
5. Forming community organization	To ensure an organized effort by the farmers for practicing and popularization of sustainable change in cropping pattern and gaining assistance from NGOs and Government organizations.	An IFM committee was formed with representatives from the participating villages	Cropping pattern management activities and gaining assistance in an organized form
6. Block demonstration of	Diversify cropping pattern of Charan Beel floodplain by	84 farmers will established	Irrigation requirement for dry season farming will

Activity	Objective	Implementation	Expected Outcomes
selected crops	alternative *rabi* crops and popularizing the idea in the area	demonstrations of wheat, maize, potato and garlic in 3 blocks on 43 acres of land in Charan Beel	be reduced, more farmers will be involved by seeing the results
7. Promotional Initiatives, throughout the project period	National level: Will be aware of the need for IFM approach and its options and will be adopted in the wetland and floodplain management policy, projects etc. District level: Will be aware of the need for IFM approach and activities and will be included and implemented through projects and activities. Local levels: will be aware of the need for IFM activities and agreed activities will be implemented properly.	Workshops, presentations, discussion meetings, motivational visits	Policy reflections, appropriate activities planned and implemented, communities are getting appropriate support.

2.2 Fisheries Management

The fisheries management aspect of the project in Charan Beel was carried out under the management of the Charan Beel Management Committee (BMC) formed under the CBFM 2 project. This part was not directly handled by this project, and as such, the plan of activities presented here is that made by the BMC, in cooperation with the project. Table 2.2 is the plan for the years 2003-2005.

Table 2.2 Fisheries management plan.

Activity and time	Objective	Implementation	Expected out come
1. Establish permanent sanctuary	Protect mother fish during dry season for sustainable production and biodiversity	The BMC, NGO and project by purchasing land	Mother fish will get permanent shelter during critical dry season, thus a sustained fisheries production and biodiversity will be conserved
2. Excavate the permanent sanctuary	Increase the volume of water in it during dry season	NGO and BMC	More water will ensure more fish in the sanctuary
3. Observe fishing ban period during *Jaishtha* to *Sraban*	Allow fry and fingerlings to grow and reduce effort	BMC and NGO will oversee	Produced fry and fingerlings will get the chance to grow bigger and fishing intensity will be reduced
4. Restrict use of harmful gears	To decrease fishing intensity	BMC and NGO will oversee	Restriction of harmful gears will allow fish to survive.
5. Reintroduction of locally lost fish species	To help reviving of locally lost fish specie, increase biodiversity and thus production	NGO and BMC	Fisheries biodiversity and production from the beel will be increased

Activity and time	Objective	Implementation	Expected out come
6. Collect toll regularly	To collect Government revenue and reduce fishing intensity	BMC	The beel will under the BMC and fisheries conservation

2.3 Means of Communication

During the whole process to introduce and familiarize the concept and activities of IFM, many materials were to be developed, used, and distributed among the different target groups. These were to include: policy briefs, fact sheets, posters, resource pack, training session guide, related reading materials, workshops, workshop proceedings, PowerPoint presentations, video clips, TV spots (for ATN and BTV), diary, year planner, etc.

Chapter 3: Participatory Action Plan Development (PAPD)

M. Anisul Islam and Abu Suman

The purpose of conducting the PAPD in the IFM site was to build consensus among the farming communities in favour of IFM and develop an action plan for community participation in IFM, mainly to introduce *rabi* crop diversification in Charan *Beel* floodplain.

The report covers the brief methods and outcomes PAPD (consensus building) among the relevant stakeholders of Charan *Beel* area, Kalihati upazila under Tangail district.

A total of 49 participants were selected from 3 villages around Charan *Beel* area namely Agcharan, Pachcharan and Badda. Four different stakeholders' groups relevant to farming activities were formed on the basis of occupation and sex: women, farmers, sharecroppers, and irrigation pump owners/operators.

3.1 The Method

The social and occupational groups of the farming-stakeholders were identified. Each group identified problems and issues related to their occupation, prioritized, analyzed the cause and effects in the problem census part and prepared an action plan in the planning part of the workshop.

The problem census was the first step where each group identified the problems they encountered in isolation so that more powerful groups did not have any influence over other groups in identifying their own problems. Then all the problems were listed, prioritized, ranked and filtered to fit into the project objectives and scopes along with the participants. The participants also performed cause and effect analysis of each of the problems and worked out possible solutions for the most important problems.

Major Activities of PAPD

A. Sharing experience from exposure visit
B. Identification of problems
   - Selection of five major problems
   - Problem prioritization
   - Cause and effect analysis
   - Identification of solutions
C. Planning workshop
   - Group discussion
   - Cropping map
   - Video presentation
   - Cost benefit analysis of crops
   - CBO issues
   - Action plans development.

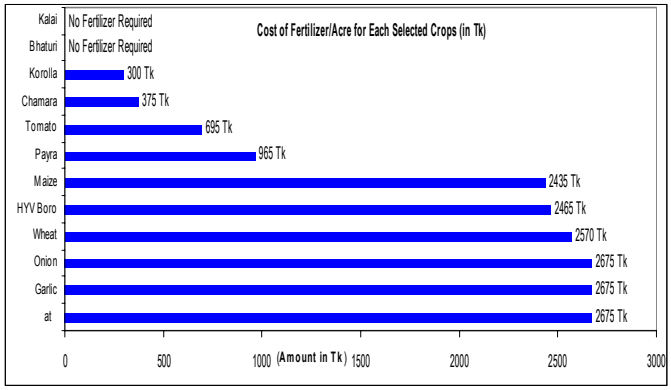
Participants introducing themselves through cobweb method/game.

3.2 Findings of PAPD

The PAPD findings along with an action plan were drafted for institutional arrangements of the IFM group and the next season of winter cropping (2004 - 2005). In addition, some other findings are presented in graphical/tabular form in the following sections.

Cost Benefit Analysis for Selected *Rabi* Crops and Sharecropping

1. Sharing production between sharecroppers and other stakeholder groups (landowner, irrigation machine owner) is irrational. First sharing after crop cutting of *boro* rice the irrigation machine owner takes one quarter (25%) of the crop, after threshing half of the rest of the product (37.5%) will go to the landowner, the net gain for a sharecropper is only 37.5% of the production.



2. Wheat has a linear sharing practice between landowner and sharecropper. After harvesting, they equally divide the bulk production between them. As wheat has less irrigation requirement, sharecroppers could have a good net gain from wheat cultivation, approximately Tk 5,660 per ha (Tk 2,290 per acre) after sharing with the landowner.

3. Rate of fertilizer application depends on the type of crops. Some crops do not require any additional supply of fertilizer other than natural sources from the soil like Kalai, Bhaturi etc. Some crops in the selected list have high fertilizer requirements, for example, HYV *boro*.

4. One of the main heads of costs for cultivating any crop lies in irrigation. Some crops are predominantly water hungry, e.g. HYV *boro*. Each acre of HYV *boro* costs about Tk 4,375 to grow which is exactly 1/4th of total product price. Other crops like, kalai, tomato, onion, garlic, maize and wheat have very little irrigation requirement, and some other crops e.g. korolla, payra, chamara (deep water *aman*), and vaturi never require any irrigation in normal conditions.

During PAPD the involved stakeholders identified a number of different problems they are facing. The problems can be split into two main categories, those problems relating to environmental degradation, and those relating to capital and a lack thereof. Capital problems are mainly in relation to a lack of availability of inputs (quality seed, fertilizer, pesticides) whilst environmental issues range from pollution to increases in pest numbers.

Table 3.1 List of Problems Identified by Different Stakeholders

1 Labour wage increased
2 Soil quality is not feasible for vegetable cultivation
3 Increased disturbance by rat
4 Lack of capital
5 Crop damage by cattle
6 Increased disturbance by insect/pest
7 Irrigation problem
8 Early/late rainfall
9 Lack of knowledge in fertilizer application
10 Increased number of crabs
11 Ploughing by power tiller
12 Cultivating chamara (early flooding)
13 Scarcity of quality seed
14 Don't get seed in time
15 Water stagnation and drainage problem
16 Increased price of fertilizer
17 Access weed in HYV *BORO*
18 pest problem in vegetables and fruits
19 Scarcity of Ploughing cattle and tractors
20 Cultivating HYV *BORO* rice
21 Less cropping diversity
22 Mono cropping
23 Scarcity of pesticide/insecticide/herbicide
24 Less interest for *Rabi* cropping
25 Farmers don't get actual price for their crops
26 Polluted *Beel* water
27 Lack of cattle's
28 Lack of agricultural tools
29 Lack of assistance from government officials
30 Poultry disease and endemic
31 Scarcity of vegetable seed
32 lack of natural fish food
33 Deceased fish production
34 Goat dies by eye blind disease
35 High price for irrigation machine fuel
36 Less production of vegetables
37 Less profit from agriculture
38 Handicap husband
39 Pest in fruits
40 Scarcity of organic manure for paddy cultivation
41 Embankment problem
42 Access weed in cultivation
43 Electricity problem
44 katcha Irrigation drains
45 woman's problem for homestead working
46 no machine for rice husking
47 Agricultural loans are not available
48 Draughts

Table 3.2 illustrates the causes, effects, solutions, and considerations, relating to various problems, as suggested by the community during PAPD. One of the main outcomes of this was the identification of *boro* rice cultivation as something that must be cut back, with alternative *rabi* crops identified as a possible alternative. In addition, the need for training was identified to ensure the success of interventions. The other key outcome was the identification of structural works, re *beel* re-excavation, to improve and regenerate floodplain ecosystems.

Table 3.2 Causes, Effects and Solutions Analysis of Respective Problems

Problem	Cause	Effect	Solution	Considerations
- Decreased land fertility	Access use of fertilizer and pesticide Lowering water table and calcium content of soil by the use of STW Mono cropping of *boro* Increased disturbance by pests due to intensive HYV *boro* cultivation Silts cannot settle on the cultivable land due to the development of transport system around the *Beel* (new road construction and Jamuna dam interfere flood water intake into the *Beel*) Government introduced unplanned HYV *boro* and different type of chemical fertilizers	Decreased production level for crops and different type of fruits Water Pollution due to access application of fertilizer which causes human diseases viz. gastric, dysentery and skin diseases Access use of fertilizer causes increased diseases for fish Poor economic condition due to increasing production cost of agriculture -- Loan burden for sharecroppers	Ensure the use of organic manure for cultivation Diversified cropping other than mono cropping of HYV *boro* Re-excavating River Sapai to regenerate natural drainage for the *Beel*	Training to the farmers on making organic manure Encourage farmers to use organic manure Ensure motivation of the farmers towards benefit of diversified cropping Create competitiveness among the farmers and arrangements for performance award Ensure primary level assistance for the farmers Construction of sluice gate and re-excavation the rivers
Lack of unity	Individual interest, grouping, and leadership conflict Social class problem Poverty and lack of sympathy among each other	Economic loss Reducing resources due to the division of family wealth Difficulties for large scale social development works Grouping conflict Implementation of plans are difficult Difficult to practice diversified cropping Crop damage by cattle Hard to practice modern agricultural applications	Arrangements for night shift primary education Raise unity by the formation cooperative societies	Arrangements for books, pen & paper, teacher, sitting place and light Frequent discussion and exchange of views with local peoples Assistance from local knowledgeable persons, elites, chairman, members, village government and thana education officer Required help and financial assistance from Government – NGO (BRAC) organizations
Increased disturbance by rats and insects	Decreased number of cats, birds, snakes & mongoose Emergence of new	Decreasing level of production for all crops Increasing	Government assistance for pest control (spraying pesticide)	Officially inform local agricultural office for pest control Cultivation of crops

Problem	Cause	Effect	Solution	Considerations
	cropping insects due to HYV *boro* cultivation (before there was only patra poka in deep water *aman*) Water stagnation in Beels Climatic change (negative) Favourable pest environment due to access irrigation and blocking sunlight to the ground in HYV *boro* cultivation	production cost due to the excessive use of pesticides Spread of diseases (specially skin disease) among the farmers and labourers working in the *Beel* due to excessive use of pesticides Decreasing land fertility	Discourage HYV *BORO* cultivation Remove *Beel* water stagnation	having less irrigation requirement
Increased price of fertilizer	Increasing price and less supply irrespective of demand for fertilizer Only a few fertilizer industry in the country Dealers/Agents store fertilizer out of market and create artificial crisis to raise the price Increased scope of fertilizer application viz. fruits cultivation and fishponds Requires political connection to get fertilizer dealership	Difficult to manage timely application and required amount of fertilizer in crops thus reducing production Loan burden on the farmers due to high interest rate of agricultural loans Depressed family life due to poverty	Innovation of alternative for chemical fertilizers Government have to take action to reduce the price of fertilizer	Government will take initiative to innovate alternatives Incentive to the fertilizer industries to increase production Formally apply to reduce fertilizer price through discussion between farmers cooperative and government officials
Mono Cropping	Introduction of HYV *boro* Disturbance of cattle is much more higher for any crop other than HYV *boro* Land owner gives condition for HYV *boro* cultivation while sharecropping Machine owners are not interested to provide irrigation requirements for any crops other than HYV *boro* because they get one fourth (1/4) of total production for HYV *boro* Mentality to get high production from land due to increase in population Irrigation problem for other crops Land fertility is decreased due to HYV *boro* cultivation (now land requires access irrigation, fertilizer and	Cultivable land remains fellow due to mono cropping of HYV *boro* Less income from the land Decreasing land fertility	Stop cultivation of HYV *boro* Stop withdrawing water from underground by machine (STW) Encourage farmer towards diversified cropping	Farmers need to know about the benefits of diversified cropping Create competitiveness among the farmers and arrangements for performance award Unity among sharecroppers Sharecroppers have to stop irrigating through STW Machine owners needs to know about the negative impacts of withdrawing underground water Encourage machine owners to irrigate diversified cropping because it has less irrigation requirement than HYV *boro* Show the benefits of diversified cropping to the farmers along with HYV *boro* Encourage farmers towards diversified cropping through

Problem	Cause	Effect		Considerations
	pesticide) Late water discharge from the *Beel* due to the construction of unplanned embankment and sluice gate			demonstration Inform local farmers about the production of demonstration crops Formulate farmers committee as they can discuss with other farmers about the benefits of diversified cropping practice
Less fish production	Silted rivers and canals Catching fish fry and brood fish Population increase Disturbed connectivity between river and Beels River dam Fish catch by current Jal and khoia jal	Scarcity of fish for consumption Income level decreased Increased poverty Unable to take nutritional food Increased fish price Night-blind disease	Re-excavation of rivers and canals Demolition of big embankments and sluice gates Impose ban on current Jal and Khoia jal Stop catching brood fish Fish sanctuary Stop fishing during Baishakh to Ashar creating alternative source of income for the fishermen	Assistance from Fishery Officer, chairman, Members, Village Government, Fishers and Thana Committee formation Arrangements for security guards
Scarcity of quality seed	Don't know the seed preservation process Government don't supply seed to the farmers Production level is not satisfactory Block Supervisors are not taking care of crops regularly by technical assistance Mixture in seeds during paddy harvesting Timely seed collection is disturbed due to early or late rain Seeds from local markets don't maintain quality Don't know the source for quality seed Cheating by the seed dealers (they sell old seeds as new) Agriculture and BRAC office is far away from the village	Less production causing economic pressure Less income relative to cost Too hard to preserve seeds for the next year High price of seed due to less market supply Weaker plans due to bad quality seed causing less production Scarcity of vegetable seed causing insufficiency of green vegetables Increased damage by pest Labour became worthless and sometimes land became fellow due to bad quality seed	Government have to provide seeds officially Training on better production and making good quality seed Information on the source of good quality seed	Govt. and NGO should come forth together to help seed problem Local people should go to the block supervisor for assistance Officially inform the related govt. department Communicate with local leaders Assistance from BADC, DAE, and Dealers Preserve good quality seed for the next year
Lack of agricultural knowledge	Lack of education Lack of interest and awareness More interest on traditional practice Absence of grassroots	Defective method of cropping causing less production Hard to preserve quality seed	Govt. and NGO arrangements to provide relevant agricultural books and information through Block Supervisor	Communicate with agriculture officials and local leaders Officially inform agriculture officials and local leaders

Problem	Cause	Effect	Solution	Considerations
	level training officially by the govt. Agricultural books and cropping manuals are not available in local markets Less interest on modern agricultural techniques	Less income No such extensive change in agricultural	Arrange training for local farmers through agriculture officer, block supervisor, and NGO's Arrangements for exchange/motivational visit	
No embankment	Initiatives are not taken to construct embankments	HYV *boro* goes under water Rotting *Aman* by water stagnation Timely transplantation of HYV *boro* is interrupted Early entrance of water into the *beel* destroys crops/paddy before harvesting	Need to raise east and west side of the *Beel* Need to re-excavate entry/exit points of water into the *Beel* Need to construct sluice gate at Balla-Nagar area	Discussion with Water Development Board and Local land owners
Poultry disease and endemic	Lack of knowledge about poultry disease and endemic *Beel* water gets warm due to low depth No adequate space to raise poultry Lack of knowledge for taking care Difficult to provide necessary amount of poultry fodder Veterinary clinic is far away	Decreasing family income Increasing dependency on husbands income Malnutrition	Establishing nearby veterinary clinic Official arrangements for quarterly vaccination Trainings on poultry	Assistance from veterinary doctor Ensure regular visit of veterinary doctors to every village
Lack of capital	Farmers don't get reasonable price for their crops during harvesting No other activities other that agriculture Land owners takes half of the harvested crops without giving proportional production cost Sharecroppers don't get bank loan High interest loans from money lender High price of paddy during crisis moment Lack of interest for savings Crop destruction by natural disasters Due to poor communication system	Loan burden due to high interest loans for cultivation Difficult to apply fertilizers at due times causing less production Physical and mental pressure Child education is disturbed Agricultural practice is disturbed Poverty Social crime increase	Requires arrangement for diversified cropping other than HYV *boro* dependent agriculture Arrangements for low interest loans Every earning members of the family should try to work Seek alternate earning sources Collection of quality seed Official arrangements to buy agricultural products by the Govt. Supply of quality seed by Govt. and NGO initiative Trainings on seed	Encourage farmers for diversified cropping providing every assistance for cultivation Agricultural Department and NGO's have to ensure assistance to the farmers Organize local farmers Creation of farmers cooperative Group loans through cooperative Assistance from NGO, Agriculture Bank, and Agriculture Division Arrangements for monthly installments for loans Good relationship between family members and understanding about

Problem	Cause	Effect	Solution	Considerations
	No arrangements for storing agricultural products (e.g. cold storage) Income is less than cost Excess price for fertilizer, labour, and irrigation Machine owners take 1/4th of total production for irrigation		storing and profitable cultivation	family expenditure Alternate earning sources Create working environment in the locality Formation of cooperative Provision of easy term loan by Govt. and NGO Assistance from Upazila Agriculture Officer, chairman, and member Officially inform local MP and Government officials about local problems
Scarcity of pesticide	Inadequate supply of pesticides in the market High price of pesticides No arrangements for distribution of pesticides by Govt. initiative A small amount of local production of pesticides	Disturbance of insects in paddy, sweet gourd, potato etc. Less production due to the disturbance by pest Difficult to store quality seed Economic loss	Ensure distribution of pesticides by Govt. and NGO initiative Keep price of pesticides in the farmers buying capacity Arrangements for selling in open market rather in dealership	Officially inform Agriculture Department Communicate with NGO's Ensure local production of pesticides Take action for the creation of artificial crisis by the dealers
Lack of natural food for fish	Low depth of water due to the siltation Access fertilizer application in agricultural land Cleaning up water hyacinth and aquatic plants	Not so good test of fish Less production due to the small size of fish High price of fish Some local species are lost	Re-excavation of *Beel* Protection of aquatic plants creating environment for regeneration Arrangements to keep water in the *Beel* all round the year	Assistance from Fisheries Department, chairman, member, village government
Excess weed	- Cultivation of land	Less production More labour required for de-weeding	Spraying herbicide Using more labour	Assistance from Agriculture Office, Block Supervisor and dealers
Irrigation drains are kacha	Economic inability Bad soil condition to construct kancha irrigation drains	Increasing cost for machine oil Less crop production in the drain side lands Misuse of water	Construction of concrete drains by govt. assistance	Discuss with UNO Communicate with machine owners and land owners
Electricity	Less supply capacity Limited connections Natural disaster, specially thunderstorm	Insufficient water supply for irrigation Less production of paddy	Increasing capacity Efficient maintenance Create available electric connection	Assistance from Balla and Tangail Rural Electrification Office Awareness building of local population by Rural Electrification Office

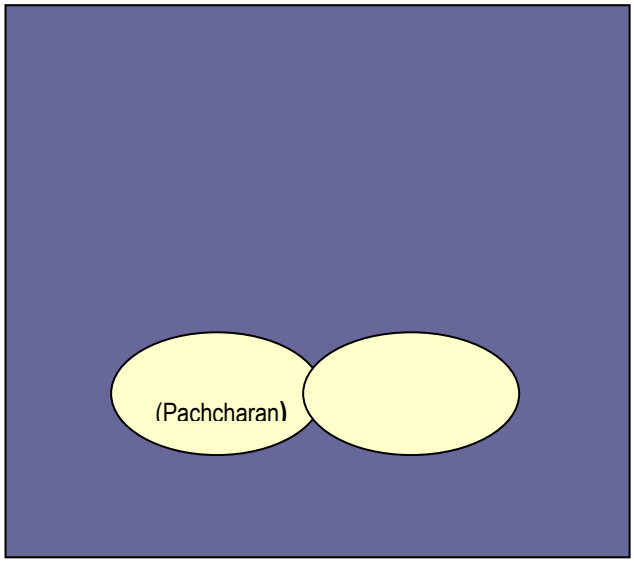
3.3 Formulating the Action Plan

At the end of the PAPD workshops, the participants developed an action plan for practicing cropping pattern management options in the Charan *Beel* basin. All participants reached a consensus to form a farmers' organization and develop a plan for practicing alternative rabi crop diversification options in the next *rabi* season, October 2004 to April 2005.

Formation of Farmers' Organizations

The participants in the consensus building workshops (PAPD) opined, "it is hard to work alone but easy to work together". Through this saying, they felt the need for farmers' unity through forming their organizations at local (village) level. They expressed that through a farmers association it would be easier to have access to various services and benefits from various organizations and groups including relevant government agencies.

The structure of farmers organizations, as suggested, should be two tiers. The first tier village level farmers' organization should be formed taking representatives from different floodplain farming communities (owner farmers, sharecroppers and irrigation pump owners). Then at the second tier, an inter-village level committee would be formed taking representatives from all village level organizations (Figure 3.1).



Regarding selection of members of the farmers' organization, it was agreed that large village level meetings would be conducted separately in each of the four villages. All the households will be invited to attend that meeting and an agreed selection procedure would be followed to select their general committee members as well as executive committee members of the farmers' organization. The participating groups emphasized the importance of the presence of UP Chairmen and members in the general meetings. It was raised by the participants that the number of representatives from each social group (owner-farmers, sharecroppers, and irrigation pump owners, women), should be proportionate by villages. If there were fewer representatives found in any group, then more sharecroppers would be included to fill the quota.

All the participating groups recognized the necessity of advisors for their organization and suggested that at least 3 advisors should be selected from within the local respectable persons. However, the participating groups decided to hold elaborate discussions later regarding the matter at the village level.

Inter-village Level Committee: This committee will be formed through discussions among the village committees taking 15 members from each of the four village committees. Therefore, the Inter-village committee would comprise 60 members taking 15 from each of the VCs in four villages viz. Agcharan, Pachcharan, Badda, and Kuturia. An executive committee (EC) of 15 members would be formed from this general body of 60 members. All the participating groups agreed that the EC of inter-village committee would be formed on consensual basis among the VCs.

Alternative *Rabi* Crop Diversification plan

The participants agreed to practice alternative *rabi* crop cultivation in the Charan *Beel* basin from the next *rabi* season viz. from October 2004 through April 2005. The participants representing different groups viz. owner-farmers, sharecroppers, pump operators and women made their different plan of action for alternative *rabi* crop diversification in the next season. Group wise detailed action plans for *rabi* cultivation are presented in Appendices 1-4.

As per the plan of the four participating groups a total of 50.61 acres of land would be brought under *rabi* cultivation by the participants (Table 3.3). Of the total land, boro cultivation would be done in 63% of the land and 37% would be used for alternative *rabi* crops by 44 households. Five participants mentioned that they would grow only *boro* crop in the next season but may go for alternative *rabi* crops in future.

Table 3.3 Action plan of participating faming groups for alternative *rabi* diversification in Charan *Beel* during October 2004-April 2005 season

Participants	Number of farmers	planned for 2004-2005 *rabi* season (%)								Total land (dec.)
		Maize	Potato		Garlic	Onion	Tomato	Veget-ables[1]	*boro*	
1. Owner Farmers	12	115 (5)	194 (8)	197 (8)	30 (1)	25 (1)	25 (1)	94 (4)	1,850 (73)	2,530 (100)
2. Share Croppers	12 (11)[2]	5 (0)	73 (4)	202 (11)	151 (8)	7 (0)	- (0)	97 (5)	1,340 (72)	1,875 (100)
3. Pump Operators	12 (9)[2]	- (0)	103 (27)	133 (35)	55 (14)	55 (14)	- (0)	35 (9)	- (0)	381 (100)
4. Women	13	22 (7)	60 (18)	187 (56)	29 (9)	4 (1)	1 (0)	32 (10)	- (0)	335 (100)
Total	49	142 (3)	430 (9)	719 (14)	265 (5)	91 (2)	26 (1)	198 (4)	3190 (63)	5,061 (100)

1 Vegetables included 3-4 crop types i.e. sweet guard, bitter guard, eggplants, spinach, etc.
2 Out of 12 participants, 11 and 9 agreed to practice alternative *rabi* crops from sharecroppers and pump operators respectively

Analyzing the outcomes of individual group work, it was observed that 12 owner-farmers of three participating villages planned for 2.53 acres of land for rabi cultivation including *boro* rice in the next rabi season (October 2004-April 2005). Data shows that out of the total land of 2.53 acres, farmers would grow *boro* rice in 73% of their lands while they would grow 10 different alternative rabi crops in 27% of the lands (Table 3.3). Data also shows that farmers prefer wheat and potato the most covering 29% and 28% of their lands respectively while vegetables items are of less preference by them.

Among the sharecroppers, 11 out of 12 participants agreed to practice alternative rabi crops in the next season. They altogether planned for rabi cultivation in 1.87 acres of lands of which they would grow *boro* rice in about 71% land and the rest will be used for alternative rabi crops (Table 1).

The pump owners/operators would also planned to cultivate alternative rabi crops in their land in the next season. However, 4 pump operators would grow only *boro* rice the next season.

The women participants also agreed to cultivate alternative rabi crops and they made plan for alternative crops. Table 1 shows that as women planned for alternative rabi crops in 3.35 acres of lands. They showed higher preference on wheat (56% land) followed by potato (18% of land). They however, selected various vegetable crops for the next season.

Chapter 4: Institutions and Approaches

M. Mokhlesur Rahman and M. Anisul Islam

Charan Beel situated in Kalihati, Tangail is a 700 acres floodplain where 600 acre privately owned cultivable land and 100 acre khash beel area. Primary user stakeholders of this beel are farmers and fishers mainly from 5 surrounding villages of the beel. Access to fisheries during the monsoon is free. The main agricultural crop of this beel boro rice (irrigated HYV rice variety grown during dry season). The entire 600 acres of land in the beel is cultivated with boro rice, which results in further shortages of dry season water. There are 227 fishermen in the 5 surrounding villages of the beel.

4.1 The Beel Management Committee (BMC)

There is a Beel Management Committee, initially formed with 178 fishers for CBFM by CNRS, under the CBFM 2 project. Later 49 fishers joined making the general body of the BMC 227. A 21-member management committee is responsible for planning and implementation of management activities and decisions in Charan Beel. The IFM committee in Charan Beel has a direct working relationship with the Charan BMC.

In 2001 Charan Beel was handed over to the Ministry of Fisheries and Livestock, on behalf of MOFL the Upazila Fisheries Officer took the handover from the Deputy Commissioner, Tangail for 10 years. The UFO, Kalihati then handed over the management of the beel to the Charan BMC. Annual lease value of the beel presently is Tk.68,062.50.

Besides this, there is a cluster committee in the Kalihati site; the IFM committee has a relationship with this committee too. A description of the cluster setting and the Apex committee for the cluster is given below.

4.2 The Cluster Committee and Cluster Management in Kalihati Site

CNRS has been working in 15 water-bodies, which include river, floodplain beel and Jalmohals in Kalihati site. These water bodies are located in three sub watersheds that cover around 9 square kilometer areas. All the three sub watersheds are interlinked through a number of canals and rivers. Considering this, the Kalihati site has been organized as a cluster site.

A total of 3 cluster committees have been formed in the 15 water-bodies in the Kalihati project site, with their members selected by the respective BMC/RSMC. Charan cluster has been formed with the large leased in Jalmahal having above 20 acre sized Jalmahal along with six more private floodplain beels. This committee consists of 15 members, taking three people from the Charan water-body management committee and 12 people from other six beels management committees, two from each. The Kuromvi cluster has been formed with 12 members, from 4 beels run by 3 management committees. River clusters have been formed with 12 people from 4 sections of three rivers.

An Apex Committee has been formed consists of 12 members comprising the all-15 project water-bodies. One member selected by each BMC (presently registered as primary cooperative society) from their executive committees becomes the member of Apex Committee. Presently it is under process of registration of the Apex Committee as a Central Society (at the upazila level) under Cooperative Department.

The Charan IFM Committee also has a relationship with the Cluster Committee and the BMC's under the Cluster Committee. The main objective of the linkage with them is to introduce and popularize alternative rabi crops in those areas. With this objective, the CNRS Charan Site Office along with the IFM Committee organized field visits, discussion meetings and exposure visits to other areas. The crop diversification in terms of better dry season water management attracted all.

4.3 Community Organization: The IFM Committee

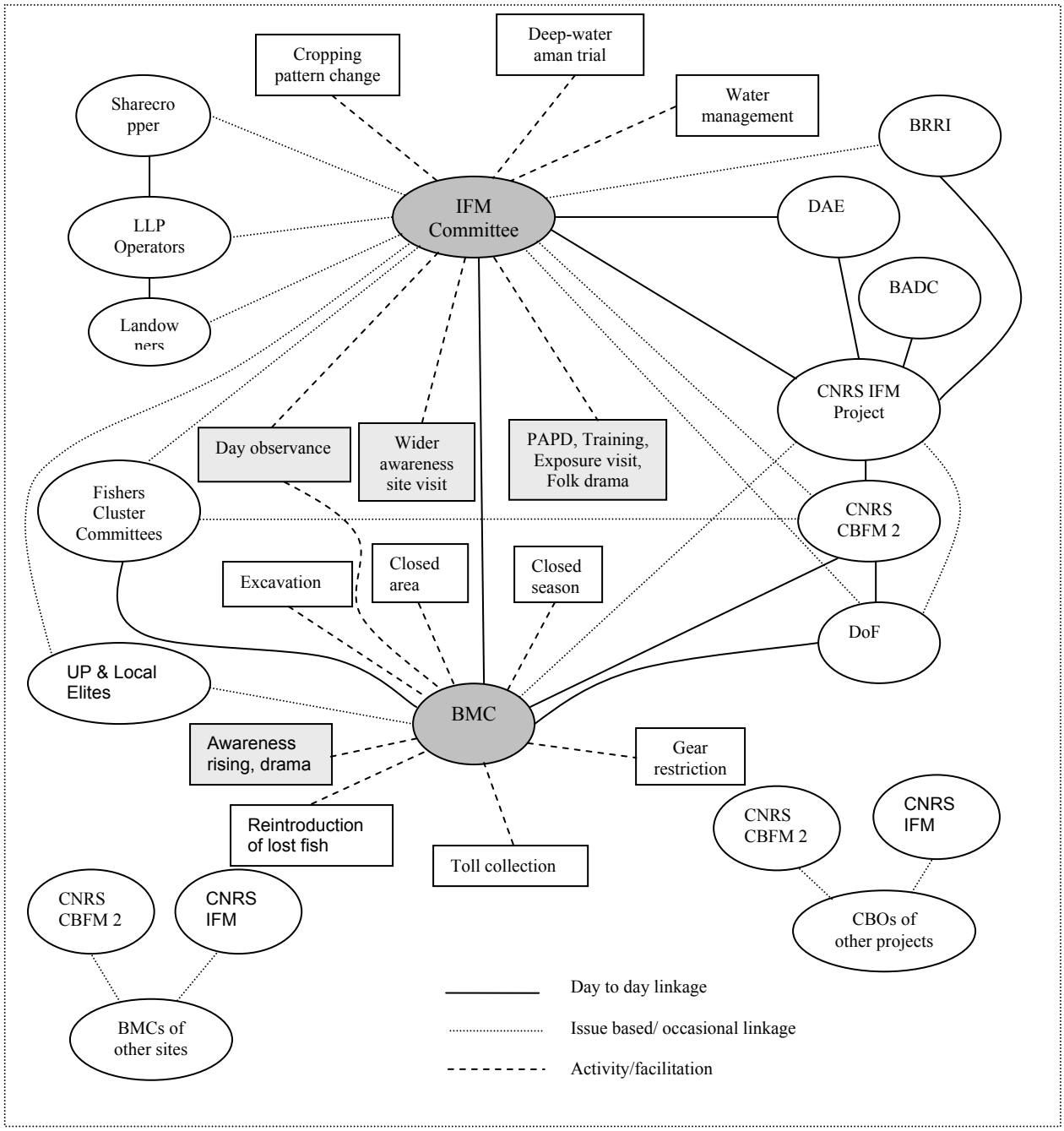
At one stage, after observing the results of the field trials and some exposure visits to some of the crop growing areas, the farmers were motivated to change their cropping pattern towards a wider community benefit. Before that, the participants in the consensus-building workshop (PAPD) opined, "it is hard to work alone but easy to work together". Through this saying, they felt the need for farmers' unity through forming their own organization at the local (village) level. They expressed that through farmers association it would be easier to gain access to services and benefits from various organizations & groups including relevant government agencies. They become interested to from a community organization for an organized effort too. They made an initial plan for forming the village organization in the PAPD workshop.

Initially they formed village committees in three villages with 9 members in each; 3 representatives from each of the village committees formed the 9-member IFM committee. Later they included one female member in their committee making it a 10-member committee. The village committee was formed with representatives nominated by the villagers and IFM committee was formed with representatives of the village committees nominated by them. This committee took the responsibility to exchange ideas with local farmers, motivate and organize them, communicate with the BMC, Cluster committee in Charan, local government facilities and other initiative on behalves of the local farmers like quality seed irrigation facilities, conflicts etc. The committee members have developed a constitution to run their committee and are in the process of obtaining registration from the concerned government authority to improve sustainability.

4.4 Other Linkages

The IFM Committee has developed a close linkage with local DAE, BRRI, BADC and DoF. The Block Supervisors of the area frequently visit IFM farmers, provides suggestions and other supports. The Upazila Agriculture Officer and the Upazila Fisheries Officer also visits them time-to-time. The committee members also go to them in need. The BRRI scientists established a deep-water Aman field testing trial in Charan to find out a suitable high yielding variety for the farmers. The BADC through CNRS supplying quality seed of alternative rabi crops which are scarce in the area. The relationship is better now than ever with all these government organizations.

Figure 4.1 Institutional Linkages of Charan IFM Committee.



Chapter 5: Cropping Pattern Management

M. Mokhlesur Rahman, Abdul Malek and Md. Matiar Rahman

5.1. Introduction

Cropping pattern management is one of the options for Integrated Floodplain Management (IFM), suggested in NRSP project R7868 for low-lying floodplain basins ("beels"). The rationale is that through diversifying cultivation out of HYV boro rice (winter rice), into alternative, low irrigation, rabi crops, it is possible to save large amounts of water required for the irrigation of HYV boro. This conserves beel water, sustaining the beel environment so that fish can survive the dry winter season, allowing them to attain maturity and preserving/regenerating the fish stocks on which many poor people's livelihoods depend.

To this end, it is essential to retain the required volume of water in the floodplain beels in the dry season so that fish and other aquatic biota can survive during the crucial dry season when both fishing and natural fish mortality are high. Cropping pattern here is particularly important as HYV boro competes with fish for water, which is scarce in the dry season. Boro rice is recognized as the most "water hungry" crop, requiring 10,000 cubic meter of water to irrigate one ha boro rice field. Other rabi crops available (maize, wheat, garlic, onion, potato, and vegetables) need less irrigation, one third or less, compared to that of Boro rice. These *Rabi* crops are very suitable alternatives to Boro rice in certain land types (F1- medium high land, F2- medium low and F3-low land) in beel basins, and could save water in beels for fish to survive and thus could ensure maximizing joint benefit of fish and crops.

The project team therefore, considered piloting of cropping pattern change as a very important and challenging activity in a situation where practice of boro farming is widespread across the country, whilst fish are considered a neglected production sub-system by all concerned, especially during the dry season "rice-farming dominated" (or farmers dominated) land use practices.

5.2. Farming practices in Charan Beel – before IFM piloting

5.2.1 Wet season

The farming pattern in Charan Beel has long been rice dominated. In the wet season, all land in beel and adjoining areas get inundated, thus aus rice (kharip-1) is practically impossible to cultivate because land is not free as boro is harvested in late April / May. Late aus is not possible due to a rapid increase in water volume in the early monsoon (June-July). However, many farmers grow only the deepwater aman rice (*Chamara*) with almost no care. They just plant aman seeds in May after harvesting boro rice. Farmers consider this an extra crop and whatever they produce, they are happy for the additional income and food. *Chamara* is grown in the low and medium high land at the edges of village settlements, to avoid damage of crops due to waves.

Most of the lands remains fallow in the wet season and thus fishing become the major activity (land use) in the wet season, when professional, part time, and subsistence fishers, all make a part of their livelihood out of fishing. Collection of various aquatic fruits and vegetables from the beel also provides some livelihood options for poor households in the area.

5.2.2 Dry season

As mentioned, rice farming is the major land use of Charan Beel basin in the dry season. Some farmers grow mustard as an early crop prior to transplanting boro. However, after harvesting mustard in January, farmers transplant boro to the same field. Thus, all land of Charan Beel in the rabi season goes under boro rice cultivation.

Recession of beel water (floodwater) in the late monsoon varies spatially as well as temporally depending on the extent of flooding and rainfall. Beel water does not recede at the same time every year and that influences farmers cropping patterns. As learned, if beel water receded in early October, then they can only grow mustard as a pre-boro crop. The mustard growing area can even go up to around 500 acres, out of a total of 600 acres of cultivable lands in the Charan beel basin. Farmers experienced that they get the opportunity to grow mustard once every four years. In addition to 600 acres of cultivable land, there is a 104 acres perennial water body in Charan Beel, which is not suitable for cultivation due to water cover. The land type of Charan Beel is presented in Table 1.

Table 5.1 Land type classification of Charan Beel

Land types	Area (%)	Remarks
High (F0)	17%	Homestead and flood free lands
Medium High (F1)	31%	Suitable for farming – Mustard followed by boro depending on water receding
Medium low (F2)	41%	Suitable for farming – Mustard followed by boro depending on water receding
Low (F3)	9%	Suitable for boro and perennial beel
Very Low (F4)	2%	Perennial part is beel not under farming

There were 8 LLPs (Low Lift pumps) set at different points of the beel to irrigate the boro fields. In addition, there are 33 STWs (Shallow Tube Wells) in operation, meeting the irrigation demands in relative higher lands that are located too far from the perennial part of the beel, thus cost ineffective to use surface water.

In most cases, large landowners do not cultivate their land, and rather shift responsibly to sharecroppers. Sharing of crop between landlords and sharecroppers was found to vary by villages even though the land is all in the Charan Beel basin. For example, in Badda village, landlords provide half of the required fertilizer and sometimes half of the required seeds to the sharecropper, but in Agcharan, landlords do not provide anything to the sharecroppers. After a share has been given to irrigation machine owner, landlords take half of the remaining crops from the sharecroppers.

In most years, sharecroppers have little or no benefit from boro cultivation. The sharecroppers are poor and are the most deprived group of the primary stakeholders in floodplain agriculture in the Charan Beel area. However, they tend to continue cultivate boro in shared-in land due to some local factors, instead of working on others land as labourers. Working on own cultivation (even it is sharecropping) carries more social respect than wage labouring.

As learned from farmers, the loss of crop varieties and take up of boro rice in Charan beel was triggered by the following factors:

- High yielding capacity of HYV boro compared to other crops
- Bad match (timing) with HYV and boro and other crops viz. wheat, mustard, etc.
- Irrigation machine operators do not want to irrigate croplands other than HYV boro due to lower irrigation requirement
- Overflowing excess irrigation water from HYV boro plots causes destruction to the other rabi crops in adjoining plots.

5.2.3 Soil types

The soil quality of the crop fields of the three villages is not similar. The soil type of Badda village is 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 village is loam that is suitable for growing any crop with minimum irrigation. Whilst the soil of Panch Charan is loamy sand that is also suitable for growing any alternative rabi crops but more organic matter needs to be added. The soil of Panch Charan is less suitable for boro cultivation because water is not retained in the soil so higher irrigation is required.

5.3. Cropping pattern changes - IFM piloting

The challenge for changing cropping patterns in Charan Beel area was great as 100% of land was covered with boro rice as the main crop and farmers were equipped with the knowledge required and skills relevant to boro farming in the rabi season. They seemed apparently happy with their rabi farming practices.

5.3.1 Rabi demonstration in year 1

In 2003-2004 rabi season (October-March) attempts were made with the farmers to field test alternative rabi crops in beel areas through a process of sensitisation, cost-benefit analysis and rationalisation. It was argued joint benefits existed, satisfying the needs of both fishers and farmers as well as improving the livelihoods of the communities from floodplain areas, especially for the poor, who under various arrangements enjoy access to floodplain resources for their livelihoods needs.

However, farmers were sceptical, and reluctant to try a new cropping system due to various reasons: uncertainty, lack of skills, preference for rice, market demand, lack of quality seeds, as well as various other social and institutional aspects, such as the relations/conditions with LLP operators relevant to sharing crops for getting water, decision of landowners and so forth.

Demonstration farmers and agreements

However, three farmers agreed to test the new crops provided that they would be compensated for losing the boro crop they would have instead cultivated, and allow the project to demonstrate alternative rabi crops in their 3 acres of lands. The project team felt it

important to set up a trial with various possible alternative rabi crops on this land to assess the performance of each crop in terms of suitability and profitability in Charan Beel site.

The terms of agreement with those three farmers were different depending on their personal views. For example, agreement between the project (CNRS team) and Mr Zamir Uddin was that the project would compensate the probable net income from boro cultivation of 110 decimals of land and the project would bear all costs associated with sowing to harvesting.

Agreement between the project and Mr Abul Kashem and Mr Tipu Khan was different where the project would provide seed, fertilizer and irrigation cost. While the farmers would bear all other costs for example labours, pesticides, etc. In case of product sharing, total product would be equally distributed between the project and landowners

Crop selection for piloting

The landowners around Charan Beel are involved in various activities in the locality as well as outside. A numbers of landowners have direct and indirect involvement in *taant* (cloth weaving), fishing and agriculture. Most of the landowners themselves do not cultivate their land by themselves preferring to let it out to sharecroppers.

Therefore, farmers who do not cultivate land themselves did not show much interest in cropping pattern changes, though some of the sharecroppers showed their interest in rabi diversification with their expectation that they may get higher benefit through cultivation of alternative rabi crops, especially cash crops.

However, at last we reached a consensus that as many alternative rabi crop possible would be demonstrated in the 3 acres of lands, to test the adaptability and performance of the of the crops. A total of 20 selected rabi crops were cultivated in these three demonstration plots (Table 5.2).

These crops were demonstrated in three demonstration plots with the target of assessing the performance of individual crops in different land types so that their spatial suitability could be assessed for future expansion. It is noted that these crops were selected in agreement with the demonstration farmers, as well as advice obtained from upazila agriculture officials, including Block Supervisors (BS). Distribution of crops in the three demonstration plots is given in Table 5.2.

Table 5.2: Distribution of rabi crops in three demonstration plots in year -1

Plot	Name	Land area (dec.)	Demonstration Crops
1	Zamir Uddin	110.00	Wheat, potato, Maize, pulses, egg plant, chilli, tomato, *data*, *motor shuti*, lal shak, water melon, sweet guard, radish, cucumber, *korolla*, ladies finger, onion, and bean
2	Tipu Khan	115.00	Wheat, Maize, *motor shuti*, *lal shak*, water melon, sweet guard, radish, cucumber, *korolla*, ladies finger, onion, and bean
3	Abul Kashem	60.00	Wheat, Maize, *data*, *motor shuti*, *lal shak*, water melon, sweet guard, radish, cucumber, *korolla*, ladies finger, onion, and bean

Performance of demonstrated crops

Not all the 20 crops demonstrated performed equally. Table 2 shows the performance of different crops. Among the demonstration crops eight crops, mainly vegetables, proved to be favourable for the Charan floodplain. These crops are ***tomato, Bitter Gourd, sweet gourd, eggplant, long yard bean, radish, lal shak, and maize***.

The other seven crops, mainly the oil seeds, spices, and pulses, performed fairly well such as ***potato, wheat, chilli, data, motoshuti, cucumber, lentil, and kalai***. The remaining three crops - ***watermelon, ladies-finger*** and ***onion*** - did not perform well enough to convince local farmers and also these three winter varieties do not have any previous recognition in this area (Table 5.3).

Table 5.3: Performance of alternative rabi crops demonstrated at Charan Beel site in year-1 (October'03-March'04)

Crops that performed best	Crops that performed fairly well	Crops that did not do well - not suitable (or further trials are required)
Tomato	Chilli	Onion
Maize	Wheat	Water melon
Sweet gourd	Potato	Bush bean
Egg plant	Datta	
Bitter gourd	Cucumber	
Radish	Lintel	
Long yard bean	Kalai	
Red Spinach	Moto shuti	

During the demonstration, farmers of Charan visited different sites of Bogra and Natok districts to see for themselves the performance of the above crops, and garlic.

5.3.2 Rabi demonstration in year-2

Based on the experience gained from demonstration of alternative rabi crops in three plots and observing their performance, the farmers selected four field rabi crops for piloting in the second year (October '04- March '05). The selected crops were wheat, maize, potato, and garlic. In addition, women folk preferred various vegetable crops for homestead gardening and field plots adjacent to their homesteads.

Arrangements with the participating farmers

The arrangements made with the participating farmers in year-2 was different from that of year-1. In year-2, the farmers were only given the seed form the project as there was a lack of good quality seeds in the locality. We collected seed from different government and private sources that supply quality seeds. The participating farmers bore all other costs related to tilling, watering, labour, pesticides, weeding, fertilizing, and harvesting for all the four rabi crops.

Wheat cultivation

A total of 42 farmers piloted wheat in their field plots at different elevations in Charan Beel basin. Of the farmers, 20 from Ag Charan village cultivated wheat in 3.15 hectares of land, 11 from Badda village cultivated wheat in 1.86 hectares of land and 11 from Pach Charan village cultivated in 1.24 hectares of land. The average area per farmer for wheat demonstration was 0.16 ha (0.40 acre).

Production performance

Although wheat is a new crop for the local farmers, the average production of wheat was encouraging compared to national and local production. Data shows that average production of wheat was 1.69 t/ha with a maximum of 3.33 t/ha to a minimum of 0.5 t/ha (Figure 5.1).

Performance of wheat varied between villages. Highest average yield of 1.9 t/ha was achieved by 18 farmers in Ag Charan village whilst the lowest average yield of wheat of 1.35 t/ha was recorded in Panch Charan village. Average yield of Badda village was 1.68 t/ha (Figure 5.1). The yield differences by villages may have various reasons: soil quality, quality of seeds sown, required irrigation and intercultural practices.
The potential yield of wheat in Bangladesh ranges from 3.5-4.5 t/ha[1] and the average yields at farmer level in last three years were 2.16 t/ha, 2.13 t/ha and 2.2 t/ha in the years 2001-2002, 2002-2003 and 2003-2004 respectively (BBS, 2004). Most of the farmers of Ag Charan achieved this yield successfully (Figure 5.1). While some farmers (6 out of 18 farmers) did not get the optimum yield.

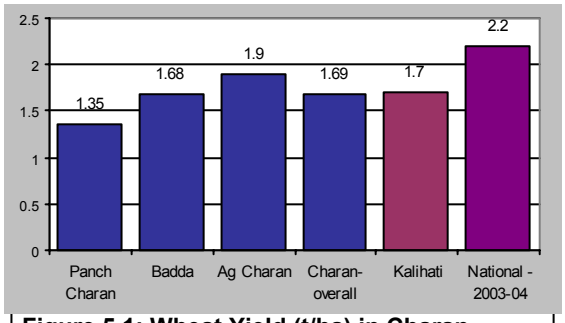


Figure 5.1: Wheat Yield (t/ha) in Charan piloting, Kalihati and national rate (2003-04)

Reasons for lower yields
The yield performance at Badda and Pach Charan village were not good compared to that of Ag Charan. It is noted that the average yield of wheat at Kalihati upazila in 2004-05 was 1.7 t/ha (Source: Upazila Agriculture Office, Kalihati). However, as recorded, major constraints that contributed to lower yield of wheat included:

- Farmers were new in wheat cultivation thus not skilled in wheat cultivation.
- Inappropriate or no use of fertilizer and irrigation.
- Careless intercultural operations such as weeding, watering, fertilizing, etc.
- Less soil moisture due to sandy type soil with high elevation, especially in Panch Charan village.
- Farmers opined that the weather in 2004-05 was not favourable for wheat, particularly the higher temperature (15-19 ^{o}C) and shorter winter, which hampered proper grain formation. Sudden rains at the time of heading stage might be a cause for the low yield of wheat.
- Soil texture in Badda village is clay type and the farmers irrigated the wheat crop like boro rice (flood irrigation) at the age of 17-21 days of seeding. As a result, soil surface became compact that may have hampered respiration of roots and affected plant growth.
- Use of fewer seeds than recommended[2]

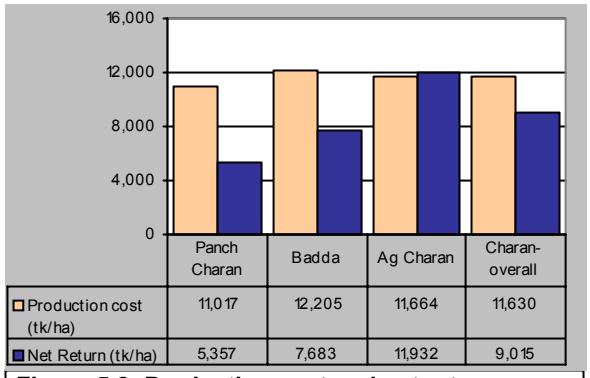


Figure 5.2: Production cost and net return (Tk/ha) from wheat in Charan piloting

[1] Source: Agricultural Technology Handbook, BARI, 3rd edition.
[2] Recommended seed rate 120 kg/ha (in furrow sowing). Farmers normally practice broadcast method of sowing and about 150 kg seed is required/ha in broadcast method. IFM farmers used recommended seed rate following broadcast method. A section of farmers used less than

- First irrigation after 30 days of seeding[3]
- Use of less of TSP, and MP

Cost and return from wheat cultivation

Analysing the cost and return data from wheat cultivation it was found that the average production cost (Tk. 11,630/ha) was higher than that of net return[5] (Tk. 9,015/ha) as shown in Figure 5.2. However, the net return varied with the production rate. As observed in case of the results of 20 farmers plots in Ag Charan village that higher production rate (1.9 t/ha) ensured higher net return (Tk. 11,932/ha) even if the production cost was similar (Tk.11,664/ha) or higher than one village (in Panch Charan production cost was Tk. 11,017/ha – lower than that of Badda village).

Net return over investment varied from a minimum of 49% in Panch Charan village to a maximum of 102% in Ag Charan village, with an average of 78% for the 42 demonstration farmers in three villages.

Farmers view about wheat cultivation

After harvesting of rabi crops, we arranged a discussion session with the farmers and discussed the overall performance of rabi crops. At the discussion, farmers who cultivated wheat expressed their views about wheat cultivation. A brief of the discussion is presented here:

- ***Wheat use as food:*** Most of the farmers harvested their wheat crop in the first fortnight of March when the rural farmers suffer from food shortage. Therefore, the farmers consumed a portion of wheat as daily food.
- ***Use as hand cash:*** Before harvesting boro rice farmers suffer seriously from lack of money. There are so many expenditures at that time; like fertilizer, fuel oil and pesticide purchasing, labour payment for rice harvesting, family expenditure, etc., that many farmers met up such kinds of necessity by selling wheat.
- ***Wheat straw as fuel and fence:*** Farmers used wheat straw as fuel and they made fence at kitchen garden or at kitchen.
- ***Benefits to the poor:*** Neighbours/relatives who are poor and suffered from food shortage, borrowed wheat from wheat growers on credit saying they could pay back after boro harvesting. Moreover, poor neighbours (mainly women) threshed the wheat and took the straw as their wage. They used this straw as fuel and for making fences.
- ***Employment opportunity:*** As farmers of Charan customarily cultivate boro rice in the rabi season, they (both men and women worker) remain unemployed till the harvesting of boro rice starts. Therefore, by cultivating wheat some employment opportunity is created in the period of wheat harvesting.[4]

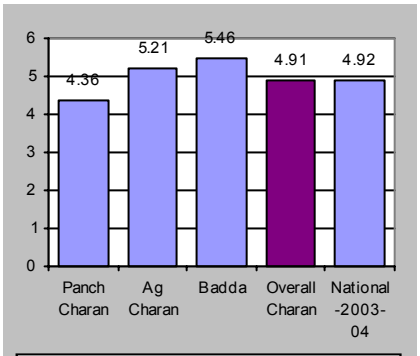


Figure 5.3: Yield of maize (t/ha)

Maize Cultivation

Although maize is a new cultivar in Bangladesh, it has rapidly spread over short period of time due to high market demand, especially from the expanding poultry sector. Currently, maize stands in third position, in terms of its importance as a crop, after rice and wheat. Our annual

recommended rate in some extent.

[3] Wheat crop needs 2-3 irrigation; 1st at three leaves stage (17-21 days of seeding), 2nd at heading stage (55-60 days of seeding) and 3rd at grain filling stage (75-80 days of seeding).

[4] Wheat harvested at the period of 1st fortnight of March and boro rice harvested at the month of May.

domestic production of maize (0.4 million tones) is very low compare to requirements (0.8 million tones) from 70,000 hectares of land (BARI, Oct. 2005)[5]. On the other hand, market price of maize is high compared to the other cereal crops and farmers can easily gain a good profit from maize cultivation. Government of Bangladesh has taken the initiative to increasing maize production. Therefore, maize is a prospective cereal crop in our country.

Production performance of maize

Through IFM project farmers of Charan were encouraged to cultivate maize and 27 farmers piloted cultivation in the year-2 demonstration as a cash crop in rabi season. In fact, maize cultivation is new not only in Charan beel but also in Kalihati upazila. Therefore, the project team, including the upazila agriculture officials, provided necessary technical support to the participating farmers on regular basis before and during the cultivation period.

As new growers most of the farmers of three villages got good yield. The average yield ranged from a minimum of 4.36 t/ha in Pach Charan village to a maximum of 5.46 t/ha in Ag Charan village with an average of 4.91 t/ha combining three villages and 32 participating farmers (Figure 5.3).

As observed 12 farmers out of 27 got 5-8 t/ha, which is much higher than the average national production of the country. As per the BBS data (2004), the national average yields of maize at farmers level were 5.6 t/ha, 4.03 t/ha and 4.92 t/ha in 2001-2002, 2002-2003 and 2003-2004 respectively.

Reasons for lower yields

The lowest yields achieved by farmers was by ten farmers, each cropping 3.5-5 t/ha., It should be noted that all farmers got below national level. Reasons for lower yield have been identified in participatory discussion included the following:

- Farmers are new in maize cultivation and thus could not ensure intercultural demands
- Imbalanced/inadequate fertilizing
- Improper irrigation management
- Dense planting, which produced comparatively weaker plants.
- Careless intercultural operations
- In early stage of crop, some 6 plots were partially affected by cattle.
- Some cobs lost by theft

Cost and return from maize cultivation

Although production cost of maize is higher than wheat production, net return from maize has been found much higher than wheat. Data shows that average production cost of maize was Tk. 18,172/ha while the net return was Tk. 24,819/ha, which was 137% higher over the investment (Figure 5.4).

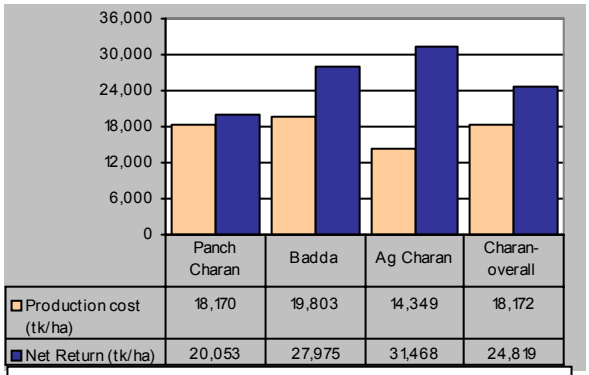


Figure 5.4: production costs and net return from maize from Charan piloting

The highest average (combining data of 8 farmers) net return was observed in Ag Charan village where the net return was Tk. 31,468/ha against production costs of Tk. 14,349; thus the net return over investment was 219%.

[5] Workshop Manual, Workshop on " Income Generation, Employment and Poverty Alleviation of farmers Through the use of BARI Technologies, October 2005, p: 7.

The net return in other two villages was 141% and 110% in Badda and Panch Charan respectively. Thus, it can be concluded that Charan Beel area is suitable for maize production both in terms of good yield as well as in terms of lucrative profits with relatively less risk of damage by flood compared to boro rice. The entire maize crop was sold locally as the demand was very high in the fish and poultry farms.

Farmers view about maize cultivation

Attitudes of farmers were observed and recorded during cultivation and after harvesting of maize. Figure 5.5 shows the views of farmers including women members from their families on various uses of maize. The participating farmers reflected their views about maize cultivation as follows:

- It is a profitable crop
- It has good market value (300-350 Tk/maund)
- It can be sold green or matured.
- Farmers were worried about husking of corn but a maize thrasher from project was very useful
- Farmers lost some cobs from field by theft. As maize was a new crop in this area, people were curious.
- Immature green cob is delicious to chew and mature cob is very attractive for its size and colour.
- People approached and collected cobs from their neighbours/relatives
- It is expected that more farmers will come forward to grow maize in the next year

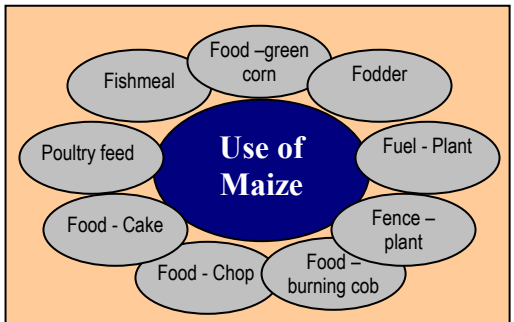


Figure 5.5: various use of maize as expressed by farmers in Charan Beel

Potato cultivation

Potato is widely eaten in Bangladesh. In the last year (2003-2004) 5.31 million tones of potato was produced from 0.267 million hectares of land in Bangladesh (BBS, 2004). The national average yields of potato were 12.8 t/ha, 13.82 t/ha and 19.89 t/ha in 2001-2002, 2002-2003 and 2003-2004 respectively (BBS, 2004) against the potential yield of 25-30 t/ha. This yield gap occurs mainly due to use of low quality seed tubers and improper cultivation practices.

As with other alternative field rabi crops, potato as field crops in rabi season in Charan Beel area is new to the farmers. The project motivated farmers through training and visits, to pilot potato cultivation in the area to diversify crops. To this end, 40 farmers of Charan Beel cultivated potato in the 2004-05 rabi season with technical support from the upazila agriculture office and the project team.

Production performance

Being a new crop, yield performance of potato, as field crop was found encouraging. Out of 40 project farmers that piloted potato cultivation, 3 could get the potential yield of 25 t/ha and above, 12 farmers got 20-25 t/ha (which is also higher than the national average), 13 farmers got 15-20 t/ha, which is in line of the national average yield and rest of the farmers got lower yield.

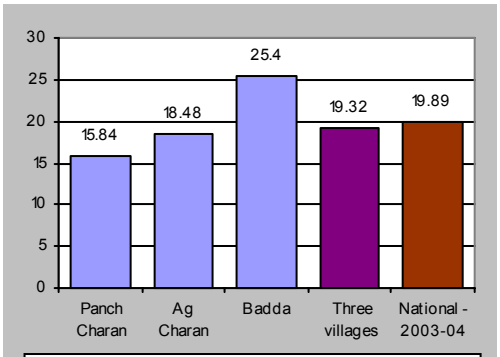


Figure 5.6: Yield of potato (t/ha) in Charan Beel and national yield

The average yield of 33 farmers in Charan site was 19.32 t/ha with a maximum of 30 t/ha and a minimum of 10 t/ha. There were differences in yield by villages as the highest per unit yield of 25.4 t/ha was obtained in Badda village followed by 18.48 t/ha in Ag Charan village and the lowest average production of 15.84 t/ha was obtained in Panch Charan village. The soil type in Panch Charan might be the reason for lower yield in Panch Charan village. Based on the overall performance of potato cultivation it can be concluded that potato is a suitable field crop in Charan Beel area during rabi season.

Reasons for lower yields

The lower production of potato by some of the participating farmers were mainly due to following reasons:

- Improper tillage operations
- Imbalanced/inadequate use of fertilizers
- No use of compost or cow dung in some plots
- Improper irrigation management or mulching
- Carelessness in intercultural operations
- Premature harvesting from the fields
- Poaching of potato from fields
- Some plots were near to homesteads and thus partially affected by homestead pests
- Farmers are not experienced enough in potato cultivation

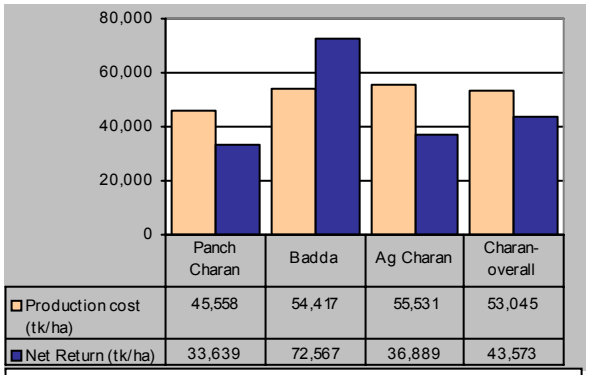


Figure 5.7: Production cost and net return from potato from Charan Piloting

Cost and return from potato cultivation

The cost of potato production is very high compared to other alternative rabi crops or probably compared all other rabi crops including boro rice.

Figure 5.7 shows that average production cost of potato cultivation ranged from a minimum of Tk. 45,558/ha in Panch Charan to a maximum of Tk. 55,531/ha in Ag Charan Village with an average of Tk. 53,045 in three villages combining the data of 33 farmers.

The average return to investment in three villages was found 82% of production costs. However, the average return in case of Badda village was found (133%) that of investment. It was due to higher production rate of 25.4 tones per hectare.

Although the average net return was lower than the production cost, the absolute return from potato is much higher than other alternative rabi crops. However, the investment in potato is also very high. Therefore, it may not be a good option for poor farmers or sharecroppers as many of them may not be able to continue potato cultivation without external financial support. However, still it could be a viable option for medium and rich farmers to get a higher return as well as safe harvest of crops avoiding the risk of flood damage. Another important factor as discussed by the farmers that potato cultivation enriches soil fertility and thus follow on crop (next to potato) require less fertilizer and thus less costs.

Garlic Cultivation

Garlic cultivation was not common in Charan Beel, whether as kitchen garden or field crop, in rabi season. Garlic cultivation as field crop in low-lying floodplain beel areas is common and widespread in Chalan Beel area in Natore district (northwest Bangladesh). Farmers in selected areas of Natore district preferred garlic over boro rice as this is short duration crop,

it requires no tillage, less irrigation and the return is higher than boro rice. After paying a project arranged exposure visit to Natore area, farmers in Charan Beel area piloted garlic cultivation in their plots. A total of 45 farmers piloted garlic cultivation both as field crop as well as in homestead garden.

Production performance

The national average yield of garlic has been 2.78 t/ha, 2.87 t/ha and 3.0 t/ha in 2001-2002, 2002-2003 and 2003-2004 respectively (BBS, 2004). Despite being a new crop, average performance of 45 participating farmers piloted garlic cultivation in Charan Beel has been found very close to the national average. The yield of garlic from pilot plots was 2.25 t/ha (Figure 5.8). However, of the 45 participating farmers, 11 farmers achieved yield rate of 3.0 t/ha and above.

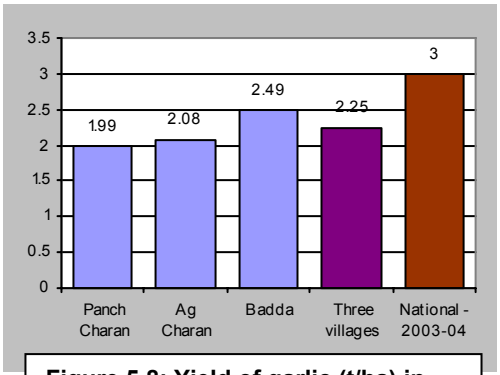


Figure 5.8: Yield of garlic (t/ha) in Charan Beel and national yield

Best performance was recorded in Badda village where average yield was 2.54 t/ha while the lowest was in Panch Charan with a yield of 1.99 t/ha. Data shows that 7 out of 15 farmers in Badda village achieved the yield of national average (even higher). Abdul Kader, a participating farmer of Badda village got the highest yield of 6.67 t/ha, which was over two fold higher than the national average.

Reasons for lower yields

Although the average yield of garlic was satisfactory as a new crop in the area, there is potential to improve the yields further if the constraints faced can be overcome. The constraints responsible for lower yield of garlic in some plots were as follows:

- Plots near homesteads affected by hens
- Imbalanced/inadequate use of fertilizers
- No or less application of compost/cow dung
- Improper irrigation management
- Careless intercultural operations
- Premature or over mature harvesting
- Stealing of garlic from field plots

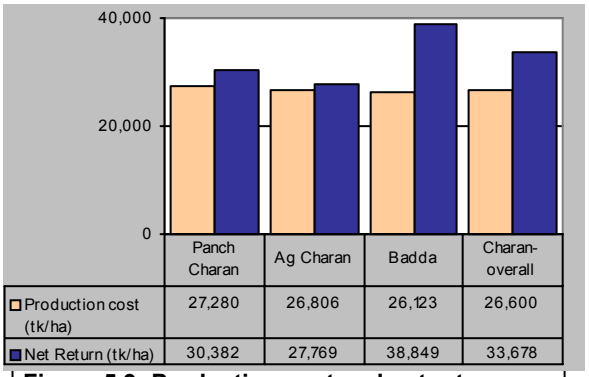


Figure 5.9: Production cost and net return (Tk/ha) from garlic in Charan piloting

Cost and return from garlic cultivation

The cost -benefit scenario of garlic demonstration was encouraging though the average production potential at the farmers level could not been fully realized. However, the net return achieved by the farmers of Badda village demonstrated the potential for wider practice of garlic in the area.

Figure 5.9 shows that average cost of production did not vary significantly among the three villages but the variation in net return was higher. For example, cost of production was around Tk. 26,000/ha in Ag Charan (18 farmers) and Badda (15 farmers) villages but the net returns varied widely between the two villages as the return was Tk. 27,769 in Ag Charan (104% net return over investment) while it was Tk. 38,678/ha (about 150% net return over investment) in Badda village.

However, the overall cost-benefit scenario of 45 participating farmers in three villages combined showed that the average cost of production was Tk. 26,600/ha against the net return of Tk. 33,678/ha thus farmers made a net return of 127% over investment.

5.3.3 Cultivation of extra crops following the main rabi crops

After harvesting of alternative rabi crops (maize, potato, garlic and wheat) some farmers cultivated other crops like jute and vegetables as extra crops in the same plots. Of the participating farmers who cultivated additional crops, 16 cultivated jute (a kharif-1 crop) in 2.26 ha of land and 4 cultivated vegetables in 1.64 ha field plots.

Jute as follow on crop

Jute was not cultivated in Charan Beel area, as the farmers did not get the opportunity to sow jute after harvesting boro 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 its premature stage due to flooding in July. The IFM farmers sowed jute in mid-April and had to harvest in mid-July due to floods when the fibres were not full grown. However, those who grew jute in higher elevations got better yields.

Production performance, costs and returns from Jute

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 what they got as an extra income and was 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.

In addition to fibre as the main output, jute cultivation has other benefits viz. jute leaves at young stage are widely eaten in Bangladesh as vegetables and have good market demand, jute stick is also another important by-product that people use for various purposes, like fuel and fencing material and has good market value. Data shows that fibre alone contributed 64% of the total gross return from jute of Tk. 41,894/ha while 36% came from jute leaves and stick. Table 5.3 presents some relevant attributes of jute cultivation as a follow on rabi crop.

Table 5.3. Jute cultivation related statements

Jute related Attributes	Statements
Is jute a common crop in Charan?	No – only possible after alternative rabi crops, it would be too late for jute sowing after boro (not possible).
Why jute was preferred after rabi?	Time matched and interest of farmers due to higher price. 16 farmers grown as follow on crop (kharip-1 crop) after rabi in the same plots
How was the production?	1.52t/ha close to national yield ranged from 1.6t/ha to 2.02t/ha
What was the cost of production?	Tk. 14,359/ha
Was the net return?	Tk. 27,535/ha (192% over investment) - higher than, wheat, boro and maize alone
Is only monetary return from jute?	Various benefits, jute stick (as fencing and fuel) and leaves as vegetables, fibre as cash. Possible to realize costs from stick and vegetables. Land fertility increases.
Was jute sowing late?	Sown in mid-April after wheat, potato, maize and garlic. Sown late as was not planned earlier and had to wait for rains – would have been sown earlier if planned before.
Are all land types suitable for jute after rabi?	Only higher elevations in Charan Beel are appropriate so that it be harvested before flooding.
Is good seed available locally?	No – project helped collecting good seeds

If we consider only the price of jute leaves and sticks then the net return from jute stands at Tk. 9912/ha meaning the subsidiary outputs of jute can even be profitable or at least break even (meeting the production costs) and thus the fibre would be the net benefit. If we consider only the price of fibre then the net return from jute stands at Tk. 17,622/ha, which is 122% over investment. Therefore, selling jute fibre alone is profitable and the net return is higher or similar than that of wheat, boro and maize. The net return from jute (including fibres, stick and selling leaves as vegetables) was found to be 192% over investment.

Although farmers found jute production was profitable, they perceived that the amount of profit could have been further achieved if optimum production was ensured. Farmers identified following factors contributed to achieve lower yield:

- Dense seeding
- No thinning
- Late sowing due to draught (mid/late April instead of end March or early April)
- Pre mature harvesting due to flooding (harvested at around 90 days instead of about 120 days)
- Inadequate use of fertilizer

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 overall income (rabi plus jute together) many fold compared to cultivating boro rice alone.

Rabi in combination with Jute

Farmers cultivated jute as a follow on extra crop in different combinations such as wheat followed by jute, maize followed by jute, potato followed jute and garlic followed by jute. Higher net return of Tk. 71,132/ha was achieved from potato and jute combination, garlic and jute combination made a net return of Tk. 61,183/ha and then Tk.53,577/ha with maize and jute.

The lowest return of Tk. 38,368/ha was found in case of wheat and jute combination (Figure 5.10). Data shows that wheat as single crop is not much profitable (net return of Tk. 10,833/ha) but when combined with a follow on crop like jute then the combined return is much higher than boro rice. boro rice alone could achieve a net return of Tk. 20,000/ha while the wheat and jute jointly achieved a net return of 36,607/ha, which is nearly double that of boro rice alone.

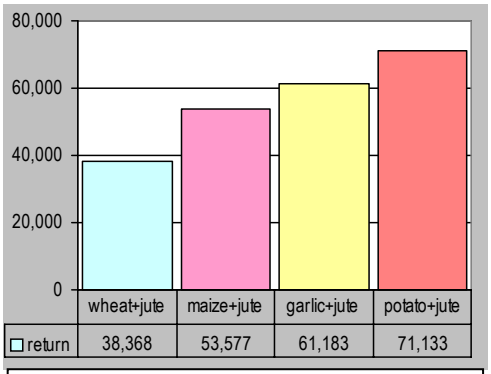


Figure 5.10: Net return from double cropping

Vegetables as follow on crop

Farmers took the opportunity to cultivate short duration vegetables after harvesting rabi crops in their field plots with a view to utilize the land before monsoon flooding as well as to get an extra income out of short duration vegetables. The vegetables cultivated included ladies finger, red amaranth, Indian spinach. The main rabi crops were harvested by March and the flooding time in Charan Beel area is mid June onwards in higher lands and thus around two months time was available for getting extra crops with minimum investment in vegetables.

Four farmers, tried vegetables in 1.64 ha of lands after harvesting their main rabi crops. Data shows that on an average production costs were only Tk. 6,830/ha while the net return was

Tk. 58,872/ha. Thus the return over investment was 862%. Which is very high compared to any other crop within this very short period of time. It is noted that vegetable prices are comparatively higher in Charan area as there are a good numbers of labourers working in weaving industries.

5.4 Comparative costs and benefits - All rabi crops

Comparing the cost and returns of all rabi crops demonstrated in Charan Beel, the results from potato was found encouraging (Figures 5.11 and 12). In absolute term, the gross returns of potato, of Tk.43,573/ha, was found to be the highest. However, the initial investment needed for potato was also the highest (Tk. 53,045/ha). Although the gross return from potato was highest, the amount of return was found low, at 82% of the investment. Thus, one has to invest relatively more money to cultivate potato.

Next to potato, garlic produced the second highest return, Tk. 33,678/ha. The cost of production of garlic was also higher (Tk. 26,600/ha) than that of wheat and maize. However, in case garlic the net return over investment was higher (126.61%).

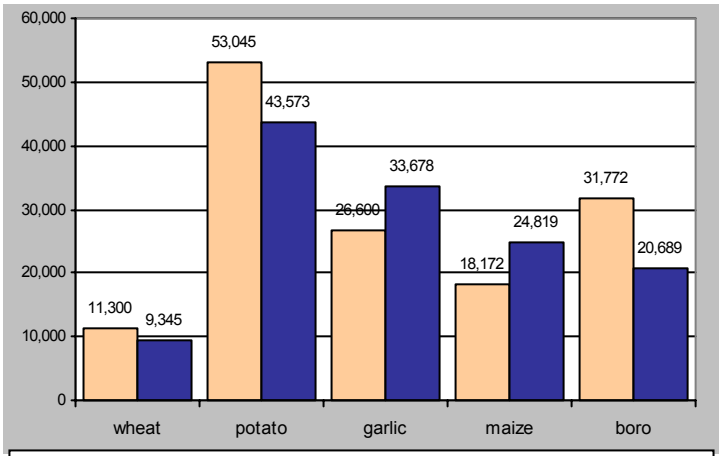


Figure 5.11: Costs and net returns from different alternative rabi crops and Boro rice

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 the production costs of Tk. 18,172/ha only.

Wheat produced the least return of Tk. 9,015/ha was achieved in absolute term. The investment in wheat was also very low, only Tk. 11,300/ha. However, return over investment was 78%, which is nearly similar to that of potato (82%) and higher than that of boro rice (65%). Thus, wheat can be considered as the cheaper crop. With relatively low costs, this can be grown. Thus, wheat should be a good choice for the poor farmers in the rabi season. The advantage of wheat is that the farmers could easily cultivate an extra crop after harvesting the wheat.

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 than that of wheat and near to maize. However, due to the cost-benefit ratio boro, it is not the right choice for farmers. Figure 13 shows that the net return over investment in boro was 65% only, was the lowest than all other rabi crops.

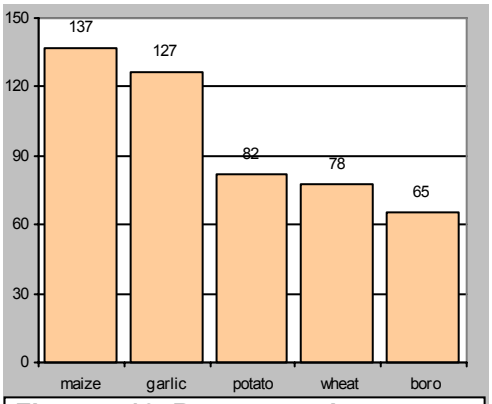
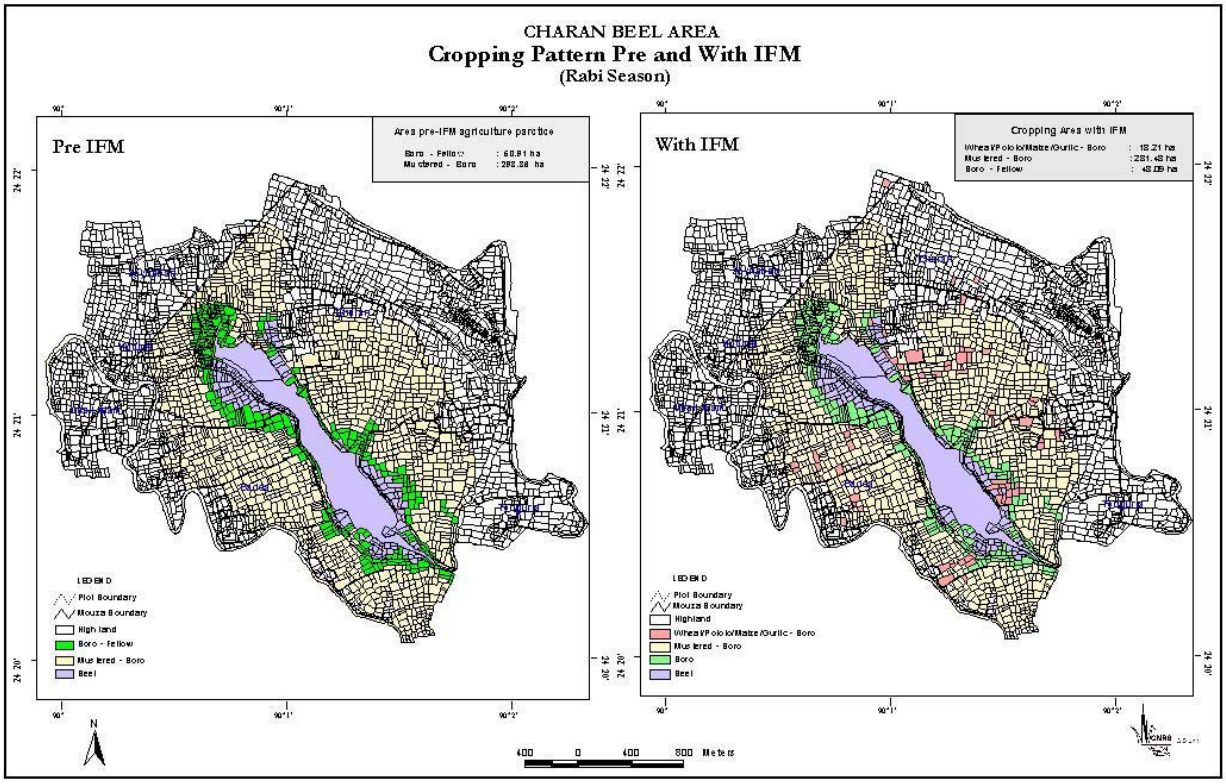
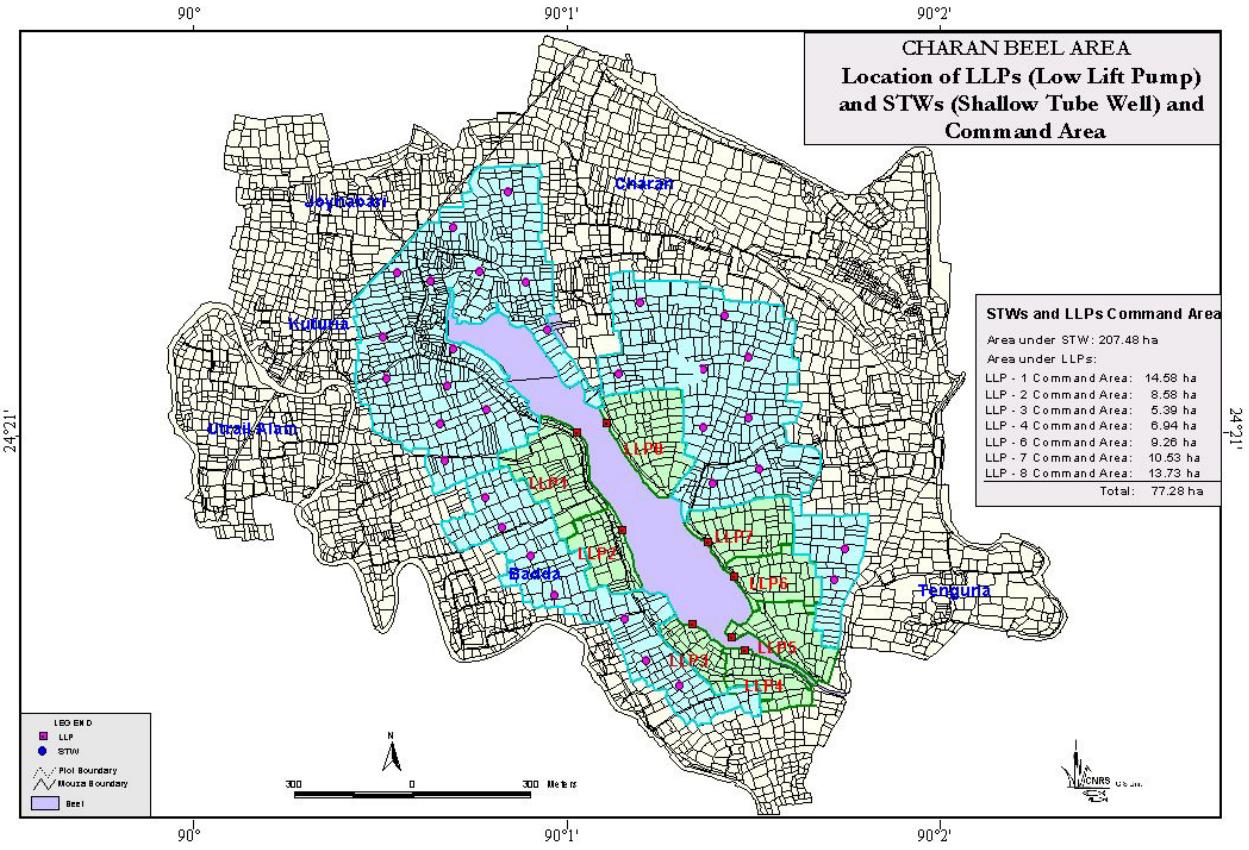


Figure 5.12: Return over investment (%) for different rabi crops

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.


CHARAN BEEL AREA
Cropping Pattern Pre and With IFM
(Rabi Season)
Pre IFM
With IFM
Area pre-IFM agriculture practice
Boro - Fellow : 60.81 ha
Mustered - Boro : 285.38 ha
Cropping Area with IFM
Wheat/Potato/Maize/Gurlic - Boro : 18.21 ha
Mustered - Boro : 281.48 ha
Boro - Fellow : 48.09 ha
LEGEND
Plot Boundary
Mouza Boundary
High land
Boro - Fellow
Mustered - Boro
Beel
Highland
Wheat/Potato/Maize/Gurlic - Boro
Boro
N
400 0 400 800 Meters


CHARAN BEEL AREA
Location of LLPs (Low Lift Pump) and STWs (Shallow Tube Well) and Command Area
Charan
Joychandi
Kuturia
Utrail Alam
Badda
Tenguria
LLP1
LLP2
LLP3
LLP4
LLP5
LLP6
LLP7
LLP8
STWs and LLPs Command Area
Area under STW : 207.48 ha
Area under LLPs:
LLP - 1 Command Area: 14.58 ha
LLP - 2 Command Area: 8.58 ha
LLP - 3 Command Area: 5.39 ha
LLP - 4 Command Area: 6.94 ha
LLP - 6 Command Area: 9.26 ha
LLP - 7 Command Area: 10.53 ha
LLP - 8 Command Area: 13.73 ha
Total: 77.28 ha
LEGEND
LLP
STW
Plot Boundary
Mouza Boundary
Beel
N
300 0 300 Meters
90°
90°1'
90°2'
24°21'

Chapter 6: Fishing Effort Control

Abu Mostafa Kamal Udding and M. Mokhlesur Rahman

The objective of the fisheries component of this project is to provide a clear understanding of the floodplain fisheries system including yield, catch, fishers and the hydrological regime.

6.1 The Floodplain Fisheries System

The floodplain fisheries system consists in principle of three components: fish-habitat-fishers. Beel fish species inhabit beels and low pockets of floodplains during the dry season and prepare themselves for spawning during the onset of the flood season. Beel fish species require a rise of water level to trigger spawning (CPP study). Increased water creates a suitable habitat around the edge of the beel and spawn spread into these shallow nursery areas during the onset of the flood season. During the flood season, the entire floodplain becomes a habitat for fish. On the other hand riverine fish species reside in the river system and spawn there drift into the floodplain for nursing and growing and return when the water recedes at the end of monsoon. The riverine fish species spawn during pre monsoon and first floodwaters have the highest concentrations of spawn and hatchling. Maintaining water level during the height of the dry season is necessary for the beel resident fish species; entry of floodwater with high spawn concentrations is necessary for their recruitment in the flood plain and inundated floodplain over the entire monsoon is necessary for growing.

6.1.1 Context

Natural fisheries productivity varies over the years depending on the recruitment (both beel resident and migratory), the inundation regime (extent and duration), and management practices. During the dry season, brood stocks (beel fish species) reside in beels and spawn in favourable conditions. Water abstraction for irrigation reduces beel water depth creating harsh conditions for recruiting broods. Recruitment of migratory fish species occurs along with floodwater. On the other hand, there are various motivations of fishers (professional, part timer and subsistence) and gears. Gear concentrations vary day-to-day and over seasons, depending on availability of fish and the socioeconomic conditions of the fishers. Catching hours and frequency also vary accordingly. To gain a clear understanding of the fisheries regime it is necessary to monitor various parameters including quantity of fish caught, number of efforts, catch per unit effort, species richness, and compositions. The focus of concern is the relationship between the fisheries regime and the hydrological regime, and any correlation that may exist between them.

6.1.2 Habitat Description

Geographically the Charan floodplain-beel complex is southwest of Dhaka near the mighty Jamuna River and is blessed with its water. Administratively the site is in Kalihati upazila, Tangail district. The Charan water regime is very closely related to the water regime of the lateral branch of the Jamuna river, Upper Lohajong, originating at Pachdecree from the Jamuna River. During the early monsoon floodwater from the river enters into the system.

During water recession from Charan beel there are two ways fr water to drain out to Bongshai river, one from Charan to Khoiajani Khal to Haora river to Bongshai river and another from Charan beel to Baisha beel to Pichra beel to Boula beel to Shat beel to Kaoljani river to Bongshai river.

There are 2 pagars (ditches) near Bhadda village and 70 fishing kathas (brushpiles) in the beel, all are used as fish aggregating devices. Although the beel is a perennial water body there are instances of it completely drying out in the recent past following prolonged drought. During the last 10 years, the beel bed has reportedly risen by around 2 feet following silt deposition. There are five villages namely i) Agcharan, ii) Pachcharan, iii) Ghaturia, iv) Kuturia, and v) Bhadda around the Charan beel complex. Around 200 fishers live there by catching fish in the beel.

6.2 Management practice

A management committee consisting of 21 members was formed out of beneficiary group members during 2002 under CBFM-2 project after completion of CBWM project. Charan is a khas beel and its use has been handed over to the management committee for 10 years on xxxx. Lease value of the beel is Tk. 68, 000 per annum. Fishers fishing in the beel pay fees to the committee to meet the lease value and management expenses. However, subsistence fishing is free.

The following management options are in practice: i) closed season in pre-monsoon (July), ii) ban on current jal, and seasonal closure on ber jal; iii) no fishing in the sanctuary.

A fish sanctuary was established in the middle of the beel after re-excavation in November 2003. The 1-hectare sanctuary includes a 2-acre core zone and a 0.5-acre buffer area. No fishing is allowed in the sanctuary. Tree branches placed in the sanctuary provide shelter to fish, creates habitat, and prevent fishing. The sanctuary area is demarcated by bamboo and red flags that indicate “no fishing”. The Beel Management Committee (BMC) and common users take care of the sanctuary.

6.3 Fish catch monitoring

Data collection for fish catch assessment in Charan Beel started in August 1999 and continued to April 2002 under CBWM project. From May 2002 to date, data collection has continued under CBFM-2. A structured form was developed and is used for data collection.

6.3.1 Data collection protocol

From August 1999 to April 2002 under CBWM the system was:

1. Data was collected separately from beel, floodplain and canals once in every week.
2. Around 30-40 % (minimum three gears of each operated types) of operated gears by types have been monitored on the monitoring day. Catch estimates of at least three gears of each type was collected.
3. Bi-monthly monitoring days
4. Gears have been enumerated by type on the monitoring day.
5. Monitoring continued from early morning to 5 pm of the monitoring day.
6. Katha catch has been considered as a gear type.

From May 2002 onwards monitoring was under CBFM-2 following a revised system:

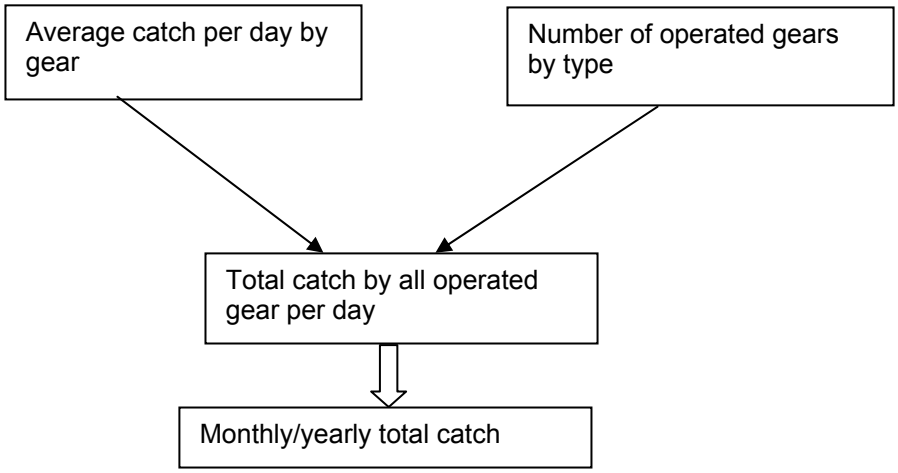
1. All of Charan Beel was divided into three parts and data has been collected from the middle part of beel and floodplain area.

2. Around 30-40 % (minimum three gears of each operated types) of operated gears by types have been monitored on the monitoring day. Catch estimates of at least three gears of each type was collected
3. Weekly monitoring days
4. Monitoring continued from early morning to 5 pm of the monitoring day.
5. Gears have been enumerated by type on the monitoring day.
6. Selected Katha catch as sample monitored separately when katha owner caught their fish normally.

6.3.2 Assessment matrix

MS Access based software was used to store and analyze data. Using standard protocols data quality was validated. Average catch of each gear type on the monitoring day was used to extrapolate the numbers of gears operated on the day, as each type of gear nets a certain amount of fish, based on total catch by gear it was possible to estimate numbers of gears. The catch of all sampled gears multiplied up by the estimate of operated gears gave catch estimates of the day, which was then extrapolated over the month and years. In case of CBWM, katha catch has been considered as a gear type and is inbuilt in the overall catch estimates. Whereas katha fish catch has been estimated separately during the CBFM-2 assessment and was added to the final result of the year. In the case of species richness, occurrence of number of species on the monitoring day and then cumulated over the year was considered.

Figure 6.1 Monthly catch estimation in Charan beel



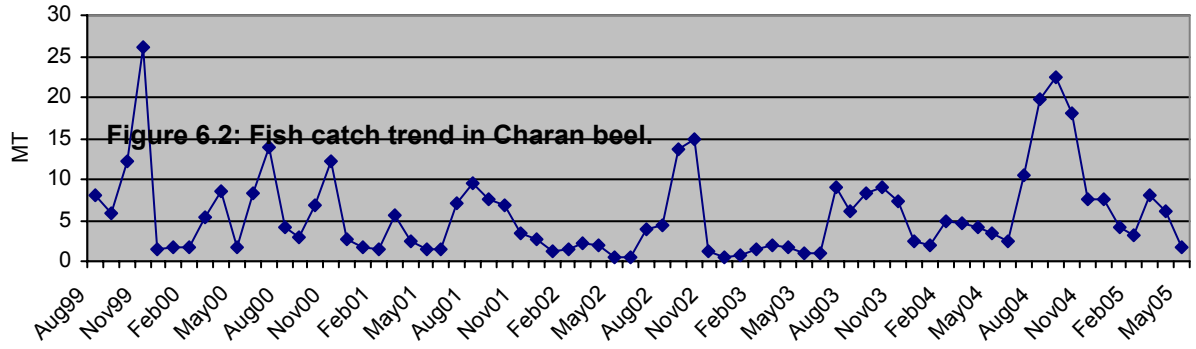
During CBWM total catch by all operated gears per day has been estimated separately for beel, floodplain and canals and then added together.

6.4 Fisheries Findings

6.4.1 Monthly total catch (99-2005)

Estimated fish catch was 72.5 MT during the first year (August 1999 to May 2000 - adjusted) of monitoring (Figure 6.2) 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 usual, fish catch was highest in October/November and low during the dry season.

Figure 6.2 Catch per unit effort (CPUE)



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 jals in Charan beel. As expected, CPUE decreased in line with total catch uptil June 2002 – May 2003 and then increased until last year (Table 6.1).

Table 6.1: Catch per unit effort (CPUE) of major gears

Gear	CPUE (kg per unit effort)					
	Aug'99 - May'00	June'00 -	June'01 - Apr'02	June'02 - May'03	June'03 - May'04	June'04 -
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

6.4.2 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 6.2).

Table 6.2: Fishing intensity of major gears

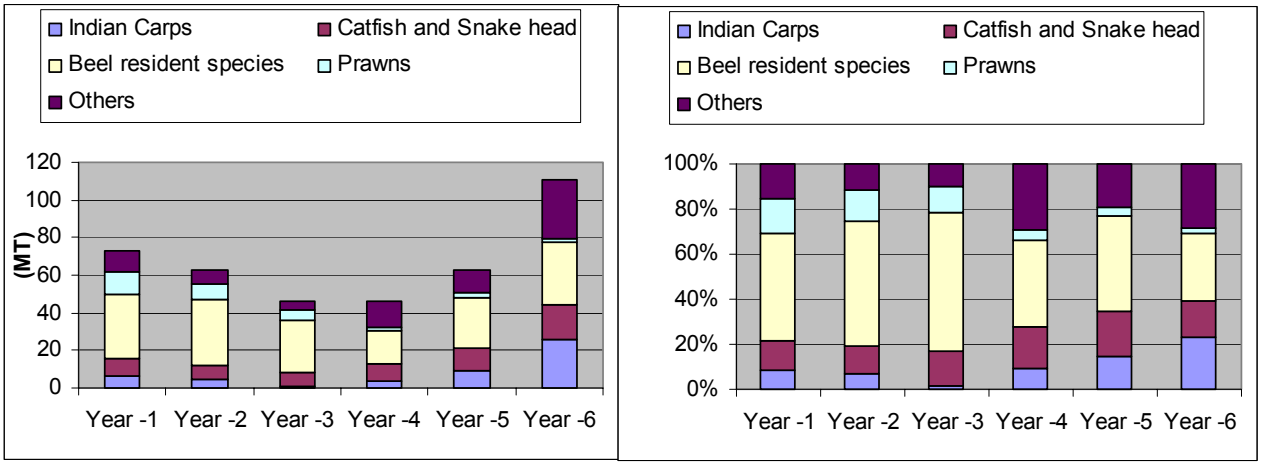
Fishing gears	(Number operated during the period)					
	Aug'99 - May'00	June'00 - May'01	June'01 - Apr'02	June'02 - May'03	June'03 - May'04	June'04 - May'05
Ber jal	1,393	658	791	1,417	1,378	1,056
Current jal	34,048	55,489	59,654	26,371	39,360	88,949
Daon borshi	21,140	38,220	81,900	7,650	55,450	54,242
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

6.4.3 Fish species composition

There is a visible difference in the catch composition 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 6.3). 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.

Species richness was decreasing until the fourth year of monitoring (from 75 to 49) and increased thereafter, to 76 by the 6th year, indicating revival of species richness (Figure 6.3). Data reveals that there was a correlation between fish catch and species diversity. The correlation value was 0.73.

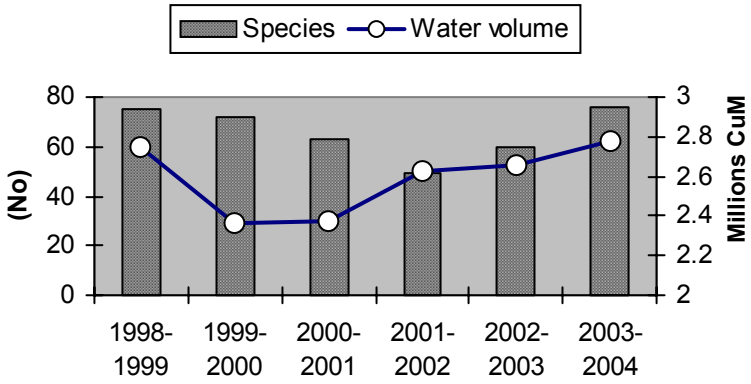
Figure 6.3: Species richness and catch composition in Charan *Beel* (1999-2005, CBFM)



6.4.4 Relation between catch and hydrology

Average standing water volume in the dry season was lower in the 2nd year of monitoring compared to the other 5 years (Figure 6.4). Less standing water in the 2nd year, led to lower fish catch yielded in subsequent years (3th & 4th). In the 4th and 5th years average standing water volume was higher resulting in increased catch in the following years 5th and 6th. The standing water volume of the previous period is related to the coming year's fish catch. In this analysis the fish catch year is considered to be from June to May. For water, Year 1 refers to average standing water volume during the dry season of 1998-99. While in the case of fish, Year 1 refers to yield from June 1999 to May 2000. Similarly, Year 2, Year 3, Year 4, Year 5, and Year 6 refer average standing water volumes of the year before the fish yield considered.

Figure 6.4: Yearly trends for catch per unit area (CPUE)



The findings clearly show standing water volume in the previous year is correlated with the subsequent year's fish yield (Figure 6.4). The correlation coefficient of 6 years water volume and fish catch data is 0.62 (Figure 6.5 and 6.6).

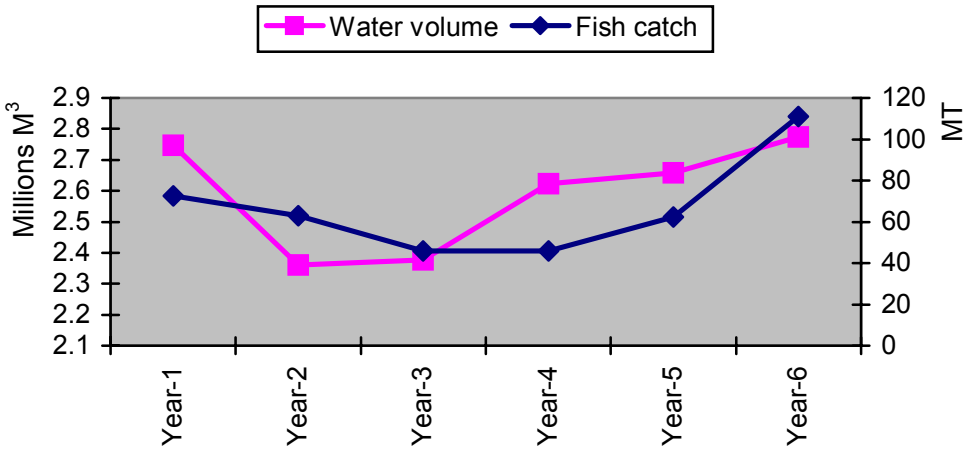


Figure 6.5: Yearly fish catch trend and dry season water retention volume in Charan Beel

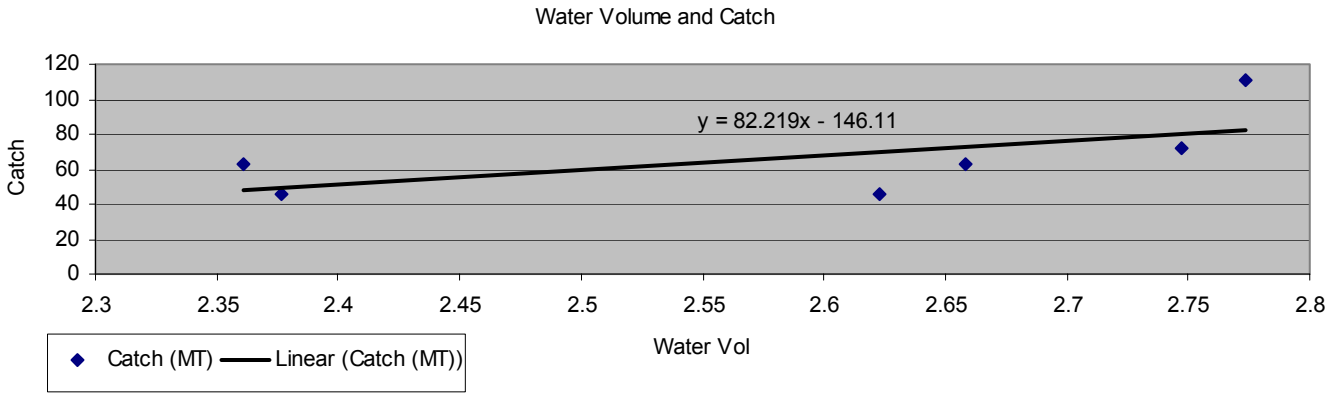


Figure 6.6: Correlation of average standing water volume of the disconnected period and the fish yield of subsequent years.

6.4.5 Water savings for dry season

The increase in fish catch shown is not entirely due to increased water volume. CBFM-2 project introduced fisheries management implemented through the Beel Management Committee (BMC). Management practices include: establishment of fish sanctuary in 5th year (November 2003); close season during pre-monsoon and restriction on harmful gear like ber jal and current jal in the 4th year (2002). In addition there were some water savings through crop diversification in the dry season during 6th year (2004), water volume and subsequent fish catch are shown in Table 6.3.

Table 6.3 Relation between water volume and fish catch

Water Volume (m^3, disconnected period)		**Fish Catch (kg)**	
1998-1999	2746952	August'99-May'00	72537
1999-2000	2360776	June'00-May'01	63059
2000-2001	2376422	June'01-May'02	46024
2001-2002	2622992	June'02-May'03	45887
2002-2003	2658424	June'03-May'04	62348
2003-2004	2773859	June'04-May'05	111123
2004-2005	3045988	June'05-May'06	104328 *
Correlation Coefficient:	0.615		

It is mentionable that during the 2004-2005 dry season, the project initiatives saved over 84,000m^3 of water. Without saving the average standing water volume would have been 2,961,603m^3 and saving resulted in 3,045,989m^3 (3% more water). In the analysis, so far, we have average standing water volume for 7 years, and fish catch for 6 years. The seventh year's fish catch has been projected from the trend. The 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.

Chapter 7: Stakeholder Assessment and Learning

Mahbubur Rahman and Abu Suman

7.1 Separate Stakeholder Assessments

Seven stakeholders groups have separately evaluated IFM project related activities in September 2005, their participation based on progress, achievements, attitudinal changes and benefits to themselves, and betterment of the resources. The groups were:

1. A male farmers group who are participating in IFM activities.
2. A LLP owner group, who are involved in extracting water from Charan beel.
3. A male farmers group of the locality who are not directly involved with IFM activities.
4. A fisher group, who fish in Charan Beel for their livelihood and also are involved in community based fisheries management under the CBFM 2 project.
5. A female group from fisher families, dependent mostly on fish and other wetland resources.
6. A female group from farming households residing beside a wetland and involved in using wetland products, some are also involved with IFM activities.
7. A female group from landless families, who are directly involved in harvesting of different wetland resources for their own consumption and other livelihood purposes.

Table 7.1 summarises the consolidated lessons that each of these groups drew regarding the project activities carried out by members.

Table 7.1 Stakeholder evaluations and outcomes:

Reviewed Activities/ Issues	Learning	By whom
1. Nine Member IFM committee formed:	The committee coordinated resource management activities among farmers, farmers-fishers, local people-GO/NGO offices including CNRS. The IFM committee was instrumental during the second year of piloting in planning, crop selection, organizing motivational visits, training, seed distribution, communication with DAE, etc. and ultimately in making piloting successful in 41 acres of land with 85 farmers. However, the committee was not very effective in settling with the LLP owners, and communicating the IFM messages with the BMC within the area. The LLP owners issue did not surface much in 2004-05 rabi season, but the owners are concerned and it will be a challenge when much more land will come under alternative rabi cultivation.	Community, the ad-hoc committee and CNRS staff.
2. Cross / motivational visits	Through 18 alternative rabi crops grown in Charan during first year piloting, farmers believed that those crops could be grown in their area, but they were not convinced about the comparative benefit. Cross-visits and motivational visits to other floodplain areas arranged at this stage played a vital role in popularizing diversified cropping pattern in Charan beel area, as well as for other CBRM sites that visited Charan as an example. The main forces behind this are eyewitness (seeing) and hearing about cultivation methods, challenges and benefits directly from practicing farmers, this helped to grow confidence for piloting among the Charan Beel farmers.	Organized by CNRS, participated by local farmers, fishers, government officials.
3. Trainings	The participating and interested farmers received several formal and informal trainings on new crop management, benefits etc. objectives and benefits of rabi crop diversification to them, to the	CNRS with assistance from DAE,

Reviewed Activities/ Issues	Learning	By whom
	land and floodplain resources. The initiatives worked well, farmers' confidently piloted alternative rabi crops on 41 ha land during 2004-05 rabi season and deepwater Aman during 2004 and 2005 Aman season. With few exceptions all the new alternative rabi crops grew well.	DoF, BARI, BRRI
4. Communication and linkages	At the resource level farmers, fishers and LLP owners are now better coordinated, they care for each other when taking any resource management decisions, understanding of the wider benefit to the community is growing among them. They are also communicating with the local GoB officials when they need. Block supervisors are visiting the farmers regularly, the concerned officers (DoF, DAE) are also visiting them from time to time. However, the arrangement among farmers and LLP owners are yet to workout. Most of the Upazila and District level officials of DAE, DoF, BADC, BARRI and BIRRI in Tangail visited the piloting activities and shared experiences with project staff and farmers.	IFM committee, CBO of CBFM 2, CNRS and local GoB departments
5. Rabi crop diversification/ low use of irrigation water – successful piloting.	Very low use of irrigation water, low production cost and high returns made farmers happy and attracted them to alternative rabi crops. Wheat, maize, garlic and potato were very successful in benefiting farmers, in addition those who cultivated Jute after harvesting of rabi made a very high profit. Jute cultivation is not normally possible after boro rice. Again, wheat proved to be a beneficial crop during the lean period, as it is harvested well in advance of boro rice. All these results attracted many farmers at the local level and those who visited Charan beel area.	Farmers, CNRS, DAE
6. CBFM	The BMC members are happy observing farmers' initiative through crop diversification, which also benefits the wetland resources. The BMC under the CBFM 2 project is maintaining 4 sanctuaries, closed season for 3 months during June, July, and August (followed in 2005), ban on different harmful gears and methods, reintroducing some of the locally lost fish species. These activities are giving good results. Fishers reported an increase in production of fish with increasing species diversity. With the increasing resource, fishers are happily observing changes in their livelihoods.	
7. Farmers and LLP owners	More than 41 ha. of boro rice land were cultivated with alternative rabi crops without conflict with the LLP owners (the LLP owners did not get any benefit from these lands) though the LLP owners are still not in favour of crop diversification. They are worried of loosing the high benefit they used to get from boro rice cultivation. This situation will continue before an arrangement agreed by all parties is made, the LLP owners are a little scared to face the new situation. This appears to be a new challenge in popularizing alternative rabi crops.	
8. Share cropping farmers and landowners.	Another challenge in replacing boro rice may be the landowners, especially for Charan beel, where many farmers are sharecroppers. Sometimes it is difficult for the sharecropper to decide which crops to cultivate, the land owners tends not to enter into a new system where their share and arrangements will require resettling. Awareness of the increased benefit can help in this regard.	
9. Marketing of new crops	As per the farmers and other stakeholders, marketing of new alternative rabi crops like maize, wheat, potato and garlic is not a problem in this area. Reasons they mentioned are existence of a	

Reviewed Activities/ Issues	Learning	By whom
	growth centre in the area and also local demand for human and poultry consumption. Piloting experience regarding marketing of their produce is also the same. Farmers believe that even if the produce is much more, marketing will not be a problem in this area.	
10. Supply of quality seed	Quality seed in sufficient quantity for the selected crops is not available in the area as these are not usually cultivated in the area. That is why CNRS took initiative and supplied quality seed to the farmers, so that farmers could decide and cultivate the new crops confidently. The initiative proved to be successful and could attract farmers to pilot confidently, and get a good harvest. The piloting farmers and many other new farmers are now interested to grow and continue growing these crops.	

Strengths of IFM Piloting

1. Communication from grassroot levels with the farmers to the policy levels was carried out satisfactorily. Through other farmers' visits to the pilot site, it was possible to disseminate information about the approach and options among many farmers from different parts of the country.
2. Initiatives to improve local level communications, ensuring relevant local government official's support, were successful.
3. Farmers are organized under the IFM committee, sharing experiences and ideas, coping with new situations. They are also interested in give an institutional form to their IFM committee through registering it with the government.
4. A practice of working in a team is developing among the farmers.
5. Capacity to reach the local level government offices increased, also the officials are showing interest to visit the organized farmers.

Weaknesses of IFM Piloting

1. There is still room for popularising the ideas and options at the policy level to see real reflection in the relevant policy changes, sorting new projects and activities for making the floodplain resources management sustainable throughout the country.
2. The achievement of new arrangements with the LLP owners and landowners are among the challenges, though dialogue is ongoing towards an amicable positive arrangement between the concerned parties.
3. Organizational strengthening of the IFM committee is still to be achieve.

7.2 Fisheries Management Activities Assessment

Fisheries management in Charan Beel has been carried out by the Charan BMC since its formation in 2002. In consultation with CBFM2 project staff, the BMC plans each year's management activities, and implements them accordingly. Sessions were conducted to assess these activities with fishers of Charan Beel. Overall, they are happy about the management initiatives; they reported an increase in fish production, reappearance of some locally lost fish species, and increase in fishers' income. On the other hand, they also highlighted some areas that need to improve. Below is an account of the assessment and comments.

1. A sanctuary has been established with required excavation work, properly protected with tree branches and bamboos and guarding. The sanctuary is effective in conserving brood fish as well as biodiversity.
2. In Charan Beel the fishers maintain a fishing ban period of 3 months during Jaishtha-Shraban. This ban period is contributing to fisheries production by allowing spawn and fingerlings to grow bigger. Fishers described it as an effective measure for fisheries conservation that contributes in increasing fish production and biodiversity conservation.
3. The fishers also maintain gear restrictions. Use of current jal is banned entirely and ber jal for a selected period; although some fishers' are still using current jal.
4. Fifty thousand fish of some rare species were stocked in the beel by the project, fishers are happy about that.
5. Fishers pay gear-wise toll to the Charan BMC for fishing in the beel.
6. At this moment they consider chai (a fishing trap) as a harmful fishing gear and a threat to management because of the number in use and its ability to trap all sorts of small fishes.
7. Another threat to management mentioned is trapping of fish in some pockets of the beel during recession of water. People make small dikes to trap fish in pocket areas and harvest them all by dewatering.
8. Increased water area during critical dry season due to alternative rabi cultivation in place of water hungry boro rice will certainly contribute to increasing fisheries production.

Subsequent learning reported by the fishers:

1. Sanctuary, ban period, gear restriction, and stocking of locally lost fish species are effective management tools in improving and sustaining fisheries production and biodiversity.
2. Paying of gear-wise toll for fishing helps the BMC to accumulate the lease money for the beel, which they pay to the concerned government authority.
3. New challenges to management are coming up, chai and trapping fish in enclosed pockets.
4. A new tool, crop diversification, will have positive impact on sustainable fisheries management through increasing dry season water in the beel.

7.3 Farming Management Activities Assessment

In October 2003, project activities started with the objective of building a consensus among the community and secondary stakeholders on the importance and need for an integrated approach towards floodplain management, and to popularise the solution options. Several focus group discussions, awareness meetings, and individual contacts were made with users and local level government officials to achieve this.

The results were very positive, people became aware about the degradation of floodplain resources and agreed upon the need for an integrated approach. The user groups agreed to adopt activities that would be beneficial or at least not harmful for another resource or another group of resource users.

7.3.1 Plan for Field Trials

The fisheries management part of IFM is carried out by the CBO formed under CBFM-2 project. The main initiative of the farmers was to bring about a change in local cropping patterns so that diversified rabi crops that consume far less irrigation water are cultivated in the floodplain, replacing/reducing the present practice of mono cropping with water hungry boro rice. The plan for 2003, in consultation with the local farmers, was that:

1. Three farmers would establish field trials on 3 acres of their land with direct supervision of the project staff.
2. Eighteen alternative rabi crops were jointly selected by farmers and staff for piloting.
3. The crops were wheat, maize, garlic, onion, potato, lal shak, mula, okra, yard-long bean, watermelon, eggplant, tomato etc.
4. Production cost would be born by the project.
5. The objective of this field trial was to find out which of the alternative rabi crops grow well in Charan Beel area.
6. Learning and Follow-up Plan

Fifteen crops grew well. Only watermelon, okra and onion did not grow well, possibly due to poor seed quality. Farmers realised that these crops could be grown successfully on their soil they identified an interest in growing many of the crops. They wanted to visit some of the areas where these crops are grown to learn more about the intercultural operations and the costs and benefits, storing, and marketing facilities for these crops. They requested that CNRS supply quality seed: as these crops are not normally cultivated, quality seed is not available in their area.

7.3.2 Motivational visit and technical support

As part of the plan to create awareness and motivate farmers as to the intercultural operations and returns of the crops, and to select suitable alternative crops for them, some motivational visits were organised. The visiting farmers directly learnt the cultivation methods of those crops in the field from the farmers of those areas. The host farmers explained the intercultural operations, critical crop management aspects, and returns to the visiting farmers, which were convincing.

Besides, many formal and informal sessions were organised by the project, involving project staff, local Agriculture Officers, Fisheries Officers, and Block Supervisors etc. to provide adequate technical support on new crops to the interested farmers.

7.3.3 Result of the visit and support

Farmers learned the cultivation practice, harvesting, storing, and cost-benefit of wheat, maize, garlic and potato directly from farmers who grow these crops commercially. They also saw cultivation practices in the field

1. DAE staff of different levels supplied them with knowledge on those crops.
2. They become interested and confident to grow those crops as field crops in their own land as block demonstration.

7.3.4 Community Organisation

At this stage, the farmers were motivated and enthusiastic towards changing their cropping pattern towards a wider community benefit. They become interested to form a community organisation for structured effort. Initially, as per the PAPD plan, they formed village

committees in three villages; three village committee representatives from each of the village committees formed the 9-member IFM committee, later they included one female member. This committee took the responsibility to:

1. exchange ideas with local farmers, motivate and organise them on crop diversification and other practices of IFM;
2. communicate with local government and take other initiatives on behalf of the local farmers;
3. resolve and mitigate conflicts;
4. assist participating farmers in marketing of their new crops;
5. register the IFM committee with concerned government authorities for sustainability and legal status.

So far, the IFM committee has made satisfactory progress, and proved to be useful. However, the committee still requires much development to become a sustainable and useful CBO to the community.

Areas of improvement due to the community organisation and NGO support:

1. Farmers are much more organised now.
2. They are more aware about local natural resources and their sustainable use.
3. They are now jointly deciding and influencing project activities.
4. At present, they have a much better relationship with relevant government officials, and are getting the support they need.
5. Through the IFM committee, farmers have coordination with the Charan BMC (of the CBFM 2 Project).
6. Training and seed distribution process was quite satisfactory due to the existence of the IFM committee.
7. Risk sharing with the NGO on adopting new farming technology.

Some of the areas that require further improvement are:

1. Finalise the constitution and registering the CBO with appropriate government authorities.
2. Running the CBO as per the constitution, holding regular meetings.
3. Take lead on IFM and other farming related activities and assist the community in this regard.
4. Develop and maintain linkages with local level government and non-government organisations.

7.3.5 Block demonstrations

As per the plan, 85 farmers with support from CNRS and local DAE and 7 other community farmers started cultivation of 4 field crops and 10 vegetable crops in 42 acres of land divided into 3 blocks in Charan Beel area (villages Pachcharan, Agcharan and Badda). The block approach was important for these low water consuming crops, as intensive irrigation for boro rice would damage these crops. In all the three blocks, piloting was successful; farmers realised that these 4 alternative rabi crops:

1. require much less irrigation water (only 2-3 irrigations instead of an average of 50 irrigations for boro rice), thus extracting much less beel water,
2. are harvested much earlier than boro rice, thus reducing the risk of flood damage,

3. have high market potentials even within their local market,
4. allow cultivation of Jute and deepwater Amon that gives them an additional benefit.
5. they also realised that block farming is required, otherwise these low water demanding crops will be damaged due to more water that might come from adjacent boro rice field through seepage.

Besides the participating farmers, many other local farmers also observed the cultivation practices closely and had discussion with them about the benefits of these crops.

7.3.6 Participatory Assessment of the Crop Demonstration and Benefits

At the end of the season, participating farmers assessed their demonstration performance, focussing on direct and other benefits of growing wheat, maize, potato, and garlic. The general observations and feelings of the farmers were:

1. all the 4 crops grew well in the region and farmers made a profit on all the 4 crops;
2. they required much less irrigation water (only 3 to 4 irrigations compared to 50 irrigations on an average for boro rice);
3. high market demand of the produce.
4. early harvesting benefited them during a lean period before harvesting boro rice, especially for poor;
5. use of the bi-products;
6. after harvesting all these 4 crops, all of the farmers cultivated Jute (which is not possible after harvesting boro rice) and got a good return from Jute fiber and stick.
7. All the farmers agreed that learning through practice and by paying more attention to their crop, they will be able to produce more than this next year.
8. They opined that maize, potato, and wheat cultivation would be sustained in Charan area.

In general, they thought that farmers and fishers will benefit from crop diversification, pump owners will be negatively impacted.

7.4 Learning from IFM Implementation in Charan Beel

The implementation of IFM in Charan Beel had one overriding characteristic, relating to the manner in which the project was implemented. As fisheries management aspects of the project were already being carried out in the area under the CBFM-2 umbrella, they were not included in the scope of IFM activities.

This created a number of problems that undermined the integrated nature of the project, the foremost of which was the lack of a cluster / project level committee uniting the farmers' and fishers' respective committees. At the site, however, the fishers were unwilling to back the formation of such a committee, as it would have diluted the autonomy of the BMC.

A possible solution would have been for the BMC to manage all aspects of the interventions in the area, including diversified cropping, and farmers were in favour of this idea, provided they were well represented on the BMC. However, due to the design and scope of the CBFM-2 project, agricultural aspects of wetland management are not considered, despite efforts by CNRS and others to promote crop diversification at a policy level. Thus, at the field level, and in relation to this project, it was advised that it was not possible to represent farmers on the BMC, undermining the integration nature of this project.

7.5 Social Analysis of IFM and Changes in Local Community

The IFM approach seems to be well received by the participants and the local community; they could see the benefits of cropping pattern change and the resultant benefit to their aquatic resources directly. It was observed that:

1. Farmers are more organised than ever before.
2. They are also much happier and hopeful about the organised effort through the IFM committee and the decision making process exercised where all concerned could express their opinions and values.
3. Involvement of the local government officials, mainly the DAE and DoF, was also encouraging for them.
4. Project supports in various aspects were accurate and effective and welcomed by the community. These were participatory identification of the problems and analysis, identification of solutions, preparation of the action plan, formation and strengthening of the IFM committee, technical support in crop diversification, and quality seed supply.
5. Farmers learned about quality seed of different rabi crops and their cultivation method.
6. Performance of different crops (maize, wheat, potato, garlic and vegetable crop) were encouraging for them. The cumulative benefit of Jute and rabi crops was very profitable in comparison to boro rice.
7. Involved farmers' incomes have been increased considerably, especially those who cultivated Jute after rabi crop.
8. Due to diversification of cropping their food security status has improved.
9. Fishers could also see a sustainable solution for their problem of lack of dry season water in the beel if these alternative crops are cultivated extensively.
10. Sanctuary, ban period, gear restriction, and stocking of locally lost fish species are effective management tools in improving and sustaining fisheries production and biodiversity.
11. Paying of gear-wise toll for fishing helps the BMC to accumulate the lease money for the beel, which they pay to the concerned government authority.
12. New challenges to management are coming up, chai and trapping fish in enclosed pockets of the beel.
13. A new tool, crop diversification, will have positive impact on sustainable fisheries management through increasing dry season water in the beel.
14. Only some pump owners, who are mostly big farmers and elites, were negatively impacted as irrigation needs for some plots were reduced.

Chapter 8: Social and Institutional uptake of IFM Options: Key Observations

Abu Suman, M. Anisul Islam and Roger Lewins

8.1 Methods

This section describes efforts to track the uptake of integrated floodplain (IFM) options at the Charan Beel project site, discussing some key observations from the reporting formats and includes attempts to explain their significance with respect to site-specific characters and the future uptake of IFM external to the project.

The process reporting formats were developed with the CNRS team principally to generate knowledge relating to three aspects of the project activities:

1. an understanding of the process of adoption (how potential local users adopted rabi or other IFM options; the role of project facilitation; and informal, autonomous processes related to uptake);
2. constraints and opportunities for new management approaches for IFM at the two sites (an understanding of local reluctance or acceptability etc.); and
3. related to this, the way perceived problems were overcome or negotiated by target groups and the project team.

Monthly diary reports provided an insight into two key aspects of the project:

1) the reaction of local stakeholders to the IFM options, and
2) the focus of the local project teams and their understanding of the project focus and the meaning of “IFM”.

8.2 Social and institutional feedback of IFM options –issues

For the purposes of discussion, the following section clumps feedback related to “acceptability” with “participation”, and “learning” with “communication”.

Acceptability & Participation

These issues relate to the attitude of participants and non-participants towards the IFM options. The issues are critical because they indicate the extent to which participants and non-participants may embrace aspects of the IFM options.

Learning & Communication

These issues are key because they relate to behaviour outside the project activities – the extent to which autonomous modifications or adoption have taken place, which institutional avenues of support are sought by stakeholders without project facilitation, and how these may be significant post-project. The issues also relate to “acceptability and participation” because local modifications may reflect local needs and preferences (e.g. for modifications in the IFM management committees or for alternative crop choices).

Together, the criteria were intended to provide an indication to the field teams of the type of features that would demonstrate prospects or obstacles to social and institutional sustainability of the IFM options. The emphasis was to be on those unexpected processes such as autonomous planning or conflict, rather than project designed activities and structures that were the responsibility of the project team.

Retrospective analysis

In addition to discussing the general themes and issues recorded, the team developed retrospective timelines of the events they saw as significant to IFM. Two timelines were to be produced: one outlining the sequence and timing of key technical and project-driven steps and one outlining the key institutional and social events. This latter timeline was intended to represent both positive breakthroughs and negative changes such as reduced participation or local conflict.

The Charan team were primarily concerned with rolling-out rabi as an alternative farming system with reduced dry season water demand. As a result, the diary reporting tended to focus on positive developments and breakthroughs related to "acceptability and participation" rather than "learning and communication".

8.3 Acceptability and Participation

It is evident that the diary format has helped the local team consider the uptake and sustainability of IFM options from a social and institutional perspective. Of particular interest, is the way in which initial obstruction by powerful interests, especially the low-lift pump (LLP) owners, was managed by the project and how some of these stakeholders were gradually attracted to rabi cropping (CNRS provided detailed evidence of the costs and benefits of rabi cultivation versus boro).

From an early stage (June-August 2004), large numbers of participants were recruited to the trials for alternative cropping and were "listed" to receive seed and other inputs via the project.

The popularity of rabi seemed to be reflected in the attendance and frequency of the committee meetings which increased sharply to 42 (including 6 women) in October 2004 prior to the second winter cropping.

There was evidence of the potential for horizontal spread of rabi beyond the direct project participants, however. Individuals from neighbouring areas have consulted local people, CNRS 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" 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 land-owners, farmers or share-croppers.

Encouragingly, the IFM committee convened meetings independent of CNRS to resolve local disputes on several occasions. The fact that one trial field was sabotaged by a neighbouring farmer indicates that there may be strong resistance to rabi experiments from some sections of the community and it seems that the project team have discussed the cultural significance of rice to the local people over and above new market opportunities from exotic crops. Some local stakeholders "remain stubborn" in this respect.

The project team have attempted to explain the significance of sabotage or obstruction, however, and most problems seem to relate to misunderstanding of the technology (one farmers' father ruined crops by introducing his animals to the plot, for instance) or jealousy

caused by apparent success and free inputs. However, at least 6 farmers abandoned rabi and returned to HYB boro rice, while relations with one of the LLP owners remained poor.

In retrospect, it would have been useful to attempt to deconstruct the types of interest groups attracted to the new IFM options in the reporting and how, for instance, movement between fisheries and agriculture options relates to socio-economic status and occupation - how do wage labourers perceive rabi and are these stakeholders directly involved in fisheries management options, for instance?

8.4 Learning and Communication

Despite the local emphasis on technical success, the team did manage to record evidence of autonomous modification or planning around IFM. Again, the majority of this reporting concerns crop diversification with a view to reducing the winter water demand of agriculture but events significant to the support and uptake of IFM were uncovered.

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 able to successfully source their seeds independently of CNRS.

Of particular interest from a social and institutional perspective, was evidence that “listed” participants and others outside the project area were engaging with relevant secondary stakeholders such as the UAO and the BS independently of CNRS and 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 crops appeared to improve as the project progressed. When mistakes and problems had occurred, the issues were addressed by project staff. 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. Again, it is not clear how attendance at these formal events cross-cut the range of stakeholders at local level or whether they were self-selecting for wealthier individuals.

The field staff noted that discussion of rabi between listed farmers and others occurred informally and that farmers would invite non-participants to inspect their plots and discuss rabi.

Table 8.1 summarises the diary records as a calender for both categories of assessment.

Table 8.1 Recorded social and institutional features of IFM - Charan Beel, Tangail (CNRS). Observations are selected from the 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 Argric. Office. CNRS office visited regularly by individuals.
October	+ve: Residents praise rabi and 2 extra request membership. Committee increase form 20-36 plus 6 women. "List" increase 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 others' 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 amman, 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	

	Acceptability & Participation	Learning & Communication
	farmers. NNRS-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.	

8.5 Conclusions

The recording formats were intended to help guide the field teams think strategically about the significance of local developments and how these might affect uptake in the future but they were also intended to provide feedback on the prospects of IFM uptake given the project's local strategy for participation and training. Key to this was the perceived relevance of IFM (and given the project's focus, rabi, especially) not just by participants and potential participants but also by the community in general. However, it is not clear to what degree rabi at both sites is socially feasible in this respect.

In early visits to the project site at Charan there seemed to be a danger that the local project team were more concerned about the process of technical extension (total coverage and uptake of rabi) rather than the process of discussing its local significance and acceptability to the range of local interests. The diary was intended to encourage the team's thinking with respect to the significance of local people's attitudes (positions). In addition, the diary required planning or thinking ahead in response to observations and comments made. There are good indications that the diary did succeed in this regard. Despite the piloting phase with the Charan team; given the parallel fisheries work of CBFM-2, it was understandable that the focus of field staff was to promote rabi through demonstration. In turn, this would have influenced what constituted "success" or "failure" and hence the reporting.

With respect to signs of institutionalisation, there were encouraging indications of local modification (switches from project-recommended crops to alternatives, etc.), uptake, and new linkages to existing institutions and service providers independent of the project team. This indicates that rabi is both an attractive proposition to some farmers and that financial, market and technical support might exist beyond the project's life.

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 linkage 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 is acknowledged.

Chapter 9: Promotional Efforts and Knowledge Sharing

M. Mokhlesur Rahman, Mahbubur Rahman and Md. Matiar Rahman

The purpose of the project "Better Options for Integrated Floodplain Management" is the piloting and promotion of the better IFM options. 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 for the better options of integrated floodplain management were implemented from the root level at the two sites, to the Upazila, District and (policy stakeholders at the) national levels. Many farmer participants, NGO and GOB officials from different part of the country were also covered.

In carrying out the promotional activities many methods and media were used, the knowledge and experience gained through piloting process and from previous projects were used. The methods used were: workshops, discussion meetings, training, presentations, field visits, exposure visits, motivational visits etc. Media and materials included: TV spots, video clips, street folk drama, posters, policy briefs, leaflets, dairy, year planner, fact sheets, billboard, training manual, powerpoint presentation, training session guide, and handout.

9.1 Training and Workshops

Courtyard Meetings

Six courtyard meetings were conducted with the participants at village level in Charan beel to explain and popularize the IFM concept and the options for uptake. Each of the meetings was participated by 20 to 25 farmers, fishers and other people. The meetings played a vital role in creating a common understanding of the floodplain resources, trends, and options for sustainable use of those resources, highlighting crop diversification as one of the important options that will benefit both farmers and fishers.

a) On 15th September 2002 at Liakat Ali`s courtyard a meeting was held. Mr. Liakat Ali Tipu Khan, Rinju, Abdul Khaleque, Quddus, Fazlu and Zamir Ali were present in the meeting. Discussion was held on the selection of demonstration site. None of the farmers agreed to offer land for setting the demonstration. The meeting ended without any positive decision.

b) On 3rd October 2003 a courtyard meeting was held at Quddus house. In this meeting Tipu Khan, Liakat Ali and Rinju Mian agreed to offer their land for setting demonstration on cultivation of alternative rabi crops such as wheat, potato, maize, garlic, brinjal, chili etc on a lease basis.

c) On 15 March 2004, a meeting was held at courtyard of Quddus mia to discuss about the performance of the demonstrated crops. The farmers were present in the meeting, watched the demonstration, and agreed that these crops could be grown in this land.

d) On 5 October 2004 a meeting was held at the courtyard of Mr. Mohiuddin Badda discussion was on the selection of land for potato, maize, garlic, wheat, and vegetables. In the meeting, participants themselves prepared a list of farmers with the land area and requirement of seeds.

e) On 6 October 2004, at Agcharan another meeting was held at the courtyard of Mr. Tipu Khan. About 30 farmers of the village attended the meeting. They prepared a list of farmers who wanted to cultivate rabi crops in the area.

f) On 7th October at Pach charan a similar meeting was held at the courtyard of Mr. Abul Qushem. 20 farmers attended the meeting. The participants expressed their interest of growing new crops. The participating farmers themselves prepared a list of farmers with the name of crops and area.

9.2 Site Visits

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. The following visits took place with these objectives in mind.

1. DAE HQ officials visited Charan Beel: Six senior level DAE officials visited the IFM piloting activities at Charan Beel on 16 February 2005. The objective of the visit was to see the field activities, discuss with local participants and other stakeholders about the options, activities and approaches. The visit started with a short description of the site, highlighting physical, demographic, fisheries and agricultural features mainly. Afterwards, the visitors spent the rest of the day visiting crop diversification initiatives, fisheries management initiatives, the community organizations, to gain an understanding about IFM options and their implementation.

2. DoF HQ officials visited Charan Beel: On 30 March 2005, two senior level officials and two expatriate consultants of the Fourth Fisheries Project of the DoF (who are also involved with the open water fisheries policy formulation for the government) visited Charan to see the IFM activities. Their interest was mainly on the integrated approach, which is based on the resource system and the community participation. Through visiting the whole area and discussion with participants, other stakeholders and the project staff, they were satisfied with the concept and its implementation process that was adopted at Charan and the performance.

3. District and Upazila level officials of Tangail District visited Charan. On 23 February 2005, a 19-member team of district and upazila level officials from different government departments visited Charan Beel to see the IFM activities and discuss IFM with the people there. The participants were from the Department of Agricultural Extension, Department of Fisheries, Bangladesh Agricultural Research Institute and Bangladesh Agricultural Development Corporation. All the visitors were convinced about the concept and approach adopted at Charan along with the field activities performance. They had discussions with many farmers, and fishers in the field during their visit. The Upazila level officials suggested that there are many floodplains in Tangail District like Charan, where the IFM concept and its options would be appropriate but at this moment they do not have any funds to start such activities. They expressed their commitment to convey these massages to other officials and communities.

4. Wetland related NGO Coordinator visits: CBFM-2 partner NGO coordinators, Executive Directors of ERDA and TARA, officials from IUCN and ITDG visited the Charan site IFM activities on 19 March 2005. All the 12 NGOs are involved with floodplain resource management and carry out major activities in floodplain areas. They have an opportunity to incorporate IFM options into their projects. Therefore, their interest was to see what the options are, how these are being implemented with the CBOs, and what is happening to other interest groups.

5. CBO members of CBFM-2 Kalihati visited Charan: On 12 February 2005, 28 representatives from 14 CBOs in Kalihati Upazila visited IFM activities at Charan. They had discussions with the IFM farmers about their practice, benefits and benefits to wetland resources. This team was also taken to boroigram of Chalan Beel area to see mass garlic and wheat cultivation and they exchanged ideas with the local farmers. All the members were excited to see the alternative crops cultivation and the information they gathered from both the places. They showed their interest and enthusiasms in adopting alternative rabi crops cultivation and the integrated approach for floodplain resources management.

6. IFM committee members from Narail visited Charan: Twelve members' from the IFM committee at Goakhola-Hatiara beel in Narail District visited the IFM activities at Charan site. Goakhola-Hatiara is one of the two IFM sites, which is why this visit was of such interest; the visiting farmers were very much interested to learn from the host farmers what they have been doing here in Charan site, what results they obtained, what are the obstacles they face. The host farmers were also interested to know the same from the visiting farmers. They exchanged ideas on cultivation of some new crops, and some fisheries management norms etc.

7. Chief Scientific Officer, BRRI visited Charan: Dr. Abus Salam, Chief Scientific Officer, Bangladesh Rice Research Institute, Gazipur visited Charan Beel site on 10 July 2005. The main purpose of his visit was to see the trials of deep water aman that were going on in coordination with CNRS and Charan Beel IFM committee. Besides, he was also interested to know the diversified cropping pattern and fisheries management of the beel area. He was impressed to learn the objectives of reintroduction of deepwater aman, rabi crop diversification, and fisheries management efforts – the integrated management approach towards floodplain resources.

8. Farmers from CBFM 2, Magura visited Charan Site: A group of farmers from CBFM 2 Magura Site visited IFM activities at Charan beel area on 2 March 2005. The visitors appreciated the basin wide approach of IFM involving all the stakeholders. They also learned cultural methods and benefits and advantages of alternative rabi crops.

9. CBO members and Field Officers from MACH Project, Sherpur Site visited Charan Site: on 27 February 2005, 27 members of CBOs and 7-site level MACH project staff visited Charan Beel IFM activities. The objectives of the visit were to get an in-depth insight on Integrated Floodplain Management and to identify the possibility to replicate the better options in their areas. The visit was very successful in that the visiting farmers and staff got the idea of the project and the importance and process of crop diversification.

10. Farmers from CBFM 2 project sites in Jamalganj, Sunamganj visited Charan Site: A 10-farmer team from Jamalganj, Sunamganj visited Charan Beel IFM site on 16 March 2005. All of them are from a community-based fisheries management implementation area covered under the CBFM 2 project. These farmers were mainly interested to learn what farming system options could better complement floodplain management and what was most suitable for their area. Besides this, they were also interested in the integrated resource

system and the management approach. They observed activities in the field, discussed with farmers and fishers of Charan beel area.

11. Farmers from CBFM 2 project, Pakundia, Kishoreganj visited Charan Site: A 14 member's team of farmers CBFM 2 project area visited integrated floodplain management activities at Charan Beel on 5 March 2005. Besides the integrated approach in floodplain management, they were also very interested in the possibility of growing diverse crops in their areas

12. Farmers from CBFM 2 project, Kulaura, Moulvibazar visited Charan Site: A team of 19 farmers visited IFM activities in Charan Beel on 16 March 2005. Like others, objectives of their visit were also to observe practically in the field and learn directly from the participants the IFM activities and process on going in Charan Beel. The visiting farmers were highly impressed enthusiastic towards alternative management initiatives observed.

9.3 Motivational visits of the IFM Farmers of Charan Beel

To learn about new alternative rabi crop cultivation, the costs and benefits, and to build confidence and interest, many farmers attended a number of exposure visits to different places. The main objectives of these visits were to give them the opportunity to learn directly from the field and from the farmers by observing and exchanging ideas. The visits were successful in building farmers knowledge and confidence on the target crops.

1. IFM farmers visited alternative rabi crop cultivation at Grudashpur, Natore and Dhunat, Bogra: On 17 March 2004 a team of 7 farmers from Charan Beel were taken for a exposure visit to Gurdashpur, Natore and Dhunat, Bogra. The objective of the visit was to allow the visiting farmers to see different alternative rabi crop cultivation in two different sites. It also allowed them to exchange ideas and experiences with local farmers on farming practices and costs / benefits of these crops directly, and through this, the visiting farmers were convinced and motivated to cultivate alternative rabi crops in their areas instead of water hungry boro rice. In Gurudashpur the team observed cultivation of garlic and wheat on a massive scale, and in Dhunat the team was exposed to maize cultivation. In both places, the visiting farmers got the opportunity to learn directly in the field and from the farmers. They shared experience about the cultivation practices and coast-benefits of all the 3 alternative crops.

2. Second batch of IFM farmers visited alternative rabi crop cultivation at Grudashpur, Natore and Dhunat, Bogra: The first exposure visit was successful in that it could create a positive impact in the minds of the visiting farmers, and create interest. Upon return, they shared their experiences with their neighbours and many more farmers become interested. They came to the CNRS staff and showed their interest in learning about the new crops. A second motivational visit was organized for 28 new farmers to Gurudashpur and Dhunat to the same crops garlic, wheat, and maize sites on 1 April 2004. This was also a very successful visit; many farmers learned about the benefits and become highly interested in alternative rabi crop cultivation. They formed a farmers committee to disseminate information about alternative rabi cultivation.

3. IFM farmers visited Munshiganj: At the time of planning for alternative rabi crops for 2004-2005 winter rabi season, the farmers planned to cultivate potato which is also a new crop to them. Again, an exposure visit to a potato growing area was necessary. As per the need, another exposure visit was conducted to Munshiganj, one of the famous potato growing areas of the country. The visit was on the 22 November 2004 with 32 farmers and 6 staff members. The visiting farmers were highly motivated to cultivate potato in their area after observing and learning about the practice and cost-benefits of potato cultivation.