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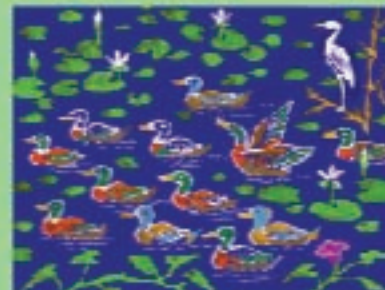
Sustainable Environment Management Programme (SEMP)

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Major Interventions for Sustainable Wetland Resource Management

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Major Interventions for Sustainable Wetland Resource Management

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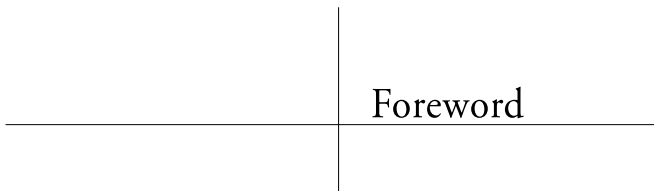
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Foreword

IUCN Bangladesh Country Office, in association with Center for Natural Resource Studies (CNRS), Bangladesh Centre for Advanced Studies (BCAS) and Nature Conservation Management (NACOM), has been implementing the Community Based *Haor* and Floodplain Resource Management components of the Sustainable Environment Management Programme (SEMP), in two *haor* and three degraded floodplain areas of Bangladesh. The project, started in October 1998, is supposed to end in December 2005 including two years' of extension after the original project tenure.

The IUCN Bangladesh implemented SEMP components are in programme mode and participatory in nature. All the planning and activities within these programmes were done according to the demand and decision of the community. Anything suggested by the community in line with accomplishing the goal of the project 'attaining sustainable environmental management', if affordable, was incorporated in the programmes. The executed activities varied from area to area as the environmental issues, livelihood patterns, conservation opportunities and management options are different at different sites. At the first look, many of these small supporting activities may seem to have deviated from the core programme, but all these are interlinked to addressing site-specific requirements. This report, in brief, describes the

various activities and provides an overall view of the initiatives undertaken. We wish that this account will be prove useful to those who are engaged in participatory environment management initiatives.

Dhaka
December 2005

Ainun Nishat
Country Representative
IUCN Bangladesh Country Office

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We are also grateful to all the field staff of the project who have lent a cordial hand in implementing the project activities. The activities were varied, extensive and sometimes, outside the scope of regular programme activities that were committed, which means that the project staff had a lot of extra responsibilities to bear with much enthusiasm, without which, the project would not have achieved such a great success.

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members of the Union Parishads (the union level local government office) during the project implementation.

IUCN Bangladesh gratefully recognizes the support provided by Syed Marghub Murshed, Mahfuzul Islam, Sabihuddin Ahmed, Syed Tanveer Hussain and Shoaib Ahmed who had been working with SEMP as the National Programme Director (NPD) and the Secretary, Ministry of Environment and Forest (MoEF). We are also pleased to acknowledge the contribution of Jafar Ahmed Chowdhury, the current NPD and Secretary, MoEF for his kind assistance in our implementation of the projects through providing support and policy guidance.

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Dhaka
December 2005

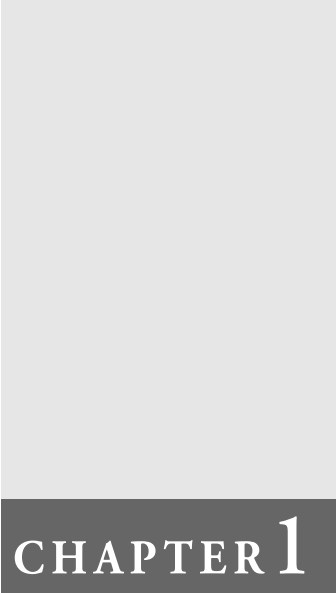
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Table of Contents

1. Introduction	01
2. Approach and Methodology	11
3. Site Selection	17
4. Starting off the Initiative	27
5. Establishing the Baselines	31
6. Preparing the Action Plans	41
7. Special Studies	45
8. Organising the Communities	53
9. Awareness Raising	61
10. Demonstrations	73
11. Improvement of Livelihood Security	83
12. Alternative Energy Options	89
13. Nursery and Plantation	93
14. Physical Interventions	101
15. Biodiversity Conservation	111
16. Monitoring and Evaluation	121
17. Reporting and Documentation	125
18. Conclusion	129
Bibliography	132

Abbreviations, Acronyms and Local Terms

<i>Amon</i>	Rice planted before or during the monsoon beginning in July-August and harvested in November
<i>Aus</i>	Rice planted during March-April and harvested during July and August
AIGA	Alternative income generation activity
<i>Baira</i>	A type of hydroponics (floating garden) made by piling up water hyacinth and other aquatic plants in the form of a platform to raise seedlings and cultivate crops.
BCAS	Bangladesh Centre for Advanced Studies
BCSIR	Bangladesh Council for Scientific and Industrial Research
<i>Beel</i>	A saucer-shaped depression, which generally retains water all the year around
<i>Boro</i>	Winter rice planted in December-January and harvested before the onset of monsoon in April-May
CBHFRM	Community Based <i>Haor</i> and Floodplain Resource Management
CNRS	Center for Natural Resource Studies
<i>Ejmali</i>	Community-owned land
FRMC	Floodplain Resource Management Committee
GIS	Geographic Information System
<i>Haor</i>	A back swamp or bowl-shaped depression located between the natural levees of rivers and may consist of a number of <i>beels</i>
HRMC	<i>Haor</i> Resource Management Committee
IFS	Integrated Farming System
IPM	Integrated Pest Management
IUCN	The World Conservation Union
<i>Kanda</i>	Ridges that are higher than the haor basin but lower than homestead land
<i>Kathha</i>	Pile of branches of trees in the water bodies
<i>Khas</i>	Government-owned land
<i>Kua</i>	A deeper site in the flat agricultural fields in the floodplain that continues to carry water during dry periods
<i>Madrasah</i>	Islamic religious school
MoEF	Ministry of Environment and Forest
NACOM	Nature Conservation Management
NEMAP	National Environment Management Action Plan
NGO	Non-government organisation
PAPD	Participatory Action Plan Development
PIP	Project Implementation Plan



CHAPTER 1

INTRODUCTION

Bangladesh is occupying a unique geographical location in South Asia. Bangladesh is virtually the only drainage outlet for a vast complex river basin made up of the Ganges, Brahmaputra and Meghna Rivers and their network of tributaries. Bangladesh enjoys a tropical monsoon climate characterised by rain bearing winds, warm temperatures and high humidity. The country has been subject to extreme climatic conditions and visitation of natural disasters such as, tropical cyclones, storm surges and tidal bores causing widespread damage and destruction especially during the summer and monsoon months. All these factors have created a variety of wetlands in Bangladesh, mostly floodplains. In fact, more than two-thirds of the country's landmass can be classified as wetlands according to the definition in the Ramsar Convention, which is quite evident in monsoon (Khan, 1993).

The wetlands in Bangladesh have great ecological, economic, commercial and socio-economic importance and values. They have been contributing substantially to the lives of millions of people of rural Bangladesh by providing opportunities of employment, food and nutrition, fuel, fodder, transportation, irrigation, etc. They contain very rich components of biodiversity, both flora and fauna of local, national and regional significance. Wetlands provide habitat for a rich variety of resident and migratory waterfowls, a number of threatened species of international interest, and a large number of species of commercial importance. Unfortunately, the wetlands of Bangladesh have been subjected to massive degradation due to population pressure, withdrawal of water for irrigation, destruction of swamp forests and a number of other

anthropogenic and natural causes. Large-scale habitat conversions, unsustainable harvesting practices, lack of wetland policies and ecological considerations have led to the destruction of valuable wetlands. Thus, there is genuine and urgent need of undertaking efficient and sustainable management of wetland resources of the country.



Island-like homesteads in the Madhumati Floodplain

Wetlands of Bangladesh

Diverse dynamic ecosystems such as mangrove forests, freshwater marshes, natural lakes, man-made reservoirs, oxbow lakes, freshwater depressions, fish-ponds and tanks characterise the wetlands of Bangladesh (Table 1.1). In addition to floodplains, *haor*, *baors* (oxbow lakes), *beels* and *jheels* are also important lentic freshwater ecosystems in Bangladesh.

The greater part of north-eastern Bangladesh is basically *haor* areas. *Haors* get flooded annually during the rains and remain under water for seven to eight months a year. The *haor* basin contains about 47 major *haors* and about 6,300 *beels* of which about 3,500 are permanent and 2,800 are seasonal. These wetlands vary in size from as little as a few hectares to many thousand hectares (FAP 6, 1993).

There are about 700 rivers in Bangladesh; the estimated total length is about 24,140 km covering about 5.5 million ha of inundable floodplains (Akonda, 1989). The floodplain area is a complex and diverse sub-system of main rivers, formed mainly of river sediment, enables temporary storage of excess water from the main river channel during flood, and increases the fishery productivity of riverine system enormously. The water retention time for floodplains is four to five months.

Table 1.1. Major types of wetlands in Bangladesh.

Open waters	Area (in ha)
Rivers	479,735
Estuaries and mangrove swamps	551,828
<i>Beels and haors</i>	114,161
Floodplains	5,486,609
Kaptai Lake	68,800
Closed water	
Ponds	146,890
<i>Baors</i> (Oxbow lakes)	5,488
Brackish water farms	108,000

Source: Ali, 1990, in Khan *et al.*, 1994

Wetlands: Services, Values and Livelihoods

The association of man and wetland is ancient. The wetland systems have supported the creation of many civilizations, helped in developing cultures and provided man with basic resources, important services and livelihoods. Even today, wetlands support comparatively larger segments of human population than any other ecosystems. In Bangladesh, the wetlands are critically important for biodiversity (vegetation, fisheries and wildlife), agriculture, communication, and ecotourism. Following sections are mainly based upon FAP 6 (1993) and Khan *et al.* (1994).

Wetland natural vegetation

According to Khan and Halim (1987), the total number of aquatic vascular plants (excluding tree and mangrove species) in Bangladesh is 123, whereas 153 was reported by Karim (1993) who included swamp trees as well. Nonetheless, many of the estimated about 4,000 flowering species of Bangladesh are found in the wetland areas of the country whose exact number has not been recorded yet. Some prominent freshwater wetland trees include *hijal* (*Barringtonia acutangula*), *karoch* (*Pongamia pinnata*), *mandar* (*Erythrina variegata*), *gaab* (*Diospyros peregrina*), *jaldumur* (*Ficus* sp.), *borun* (*Crataeva nurvala*), *chhitki* (*Phyllanthus reticulatus*) and *panibaj* (*Salix tetrasperma*); other marshy vegetation include many herbs (e.g. grasses, sedges and creepers), shrubs (e.g. *patipata* and *bet* or rattans) and of course true aquatic species (e.g. duckweed, water hyacinth, lotus and water lily). Besides these, several thousand of algal

species, and many mosses and ferns have so far been recorded from the wetlands of Bangladesh and many more are being reported every year. Several of these vascular and non-vascular species are endemic to this region again indicating the uniqueness of this country from geographical position.



Karoch (Pongamia pinnata) in monsoon stagnation in a *haor*

For most of the local residents, wetlands are the only source of biomass for foods, fuel, timber, forage, medicines and fertilizer. Some examples of wetland plants are given in this section.

Apart from the cereals and other crops cultivated in the vast areas of the floodplains many wetland plant species are also used as food with high nutritional value e.g. *paniphal* (*Trapa bispinosa* and *T. maximowiczii*), *shada shapla* (*Nymphaea pubescens*), *ghechu* (*Aponogeton* spp.), *makhna* (*Euryale ferox*), *helencha* (*Enhydra fluctuans*) and *kolmishak* (*Ipomoea repens*). Two wild species of rice, *uri dhan* (*Oryza coarctata*) of brackish water and *jhora dhan* (*Oryza rufipogon*) of fresh waterbodies, are used as substitutes for cultivated rice.

For cattle feed, species like *aurli* (*Leersia hexandra*), *barti* (*Panicum paludosum*), *kochuripana* (*Eichhornia crassipes*), *petinar* (*Paspalidium punctatum*) and *phutki* (*Hygroryza aristata*) are common in the list.

People of wetlands also rely upon different herbs with medicinal properties for example, *tal makhna* (*Hygrophila auriculata*), *shada hurhurey* (*Gynandropsis gynandra*), *bishkatali* (*Persicaria hydropiper*) and *khetpapra* (*Hedyotis corymbosa*).

Swamp trees such as *borun* (*Crataeva nurvala*), *hijal* (*Barringtonia acutangula*), *karoch* (*Pongamia pinnata*) and *panibaj* (*Salix tetrasperm*) are good source of timbers. Branches and twigs of *hijal*, *karoch*, *baladumur* (*Ficus heterophylla*), *dholkolmi* (*Ipomoea fistulosa*), *bhuiokra* (*Lippia alba*), reeds and all grasses (after dried) are used as fuel in the floodplains. *Nal khagra* (*Phragmites karka*) and *kash* (*Saccharum spontaneum*) are used in paper and pulp mill and lime burning. In addition to timber for house construction, wetland plants also supply materials for thatching of huts and as



A *patipata* grove in the Hakaluki Haor area

protective screen in homestead some, examples include *golmethi* (*Cyperus corymbosus*), *C. platystylis* and *Elecocharis dulcis*. Other shrubs like *hogla* (*Typha* sp.) is used for mats and screens while *patipata/murta* (*Schumannianthus dichotoma*) is well-known for the famous *shitalpati* (a kind of mat). *Kochuripana* and other aquatic plants are good to produce compost and also, in southern Bangladesh, are used to construct floating gardens for seedling and vegetable production.

The studies on aquatic plants in Bangladesh have revealed many other interesting virtues of these natural resources which include providing ecological services (pollution control, water treatment, etc.), tools for improved agriculture practices (biofertilizers), environment-friendly energy options (bio-gas), sources of chemicals important for pharmaceuticals and agriculture industries (Irfanullah, 2002).

The ecological services provided by aquatic plants are also immense. They provide food, shelter and breeding space for water birds, fish and mammals. Swamp trees act as protection barrier from wave action in *haors* and also supports wetland animals. Nonetheless, weedy species like water hyacinth cover stagnant water bodies, change water quality adversely, and act as carriers of germs of water-borne diseases.

Wetland crops

The extensive river-systems of Bangladesh carry a huge amount of silt, acting as the key for land acclimation in the coast and along the river channels. The newly formed *char* lands (mud-

The inland fisheries of Bangladesh cover an area of 4.3 million ha of which 94% comprise open water capture fisheries, and remaining 6% closed water systems (Rahman, 1989 and 1993, in Khan *et al.*, 1994). The *haors*, *beels* and *baors* offer tremendous scope and potential for increased fish production by adoption of culture based fishery enhancement techniques. But large-scale water abstraction for irrigation, embankments, siltation, soil erosion, pollution, water channel regulators and over-exploitation have left a trail of devastating effects on fish stocks. Displacement by introduced species and diseases have further contributed to the losses.



Fishing on Hakaluki *Haor*

As *beels* are *khas* areas, they are leased out to the highest bidders on a term basis. These leased out waterbodies, a single *beel* or a group of *beels*, are known as *jalmahals*. These are a constant source of conflict; the lease-holders have to face the residents who feel they should have an equal access to the natural open resources. *Beels* which had been harvested traditionally only once in every three years are now being harvested every year. The flooded rice fields are also suitable for spawning and feeding, and are good nursery areas for fisheries, especially before transplantation and after harvest. The integrated crop-fish production system has the benefit of continuously recycling the nutrients and energy.

Navigation and communication

Wetland areas of Bangladesh rely heavily on water transport and in monsoon, navigation is an important source of employment for the residents. Both professional boatmen (locally called *majhis*) and many non-traditional boatmen join in providing boat service.

Introduction of mechanised boats has reduced the plying of country boats lately. Siltation, construction of roads and bridges and embankments also imposed negative impacts on navigation (Khan *et al.*, 1994).



A *majhi* (boatman) cruising his boat

Community Based *Haor* and Floodplain Resource Management (CBHFRM) Projects

In response to the degraded environment conditions prevailing in Bangladesh, the government has formulated the National Environment Management Action Plan (NEMAP) (MoEF-GoB, 1995). The NEMAP process had been unique in its approach in involving people's participation through grassroots consultations held with different stakeholders in a bid to identify the appropriate local concerns and needs, and options to address them. The major breakthrough of the NEMAP process consisted in the identification of the priority areas of environmental concern where immediate action is required. The Sustainable Environment Management Programme (SEMP) of the Ministry of Environment and Forest, the Government of Bangladesh, with financial support from the United Nations Development Programme (UNDP) commenced in late 1998, and is the first comprehensive effort to implement the NEMAP. The SEMP consisting of 26 components based on five major themes or sub-programmes, namely a) Policy and Institution, b) Participatory Ecosystem Management, c) Community Based Environmental Sanitation, d) Awareness and Advocacy and e) Training and Education, was designed to address the above prioritised issues. The programme started with 22 selected government, non-government and international organizations implementing the activities as sub-implementing agencies in different parts of the country and is expected to be completed in December 2005.

The Community Based *Haor* Resource Management and Community Based Floodplain Resource Management (CBHFRM) Projects are the two components of the second sub-programme of the SEMP (Components 2.2.1/A and 2.2.1/B). The goal of these components is to "establish and mainstream participatory resource management in specific ecosystems through enhanced access by the poor and especially by the women, and capacity building for sustainable utilization of resources". The CBHFRM projects have been implemented by IUCN Bangladesh since October 1998, in association with three of its member organizations, in five

select degraded *haor* and floodplain areas. The associated organizations are Center for Natural Resource Studies (CNRS), working in Pagnar, Sanuar-Dakuar and Hakaluki *Haors* in the greater Sylhet *haor* region, Nature Conservation Management (NACOM) in the Padma-Jamuna and Brahmaputra-Shitalakshya Floodplains, and the Bangladesh Centre for Advanced Studies (BCAS) in the Madhumati Floodplain. Recognising the fact that the local communities are the crucial stakeholders for effective management of the wetland resources, their participation has been considered vital for sustainable management of the resources of wetland areas of Bangladesh. Hence community participation has been made obligatory in all stages of planning as well as implementation of these projects.

Objectives and Outputs

The overall objective of the CBHFRM projects is to contribute to the improvement of the quality of life in general, coupled with attaining sustainable development, poverty alleviation and capacity building of the local communities for effective environmental management by involving the communities to a maximum extent. By doing so, the environmental restoration and community based sustainable resource management would be demonstrated in a participatory way in some selected degraded *haor*/floodplain ecosystems (IUCN Bangladesh, 2005a). The specific project objectives are:

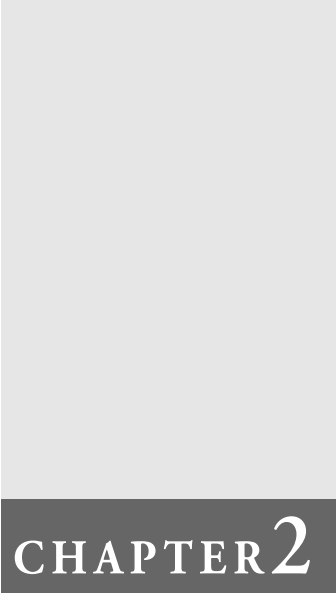
- Preventing and reversing the trends of wetland degradation
- Sustainable use of wetland resources
- Promoting sustainable development
- Ensuring people's participation in formulation and implementation of sustainable management plans
- Improving the quality of life with special focus on women
- Developing a replicable model for wetland resource management

Keeping the objectives of the project in view, four specific outputs have been identified which should be in place at the end of the project tenure:

- Participatory resource management tools developed and practiced
- Ecosystem improved/restored/rehabilitated
- Local institutions for sustainable development established and made functional
- Capacity, skill and awareness levels enhanced

Scope of the Report

The present publication registers a brief delineation of actions fielded for wetland's resource management with the local communities under the SEMP components till June 2005. In some case the reporting time vary which is duly mentioned. The principal approach of the projects and the project sites descriptions are followed by descriptions of different project interventions along with brief comments on the impacts they have created on the environment and on the local communities or beyond. Detailed description of all major activities will be found in intervention-specific reports published under these projects.



CHAPTER 2

APPROACH AND METHODOLOGY

Wetlands in Bangladesh are facing serious degradation lately, leading to the certain extinction of the existing ecosystem structures and functions. This situation has arisen largely due to the unplanned resource harvesting by the ever-increasing population. Interventions are thus necessary for changing the users' behaviour first to reverse such ill resource exploitation practices. To do so, the problematic behaviours responsible for the perceived negative trends have to be identified, and the need for inculcating environment-friendly attitudes in the people towards all kinds of resources have to be recognized. It has been realized that no environment management initiative would be sustainable unless the management approach recognizes the overall qualities of life of the people living in and around an ecosystem and that they are interlinked with the diversity, productivity and quality of that ecosystem. Moreover, it is also necessary to understand the interactions exists among different groups of stakeholders in a wetland ecosystem. Those interactions should be addressed in order to develop a balanced and participatory approach aimed at effecting human and ecosystem well-being together, which will eventually lead to sustainability. This participatory approach has been followed in the CBHFRM projects, details of which have been described in a separate publication (IUCN Bangladesh, 2005b). Here a brief approach and methodology have been presented.

Approach Considered

The CBHFRM components adopted a community based, participatory approach that integrates ecological protection and human needs to strengthen the fundamental connection between economic prosperity and environmental well-being in the *haor* and floodplain environments. This approach provides a framework bringing together the grassroots, the government, private sectors, public groups and other stakeholders. It is goal-driven and is based upon a collaboratively developed vision of idyllic future conditions that integrates ecological, economic, social as well as legal factors.

Community involvement

The programme considered the community as both manager and beneficiary of the resource management system in the long run. All the actions were planned and agreed upon through community participation considering all the stakeholders. The target of achieving participation was inclusive, i.e. to involve as many stakeholders as possible. To ensure effective community participation, initiatives such as awareness raising, formation of community groups, empowerment and capacity building of community people were undertaken. While putting a community based management approach into practice in the *haors* and floodplains, it was understood that the natural resource management options and strategies have to be mainly based upon site-specific biophysical and socio-economic conditions. Therefore, for implementation of the programme activities, area-specific resource management committees were formed as per guidelines developed jointly by the communities and the project teams.



Community people in a village meeting

Coordination between development and conservation

Sustainable wetland resource development and conservation have to be linked together to provide greater livelihood security to the rural poor. The people, particularly the poor living in the *haors* and floodplains are completely dependent upon the wetland resources for their subsistence. It is, therefore, essential that these resources be managed with the aim of sustaining their availability for the well-being of the human population. The project, therefore, simultaneously emphasised resource development and conservation through community participation where the local resource users would participate actively in planning and implementing the project activities.

Gender consideration

Participation of women in the project planning, implementation and monitoring processes has been duly considered and ensured through the following measures.

- Increasing involvement of rural women in relevant resource inventory and project planning activities
- Increasing involvement of women in resource enhancement/ rehabilitation activities
- Encouraging rural women to participate in conservation training sessions and workshops
- Considering women's participation in the project implementation and management activities.



Rural women in a consultation meeting

Ecosystem oriented

To conserve wetlands, the maintenance of ecological processes of those wetlands was the main focus. For natural resource conservation, sustaining ecosystem structure and function is the best option. The ecosystem approach provides a holistic outlook towards natural resource management. That is why, all the interventions considered ecosystem pattern of the wetlands. Though similar in many physical attributes, *haors* and floodplains vary between themselves, even among themselves. These variations along with ecological concerns were carefully considered before undertaking any site level intervention.

Focusing on livelihood

For the success of a natural resource management initiative, livelihoods of the concerned people have to be taken into account. Therefore, one of the major activities of the project was decided to be demonstrating ecologically sustainable *haor* and floodplain resource management practices that will allow access and benefits to all users, particularly the poor and the landless living at the ecosystem level. Most of the



Fish-drying in the Chanda *Beel* area

project interventions considered livelihood options either as primary or secondary livelihood support. If people can live mutually using the wetland resources, the sustainable wetland resource management can be achieved easily. It is expected that the overall success of these community based interventions, coupled with a comprehensive income generating activities package will lead to the replication of this approach in other wetlands areas of Bangladesh.

In general, the approach for the present SEMP components has been designed,

- to satisfy the needs of the project,
- to develop cost-effective survey and resource management design which can be implemented in a phased manner,
- to transfer knowledge to enable counterpart community co-workers to successfully interact and monitor the activities of the projects, and
- to improve the quality of the project outputs by improving the quality control mechanism.

Methods and Tools

While implementing the project, proven and tested participatory methods were used to assess the sustainability of the wetlands resources with a view to planning their development and managing the actions sustainably. Detailed methods of baseline data collection on socio-economic, vegetation, wildlife and fish, physical resources, land use patterns, etc. have been described in appropriate reports (see the following chapters and the Bibliography).

A number of major activities have been considered and executed to ensure community participation:

- Analysis and diagnosis of the situation prevailing in the ecosystem,
- Assessment of the sustainability of the wetland resources,
- Identification and prioritisation of options,
- Development of appropriate action plans for sustainability of the wetland resources, and
- Development of implementation and monitoring frameworks.

A variety of tools have been in use while implementing the methods outlined above:

- Participatory Rural Appraisal (PRA) techniques including focussed group discussions (FGDs), transect walks, cause-effect linkages, etc.
- Strategic negotiations with communities or government or non-government agencies (e.g. withdrawal from ill-practices, obtaining land for plantation or biodiversity conservation, etc.)
- Mapping (e.g. land use, resource, etc.)
- Communication tools (e.g. billboards, posters, leaflets, videos, charts, etc.)
- Participatory Action Plan Development (PAPD) identifying sites for plantation, conservation, restoration, etc.
- Popular cultural activities (e.g. folk drama, cultural shows, fair, etc.)
- Demonstration (e.g. conservation sites, gardening, composting, IMP, etc.)
- Guidelines (e.g. for wetland resource management committees, managing alternative income generation funds by VGs, harvesting swamp plantations, etc.)

Project Interventions

The major project interventions (Figure 2.1) were:

- Site selection
- Staff recruitment, orientation and capacity building
- Baseline establishment (households census, physical resources, socio-economy, poverty survey, participatory landuse survey, flora, fauna, etc.)
- Problem census, solution analysis and PAPD
- Special studies on flora, fauna, social aspects, etc.
- Community organisation (e.g. groups, committees, clubs, etc.) and trainings

- Awareness campaigns
- Demonstrations (of alternative livelihoods options, energy options, management practices, biodiversity conservation, etc.)
- Improvement of livelihood security through Environment Fund
- Nursery and plantation
- Wetlands rehabilitation through reexcavation
- Erosion-proofing from wave-action in *haor*
- Biodiversity conservation through *in situ* and *ex situ* measures
- Monitoring and evaluation
- Reporting and documentation

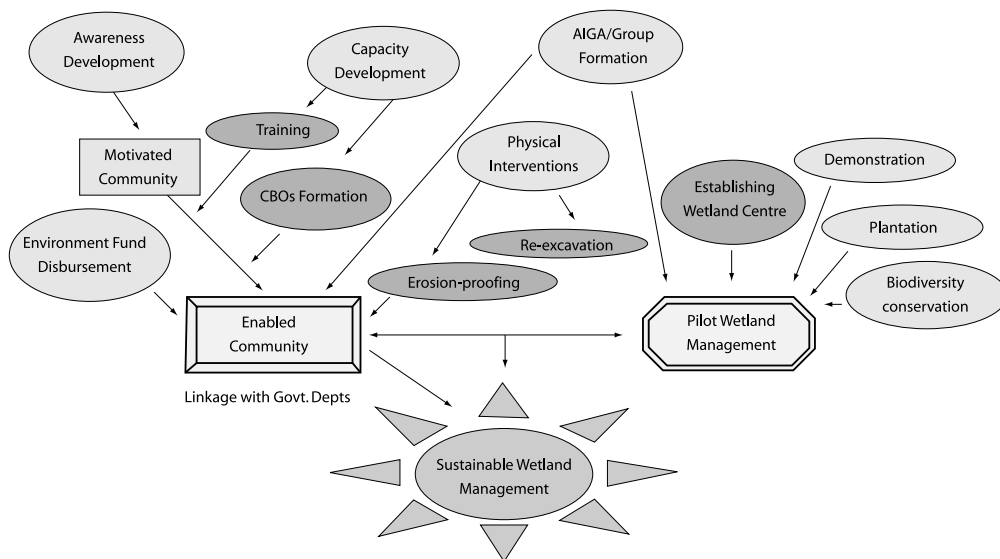
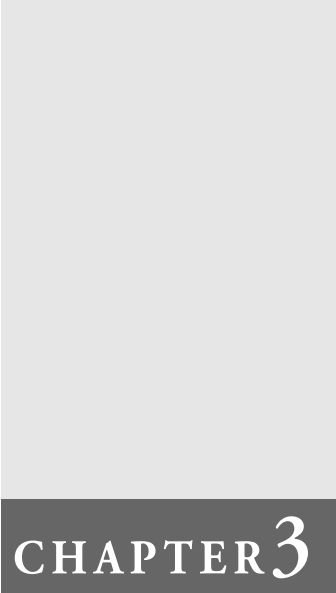


Figure 2.1. Schematic presentation linking project activities towards achieving the project goal



CHAPTER 3 SITE SELECTION

The SEMP project sites for Community Based *Haor* and Floodplain Resource Management projects were carefully chosen from the *haor* and floodplain areas of Bangladesh. The site selection criteria for the projects were developed based on the benchmarks outlined in the SEMP Project Support Document (PSD). For site selection, it was mandatory for the project staff to visit an earmarked area and hold discussions with the community leaders, fishermen, and local government officials to obtain their views of the proposed project implementation. The specific sites were selected by considering their physical, hydrological, social, and biological and management/ general criteria.

In accordance with the benchmarks, Pagnar and Sanuar-Dakuar *Haors* of Jamalganj *Upazila* of Sumanganj District were selected for the Community Based *Haor* Resource Management Project. Subsequently, based on the commendable performance in project implementation and the constructive colloquia among IUCN, UNDP and GEF, Hakaluki *Haor* on the border of Sylhet and Maulvibazar Districts was included as an additional site under the project in October 2000. Physical interventions in the Hakaluki *Haor* area were officially initiated in July 2001, though preparatory awareness building and sensitisation campaigns with the local communities and the government officials had been carried out in the area, beginning at the end of 2000.

In the case of floodplains, two separate sites were primarily selected with locations in the Padma-Jamuna (Manikganj District) and Madhumati Floodplains (Gopalganj and Madaripur Districts) for the SEMP component 2.2.1/B (Community Based Floodplain Resource Management). Both these floodplains more or less feature all the essential characteristics of a floodplain. Furthermore, the project site had been extended in two selected *beel* areas of the Brahmaputra-Shitalakshya Floodplain from October 2000; however the physical interventions began in July 2001.

Selected Sites

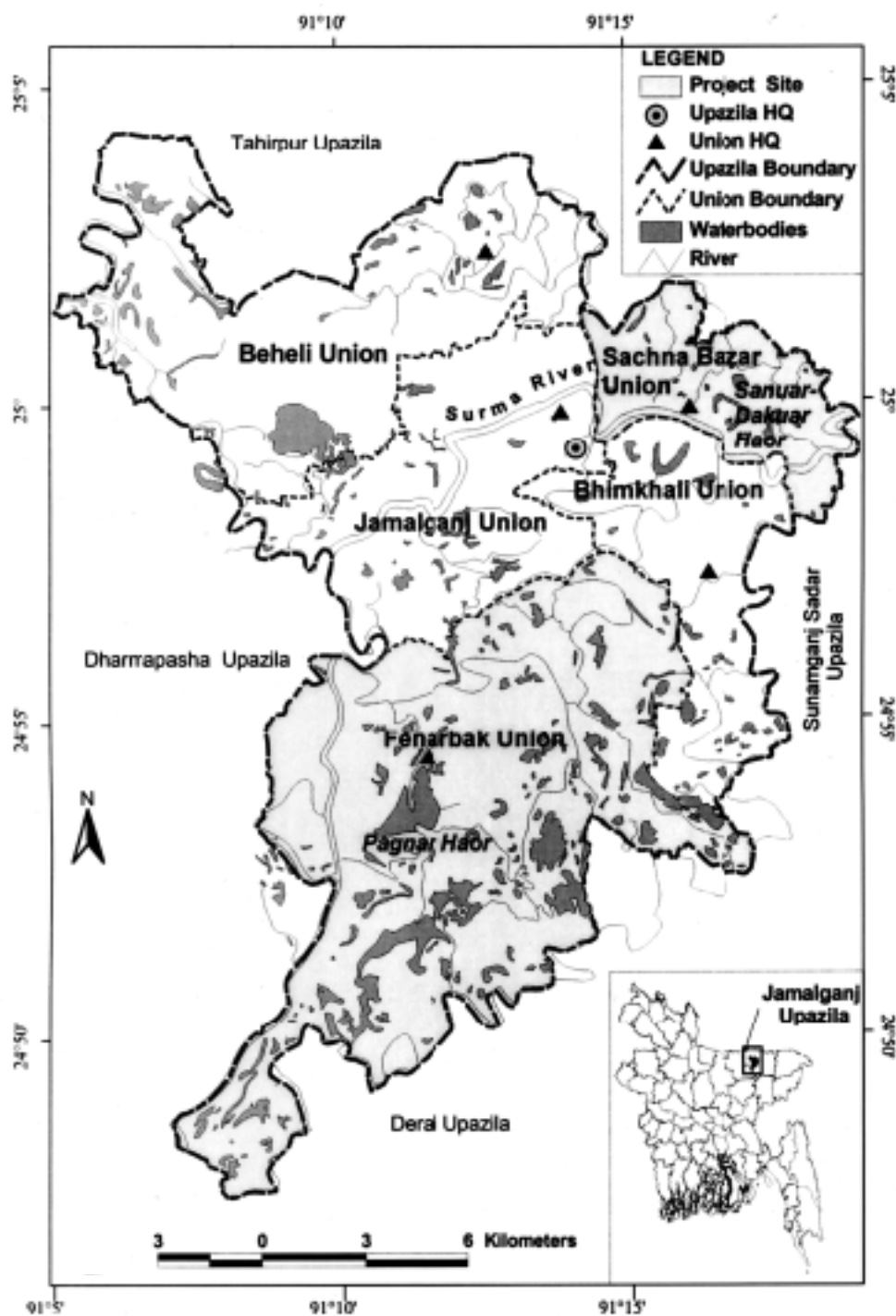
Haor sites

Pagnar and Sanuar-Dakuar Haors

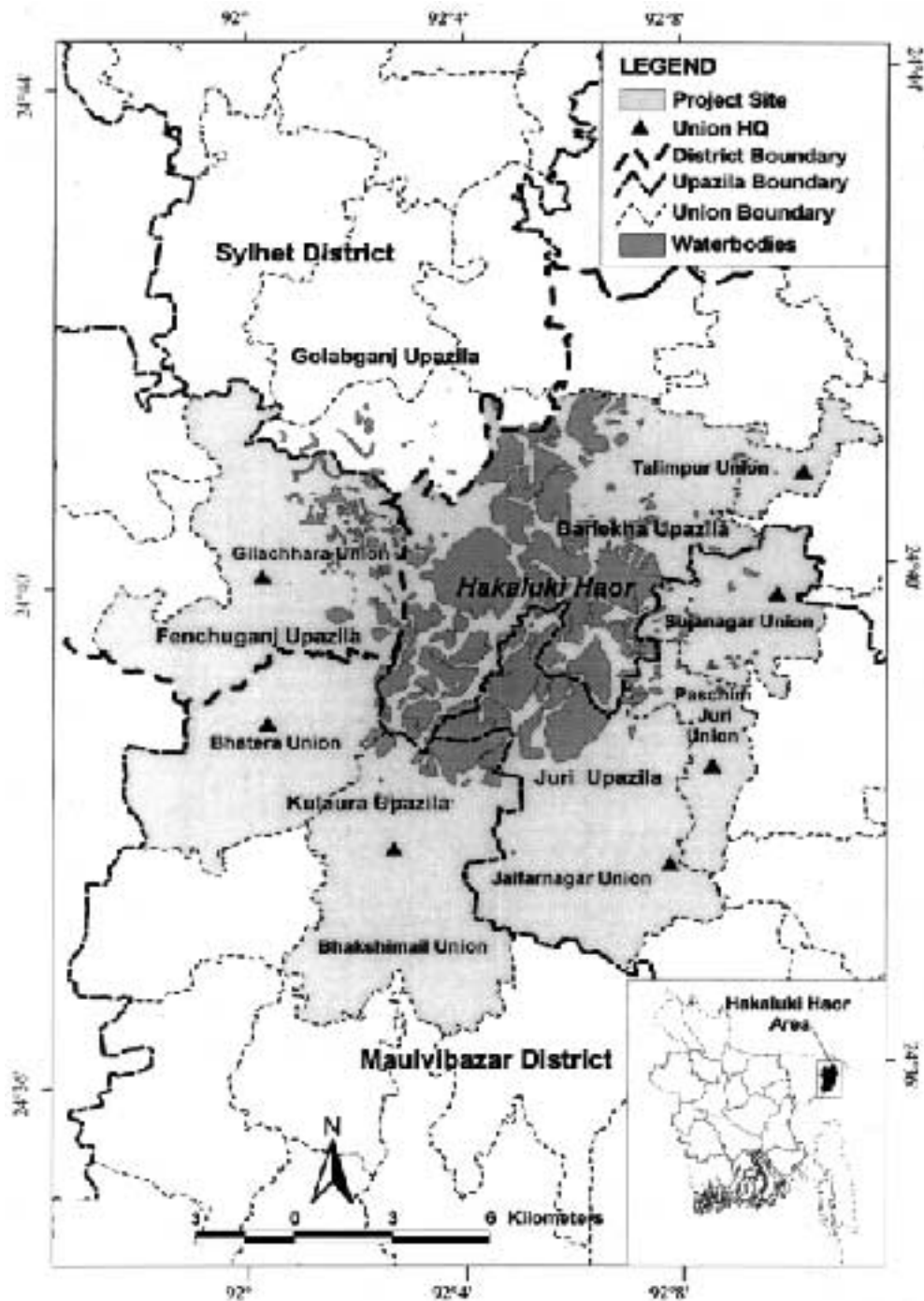
Pagnar *Haor* of Fenarbak Union and Sanuar-Dakuar *Haor* of Sachna Bazar Union, Jamalganj *Upazila*, Sunamganj District are two sites where the project first started (Map 3.1). The first *haor* consists of 22 villages with around 12,000 people and the second consists of 20 villages with about 16,000 people. The total area coverage is 55 sq km. Both sites have diverse wetland habitat features, like small and medium-size *beels* and canals, secondary rivers and huge seasonally inundated lands where people do fishing in the wet season and cultivate rice in the dry season. In addition, there are patches of degraded swamp forests in the *khas* lands and on *kandas*. Pagnar *Haor* site is a deeper flooded area as compared with Sanua-Dakuar *Haor*. Most villages of the first *haor* are exposed to the wave action in the monsoon causing drastic homestead erosion.

Hakaluki Haor

This *haor* is a complex system of more than 80 inter-connecting freshwater *beels* in a shallow basin (Map 3.2). It is one of the largest *haors* of Bangladesh with great economic and ecological significance. It is a valuable source of freshwater fish which is vital for the livelihood of the local people. In terms of ecology, the *haor* is a major resting and breeding place for thousands of migratory birds in winter. The important *beels* here are Chatala, Pinglarkona, Haorkhal Footi and Paula. For project implementation, relatively smaller, manageable and representative segments of the floodplain ecosystem were selected. The project mostly concentrated in the highly degraded parts of Hakaluki *Haor*: Ghilachhara Union of Fenchuganj *Upazila*, Bhatara and Bhakshimail Unions of Kulaura *Upazila*, Jaifarnagar, Paschim Juri and Sujanagar Unions of recently formed Juri *Upazila*, and Talimpur Union of Barlekha *Upazila*. The total number of villages in the project area is more than 30 with population around 35,000 and an area coverage of 13.1 sq km.



Map 3.1: Pagnar and Sanuar-Dakuar Haors - the project sites of the Community Based Haor Resource Management Project in Jamalganj Upazila, Sunamganj District. (Souce: CNRS, GIS Unit)



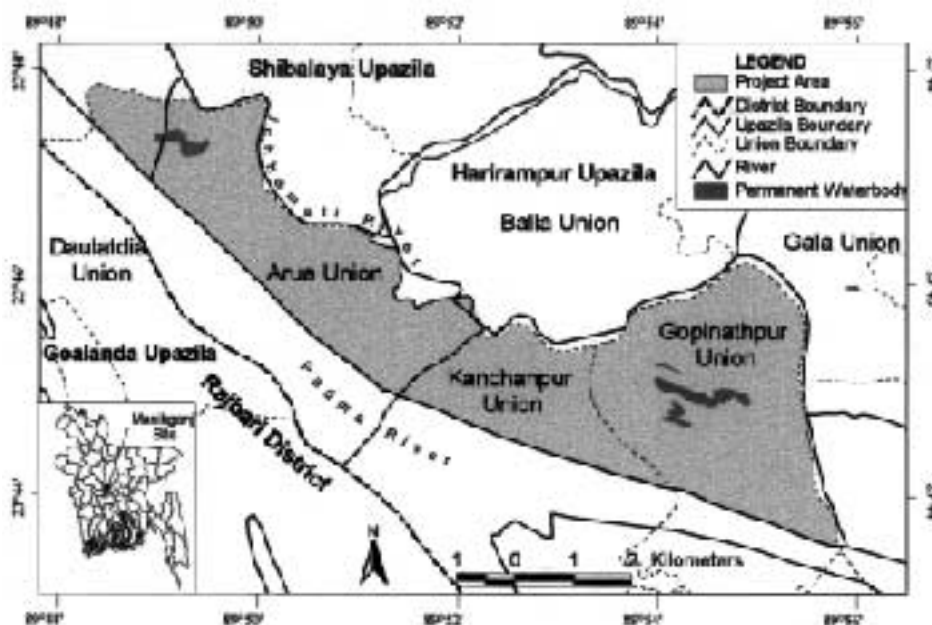
Map 3.2: Hakaluki *Haor* - the project site of the Community Based *Haor* Resource Management Project in Sylhet and Maulvibazar Districts. (Source: CNRS, GIS Unit)

Floodplain sites

Padma-Jamuna Floodplain

The project area in this floodplain includes Arua Union of Shibalya *Upazila* and Gopinathpur and Kanchanpur Unions of Harirampur *Upazila* in the district of Manikganj (Map 3.3). The GPS reading of Arua (Arua Union Council Office) is latitude 23°45'47" N and longitude 89°51'53"E. Arua Union consists of 24 villages and has a population of around 13,800, while Gopinathpur Union has nine villages and a population of about 13,000. The area of the first union is about 9.62 sq km and that of the second one is about 9.75 sq km. On the other hand, the area of Kanchanpur Union is about 3.45 sq km. It consists of seven villages and has a population of around 7,250. All the sites are situated at the lower reaches of the Jamuna basin and at the confluence of the Jamuna, Padma and Ichhamati Rivers.

The area represents a typical floodplain ecosystem of Bangladesh. In Arua, open agricultural fields are encircled by villages, consist of adjoining homesteads. Every year, the open land experiences both aquatic and terrestrial phases. The deepest part of Arua Union forms a *beel*, Arua *Beel*, which retains perennial water. Gopinathpur Union is also characterized by the presence of an extensive wet area, called Gopinathpur *Beel*. This *beel* retains water during the dry seasons, but sometimes is drained out for cultivation of *boro* rice in winter. Gopinathpur *Beel* basically represents the old course of the Padma River. All the nine villages of the union surround the *beel*, except the southern part that faces the Padma.



Map 3.3. The SEMP project sites in the Padma-Jamuna Floodplain, Manikganj District. (Source: CNRS, GIS Unit)

The soil of this area is mainly alluvial. Sandy soil is encountered near riverbanks that support some dry area plants. Traditionally, deepwater *amon* is grown in most of the areas during flood season. Since the mid-sixties high yielding varieties of paddy have been cultivated extensively in the dry season. However, in the recent years there has been a decline in the cultivation of high yielding varieties. Other winter crops, including horticultural crops, are also grown extensively in the agricultural fields and homestead gardens. Some horticultural commodities are grown commercially year round in *bhita* (purposefully raised land mass).

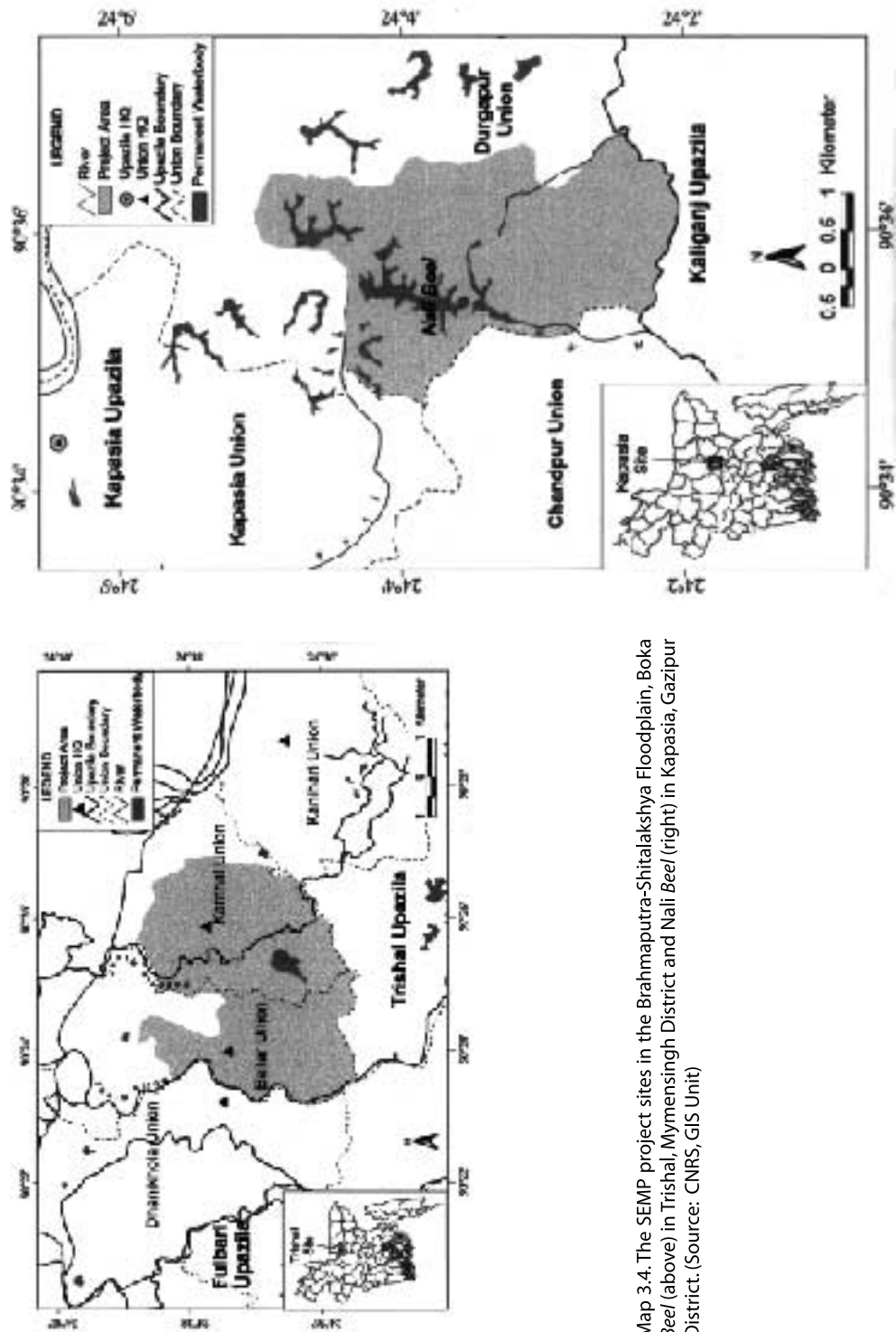
The area is initially fed by local rainfall during April-May, subsequently by backwater of the Ichhamati River and monsoon rainfall. The river water enters the floodplains as early as June through the connecting canals. The further inundation of the area occurs due to over spill of the Padma. The area is deep-flooded in the range of 0.7-3.3 m in Arua while 1.3-4 m in Gopinathpur. The peak flooding occurs in late August to early October. The water starts receding from mid October, and by November most of the floodplain area dries out. The central part of Arua *Beel*, covering an approximate area of about 280 acres, retains some water during the dry season. Gopinathpur *Beel*, however, retains more water covering a relatively extensive area (ca 900 acres).

The homestead gardens provide the main vegetation covers in the project area. Vegetation also occurs along the roads. Rice is the main crop of this area. Agricultural fields harbour varieties of lower plants, mainly the herbs (creeping, floating, emergent, submerged etc.) in the wet season. Permanent water bodies like ponds, along with the margins, support a wide range of aquatic plants with diverse life forms.

Brahmaputra-Shitalakshya Floodplain

Boka and Nali *Beels* are two wetlands chosen in this floodplain to carry out SEMP activities (Map 3.4). Boka *Beel*, located in Trishal *Upazila* of Mymensingh District, is a deeply flooded floodplain system in the Brahmaputra River basin and represents a course of a dead river. The project area consists of six villages, namely Singrail, Kanthal Hodderbhita, Baliarpar villages of Kanthal Union, and Bailor Mathhbari, Bhoradoba and Charpara villages of Bailor Union. The intervention area is about 16.49 sq km and is populated by more than 11,200 people.

The *beel* is connected by a canal to a nearly tertiary river, Pagaria River, which in turn is connected to the Brahmaputra River. The river acts as both feeder and drainage canal. The *beel* is also connected to the adjacent floodplains by three feeder canals. The central part of the beel is about 20 acres, which retains water perennially. In dry season, water depth is about 0.5 meter, but the depth varies from 1 to 4 meters in rainy season. The initial flooding occurs in late May due to local rainfall. Later in the year flooding is caused by back-up water from the river



Map 3.4. The SEMP project sites in the Brahmaputra-Shitalakshya Floodplain, Baka Beel (above) in Trishal, Mymensingh District and Nali Beel (right) in Kapasia, Gazipur District. (Source: CNRS, GIS Unit)

and monsoon rains. The peak flooding occurs in August-September. During that time the maximum flooded area could be about 1000 acres. The drying out starts in the middle of October, and the major part of the floodplain becomes exposed by November. There are about 30 excavated pits (locally called *khada* or *kanda*) scattered in this area. Many of these hold water in dry season and act as a refuge for resident fish species of the floodplain.

The second project site in the Brahmaputra-Shitalakshya floodplain is Nali *Beel* of Kapasia *Upazila*, Gazipur District. A part of Nali *Beel* has been included in the SEMP and contains five villages, namely Mashak, Fulbaria, Palashpur, Durgapur and Kamra of Durgapur Union. This project area covers an area of about 11.36 sq km, and has a total population of around 12,000.

Nali *Beel* is an extensive network of interconnected individual *beels*, locally called *ghop*, and represents an extensive low-lying floodplain area in the locality with some perennial waters in the individual *ghops*. The *beel* is surrounded by a number of hillocks, on which the homesteads are located and form the village lines. The Lakhia River, a tributary of the Brahmaputra, flows on the east of Durgapur Union and is connected to Nali *Beel* by two canals.

The most part of the floodplain area dries out during the lean period, leaving about 30 acres of perennial waters. The initial flooding of the *beel* is caused by local rainfall during April - May. The complete inundation of the floodplain occurs by mid-July due to local rainfall and floodwaters from the Brahmaputra, by when connection between the river and floodplain is established. Peak flooding occurs in August - September, and the area becomes flooded in the range of 0.6-2.7 m. The floodwater starts receding between late September and early October.

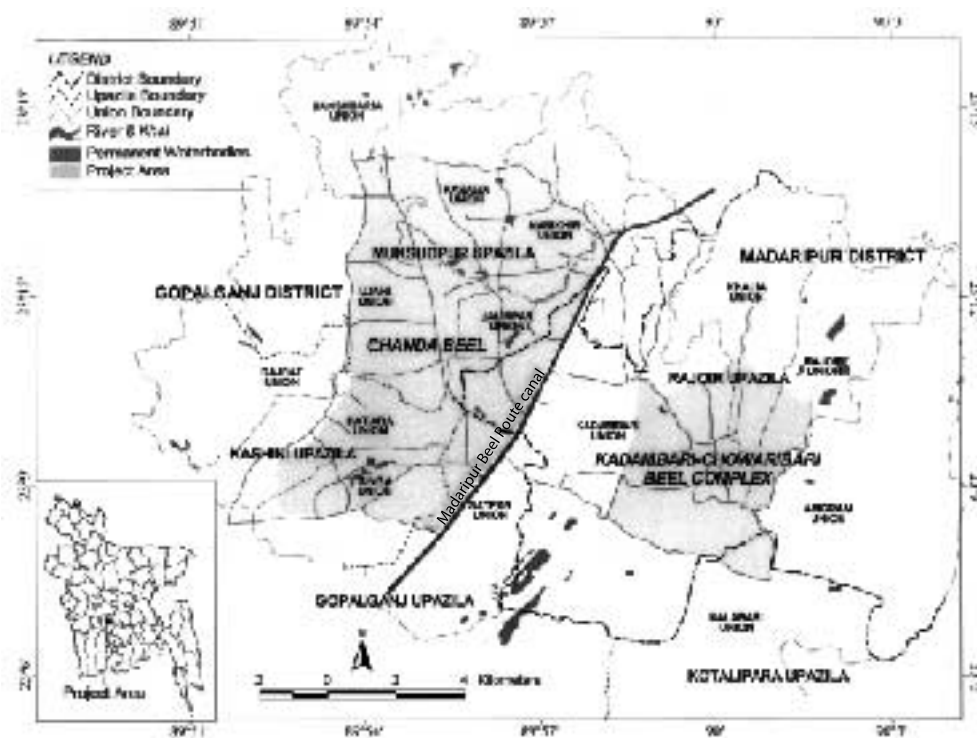
The soil of Boka *Beel* and Nali *Beel* is alluvial; but in the latter area it is slightly reddish and acid in nature. The cultivation of traditional *amon* variety of rice has reduced greatly in recent years, and grown only in very limited area of the peripheral part of the floodplain during monsoon. Improved varieties of *boro* are grown extensively during pre-monsoon period. Horticulture is practiced moderately widely in these areas.

Plant diversity has degraded extensively over the last two to three decades in these areas. Wetland trees, like *hijal* (*Barringtonia acutangula*) and *karoch* (*Pongamia pinnata*), which were once abundant are now almost lost. Homestead vegetations are important in the Boka *Beel* area. Although, there is no designated forest as such in the Nali *Beel* area, some forested areas can be seen dominated by *shal* (*Shorea robusta*).

There has been serious degradation in the local biodiversity and in the environment as reflected in the situation in the *beels* and canals, reduction in natural vegetation, reduced fish production and low abundance in wildlife and other animals and plants.

Madhumati Floodplain

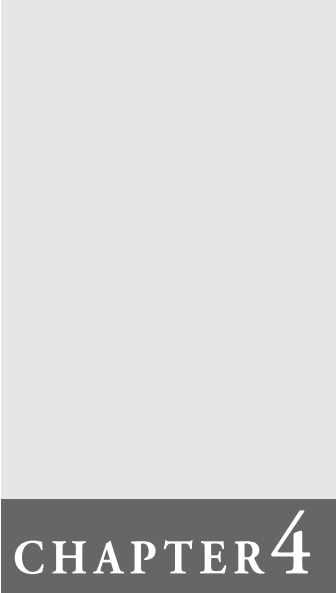
Chanda *Beel* (8050 ha., between latitude 23°08' and 23°15' N and longitude 89°15' and 89°59' E) is one of the most important *beels* in the Madhumati River floodplain ecosystem in the south of Bangladesh, and contains most of the villages under the SEMP project (Map 3.5). It is an interesting wetland occupying a relatively less disturbed floodplain of the inland open water system. The *beel* lies within the Madaripur-Gopalganj peat basin and is surrounded by a number of important roads on three sides except the east side, which is exposed to the Madaripur Beel Route Canal (MBRC). The Kadambari-Chowaribari *Beel* complex (3250 ha.) is also situated in the Madaripur-Gopalganj *Beel* depression on the east of MBRC. The project site in these *beels* cover 31 villages (16 in Chanda *Beel* and 15 in Kadambari-Chowaribari *Beel*), eight unions (Ujani, Kasalia, Nanikhir, Satpar, Jalirpar in Chanda *Beel*, and Khalia, Kadambari and Rajoir in the Kadambari-Chowaribari *Beel* complex), three *upazilas* (Muksudpur, Gopalganj Sadar and Rajoir) and two districts (Gopalganj and Madaripur). The population of the project area is more than 32,500.



Map 3.5. Chanda *Beel* and Kadambari-Chowaribari *Beel* complex- project sites of the Community Based Floodplain Resource Management Project in the Madhumati Floodplain. (Source: BCAS, GIS Unit)

The water level of the *beel* is mainly governed by the water level in MBRC, but seasonal rainfall also contributes. The physical and hydrological features and processes of this floodplain differ significantly from those of other wetland ecosystems. Seasonal variations from predominantly aquatic to predominantly terrestrial environment are the result of large annual fluctuations in river and floodwater. During the monsoon (from June to October) the Chanda *Beel* area remains inundated with water deep up to three meters. The *beel* is connected to the adjacent MBRC and the adjacent Kumar River by sixteen canals. In the wet season, the *beel* harbours a number of species of finfish, several species of prawns, bivalve molluscs, gastropod molluscs, frogs, turtles and aquatic snakes. The *beel* also supports a large variety of aquatic plants. Similar diversity could also be seen in smaller Kadambari and Chowaribari *Beels*.

At the end of October, the water starts to recede from the *beels*, and by December, most of the *beels* becomes dry except some natural trenches and artificial ditches as perennial water pockets, locally known as *kua*. These water bodies are dug by the landowners to allow fish and prawn to take refuge for subsequent harvesting. During the dry season, the land is basically used for agriculture, especially for rice cultivation. Moreover, in some parts of the *beel*, a layer of peat is found, which the local people extract to use as fuel. The ecology is massively influenced by the alternation between aquatic and terrestrial phases.



CHAPTER 4

STARTING OFF THE INITIATIVE

For implementation of the CBHFRM projects activities, the project site selection was followed by recruitment of appropriate and qualified staff to execute the proposed activities. The staff were provided with an orientation on the goal, objectives and outputs of the project. Before field activities were initiated, secondary information relevant to the project had been collected and reviewed. The project team was to make necessary adjustments to the work plan and to make appropriate modifications to the approaches and methods already formulated.

The recruitment of staff is an important and crucial element of the project because the success of a community based wetland resource management project depends upon the quality of its staff. While recruiting, attention was given to the experienced personnel who had better understanding of co-management and community based management issues. The capacity of recruited staff was enhanced through training on participatory rural appraisal, rapid rural appraisal, logical framework analysis, wetland resource management and conservation, and so on. Short-term consultants were also deployed for assisting with improving the quality of work. The job description and responsibilities of personnel were developed, fixed and assigned as appropriate.

The first field activity was to introduce the project, its team and the mandate to the local authority, the development agencies as well as to the community members. A series of participatory appraisals and workshops followed wherein the project activities were discussed and needs were identified. The project team, with participation from the community representatives prepared an implementation plan in which the activities to be undertaken and corresponding time frames were mentioned.

To achieve the project outputs a number of activities were identified and being implemented for wetland resource management and sustainable use under the project scope (IUCN Bangladesh, 2005a). The major activities implemented for achieving the outputs are mentioned in the following chapters of the present book.

Capacity Building of the Project Staff

A holistic wetland resource management from ecosystem and livelihood perspectives has been a new approach to project implementation in Bangladesh. The project team consisted of people from different backgrounds. While IUCN Bangladesh provided the technical support, each of the project sites started with a real multidisciplinary implementation team. This cross-sectoral challenge required a common understanding as well as indication of specific role to be played by each individual.

Therefore, it was crucial that these people have training on general ecosystem management and also on wetland resource management. Moreover, workshops, seminars and coordination meetings have been frequent, specially during the early days of the project. In addition, the project staff visited a few successful wetland management sites abroad to acquire practical knowledge. Information on capacity building initiatives is summarized in Table 4.1.

Table 4.1. Information on capacity building of project staff.				
Place	Type	No. of training events/visits		
		Floodplain	Haor	Total
In-country	Training arranged by own organisation	59	24	83
	Training arranged by other organisation	24		24
Abroad	Seminar and workshop / Knowledge sharing visits			9

All site-level staff received training on various topics in relation to project management as well as specific interventions. Some major instances are listed below.

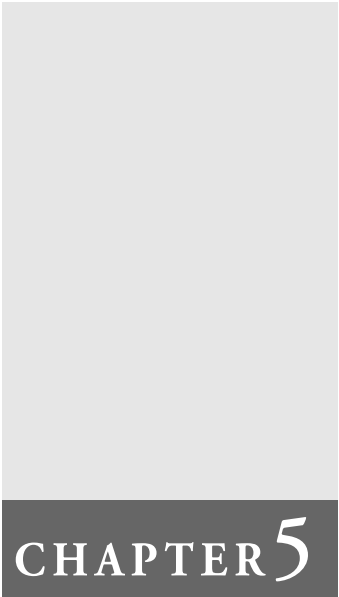
1. Implementation of development project
2. Participatory Rural Appraisal (PRA)
3. Baseline data collection
4. Resource and social mapping
5. Group formation
6. Group management
7. Natural resource management



Staff orientation on poverty survey

8. Environment and environmental law
9. Financial management of development organization
10. Participatory management skill and management style
11. Environmental protection and pollution prevention issues and initiatives
12. Participatory monitoring and impact evaluation of development programme
13. Environment Fund management
14. Improved earthen *chulli* (stove)
15. Rice-fish farming
16. Homestead vegetable cultivation
17. Report writing and analytical skill development

Some CBHFRM project staff visited different places abroad to gain experience, for example, visits to Keladeo National Park, Rajasthan, India (March 2000), Chilka Lake, Orissa, India, and East Calcutta Wetlands, Calcutta, India (Two groups, May 2000). The project staff also participated in the Monitoring and Evaluation Training, Srilanka (November 2002). Besides these, some project staff participated in international conferences/ symposia and presented papers as a part of sharing project experience, namely, the Conference on Education for the New Millenium, Madras, India (March 2000); Sixth International Wetland Symposium, Quebec, Canada (August 2000), Preparation of documents on PrepCom and WSSD activities, Bali, Indonesia (May 2002), Conference on Ecorestoration, Dehradun, India (October 2003) and World Conservation Congress, Bangkok, Thailand (November 2004).



CHAPTER 5

ESTABLISHING THE BASELINES

Baseline information collection is an important activity for assessing the status of an area with a view to monitoring and understanding the changes to take place over time towards a desired goal. The baseline information collected under CBHFRM projects were through PRA techniques and also using other subject specific standard methods. Baseline information was mainly collected on physical, biological (flora and fauna) and socio-economic status, resource exploitation, and utilization and regeneration practices in agriculture, swamp forest and fisheries. The secondary information was also reviewed, analysed and compared with the primary information gathered under the projects. The baseline data often constitute a useful component of awareness raising activities and situation analyses. Details of these baseline surveys are described in a series of site-specific reports (see the Bibliography).

Household Census

In order to develop a baseline on the population and demography of the project area, a household census was conducted focusing on the total population, number of households and homestead, family size, land-holding capacity, sex ratio and (primary and secondary) education

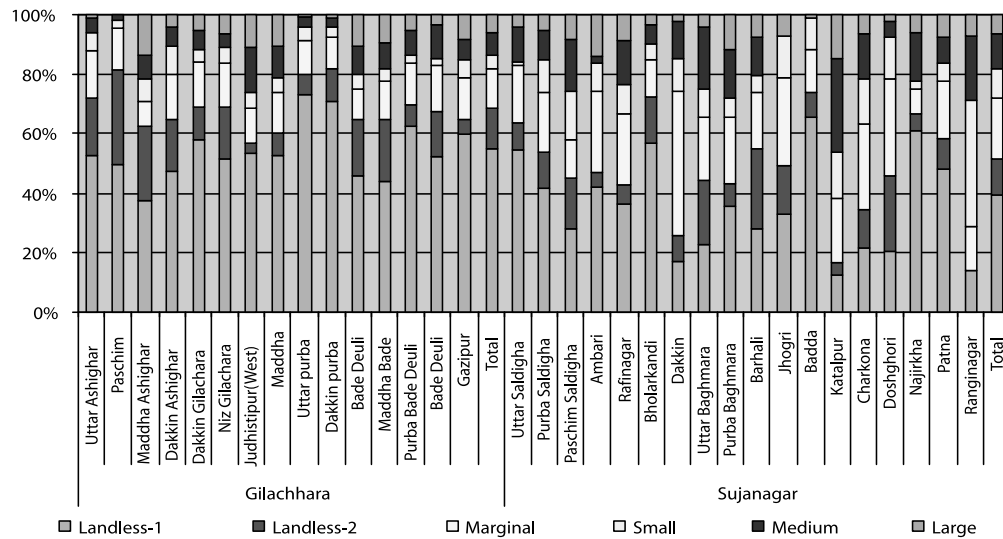


Figure 5.1. Land-holding category in Hakaluki Haor

of the area. The censuses were conducted with a pre-designed questionnaire. Each household or in some cases, representative households were visited for data collection. The Figure 5.1 shows the land-holding patterns in villages of two unions in the Hakaluki Haor area. On the other hand, the Figure 5.2 summarises the educational level, another important socio-economic aspect, of some selected villages in the Padma-Jamuna Floodplain.

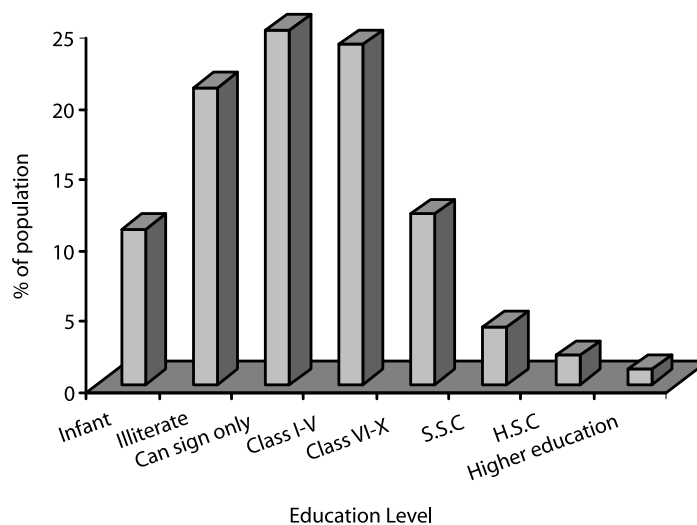


Figure 5.2. Educational level of the people of Arua and Gopinathpur Union (based on data from six villages) (IUCN Bangladesh, 2005e)

Socio-Economic Baseline Survey

After a household census, in-depth field survey was conducted to find out more detailed information from selected represented household samples. It was carried out to assess the socio-economic and livelihood conditions of the people of a project area. A two-stage probability sampling design was followed. The intensive questionnaire survey covered all issues of households and population characteristics, household income (Figure 5.3), income generation activities (Table 5.1), food security, health, ecological status and all issues pertinent to the linkage of people's livelihoods and natural resource usage.

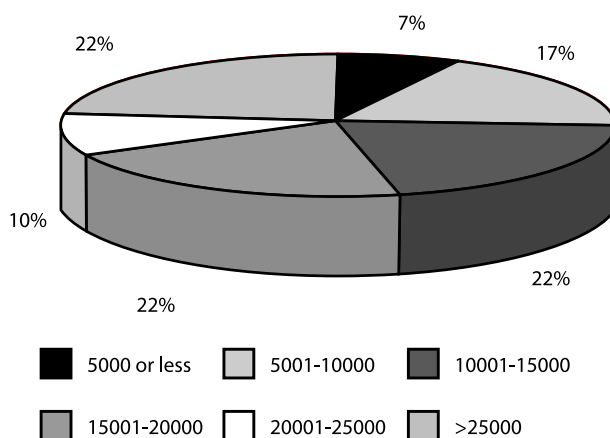


Figure 5.3. Distribution of household heads according to yearly income (in Taka) in Arua Union (IUCN Bangladesh, 2005e)

Type of IGA	Pagnar Haor (%)	Sanuar-Dakuar Haor (%)	Total (%)
Handicraft	2.14	1.90	2.04
Poultry rearing	12.14	9.52	11.02
Homestead gardening	1.43	2.86	2.04
Earth cutting	3.57	2.86	3.27
Maid-servant	12.14	4.76	8.98
Collecting left over rice	5.71	1.90	4.08
Service	2.14	0.95	1.63
Selling fuel	0.00	1.90	0.82
Small business	2.14	0.00	1.22
Midwife	0.71	0.95	0.82
Drying fish	2.14	0.00	1.22
Cattle rearing	1.43	0.00	0.82
Tailoring	0.71	0.00	0.41

Participatory Landuse Survey

Participatory landuse survey is another vital activity which involves the local community in identifying and marking the use of existing land, physical features, social interactions with the land and water resources in the project area. The surveys were conducted at *mouza* level, which is the smallest administrative unit. In conducting the survey, various maps were used viz. *mouza* level parcel maps, *thana* base maps, topographic maps, etc. The villagers who have knowledge on *mouza* map and landuse pattern were selected for the survey. Experienced project staff facilitated the survey. The aim of the survey was to identify and mark the use of existing land, physical features, and social interactions with the land and water resources in the project area. For example, the Figure 5.4 depicts the management system of different *beels* at the Sanuar-Dakuar *Haor* site.

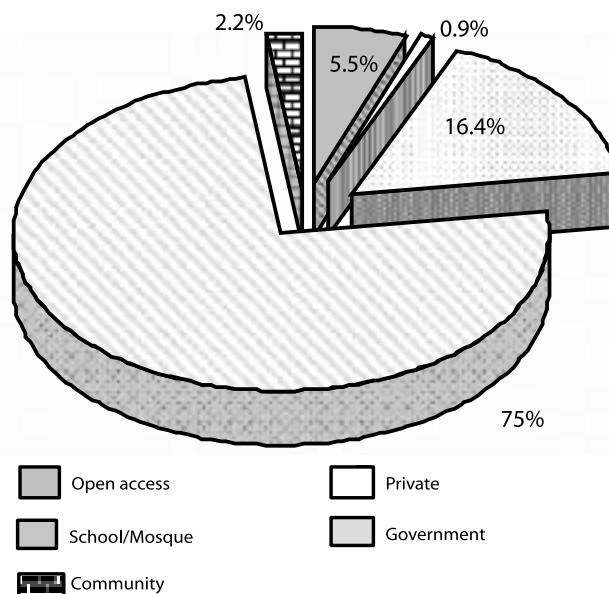


Figure 5.4. Distribution of *beels* under different management schemes at the Sanuar-Dakuar *Haor* site (Islam *et al.*, 2005b)

Poverty Survey

A poverty survey was carried out in the Hakaluki *Haor* project site (IUCN Bangladesh, 2005g). The survey examined the household situation regarding their access to different types of food, factors influencing such access. Using the information, the background of the socio-economic process of the rural people embedded in the notion of poverty was identified for the study area. For example, people of the study area were classified into different land classes in lean and peak seasons on the basis of calorie intake method (Table 5.2).

Table 5.2. Incidence of poverty (head count ratio) of different land classes by calorie intake method.

Land classes	Lean season						Peak season					
	Below poverty		Above poverty		Overall		Below poverty		Above poverty		Overall	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Absolute landless	23	60.5	75	52.4	98	54.1	16	76.2	82	51.3	98	54.1
Landless	10	26.3	28	19.6	38	21.0	2	9.5	22.5	38	21.0	
Marginal	4	10.5	21	14.7	25	13.8	2	9.5	23	14.4	25	13.8
Small	1	2.6	4	2.8	5	2.8	0	0	5	3.1	5	2.8
Medium	0	0.00	5	3.5	5	2.8	0	0	5	3.1	5	2.8
Large	0	0.00	10	7.0	10	5.5	1	4.8	9	5.6	10	5.5
Overall	38	100.0	143	100.0	181	100.0	21	100.0	160	100.0	181	100.0

Note: 1) Poverty line for the moderately poor is assumed for a person/day below 2122 kilocalorie. 2) Lean season = September and October 2002 and Peak season = December 2001 (IUCN Bangladesh, 2005g).

Baseline on Physical Resources

The inventories of physical resources documented the composition of infrastructures (roads, houses etc.), water bodies (canals, *kuas*, *kuris*, ponds and *maitals* (pits)) and tube-wells (hand-operated and shallow) as water sources.

Moreover, other physical structures namely, schools and religious constructions (mosques and temples) were also registered. These data are important as could also be used as indicators to the socio-economic conditions of a given area like understanding living standard from the house data, communication from the road data and education from school data.

The data obtained would consequently provide the community planners with appropriate and sufficient information for designing and implementing feasible and effective interventions for a community based resource management for the area. An example of physical resources documentation is presented in the Figure 5.5. *Maitals* are burrow pits, excavated for raising homesteads and *bhitas* (raised land mass) and for constructing roads.

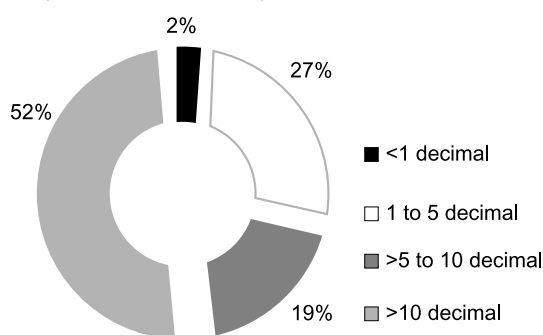


Figure 5.5. Percentage distribution of *maital* size in Arua Union, Manikganj (IUCN Bangladesh, 2005e)

Although these are not primarily for fish culture, but the *maitals* surveyed in Padma-Jamuna Floodplain showed abundant fish stock. They are usually used as a dry season reservoir for holding drinking water for cattle. Sometimes they are also used for bathing and other household activities (IUCN Bangladesh, 2005e).

Baselines on Biological Resources

Plant resource survey

Participatory approach was taken to collect information on the plant resources of the CBHFRM project sites, i.e. local people actively participated (through interviews and group discussions) in collecting information on local vegetation. Transect line and quadrat sampling/plot counting methods were also used. The local people as well as project staff collected plant samples, and their local names were ascertained by interviewing local knowledgeable persons. The scientific names were recorded after consultation with standard identification guide.



Remnants of degraded swamp forest in *haor*

A total of about 300 species of plants belonging to 75 families were recorded from Arua and Gopinathpur areas (IUCN Bangladesh, 2005f). The plant community was represented by about 170 species of wild, more than 50 planted trees and also horticultural species, and 20 species of agricultural crops. In terms of plant resource utilization a total of 45 tree species were used as timber production many of which are exotic and 15 herbaceous species were collected for vegetables. Other uses included sources of medicines, as fodders and as fuel. Tree felling was identified as a problem so were dominance of exotic species, death of trees due to water-logging, and tree pruning and lopping. Similar problems were also identified in

the haor sites. In the Pagnar and Sanuar-Dakuar *Haor* areas, about 150 species of plants were recorded of which 52 species belongs to herbs, 10 shrubs, 54 trees and 29 species of horticultural crop plant. The important wild plant species in the *haor* areas are *hijal* (*Barringtonia acutangula*), *karoch* (*Pongamia pinnata*) and *nal khagra* (*Phragmites kakra*), which were being degraded rapidly primarily due to improper management including over-harvesting.

Fish and wildlife survey

Under the scope of the projects, surveys on fauna were conducted in the project areas for determining the species abundance, providing information on migratory birds, assessing the underlying causes of over-exploitation (e.g. of turtle and other wildlife), etc. Collection of data was based upon the direct observation of the animals in the field. Animals' footprints, trailing, tracks, nests etc. were considered where an animal was difficult to locate. In addition, local people were also interviewed. Table 5.3 summarizes the findings of the wildlife species surveys in the five project areas.



Fish of Hakaluki *Haor*

Table 5.3. Number of fish and wildlife species recorded from different CBHFRM project sites.

<i>Haor/Floodplain</i>	Fish	Amphi- bian	Reptile	Bird	Mammal
Pagnar and Sanuar-Dakuar <i>Haors</i>		6	27	146	18
Hakaluki <i>Haor</i>		5	23	126	22
Padma-Jamuna Floodplain (Arua and Gopinathpur <i>Beel</i> areas)	81	7	23	85	20
Madhumati Floodplain	63	7	21	111	19
Brahmaputra-Shitalakshya Floodplain (Nali <i>Beel</i> area)	79	8	31	83	22

Resource Mapping

Participatory Resource Mapping

Participatory Resource Mapping is a diagrammatic tool used in a participatory assessment of resources of an area. During the process, a facilitator encouraged the villager(s) to make a drawing of their surroundings, in terms of its make-up, the location of physical objects or features with respect to other related or neighbouring objects using a familiar object as drawing material. Following the objectives of the exercise, the villagers provided descriptive information about the features shown on the maps which the facilitator recorded as attributive data. Thus, the outcome of the whole exercise is usually a map of a village environment. In the present project *mouza* maps, which are often similar to the village maps, of the project sites were used to prepare participatory resource maps.

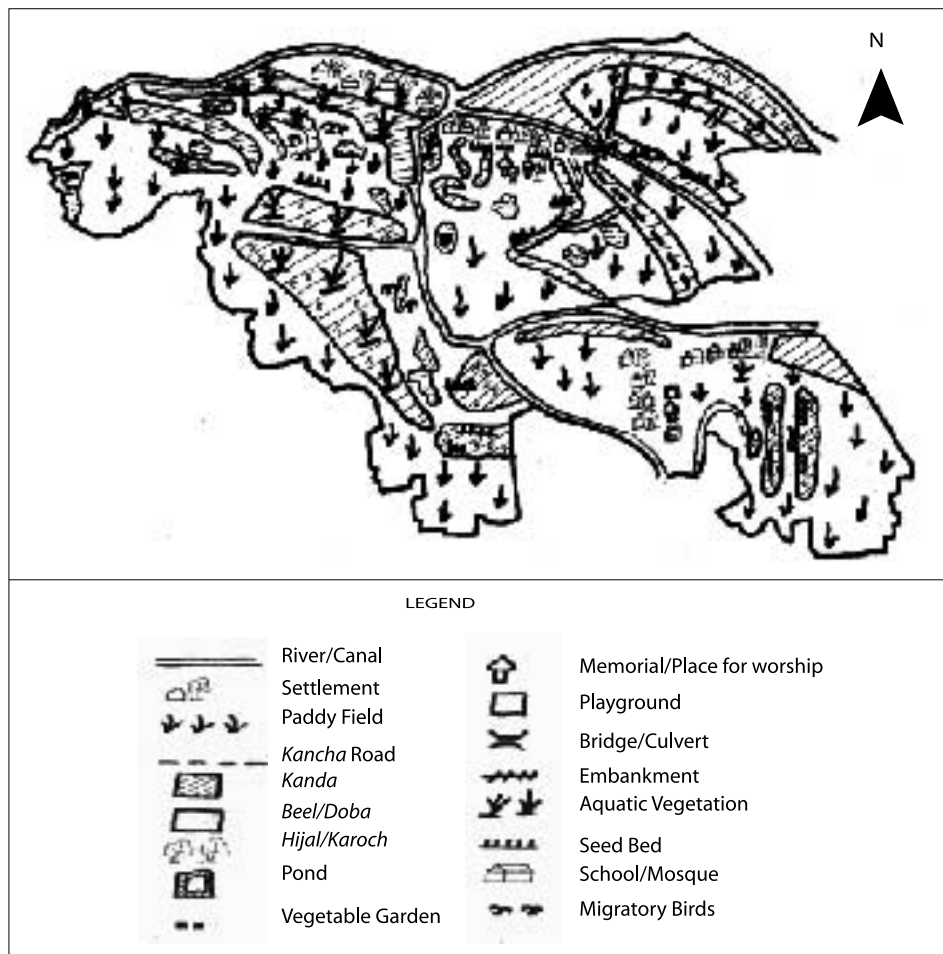


Figure 5.6. Participatory landuse map of village and *mouza* of Gangadharpur in Pagnar Haor (Islam *et al.*, 2005b)

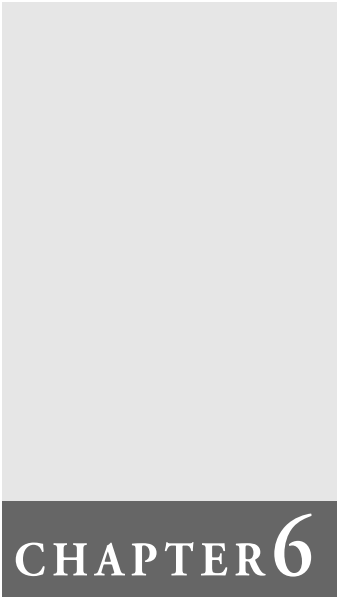
In the floodplain project sites participatory landuse survey (PLUS) was done in 39 villages in the Padma-Jamuna, 14 villages of the Brahmaputra-Shitalakshya and 31 villages in the Madhumati Floodplain. At the *haor* sites, five *mouzas* covering six villages were covered for PLUS (Islam *et al.*, 2005b). The Figure 5.6 shows the PLUS map of Gangadharpur *mouza* in Pagnar *Haor*.



PLUS mapping in Gangadharpur *mouza*

Geographic Information System (GIS)

A GIS is a relational database which uses a common coordinate system for accessing spatial data on certain objects as well as descriptive information defining those. The descriptive information can be stored in tables, graphs or as plain texts. When accessing the system, spatial objects can appear with their linked data on any part of the world. Hence, a GIS is ideal for storing information for making and understanding maps. For a few project sites, GIS information is available providing with wide range of information. GIS facilities are basically used for locating project interventions, namely plantation sites, biodiversity conservation areas, central/community nurseries, wetland re-excavation sites, etc. for documentation, ready referencing and convenience. All the maps in Chapter 3 are GIS-based maps. Different intervention reports also contains GIS maps to show intervention sites.



CHAPTER 6

PREPARING THE ACTION PLANS

Community participation and involvement of different stakeholders in different stages of the project are very crucial factors for the sustainability of a development programme. Understanding the intrinsic nature of the key problems and undertaking appropriate activity plans are also vital to any community based resource management project. In addressing these particular issues, problem census and a series of community workshops are organized for developing intervention plans. In the present SEMP components, site-specific action plans were developed involving the local communities on the basis of feedback gathered from the problem census and planning workshops. In the planning workshops, the community people have prioritised the identified problems. The action plan had been fine-tuned and detailed out in the quarterly work plans on the basis of the field conditions and considering the budget allocations.

Problem Census

Problem Census and Planning Workshops (PCs and PWs) are methodical, comprehensive and participatory development approaches. The PCs and PWs are used to examine diverse, contrasting perspectives of stakeholder groups in regard to their socio-economic and

political backgrounds and conditions. On the basis of information gathered from these activities, resources users and other stakeholders of the CBHFRM project sites became aware of the varying impacts of resource use patterns, livelihood strategies and economic activities on the local environment, sustainable resource management systems, and environmental conservation options available to them. Accordingly, the priorities were determined and the interventions were designed. It was ensured that the programmes were beneficial to all the stakeholders and facilitated community participation in the projects with an aim of resource management. The problem census processes of Pagnar and Sanuar-Dakuar Haors have been documented in a separate report (IUCN Bangladesh, 2005d).



Problem census at the Hakaluki Haor site

Solution Analysis Workshops

The whole process involved four phases. 1) Stakeholder analysis - initial identification of primary stakeholders; 2) Problem census - identification of constraints to environment-friendly, productive activities; 3) Planning workshop - stakeholders make an in-depth analyses of constraints to productive activities, resource management; and 4) System-based workshop - primary stakeholders develop an action plan to address constraints to productive activities, conserving the environment and sustainable resource use patterns. The outputs of a solution analysis workshop is documented as a draft action plan.

Table 6.1. Steps of Participatory Action Plan Development.

Steps	Purpose
Problem Census	
1. First Plenary	Inform the community about the project and help to prevent unrealistic expectations.
2. Participatory Map	Community develops a map of the settlement. Used to help plan future activities.
3. Problem Analysis	Help community to communicate the issues of most concern without group pressures or public scrutiny. Useful for understanding the issues raised during free listing and the interrelationships among issues.
4. Problem Prioritization	Rank the problems for priority action.
Solution Analysis	
5. Stakeholder Analysis	Community identifies 'stakeholders' for priority problems including the 'most vulnerable' groups.
6. Problem Tree Tool	Community identifies root causes of a problem selected for intervention. This information is used to determine the scope of an action plan to address the selected problem.
7. Solutions Matrix	Community lists potential solutions to achieve objectives and then ranks solutions according to criteria. This exercise is used to select specific strategies that to be used to achieve objectives of the action plan.
8. Second Plenary	Community receive feedback on findings of the study and decide on a problem to address during the action planning phase of the study that follows.
9. Draft Action Plan	Community develops a detailed plan (who, what, by when, resources needed) to carry out specific strategies (that were selected in step 7) to achieve the objectives of the action plan.
Consensus Development	
10. Final Plenary and Consensus on Action Plan	Community presents action plan to concerned government officials and other secondary stakeholders of the communities. The meeting is used to agree on a plan of action (as modified during the meeting or afterward, if desired) to address priority problems.
11. Follow-on Actions	Community sets up indicators for participatory monitoring and evaluation of the action plan.

Consensus on Site-Specific Action Plans

Through inclusive stakeholder participation, the output of the solution analysis sessions were reviewed and, if necessary, revised. Thus a consensus on site specific action plans was reached. The whole PAPD process may be summarized in the Table 6.1.



PAPD workshop in Kulaura, Maulvibazar

At the Pagnar and Sanuar-Dakuar Haors of Jamalganj Upazila, six problem census sessions, 12 planning workshops and six PAPD sessions were held. Moreover, 24 workshops with different focus groups in six villages were arranged for more effective involvement of the communities and to widen the stakeholder participation in the planning process. Eight PAPD workshops were conducted in eight villages of the Hakaluki Haor area covering the total target area. Six PAPD sessions were organised at the Padma-Jamuna Floodplain project area, where about 1200 participants from different stakeholder groups were involved. Another eight PAPD sessions were conducted at the Brahmaputra-Shitalakshya Floodplain site. In the Madhumati Floodplain, there have been four 3-day long PAPD sessions. Betgram PAPD covered 10 villages, Beel Chanda covered six villages, Kadambari PAPD covered eight villages and Chowaribari PAPD covered remaining seven villages of the project area.

CHAPTER 7 SPECIAL STUDIES

The wetlands of Bangladesh harbour a large number of plant, wildlife and fish species important for maintaining ecological balance, supporting livelihoods of the wetland people, and also bearing national and global significance for being rare in nature. For sensible management of these resources, in depth studies are necessary. Under the SEMP project, there was provision to conduct such studies of different species with ecological or economic importance. At the CBHFRM project sites several studies were carried out on specific species that are nationally or globally threatened namely, Ganges River Dolphin (*Platanista gangetica*) and Pallas's Fish Eagle (*Haliaeetus leucoryphus*), or just because of their importance in the ecosystem, e.g. the Little Cormorant (*Phalacrocorax niger*). Studies were also conducted on three different animal groups with economic and ecological significance, namely, snails, butterflies and bats. Another study was carried out at all three *haor* sites under the SEMP *haor* component for assessing the fish catch and household fish consumption. Several consultant reports were also prepared under the project on plant resources, wildlife and hydro-climatological features of the project areas. Detailed account of these studies could be found in separate reports. In this chapter a brief description of each study is presented.

Pallas's Fish Eagle (*Haliaeetus leucoryphus*)

Pallas's Fish Eagle (PFE), locally called *kura*, once a very common species in Bangladesh is now a globally threatened bird of prey. Bangladesh, a floodplain delta, enriched with numerous rivers and wetlands extends diverse habitat for this eagle. Status of PFE is Critically Endangered in Bangladesh and Vulnerable globally (IUCN Bangladesh, 2000). Due to man-made and natural causes, habitats of the bird (wetlands and forest) have been depleted seriously in this country. At present, this species is concentrated only in some parts of the country with relatively higher abundance in the north-eastern *haor* basin.



Pallas's Fish Eagle chick in Pagnar *Haor*

Under the present project, studies were conducted at the Jamalganj (*haor*) and Manikganj (floodplain) sites to document the past and present populations and habitat status (through direct observation and RRA), nesting and feeding behaviour, biophysical conditions of the area, existing major threats (through PAPD workshops), and local believes on PFEs, and also suggested conservation strategies. Data recorded in Pagnar and Sanuar-Dakuar *Haor* area (Table 7.1) showed a drastic decline in the PFE population. On the other hand, five nests were identified with five pairs of birds in Arua and Gopinathpur Unions, Manikganj.

Table 7.1. Population status of Pallas's Fish Eagle nests in Jamalganj.

Time	Villages (no.)	Nests (no.)
In 2001-02	13	15
1-2 years before	19	22
3-5 years before	35	39
6-10 years before	50	57
11-20 years before	61	68

A number of anthropogenic and natural threats were identified in the project areas and those included deforestation; scarcity of food, shelter, and nesting trees; killing of the adults; destruction of nestling and eggs; natural calamities; and degradation of the *haor*, *beels* and rivers due to siltation. It was also understood that to conserve PFEs it is very important to create awareness among the local people. Local ecological knowledge, beliefs, myths and rituals are also important in motivating people in favour of the eagle and their conservation. For detailed information, see the technical report on Pallas's Fish Eagle prepared under the project.

Ganges River Dolphin (*Platanista gangetica*)

Under the present project, the Ganges River Dolphin (locally known as *shishu/ shushuk*) was identified as a flagship or indicator species in terms of the health of the floodplain and associated river systems of the floodplain project sites (Madhumati and Padma-Jamuna Floodplains). It was noticed that the dolphin populations were declining in those project areas due to a lack of awareness among the local communities and destruction of the habitats through various physical interventions and pollution activities. Under the CBHFRM projects, censuses were conducted at three different sites as a part of the biodiversity survey. Information gathered during the baseline survey and also through PRA, concerns related to dolphins were identified and later on conservation programmes were initiated and implemented.

Census was done by line transect method in the Surma River in Moulvibazar District, the Padma River in Manikganj District and the Madhumati River in Gopalganj District. Information on human activities, channel types and width, water flow, fishing intensity and information on water traffic were also recorded. Data collection focussed on dolphin population, their behaviour, habitat condition, food, threats (fishing, pollution from catchment sources, hunting and poaching, disturbances, etc.) and mitigation of threats and protection measures. Important habitats were identified. Threats to dolphin were also identification through focus group discussion (FGD) including local leaders, fishermen, boatmen, riverside businessmen along with common villagers etc. and from the visits by wildlife biologists. Detailed information could be found in the technical report on Ganges River Dolphin prepared under the CBHFRM.

Snails

Snails are one of the most significant biological components of the Chanda *Beel* area. The snails of Chanda *Beel* are molluscs of aquatic freshwater variety. They are diverse in types and have significant ecological and economic value.

The collected data included number of snail collectors in the area, market price, family members' involvement, per capita income from snail trading, number of snail traders, location

and time of snail *para* (market) and amount of snail harvested. Suitable snail habitats were also marked on a map. In addition, economic analysis included market monetary transaction share.

Nine species were identified from Chanda Beel. Among the snails found in the Madhumati Floodplain areas the commercial use is common only for two species *Pila globosa* and *Indoplanorbis exustus*. The mean population



Snail harvesting in Chanda Beel

density of snail in Chanda Beel was 1.7 per sq meter. The size ratio for large, medium and small snail was 1:1:1.3. There were as many as 46 *para* in the Madhumati Floodplain area.

Only the soft body of the snail is used as fishmeal. Snail processing takes place at the end users place where snails are converted into fishmeal. More than half of the people engaged in snail trading were collectors. A snail collector earned between Tk 60-90 for 5-7 hours spent in collection of snails. The male:female ratio of snail collectors was 57:43. For detailed information see the technical report on snails prepared under the present project.

Butterfly

Butterflies (Order Lepidoptera, Suborder Ditrysia) are ecologically and agriculturally important as they pollinate during collection of nectars from flowers. In Bangladesh, only a few scientific studies have been carried out on butterflies, especially those from the plain cultivable areas of



A butterfly species of Family Nymphalidae

Bangladesh. Under the project, an attempt was made to collect information on species composition, seasonal prevalence and vegetation relationship of butterflies of such an area taking Arua and Gopinathpur Unions of Manikganj District as study sites.

The one-year study revealed 56 species of butterflies of which seven species *Leptosia nina*, *Terias hecabe*, *Appias libythea*, *Catopsilia pomona*, *Precis almana*, *Elymnias hypermnestra* and *Papilio demoleus* were found throughout the year. A total of 46 different species of flowering plants were listed, to which 52 species of butterflies were found to be associated with. The most common species was Palmfly (*Elymnias hypermnestra*), which showed relation to the palm trees. Some other associations between plant and butterfly were: Ceylon swift (*Parnara bada*) with chilli; *Papilio demoleus* and *Papilio polytes* with pumpkin, *dhundul* (*Luffa cylindrica*) and lemon, and Common grass yellow (*Terias hecabe*) with *kheshari* (*Lathyrus sativus*). The findings of the present investigation may help to formulate proper planning for any butterfly conservation strategy for the plain lands of Bangladesh. Detailed information could be found in the technical report on butterflies prepared under the project.

Bats

A study on bats was conducted at several places of three unions, namely Arua, Kanchanpur and Gopinathpur Unions of Manikganj District under the floodplain component of the SEMP with an aim to conserving the species.

The study included a census on existing bat colonies and identification of the prevailing species. Bats and their colonies were identified at six locations. The identified bat species were, Flying Fox (*Pteropus giganteus*), False Vampire (*Megaderma lyra*), Horsfield's leaf-nosed bat (*Hipposideros larvatus*), Indian Pipistrelle (*Pipistrellus coromandra*) and



A bat colony in Manikganj

Indian Pigmy Pipistrelle (*Pipistrellus minus*). Threats towards bats were identified through discussion with the local people during PRAs and PAPD workshops. The data gathered from the study were used in designing a conservation programme for bat colonies. For detailed information see the technical report on bats of the Padma-Jamuna Floodplain prepared under the project.

Fish Catch Assessment and Household Fish Consumption

In order to establish a baseline of fish yield and species diversity, a comprehensive fish catch assessment study was undertaken in the Pagnar, Sanuar-Dakuar and Hakaluki *Haors*. This assessment was supplemented by household fish consumption to ascertain whether variation in yield had actually been translated into consumption of the local community or not. The parameters that were taken into account were fishing gear (including type, number, net area and mesh size), type of fishermen, time and duration of fishing, species by number and weight, and type of fish and amount of fish consumed by each household. The per capita fish consumption has been the general indicator of fish consumption.



Fishing at the Jamalganj project site

Wildlife of *Haors* and Floodplains

An expert report was prepared to give an overview of the existing wildlife of the *haor* and floodplain in the CBHFRM project areas. The account documented the community composition, abundance and distribution of reptiles, amphibians, birds and mammals, threats faced by them and suggested measures for undertaking necessary conservation.

Plant Resources of *Haors* and Floodplains

A report was prepared to have an overview of the existing plant resources of the SEMP project areas (Choudhury, 2005). This consultant account briefly described the plant communities of the wetlands of Bangladesh and existing utilization of these natural resources. It further

illustrated the vegetation composition in different habitats as encountered in the CBHFRM project sites. Finally, recommendations were proposed to manage these resources sustainably.



Vegetation of the Chanda *Beel* area

State of the Art of Hakaluki *Haor*

A comprehensive expert report was prepared to illustrate the status of Hakaluki *Haor*. The report included data on physical, geological features of the area, discussed climatic and hydrological issues including river systems, described edaphic features, landuse patterns, current condition of the wetlands, their natural resources and their management practices. A review of the previous studies and existing national policies on wetland management were also included in this account.

CHAPTER 8

ORGANISING THE COMMUNITIES

Community based organisations (CBOs) are of paramount importance for the sustainability of a participatory resource management initiative. The establishment of local institutions for sustainable development and make them functional were of great priority under the CBHFRM components of the SEMP. Hence, the local people were organised into various groups, namely vulnerable groups, nature clubs, folk groups, resource user groups, *baira* groups, etc. as parts of different project interventions. In addition, in every village of the project area, a Village Environment Committee (VEC) or Village Committee (VC) or Village Resource Management Committee (VRMC) was formed for continuing with the implementation of the project activities following 'phase out' of the project. In participation from VECs, committees were formed at the *upazila* level (Upazila Resource Management Committee, URMCM) and with representatives from VECs and URMCMs apex bodies are formed at each *haor* and floodplain sites. The organogram for this *haor* and floodplain resource management has been shown in the Figure 8.1.

The purpose and composition of these groups are briefly described in the following sections of this chapter. Moreover, capacity building of these groups as attempted through various training sessions is also described at the end.

Vulnerable Groups

Vulnerable Groups (VGs) (in some areas also called Village Groups with the same meaning) were established with the participation of vulnerable women and men, who are chiefly dependent upon the natural resources of the wetland ecosystems. The groups were provided with training and financial support in the form of seed money to enable them access alternative livelihood opportunities.

Under the *haor* component, 42 groups were formed in the Pagnar and Sanuar-Dakuar *Haor* areas, while 22 women groups were formed at the Hakaluki *Haor* project site.

At the Padma-Jamuna Floodplain site, 34 VGs with 585 members were formed. On the other hand, at the Brahmaputra-Shitalakshya site, 16 similar groups were established and a total of 549 meetings were arranged. In the Madhumati Floodplain, 27 women groups were formed. Besides, 11 *baira* groups were formed in 11 villages of this site consisting of about 180 *baira* operators to facilitate *baira* extension.

Nature Clubs

Nature clubs are important organisations for creating awareness among the school children and local youths on environment, wetland issues and ecosystem conservation. The programme envisages selective efforts in promoting environment education and conservation actions among the future leaders of the project area and natural resource managers of the wetlands. The main activities of the nature clubs facilitated under the present project are organising debates, nature trails, bird watching, field observations, meetings and seminars; the observance of different environment days; competitions like book-reading, essay-writing, art and quiz competitions; folk drama performance; and gardening. These informal institutions were formed with participation from the local young people mostly school, *madrasah* and college students with cooperation from their respective educational institutions. Their organisation and activities are detailed out in Irfanullah and Islam (2005) and Irfanullah *et al.* (2005).

Five nature clubs were established in Jamalganj project area with 251 members. Same number of clubs were established in the Padma-Jamuna Floodplain in Manikganj with 248 members. A total of 41 meetings were organised with them. On the contrary, in the Brahmaputra-Shitalakshya site, 431 members were organised into 11 nature clubs actively pursuing the objective of the clubs. In the Madhumati Floodplain, there were 10 clubs (known as Environmental Clubs), with 253 members.

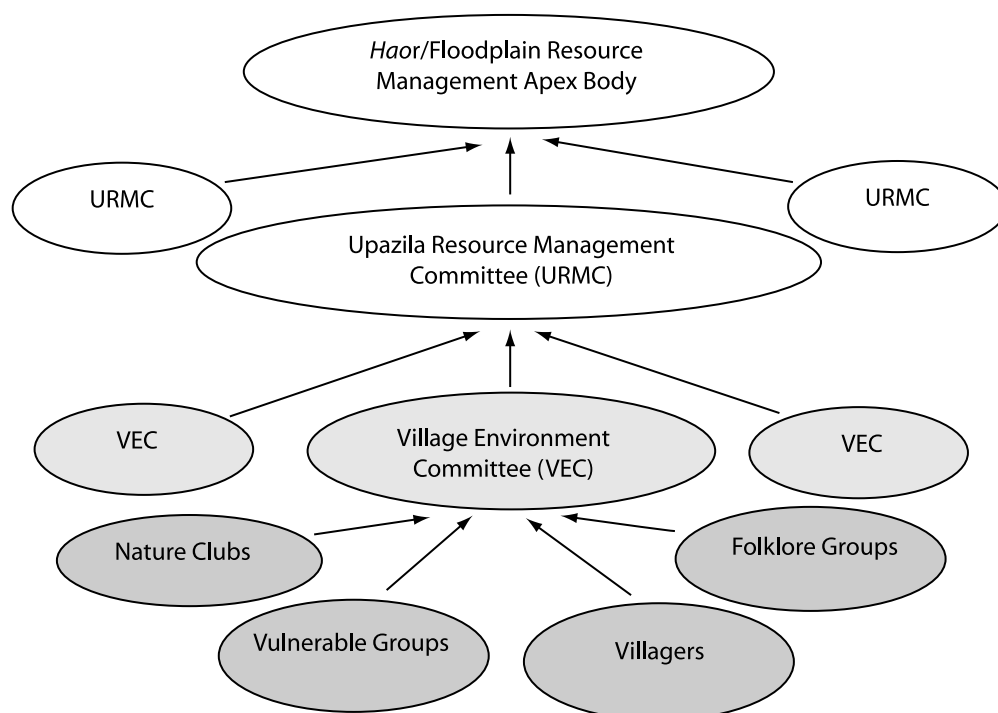


Figure 8.1. Schematic presentation of the proposed community organisations for sustainable natural resource management.

Folk/Cultural Groups

It was revealed through the SEMP initiative that folk performances (e.g. folk dramas and stage shows) are very effective tools to promote environmental awareness among the local communities. A folk drama group with 26 members was formed in the Padma-Jamuna Floodplain in 2001, whereas 'Dak Diye Jai Nattaya Dal' was formed in 2002 in Trishal with 25 members. Along with other professional cultural groups, these groups staged a good number of special shows of folk dramas highlighting environmental problems and conservation needs in the wetlands. The response of the communities to these shows was overwhelming and is discussed under the awareness raising section of the present report. These groups gradually became so united that some of them started to play their roles in wetland resources through voluntary community services. These groups demonstrated remarkable group management ability even in utilization of environment fund available to community organisations through the CBHFRM.

Village Environment Committees

One Village Environment Committee (VECs) was formed in every village with the participation of representatives from multi-stakeholders. The committee members were selected from a

village level gathering where villagers enthusiastically selected their leaders for environment management. Women's participation was ensured from the VGs and other social classes. The size of the VEC varied from 15 to 25 members, depending upon the number of households in a village. In the *haor* areas, these VECs were contracted to be called Village Committees (VCs).

At the Jamalganj project site, 18 VCs were formed with 188 members. A total of 594 VC meetings were organised. In the Hakaluki *Haor* area, on the other hand, more than 300 members have been organised into 17 VCs. A total of 282 VC meetings were conducted there.



Village Committee formation at a *haor* site

A total of 254 members were organised into 26 VECs at the Padma-Jamuna Floodplain site, and a total of 269 meetings were held with them. On the other hand, at the Brahmaputra-Shitalakshya site, 12 VECs were formed with 234 members. In total, 280 meetings were held with these VECs from Kapasia and Trishal. At the Madhumati Floodplain site, 29 VRMCs were formed having 725 members. On average, each committee had 15 to 20 meetings over the reporting period.

***Haor* and Floodplain Resource Management Committees**

A *Haor* or a Floodplain Resource Management Committee works as a federation of the VECs. The representatives from the VECs constituted these *haor* or floodplain level committees. At each of the project sites, at *haor* or floodplain level, at least one such committee is planned to

establish. The committee of the floodplain sites are called Floodplain Resource Management Committees (FRMCs) and those of the *haor* sites are called *Haor* Resource Management Committees (HRMCs). The FRMCs and HRMCs are to act as a platform for coordinating various activities administered by VECs. They are also to act as governing bodies for resolving issues outside the capability of VECs. In line with this approach, it was planned initially to form three FRMCs and two HRMCs in five project sites. But with the varying local condition and large extent of the project areas more FRMC and HRMC could be formed.

In the Padma-Jamuna Floodplain, three FRMCs were formed based upon three administrative delineated areas. At this project site 44 meetings were arranged with these FRMCs. Since the two wetlands (Nali and Boka *Beels*) are far apart within the Brahmaputra-Shitalakshya Floodplain, there were two FRMCs at two sites apiece. A total of 76 meetings of these FRMCs were organised. In the Madhumati Floodplain, there are two FRMCs, one in the Chanda *Beel* area and the other at the Kadambari-Chowaribari *Beel* site, and 18 meetings were arranged with them.

Registration of the CBOs

As there were different types of community organizations different approaches were taken for ensuring legal recognition for these groups. The VECs were accorded legal recognition by registering them with the Department of Cooperative or Department of Social Welfare at the *upazila* level. Few women groups (VGs) were registered with government's Department of Women Affairs.

In the Padma-Jamuna Floodplain, a total of 19 VECs, VGs and FRMCs were registered with cooperative or social welfare departments, while at the Brahmaputra Floodplain site, the number is 12. In the Madhumati Floodplain project area, out of 27 vulnerable women groups four were registered and out of 11 *baira* committees one was registered. Twenty-eight VRMCs were registered out of 29 at this project site.

Capacity Building of the Community

Recognizing that capacity building of the community people around livelihood practices is another key contributory factor for sustainability of such programmes as SEMP, various training sessions on skill development for the community people and other stakeholders were organised under the aegis of this project.

Participants from the VECs and VGs attended the training sessions. The project followed up the training provided to the community members with financial and technical back up with a view to enabling them apply their acquired knowledge and skills. Specifically, financial support from

the CBHFRM Environment Fund was provided to the vulnerable households to enable them access alternative livelihoods, so that they were less dependent on the wetland resources.

Capacity building of the VECs was a major concern all through as the communities were expected to be enabled to sustain the conservation and management activities after the project was handed over to them. Training sessions on Leadership development, natural resource management, financial management, and participatory monitoring and evaluation were organised for the community organisations.



Natural resource management training session at the Manikganj site

Capacity Building of Groups

People of the rural areas in Bangladesh may be known about the indigenous techniques of employment generations from the traditional activities, but still there is scope to promulgate more scientific or modern concepts so that a good profit can be achieved from the same entrepreneurs that they know traditionally. Female or male members of the group traditionally are experienced in cattle raising, duck/poultry rearing, handicraft production and aquaculture, but a small facilitation through training programmes may result in reducing the mortality of domestic lives or creating good market opportunity for their products.

Capacity building trainings for alternative employment were usually provided based on the needs of the members of the group. The trainers, from the project team or hired as a resource person, equipped with well-organised training manual and material, conducted training sessions for the targeted trainees. Local values, beliefs and traditional knowledge were incorporated in the manual blending with the environment conservation concept. The training events were usually day-long and hence organised during the lean-period of the year, ensuring better participation of the community people. Training sessions offered opportunities to establish linkages between the group members and services of various departments of government or other relevant agencies. The available services lying with the Departments of

Livestock, Fisheries, and Agriculture Extension, Forest or BCSIR would create opportunities for community people during raising poultry, cattle, nursery, or any other income generating means.

Four WMTCs were established in Matargaon, Khujargaon, Sukdevpur and Binajura villages of Pagnar and Sanuar-Dakuar *Haors*. At the Madhumati Floodplain site, another four WMTCs were established in Betgram, Beel Chanda, Chowaribari and Dodhara areas.

In Pagnar and Sanuar-Dakuar *Haor* areas, 74 training sessions were held for the VECs and 100 for the VGs. At the Hakaluki *Haor* project site, 25 training events were arranged for the VECs and 51 for the VGs. In the Padma-Jamuna Floodplain, more than thousand VG members were trained through 42 training sessions and another 17 training events were arranged for 500 non-VG participants. At this site, 25 training sessions were organised for the VECs. In addition, 40 people from the VECs, VGs and nature clubs of the Manikganj site visited other project areas. In the Madhumati Floodplain, there were 70 training sessions on 19 different topics for the VGs. On the other hand, 20 training sessions were organised for the VRMCs of this site. In the Brahmaputra-Shitalakshya Floodplain, 320 VG members were provided with trainings on 10 different topics; while 6 training events were arranged for the VECs. The details of some of these trainings could be found in the report on Environment Fund utilization under the CBHFRM projects.

Apart from these, local folk groups were trained on performing drama and other cultural activities. Three such training sessions were organised at each site. In the Madhumati Floodplain, *Baira* Groups and *Baira* Extension Committees were trained in *baira* practices (IUCN Bangladesh, 2005c).

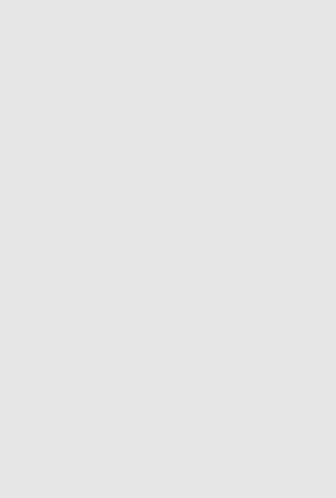
Training Manual Preparation

At each of the floodplain site, six training manuals have been prepared. At the *haor* sites, the number of the training modules were 11. The modules included training in:

- Plantation and swamp forest regeneration
- Swamp nursery development and management
- Accounts keeping and management
- Basic concepts of organisational development
- Capacity building on organisational development and management
- Women in wetland
- Gender issues
- ToT on wetland resource management

Major Interventions for Sustainable Wetland Resource Management

- Participatory monitoring and evaluation
- Fish culture
- Duck rearing
- Cattle fattening
- Homestead vegetable gardening
- *Baira* practice



CHAPTER 9 AWARENESS RAISING

Community people are the key players in the management of wetland resources. For the sustainable management of natural resources, it is important that people living within the *haor* or floodplain ecosystem should be involved in every step of the projects, from problem identification to the implementation of project interventions. However, their roles in relation to their problems had not been identified before the inception of the SEMP. For proper maintenance and use of the resources, they should be made conscious and capable of playing appropriate role. It is also important to affect appropriate changes in the policy and execution levels to keep the ecosystem in order. So, it has been envisaged that environmental awareness and education for the user community and other stakeholders should be an effective means in any attempt of checking depletion of natural resources. Accordingly, awareness has been rendered a major activity under the CBHFRM components.

An awareness campaign is an integrated part of any community based initiative. The main purpose of such movement is to send a message across a target group. Proper communication and awareness are necessary prerequisites for educating the target group about the existing condition and to motivate them to take effective actions to improve it (Figure 9.1). More precisely, communication tools can be used for problem solving, for drawing attention, for motivating about a particular issue, or to change certain behaviours or practices.

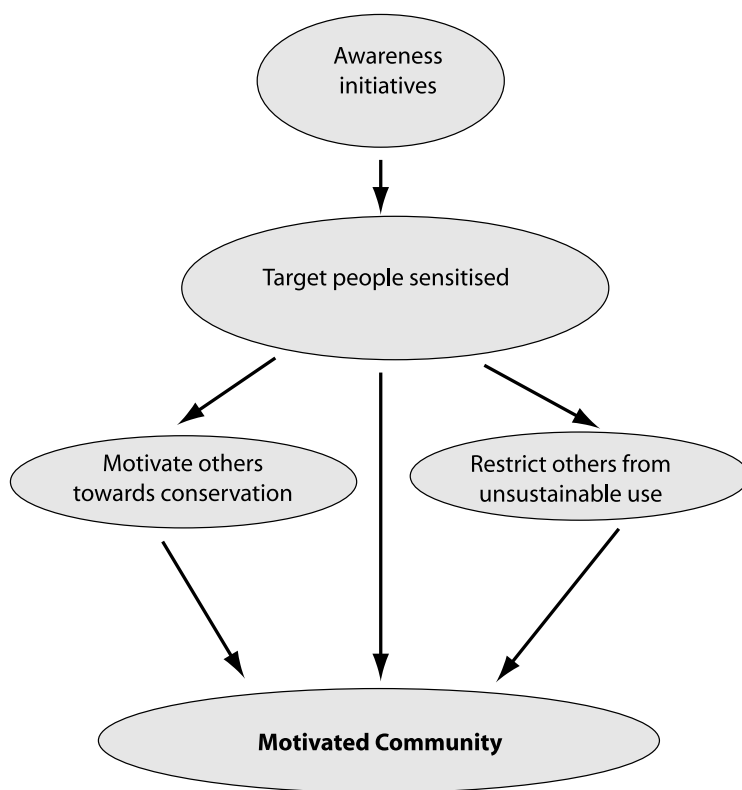


Figure 9.1. Schematic diagram of approach to awareness raising

A number of steps need to be considered while undertaking an awareness programme. These more or less could be identified as 1) issue identification, 2) target group and stakeholder identification, 3) setting up targets, 4) awareness tools development, 5) planning and execution of planned activities, 6) monitoring and evaluation, and finally, 7) impact assessment. In the CBHFRM projects, all these steps were considered since the projects' inception, but had not been formally documented earlier. Field experience and accounts were useful in describing the approach taken under the CBHFRM awareness programme as presented below.

Environmental Awareness under CBHFRM

The awareness activities are aimed at making sustainable management of wetland ecosystems and biodiversity efficient for improved livelihood security of rural community. The goal of environmental education and awareness is to encourage and assist the communities in conserving the integrity and diversity of nature, and to ensure that the use of natural resources is equitable and ecologically sustainable.

Various activities were carried out at the five CBHFRM project sites to raise awareness among the local community and other stakeholders about sustainable resource management (Table 9.1). The major portion of these programmes were awareness events at the community level and in the educational institutions. In addition to these, issue based folk drama performance, observance of environment related days, environmental awareness material (billboards, signboards and leaflets) development and dissemination, nature club establishment, demonstration (detailed out in the Chapter 10) and participation in exhibitions were also conducted. The programmes or activities covered broad environmental, biodiversity, conservation and management issues, but often depicted issues specific to a project area.

Table 9.1. Awareness programmes in Pagnar and Sanuar-Dakuar (October 1998 - September 2005), Hakaluki (October 2000 - September 2005) Haors, and Padma-Jamuna (October 1998 - September 2005), Brahmaputra-Shitalakshya (October 2000 - September 2005) and Madhumati (October 1998 - September 2005) Floodplains.

Awareness campaigns	Pagnar & Sanuar-Dakuar	Hakaluki	Padma-Jamuna	Brahma.-Shital.	Madhumati
Awareness meetings/workshops	102	53	115	119	182
School level awareness programmes	8	16	150	175	-
Environment/Nature Clubs	5	-	5	11	10
Environment related day observance (occasions)	10	13	15	11	26
Environmental knowledge sharing workshops	25	6	10	5	49
Environmental folk drama shows	18	6	112	57	21
Cowboy meetings	20	-	-	-	-
Billboards and signboards	85	82	270	181	530
Awareness programmes on local occasions	-	-	-	-	5

The interpersonal awareness programmes were facilitated by the school teachers, local NGO staff, local knowledgeable persons, local government officials (UNO, UAO, UEO, ULO, UPO and RDO), UP Chairmen and members as well as the CBHFRM project staff. A detailed description of awareness campaign has been described elsewhere (Irfanullah and Islam, 2005; Irfanullah *et al.*, 2005). A brief account of the awareness activities at both sites is rendered as follows.

Awareness Meetings and Workshops

Meetings were organised among the target groups or in the heterogeneous groups. Specific issues discussed in the meetings and the workshops included over-exploitation of natural

resources; causes of environmental degradation; environmental pollution; sustainable use of wetland resources; importance of wetland biodiversity, its management and conservation; importance of plantation; importance and use of medicinal plants; agriculture, farmer and environment; environmental rules and regulations; the use of improved ovens and so on. Meetings were also conducted as necessary to discuss any issue, which was needed to make the consensus and harmonize the issues among the resource users.



Community awareness programme in Jamalganj

At the two *haor* sites, a total of 24 thousand people (Pagnar and Sanuar-Dakuar 14,000 and Hakaluki 11,000) participated in 150 meetings. On the other hand, in the floodplain project sites the total number of participants was about 20 thousand (Padma-Jamuna ca 5,000, in the Brahmaputra-Shitalakshya ca 5,000 and Madhumati ca 10,000) participated in 416 awareness meetings and workshops.

School Awareness Programmes

To enhance the awareness level of young people, various education programmes on wetlands



School students participating in a rally in Manikganj

biodiversity, degradation trend, sustainable uses and conservation issues were organised among the school students of the project area. School teachers also actively participated in such programmes. Knowledge sharing meetings were conducted among the school teachers in the project areas. Primary school teachers were selected as they play a vital

role in building the ethical foundation of the people in early childhood. At the *haor* sites, the

total number of participants were more than five thousand including teachers attending in 24 programmes. At the floodplain sites, more than 16,000 students and teachers (Padma-Jamuna ca 9,000 and Brahmaputra-Shitalakshya ca 7,000) participated in 325 school awareness programmes.

Nature Clubs

A total of 251 students and young people of the *haor* project areas were organised in 10 environment/nature clubs, whereas at the floodplain sites 947 members were enlisted with 26 nature clubs (Padma-Jamuna 248, Brahmaputra-Shitalakshya 431 and Madhumati 253) (Table 9.1). These clubs organised various activities such as debates on environmental issues, nature walks, camping, inventorying the local status of different natural resources, and organising and participating in programmes for observing environment days (see Chapter 8).

Competitive programmes

Arrangement of incentive based competitive events is a very effective tool for motivating people, especially students and young people. The incentive is not to be given only through prizes and certificates but also through social recognition as a champion within the community. At a *haor* site, an art competition was organised for students to observe the World Environment Day in 2003. A quiz competition and an essay competition were also arranged in Jamalganj and Kulaura respectively in 2005 to observe the World Wetland Day. Seven debate sessions were organised at the Brahmaputra-Shitalakshya site while, two were organised in the Madhumati Floodplain on different environmental issues. Several essay competitions were arranged in the Padma-Jamuna and Madhumati Floodplains for environmental day observance. In Padma-Jamuna Floodplain, a quiz competition was organised while four book-reading competitions were arranged in the Madhumati Floodplain. An art competition was arranged at the Trishal site.

Libraries

A library can be a good source for acquiring information on biodiversity, environment and nature. However, environment related books were found to be scarce in the libraries of local educational institutions. Around 40 different kinds of environment related books were donated to eight libraries, including one mobile library, of the educational institutions and environment clubs at the Madhumati Floodplain site. The total number of books donated was more than 300. In this way, a small section with environmental books was developed in those institutions. The club members and the students of the respective schools were the users of these libraries.

Local herbarium and museums

A herbarium is a collection of well documented, preserved (usually dry) plant samples equipped with name, geographical and chronological data, and typically archived in natural history collections. Dry plant samples provide data for systematic and area-geographical studies. More importantly, herbariums are important tool for awareness raising and community motivation. A local herbarium is maintained at the project site of Chanda *Beel* area housed in Bangaratna College, Kaligram.



Chowaribari High School Museum, Rajoir

A museum is a depository for collecting and displaying objects having scientific or historical or artistic value. Two local museums, mainly zoological, were established in Chowaribari High School, Chowaribari and Government Kabi Kazi Nazrul College, Satpar. There are good collections of local fish and reptile specimens, and also some specimens of insects. Eight local varieties of *amon* rice were also kept in the museum. During the pond re-excavation in Betgram village, animal fossils, ancient pottery and handicrafts, peat and old branches of tree were unearthed and preserved in the museum. Local environment club members maintain the museum with active support from the school and college authorities.

Observance of Environment Related Days

Various environment related days, namely the World Wetlands Day (2 February), the World Forestry Day (21 March), the World Heritage Day (18 April), the Earth Day (22 April), the International Day for Biological Diversity (22 May), the World Environment Day (5



Celebration of World Wetlands Day 2003 in Jamalganj

June), and *Matsho Pakkha* (Fisheries Fortnight, observed nationally) were observed in different ways at all the CBHFRM project sites (Table 9.1). The activities included rallies with colourful festoons and banners depicting messages highlighting the relevant day's significance; discussion meetings; stall display; cap, T-shirts and poster-leaflet distribution; video shows and extensive use of PA systems. In addition, environment clubs and schools were facilitated to organise competitive programmes for school children as discussed above. In the Padma-Jamuna and Brahmaputra-Shitalakshya Floodplains, about 10 thousand people participated in the rallies, whereas in the Madhumati Floodplain, a total of about 3,500 people participated in those events (40% were female).

Knowledge Sharing Workshops/Meetings

Knowledge sharing meetings and workshops were arranged with the users of wetland resources such as farmers, fishermen, etc. and also with village committee/vulnerable group members, NGO and social workers, government officials and UP representatives. The purpose of these meetings was to share experiences, tools and techniques which might help better conserve and manage the valued wetlands. This is a meeting for identifying best practices available within the community. At the two *haor* sites, a total of 600 people participated in those workshops. In the Madhumati Floodplain, on the contrary, 1,700 people including 34% women attended the knowledge sharing meetings.

Communication Materials

Information, education and communication materials are very effective tools for mass awareness generation. Awareness materials produced under the SEMP included signboards and billboards, leaflets, calendars, wall-magazines, booklets, newsletters, posters and also features in newspapers.

Billboards and signboards

In total 167 billboards and signboards were erected at the *haor* sites, whereas the total number was 981 for the floodplain project sites. The main issues focused on were fish conservation, wetland conservation, plant conservation, conservation of economically and ecologically important animals, medicinal



A billboard promoting conservation of swamp trees

plants, using IPM, promotion of energy efficient options, and so on. These were erected in common public places, like the crossroads, market places, bus/launch/ferry terminals, by wetlands and conservation areas, in/by schools and religious institutions, etc. at all the project sites.

Leaflets

A total of seven different types of leaflets were published under the SEMP in the Padma-Jamuna and Brahmaputra-Shitalakshya Floodplains. In the Madhumati Floodplain, on the contrary, six leaflets were produced. In all these, issues included importance of trees, IPM, public health, conservation of biodiversity in general, conservation of threatened species and medicinal plants.



A billboard promoting conservation of wetland birds

Posters

Three posters were published under the *haor* component depicting 41 threatened bird species of Bangladesh. The SEMP team at the Madhumati Floodplain published and disseminated a poster titled *Bairay Sabji Chash* (Floating Vegetable Garden) in 2002. Two more posters were



printed under the *haor* and floodplain components on the occasion of the World Wetlands Day 2003 and 2004 (photographed on the left). One six page calendar was printed in 2003 depicting medicinal plants, environmental degradation, wildlife and social movements in favour of environment conservation.

Magazines and booklets

Jalabhumí Barta was a printed wall-magazine published under the Madhumati Floodplain component (photographed on the right). Most of the articles, features, news items, poems, general knowledge items and stories were written by the local people like school and college teachers, UP Chairmen, NGO workers and professional journalists, along with the project staff. Seven issues of this magazine were published. Students of local school and colleges of the project sites also published wall-magazines and newsletters especially in the Chanda Beel area on different occasions or on specific topics. Booklets on migratory birds, fish, insects and bird nests were also published by the project team at the Madhumati Floodplain site to generate interest in nature among the school students.



Newspaper features

Two features were published in the national newspaper in 2003. These illustrated the experience of a few journalists at the SEMP project site and adjacent areas in Manikganj, and were written from an ecotourism perspective. These highlighted different conservation initiatives taken under the SEMP at this floodplain site.



Vegetable demonstration plot in Mashak, Kapasia

Demonstration activities

In the *haor* areas, demonstration activities included compost production, floating nursery, turtle pond, solar energy panels, biogas plants and improved stoves. On the other hand, at the Madhumati site, demonstration sites included *baira* (floating garden)

cultivation, breeding ground for birds, and fish cultivation ponds. Demonstrations of IPM techniques, compost pits and bio-gas plants were done at the Manikganj and Brahmaputra-Shitalakshya sites. Beside these, biodiversity conservation areas for plants, wildlife and fish were common in all project sites so was turtle hatchery or ponds. Medicinal plant gardens/nurseries were also common in all sites. Conservation sites for snails and dolphins were established only at the Madhumati site. Details on some of these demonstration activities can be found in Chapter 10.

Folk Drama for Environment Conservation

Folk drama or popular theatre is one of the communication media that can be used very effectively. Folk drama groups stage such dramas with selected scripts in different villages, cluster villages or *bazars* under a temporary shed. A large number of environmental theatres were arranged at different CBHFRM project sites. The folk dramas were arranged in the school compounds, temple/church/*asram* precincts, open fields, SEMP field offices and market places, mostly during evening. Project personnel and community members helped to organise these shows. Public address (PA) systems were adequately used in an area to invite people to the programmes. Generally the length of the performance was one and half hour to two hours.



Folk drama performance at the Madhumati Floodplain site

At the *haor* sites, all the dramas were performed by a professional folk drama group. In the Padma-Jamuna and Brahmaputra-Shitalakshya Floodplains one local drama group was formed at each site under the project and they performed most of the shows there. In the Madhumati Floodplain, nine local drama/ cultural/ environmental clubs staged most of the folk environmental dramas. At the *haor* sites, a total audience of over 9,200 (around 6,400 at the Jamalganj site and around 2,800 at the Kulaura site) enjoyed 24 shows. At the Manikganj site, 120 to 170 thousand people, whereas in the Brahmaputra-Shitalakshya Floodplain, a total of 40 to 60 thousand people enjoyed a grand total of 169 shows. A total of 21 stage shows were conducted in different villages of the Madhumati project site and around 26 thousand people enjoyed those shows of which 44% were women.

The main topics touched upon in the dramas were importance of natural resources and their degradation, tree (swamp) nursery and plantation, wildlife conservation, fish conservation, re-excavation of water bodies, environment pollution, its causes and consequences, medicinal plants and their importance, use of organic fertilizer, IPM, improved fuel-efficient ovens, bird hunting, *baira* cultivation, NGO's responsibility, environment fund and so on. All these performances were highly accepted and appreciated by the local people.

Participation in Various Fairs

For raising awareness and ensuring sharing of experience of the project interventions, the CBOs participated in many plant fair, agricultural fair, etc. The CBHFRM field team at *haor* sites, participated in Brikkha Mela (Tree Fair) and Krishi Mela (Agriculture Fair) organised by the *upazila* and district administrations. The project teams at the Manikganj and Trishal-Kapasasia sites also participated in Tree Fairs and Agriculture Technology Transfer Fairs. At the former site, they also organised Barsha Mela (Monsoon Fair) in 2003 with spontaneous participation from the local people. A three-day long Jalabhumi Mela (Wetland Fair) was organised by the SEMP team in the Madhumati Floodplain on the occasion of the World Wetlands Day 2003. It was participated by the NGOs, community based organisations (CBOs) and local stakeholders to make the local community aware of the importance of wetland resources and actions needed for their conservation. SEMP team there also participated in Tree Fairs at the *upazila* level and won prizes. A photo exhibition was organised by them on the occasion of the World Environment Day 2002.

Preparation of Visual Aids and Arranging Shows

Photographs, flipcharts with sketches and documentary films were prepared on various activities of the projects. These photographs and films were shown to local community to boost up their enthusiasm and spirit of involvement in project activities. Visual aids are also the most effective tool for implementing awareness programmes. Showing and sharing stories of one community and another through photographs and other visual aids was found effective to communicate and motivate people for new endeavours.



Video show in Chanda Beel

Video shows on wildlife, fish, education and social rights were conducted at common public places (market place, club house, school compounds, etc.) at the project sites and also on the occasion of local religious festivals. At the Madhumati site, more than 14 thousand people enjoyed such video shows, where about 35% were women.

A short documentary film was produced in 2005 under the SEMP-IUCN components. Along with other project interventions, the film depicted the conservation issues of the wildlife, fish and flora of the project areas and also illustrated the alternative livelihood options for the local communities as promoted under the projects.

Others

Bauls are native folk singers of rural Bangladesh. The villagers like their songs very much because of their spiritual and also down to earth meanings. Under the SEMP initiative, *bauls* of the project area in the Madhumati Floodplain were encouraged to write and perform songs with environmental issues. Local festivals, and religious and cultural events were suitable for mass awareness raising. Some major programmes of this type were organised in Kadambari Asram Mela (fair), Jalirpar boat race, Khalkula Mela, Betgram Mela and Jalirpar/Banogram Mela. Banners and posters with various environmental messages were erected, leaflets on environmental issues were distributed, and stalls were built.

CHAPTER 10 DEMONSTRATIONS

A number of demonstrative initiatives were taken, often in the form of establishing plots, in the project areas. The purposes of these plots were to inform people about the restoration/rehabilitation of lost species/ecosystems, and safeguarding indigenous knowledge or alternative livelihood options. Local as well as interested people from various places visited these sites. Such visits were often accompanied by explanatory speeches by the project staff highlighting the significance of such interventions. In some cases, these plots were further used to train community people, especially during the training sessions on sustainable income generation. In this chapter, demonstrations on floating gardening (*baira*), seed bank, integrated farming including IPM and biofertilizers, ecotourism and medicinal plant nurseries are described. In Chapter 12, demonstration of alternative energy options are described. Conservation areas for biodiversity as a whole, and also for fish, turtles, snails are described in Chapter 16.

Floating Gardens: *Baira*

Floodplain

The rearing of plants in nutrient supplemented water, but without soil is called hydroponics. *Baira*, a form of hydroponics, is an age-old practice of crop cultivation in the floodplains of the southern parts of Bangladesh (e.g. Barisal, Gopalganj and Pirojpur Districts). In this method, plant materials are used to construct thick, floating platforms on which vegetables and other

crops are cultivated, and seedlings are raised in rainy season. In addition, *baira* residue is used for winter vegetable gardening in preparing beds and as biofertilizer. *Baira* is also locally known as *gathua*, *geto*, *daap*, *gatoni* etc. Being one of the most common aquatic plants of the wetlands of Bangladesh, water hyacinth or *kachuripana* (*Eichhornia crassipes*), is now the major ingredient of a *baira* platform (IUCN Bangladesh, 2005c).

One important characteristic of a floodplain area is that it remains under water for at least four months per year, if not more. During that time, many people remain unemployed because of the lack of cultivatable lands. As a result, most of them have to depend upon only one crop per year for subsistence. Under such condition, *baira* cultivation or floating gardening could be a useful and effective method for improving the social and economic conditions of the local population, especially the poor and the vulnerable. It also has agricultural and ecological benefits because of its environment-friendly approaches. Keeping that in mind one of the major interventions identified in the Madhumati Floodplain area under the SEMP was to promote *baira* as an alternative income generation activity (IUCN Bangladesh, 2005c).

The *baira* extension initiative was guided along the principle of involving people to improve their conditions using their natural resources in a sustainable way. Four major stages were adopted for the present *baira* programme: i) problem and need assessment, and option ranking, ii) participatory planning, iii) planned interventions, and finally, iv) monitoring and evaluation.

Water hyacinth is the main constituent of *baira* in Gopalganj. *Durali* (*Hygroryza aristata*) is used to make pods, locally known as *guti* or *tema* to facilitate seed germination. The construction of *baira* has been described in details in IUCN Bangladesh (2005c). In the Chanda Beel area, the length and the width of *bairas* vary a lot: the length ranges from 15-45 ft and the width, 5-9 ft. A freshly prepared *baira* is usually 6 ft high, but can be less in some cases. The dimension of *baira* shrinks significantly over time. One *baira* usually costs Tk 300-400 to make; there is no cost involved for materials at the project site, only the labour cost has to be counted. About 30 species of vegetables, spices and other crops were cultivated or raised for seedlings in the project area. Some important species include, Bottle gourd (*Lagenaria siceraria*), Ladies finger (*Abelmoschus esculentus*), Chinese amaranth (*Amaranthus tricolor*), Spinach (*Spinacea oleracea*), etc.

The present *baira* initiative in Gopalganj was concentrated in 11 villages, namely Beel Chanda, Betgram, Barampalta, Daria, Goalgram, Nanikhir, Patkelbari, Rahuthor and Singa villages of Chanda Beel, and Kolabari and Ramnagar villages of Baghair Beel. All the *Baira* Extension Centres and their committees were established in these villages between 2000 and 2003. The

total member of these committees were about 180. *Baira* had professionally been practiced, mainly to raise seedlings, by about 22 families in Nanikhir village. Hence, expert assistance was received from this village while promoting *baira* in the project area.

At the initial stage, assistance was provided to the *Baira* Centres/Committees to motivate and train poor household members to adopt *baira* cultivation. Such facilitation included training, demonstration plots, supply of *baira* platforms and seeds/seedlings, cross-visits to other areas, and fund allocation.

In total, 15 training programmes were conducted to educate *Baira* Committee members and other interested people (including staff of local NGOs) about *baira* cultivation. A total of about 400 people (40% women) participated in those programmes. A local welfare society in Rahuthor village of Chanda *Beel*, showed interest in SEMP *baira* initiative. A total of 369 members of their 20 groups, made up of poor women of the village, were also trained through five training programmes. The training topics included methods of *baira* preparation, crop selection, crop rotation and so on. In total, about five hundred demonstration plots were established in 11 villages with *Baira* Extension Centres over 2000-2003. All the *Baira* Extension Centres were also financially supported from the fund allocated for demonstration activities and also from the environment fund.



Gourd seedling raising on *baira* in Chanda *Beel*

A number of field visits were organised to Nanikhir village from other villages to witness *baira* practice and gain experience on that. Moreover, a team consisting of *Baira* Committee members and project staff visited Barisal (Banaripara *Upazila*) and Pirojpur (Sharupkati and Najirpur *Upazilas*) districts where *baira* had traditionally been practiced. Such visit enhanced the capacity of the people associated with the *baira* extension initiative and the lessons learned were useful to improve the understanding of *baira* farming and practice in the SEMP project area.

Some studies were undertaken on growing vegetables, raising seedlings, profits from vegetable cultivation and seedling raising, and contribution of *baira* to the family income. Moreover, studies were also conducted on cultivation techniques and comparing villages in the project area.

Under the *baira* extension initiative, a total of 1700 *baira* platforms were prepared by about 180 members from 2001 to 2004. The total expenditure was about 652 thousand taka (making *baira*, cost of seeds, transport, etc.) and the members earned almost Tk 1.5 million by selling seedlings and vegetables. The cumulative profit was about Tk 844 thousand. The profit would be higher if the consumption by the farmers and their neighbours and relatives are considered.

Haor

On a trial basis, two *baira* platforms were established in September 2003, one in Binajura village, Fenerbak Union by Pagnar *Haor*, and the other in the ditch within the project office compound in Jamalganj, Sunamganj District. Seedlings of pumpkin and wax gourd were raised on those platforms. Each freshly made plot was 30 ft long, 9 ft wide and 6-7 ft high. About 1000 seed germinating pods, made up of *Hygroryza aristata* (locally called *futki ban*), were placed on each *baira*. The seedlings grown there were distributed among 153 families in exchange for token money. Out of this sale, some money was deposited in the village committee's account.

Seed Bank

A seed bank is a tool for *ex situ* conservation of plant resources. Seed bank is only applicable for seeds with long viability. But many indigenous practices have the options to store even very short viable seeds. These indigenous technologies have been sought from the community and at a common place there has been few seed banks established as a part of demonstration. A seed bank with 29 rice varieties, including deep water varieties, and two jute species was established at the Trishal project site. Another seed bank with 34 indigenous crop varieties, mainly that of rice, was established at Maluchi in the Padma-Jamuna Floodplain.

Integrated Farming

The goal of deploying Integrated Farming Systems (IFS) in rice production is to demonstrate, at

the field level, alternative rice production strategies that reduce inputs while maintaining high grain yields. The conventional system aiming to produce the highest yields in the world requires high amounts of synthetic nitrogen fertilizer, several pesticide applications, and sophisticated agriculture management. Alternative management practices ensure less production inputs and examples are straw residue incorporation into the soil to conserve N, leguminous winter cover crops as an alternative N source, and water depth management for weed control and so on. One of the interventions of the present project was the demonstration of alternative rice production methods to promote sustainability and to distribute applicable information using a farmer-to-farmer extension model.

Sixteen demonstration plots of vegetables viz. tomato, potato, bean, pumpkin, amaranth spinach, cauliflower, and cabbage were established at the Jamalganj site. On the other hand, 54 vegetable plots were established at the Hakaluki *Haor* site for increasing nutritional status as well as income of the villagers.

At the Manikganj project site, 38 agriculture plots (a total area of 678 decimals) were established by about 50 farmers to demonstrate environment-friendly, organic agriculture practices viz. 13 plots in Arua, 16 in Gopinathpur, and 9 in Kanchanpur Unions. A good number of local jute, rice and vegetable varieties were cultivated in those plots. Vegetables namely, amaranth, Indian spinach, brinjal, chilli (*Bogra city* variety), mustard, radish (red and white varieties), onion (*Taherpuri* variety), pumpkin and papaya (honey dew variety) were cultivated in 32 plots. On the other hand, rice (varieties BR-29, *Molla Digha* (*amon*) and *Bawali* (*amon*), etc.) and jute (*Tosha*) were cultivated in four and two plots respectively.

A total of 43 agriculture demonstration plots (a total area of 350 decimals) were established with about 30 farmers in the Trishal-Kapasias project areas till early 2005: Kanthal Union 19 plots, Bailor 17 plots and Durgapur seven plots. Among these, four were for jute (*Deshi pat*) and 18 were for rice (varieties like *Ropa aus*, *Boro*, *Ropa boro*, *Paijam*, *Amon balam*, *Karba balam*, *Kiron mala*, etc.). Cultivation of vegetables namely, potato, onion, cauliflower, tomato, radish, chilli, bottle gourd, cowpea and ladies finger were demonstrated in 21 plots.

In the Madhumati Floodplain, three indigenous rice varieties and three summer crops were demonstrated for IFS.

Integrated Pest Management (IPM)

IPM is a system for minimizing the impact of vectors and pests by using a variety of control procedures, and decreasing the chemical input to the environment. This is basically a part of the IFS. However, larger farmer communities adopted this system having been convinced of direct and easily understandable benefits. A total of 20 VEC members received IPM knowledge

in Pagnar and Sanuar-Dakuar *Haors*, whereas the number of trainees was 30 in Hakaluki *Haor*. In the Madhumati Floodplain, two IPM demonstration plots were established, and 430 people were provided both with technical and logistic support for practicing IPM. In the Brahmaputra Floodplain, there were 22 demonstration plots,



Demonstration of IPM techniques (light-trap) in Trishal

and 8 VECs and 826 farmers were provided with IPM support. On the other hand, in the Padma-Jamuna Floodplain, a different approach was taken. There, 20 VEC with 254 members were provided with IPM support. There were 35 demonstration plots, and at least 375 people received information on IPM from this floodplain project site.

Biological fertilizer

Alongside IPM, promotion of biological fertilizer was targeted towards reducing chemical inputs into the environment. In most cases, the biological fertilizer used were produced locally with the SEMP support. In 2000, one demonstration compost pit was established in each of three villages (Matargaon, Khujargaon and Rajapur) of Pagnar and Sanuar-Dakuar *Haors*. Compost was produced from water hyacinth, cow dung and other waste products from the



Demonstration of composting in Arua

cowshed. Compost made in those pits was distributed among the local farmers. A total of 121 compost pits were established at the Padma-Jamuna Floodplain project site: 39 in Arua Union, 54 in Gopinathpur and 28 in Kanchanpur. Out of them, 38 were demonstration pits, while the rest were for promotion of this environment-friendly

agriculture option. In addition, 25 people were provided with composting support. At the Brahmaputra-Shitalakshya site, 12 demonstration compost pits were established: two in

Kanthal Union, seven in Bailor and three in Durgapur. In this project area, 174 people were provided with composting support. In the Madhumati Floodplain, 11 weed compost and 22 vermicompost production systems were demonstrated. These were used for agriculture and nursery plots located in the project area. More than 500 people were benefited from all these demonstration activities.

Seed and Seedling Distribution

In the Madhumati Floodplain, 642 members of different vulnerable groups and VRMCs were supported with seeds of vegetables and *sola/doincha* (*Sesbania* sp.), and a total of 454 members were provided with seedlings of winter and summer vegetables.

Ecotourism

In addition to conserving the wetlands resources through wise-use, the aesthetic and scenic values, the wildlife and other relevant ecosystem services associated with these unique ecosystems can also help the local resource managers generate income. Realizing that the SEMP programme components attached due importance to wetland based ecotourism activities. An action plan was developed accordingly to organise eco-tours in the *haors* and the Padma-Jamuna and Madhumati Floodplains, and implement the initiation of this budding sector.

Among the approaches considered and implemented, the following deserve special mentioning:

- (a) Construction of a dolphin watchtower, turtle rearing in shrine ponds and establishing a small local natural history museum at the Chanda *Beel* site in the Madhumati Floodplain.
- (b) In the Padma-Jamuna Floodplain, construction of a river biodiversity watch hut, water bird sanctuaries, turtle rearing ponds and the Ichhamati riverine trail, and
- (c) At Kapsasia floodplain site, deciduous forest trails and the local orchards started drawing tourists from home and abroad.

In connection with environmental awareness building and motivation practices as well as for eco-tourists, 19 dustbins were installed at the Trishal area and 10 dustbins were installed in the Padma-Jamuna area.

Medicinal Plants

As a result of unchecked deforestation, our unique wealth of medicinal plants has been depleting fast, even before they are fully assessed and evaluated. Under the CBHFRM projects, demonstration plots dedicated to nurturing and raising valuable medicinal plant species were established at all project sites.

At first, a baseline was developed through reconnaissance survey, literature review, PRA exercises and identification of local traditional healers. The identified knowledge gap in the literature review outlined the focus of the PRA exercises regarding medicinal plant resources and associated traditional knowledge in the area. Focused Group Discussions were carried out, and the communities also incorporated medicinal plants in their PAPD workshops to identify the future work plan regarding medicinal plant conservation.

In the community meetings and awareness workshops, emphasis was given to medicinal plants and their conservation values. People were motivated to consult traditional healers before using medicinal plants. Besides, experience-sharing meetings for traditional healers were also organised. In such workshops, the traditional healers demonstrated the identification of the medicinal plant species which were used locally. Medicinal plant conservation was one of the major focuses of the awareness campaign of the CBHFRM projects. The youth initiatives for medicinal plant conservation are based on eco-clubs established under the projects.



Medicinal plant nursery in Bhennabari, Gopalganj

A medicinal plant nursery was established in 2003 in the project field office premises in Jamalganj. The nursery harboured 93 plant species with medicinal properties, collected from different places and sources. The Hakaluki *Haor* site also had a medicinal plant nursery. Two central medicinal plant nurseries were established in Arua Union of the Padma-Jamuna Floodplain. In one nursery located in Maluchi, 87 species were reared and about 1,500 saplings were raised. On the other hand, in the Bawlikanda nursery, 164 species were nurtured and about 86 thousand saplings were raised till 2004. The nursery (90 decimal land) in Bashkuri village of Bailor Union, Trishal project site, was leased for this nursery nurturing a total of 128 plant species with medicinal properties. A medicinal plant plot was established in Bhennabari village of Satpar Union in the Madhumati Floodplain. A total of 185 medicinal species were cultivated in this garden.

The purpose of these central nurseries was to increase the availability of medicinal plants in the locality, help community and traditional healers with medicinal plants and plant parts, and also

to help in setting up a collection of rare and locally threatened medicinal plants. Village doctors and local people were encouraged to visit these gardens and collect plant parts to cure different diseases. These demonstrations also facilitated the establishment of medicinal plant nurseries at community and homestead levels.

Besides the above, breeding ground for birds and fish culture ponds were demonstrated in the Madhumati Floodplain project site.

Demonstration Breeding Ground

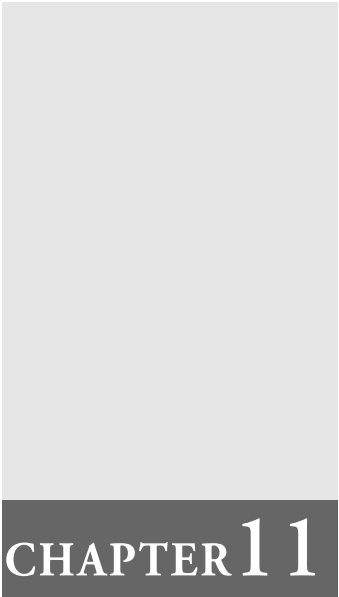
Forty-two pots, 11 bamboo baskets and 20 bamboo pieces were set to facilitate nesting and breeding in the SEMP WMTC compound, Bhennabari of Satpar Union. These nesting sites were visited by the local people, workshop and training participants, local students and other visitors to the centres.

Demonstration Ponds

Eight demonstration fish ponds were established in the WMTC in Chanda *Beel* to show standard practices in fish fry and fish production. Local people, participants of workshops and trainings, students, government officials and NGO members visited these ponds all the year round.

Demonstration of *Chailla* and Vetiver Grass

Six plots of *chailla* (*Hemarthria protensa*) and vetiver grass (*Vetiveria zizanoides*) were established in Fenerbak, Gangadharpur, Binajura, Matargaon, Chhayahara and Lalpur villages of Pagnar and Sanuar-Dakuar *Haor* areas for demonstration.



CHAPTER 1

IMPROVEMENT OF LIVELIHOOD SECURITY

Natural resources are the primary sources of livelihood and development. Thus, degradation or sustainable existence of the resources influences livelihood security to a large extent. In a country like Bangladesh, the rural communities solely depend upon the natural resources for their food, shelter, fuel, medicine or any other means of daily subsistence. People extract timber, fuel wood, fisheries, thatching materials, wild animals, birds, etc. for their income or to supplement the income. Nonetheless, extreme dependency on resources often leads to over-exploitation of resources.

Almost all households of the *haors* and floodplains in the SEMP project sites had varied linkages with the wetland resource bases. Desperate and helpless dependency of the people on the natural resources had led to serious degradation of the wetlands. In a bid to taking the extreme pressure off the wetland resource bases, for example during the breeding season of fish or from swamp forests, an incentive in the form of seed money was provided to vulnerable women and men of the project areas to enable them look for alternative income. Traditional fishermen, potters, handicraft producers, herbal healers, and others were also aided with the fund to serve similar conservation goals.

Such funding, termed as Environment Fund or Community Environment Fund, a grant, has been disbursed among the poorest of the poor with special focus on women for generating alternative employment opportunities through environment-friendly activities. This fund was provided as small capital and no interest or overhead was charged on this, therefore the approach followed for environment fund management was different from the approach taken in micro-credit management in Bangladesh. The easy

Selection Criteria

Selection criteria for Environment Fund disbursement are very similar to the selection approach of traditional micro-credit/ cooperative system working in Bangladesh. Member selection criteria are as follows:

- Person must be 18-55 years old
- S/he must be a permanent resident of the village of group formation
- S/he never involved with any subversive activity against the country
- S/he is unable to meet the basic needs of livelihood
- Members are of the same socio-economic status
- Member of the group, regular in saving accumulation and meeting
- Always participate in group activities/solidarity actions
- Trustworthy, honest and responsible

disbursement and management of fund helped the poor people revolve the same and generate employment for income supplementation. Details of the Environment Fund management has been described in a separate report on this issue (Hoque *et al.*, 2005). In this chapter, only the important issues are highlighted.

Some Important Attributes of Environment Fund

- Environment fund is a small capital for the poor families to help themselves to overcome poverty. The beneficiaries are the poor, particularly poor women. It must attain sustainability as soon as possible, so that it can expand its outreach without fund constraints.
- No collateral is required against the disbursement of environment fund. It is biased to the poor women/men households having no access to the employment or credit sector.
- Environment fund is accessible only after joining a group as a member.
- The fund is accessible for creating self-employment through income-generating activities leading to enhancement of livelihood wealth.

- Women, men or combined groups are liable to revolve their capital grant within themselves and obligated to repay in their account after making profit or during the business. A regulation based on the consensus of group members is to be adopted and enacted for receiving the instalments from members.
- A member can borrow money from the group account at any time but a prior approval from all the group members is required. Performance of the member, intending for fund, in terms of savings payment, attendance in group meetings and activities for environment conservation is the prerequisite to be eligible for environment fund.
- The savings of the group members is treated as the contribution of the members enhancing the ownership and participation in the environment fund management process.
- The group is obligated to maintain an account with a scheduled bank where at least three members from the group will be signatories for transaction.
- Registration of groups with any government department is compulsory for the sustainability of these CBOs and their activities. Envisaged linkage of groups with Department of Cooperative, Department of Youths or Department of Women Affairs will provide substantial opportunities to receive supports in respect to technical and financial matters, besides periodical monitoring and auditing of the groups by the concern government department where the group is registered.
- Environment fund is different from other micro-credit services, with a view to keeping the poor people free from any financial liability.
- The most important aspect of the environment fund is enhancement of livelihood assets for poor households. Adequate skill and leadership development trainings organised for the members of the groups and subsequent implementation in the field of income generation activities promotes their capacities in community association development for entrepreneur building, more accessibility to the capital market, sustainable livelihood development and finally in conversation of primary resources of the nature.

Orientation

Subsequent to the group formation, basic orientation about group dynamism and other perspectives including alternative employment generation, environmental and livelihood security, etc. were provided for better understanding of the approach of the environment fund management. The project staff provided constant guidance since they would run their group activities for their environment and livelihood improvement. The group prepared its

constitution with facilitation from the project staff and accordingly, the group organised meetings, deposited savings, and selected potential sectors for employment generation. Detailed information on group formation can be found in Chapter 8.

Need Assessment

Socio-economic conditions of the people of rural Bangladesh vary from place to place, ecosystem to ecosystem. It is evident from the socio-



A workshop on environment fund in Trishal

economic survey that the size of the cultivable land-holding in the villages, for example, of Pagnar and Sanuar-Dakuar *Haors* had considerable variances. Data revealed that about 53% of the Pagnar *Haor* households possessed on average 4 decimals of cultivable land per household, and were classified as landless. About 19% of the total households, considered as large farmers, had on average more than 250 decimals of cultivable land per household. Similar heterogeneity was found in respect to the occupation categories. Need assessment was, thus, important to find out the real situation in terms of their socio-economic condition, understanding of the environment, dependency on natural resources, level of awareness and all other livelihood factors. Need assessment was conducted though PRA within the groups.

Savings Generation

Following the formation of groups, the members were motivated to build a savings fund that would be available for employment generation of the group members. A discussion was held among the group members to fix the weekly or fortnightly savings amount for each person which was to be deposited in their account. The savings amount varied from group to group depending on the socio-economic condition of the members. For the floodplain sites, this savings instalment ranged from Tk 30 to 50 per month while it was Tk 20 to 30 for the *haor* sites. Usually, the cashier of the group was the depository of the fund and s/he received the savings from the group members in the weekly or fortnightly meetings for depositing the same in a joint account maintained in a local commercial bank.

The group members' savings can be used following their passing a resolution to that effect in a group meeting. They could spend also their money for the welfare of their village. The practice of savings generation would strengthen the unity among the members and facilitate building a common economic platform for livelihood security.

Disbursement of Environment Fund

Environment fund, as an incentive, was provided to groups after providing adequate motivation for reduction of pressure on the natural resource bases as well as training on various employment generating options viz. poultry and duck rearing, handicraft production, cattle fattening, nursery development, etc. The fund disbursement was usually conducted in the group meeting, so that the transaction record could be maintained in the resolution book and on the following working day, the fund would be deposited to the group's bank account.

Binajura VEC of Jamalganj *Haor* site received Tk 1.43 million for solar electrification, and 154 households have been enjoying the facilities since 2003 (see Chapter 12). At the Hakaluki *Haor* site, nine women VGs received Tk 400,000 from the environmental fund and have been utilizing it successfully. In the Padma-Jamuna Floodplain, the total environment fund disbursed to 26 VGs, five VECs and one FRMC was Tk 1,258,500. At the Brahmaputra-Shitalakshya site, Tk 974,000 were disbursed to 14 VGs (Tk 647,000), and one VEC and two FRMCs (Tk 327,000). In the Chanda *Beel* area, 41 VGs and VRMCs (including three *baira* committees) received Tk 1,540,000. The groups and VECs were engaged in pottery, net weaving, handicraft making, medicinal plant gardening, *baira* practice, vegetable farming, rice cultivation, nursery raising, poultry, goat rearing, cattle fattening, fish culture, improved oven making, rickshaw, and small business.

Skill Development Training Events

A large number of training events were organised for the VGs on alternative livelihood options so that the Environment Fund initiative could serve its purpose. In the Padma-Jamuna Floodplain, the total number of trainees was 915, in Brahmaputra-Shitalakshya 687 and at the Madhumati site, 4,069. They were trained through 176 training sessions on craft work, poultry rearing, improved stove, livestock raising, medicinal plant, nursery development, natural resource management, *baira*, fish culture, seed preservation, vegetable gardening, IPM and composting, leadership development, and account management. The details of such training offered may be found in the Environment Fund report.

Management Aspects

The environment fund management is a process where women/men get secured in terms of livelihood through practicing savings generation, capacity development, environment

management and finally, alternative employment generation. Since money is the most liquid form of resource to exhaust fast, a strong monitoring or follow-up of groups was imposed to regulate the flow of the environment fund. A project staff was deployed full-time to ensure the smooth operation of the fund. Any mismanagement or unethically exploitation of the fund was discussed in the meeting that was often organised before the representatives from the respective Village Committees. Based on the performance of individuals or group, the environment fund was transferred to the group account for subsequent utilization. Moreover, any group's books of accounts are checked by the project staff in presence of the committee members for greater transparency and accountability.

In the Padma-Jamuna Floodplain, 24 groups, three VECs and the FRMC were successfully utilizing the fund. Ten VGs and all three VEC/FRMCs were successful in utilizing the fund at the Brahmaputra-Shitalakshya site. All the 41 groups/committees have been using the fund successfully in the Madhumati Floodplain area.

CHAPTER 12

ALTERNATIVE ENERGY OPTIONS

A significant amount of wetland resources are spent to generate energy for cooking and lighting. The traditional energy-producing techniques are expensive and inconvenient in terms of input : output ratio, health risks, and decreasing availability of raw materials (fossil fuel). Under the CBHFRM projects, solar panels, biogas and improved oven were promoted as alternative environment-friendly energy options.

Solar Panel

Haor areas are fairly remote where developing conventional electric power supply systems are not a very feasible option, because of the high cost coupled with other technical difficulties. To reduce pressure on the natural resources and develop management and operational skills of the VCs towards attainment of sustainability as well as generation of funds, the



Solar panels in Binajura village, Jamalganj

haor component of the SEMP planned and implemented installation of solar panels in a project village at the Pagnar *Haor* site in consultation with the community members.

A photovoltaic (PV) system was installed by a private energy company in Binajura in January 2003. The VCs raised more than Tk 41 thousand to meet the partial establishment costs (around Tk 1.43 million). The total system supported 262 light bulbs and 10 televisions of 154 households of the entire village. Local people as well as other visitors to the project sites visited the village to see this novel energy option in operation. The village committee, established under this project, was in charge of this solar panel management. A total of more than Tk 211 thousand could be generated per year from this initiative as entry fee and electric bill. Eighty percent of the amount would be used for conservation, poverty reduction, education and health activities for the village, whereas 20% to be spent for management of the solar panel. A list of 20 poorest people of the village was also prepared, and a provision of 50% reduction of the bills for them was kept, if they joined the initiative.

Installation of solar panels was one of the important demonstration interventions in the *haor* area showing clear impacts within a short period. This has shown how people are able to raise a good sum of their own money for an environmentally sound option when they are motivated properly. The strong management system established with the VC was also a success. The solar panel demonstration significantly changed the living standard of the people of Binajura village and also influenced other villages to adopt similar system of energy supply. The initiative improved the villagers' health status, enhanced their literacy rate, reduced fuel cost, increased security against crime, access to media, viz. television, and better economic conditions through facilitating small cottage industries.

Biogas Plant

Biogas means the gas produced from the fermentation of dung and other fermentable materials i.e. domestic waste, poultry droppings, agriculture residues, etc. It is composed of 60-70% methane, which can be used as fuel; the remainder includes carbon-dioxide. The residues of biogas can be used as biofertilizer/ improved manure. The person/family/institution intending to build a biogas plant must have adequate cattle and poultry. Biogas is used for various purposes, but in our rural areas it could be widely used for cooking.

The wide use of biogas could save fossil fuel and help conserve vegetation resources immensely in any given area. In addition to that, use of biogas instead of traditional stoves, run by fossil fuel, could also help the rural people of Bangladesh, especially the women, in many ways. For example, the health hazards and diseases (e.g. eye irritation, skin problems, headache and coughing) due to indoor air pollution will be decreased. Such system will save cooking

time for women, which means more free time and less fatigue, both of which have a direct positive impact on the time available for childcare and for improving the quality of kitchen environment.

Introduction of biogas plants at the SEMP project sites attracted many people. Enthusiastic families of the project area were provided with such facilities considering their interest and necessary affordability. In addition, training was also provided with support of experts from the BCSIR to develop community skills in maintaining and operating biogas plants.

Two biogas plants were established in Radhanagar and Gangadharpur villages of the Jamalganj project site. On the other hand, six biogas plants were established for demonstration in Gilachhara Union of the Hakaluki *Haor* area in 2002. But none of the plants provided the expected positive impacts due to lack of maintenance capacity of the owner despite project support. In total, 12 biogas plants were established at the Padma-Jamuna Floodplain project site. Of these, three were to demonstrate this renewable energy option to the local people. These demonstration plots were established one each in Bawlikanda (Arua Union), Uttarpara and Mazampara villages (Gopinathpur Union). In Trishal, out of the 12 biogas plants, two were established for demonstration purposes. These were in Banshkuri (Bailor Union) and Kablapara (Rampur Union). The total expense was equally borne by BCSIR (project implemented by LGED) and the CBHFRM projects. All these were functioning well.

Improved Oven

Biomass fuel is the major source of energy consumed in Bangladesh. Agricultural residues dominate, accounting for 46 percent, while wood energy contributes about 12 percent of the total consumption. Domestic cooking consumes the largest share of biomass fuel in both rural and urban areas. Traditional *chullis* or cooking stoves were widely being used in the households of CBHFRM project sites. But the disadvantages of these stoves are manifold as described in the Biogas Plant section above.

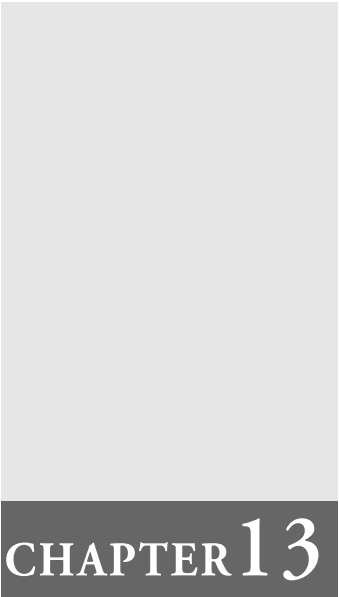
Therefore, to demonstrate another energy saving option, improved stoves were encouraged in the project areas under the CBHFRM. BCSIR has invented different



Promotion of improved oven at a SEMP site

models of improved stoves which are energy efficient and can save up to 50-70% of the fuel cost. People of the project sites were first informed about these stoves through discussions in awareness meetings or workshops. However, this stove is suitable for fuel wood, twigs and branches only.

At each *haor* site, 4-5 training programmes were organised by the BCSIR and enthusiastic local people took part in those. After being trained, these participants made their own ovens for personal use. A total of 102 stoves were installed at the two *haor* project sites. In the Hakaluki *Haor* area, 81 such *chullis* were on demonstration. There were 270 *chullis* demonstrated and another 463 were supported at the Brahmaputra-Shitalakshya Floodplain site, and 300 *chullis* were demonstrated at the Padma-Jamuna Floodplain site.



CHAPTER 13

NURSERY AND PLANTATION

Trees of wetlands are very important natural resources that have been facing over-exploitation at an exponential rate. Plantation under social forestry initiatives raised most prominently as roadside plantation over the last few decades might have compensated partially the lost forest cover in the areas. On most of the occasions, native species were avoided and the lost natural vegetation cover was not possible to replace with even functionally similar species.

In the past, most of the *kandas* in *haors* were covered with swamp trees (*hijal* and *karoach*) and numerous species of grasses and reeds. But, over-harvesting of resources, clearing of swamp forests for other purposes, building water control dykes and increased agriculture practices caused this characteristic feature of the *haor* ecosystem to degrade in the recent years. Similar trend was perceived in Pagnar and Sanuar-Dakuar *Haors*, the SEMP project sites. At the SEMP floodplain sites, the situation was not any better. Homesteads were the main components of forest cover in those areas. In addition to the almost depleted wetland forest cover, avoidance of indigenous species in the plantation programmes were also observed in these places.

At the beginning of the CBHFRM projects, the local communities were facilitated in identifying the underlying causes of such degradation in vegetation and suggesting remedies through

problem census and PAPD workshops. As a response to that, capacity building of the local people for nursery establishment and plantation, facilitation of nursery establishment and promotion of plantation programmes in community, institutions, private (including homestead) and *khas* lands were planned and executed. The locally threatened and economically important species were selected for *in situ* and *ex situ* conservation. The specific objectives of the CBHFRM plantation programme were to improve the quality of local environment, enhance biodiversity conservation practices, ensure livelihood security and demonstrate plantations. This programme also promoted forest coverage through locally adapted species in the project areas, wetland species regeneration and sustainable plantation management practices by the local community. A detailed description of this initiative can be found in the plantation reports of the *haor* and floodplain (Faisal *et al.*, 2005) project sites.

Training on Nursery Establishment

In the *haors*, a total of 16 training programmes were conducted for the women of the VGs in the Regional Training Centre, Jamalganj with 319 participants. Similarly, training sessions were organised at the intervention spots in the Hakaluki *Haor* project area. In the Padma-Jamuna Floodplain, six training workshops on nursery establishment, plantation technique, and plantation aftercare and maintenance were organised at the field level. A total of 156 people were present in those training events (148 men and 8 women). On the other hand, a total of 42 training sessions with more than one thousand participants were organised in the Chanda *Beel* and Kadambari-Chowaribari *Beel* areas.

Nurseries and Seedling Raising

Nursery establishment can play an important role in propagating plants under threat and make them available for plantation. A nursery acts as a mother stock of the plants. Nurseries also provide an opportunity for relocating plant species to suitable habitats where it had existed earlier. In addition, nurseries have a great economic potential. Under the current projects, nurseries were established at different levels, viz. central, community level, private level, and also medicinal plant nurseries.

Central plant nurseries have been established at all the SEMP project sites to aid



A Vulnerable Group member by her nursery

plantation activities and to demonstrate nursery establishment to people. In most of the cases, the nurseries were raised in such areas under the project where no nursery existed and there was demand for seedlings among the local communities. Other criteria for nursery site selection were the local demand for timber/fuel wood, water supply, an elevated nursery bed, availability of shade for some of the plants, healthy seedling raising condition, etc.

In Pagnar and Sanuar-Dakuar *Haors*, 150 community nurseries were established producing *hijal*, *karoch* and *borun* (*Crataeva magna*) saplings. A total of 60,000 saplings were raised in Matargaon, Kujargaon and Sukdevpur villages. From the central and community nurseries, a total of 8,300 saplings of jackfruit, guava, black berry, olive, neem, *basak* (*Adhatoda zeylanica*), mahogany, *koro*i (*Albizia* spp.), rain tree, etc. were distributed to 23 social and educational institutions of the area. On the other hand, at the Hakaluki *Haor* project site, 2,802 saplings of fruit and timber tree species were distributed to similar institutions.

Central nurseries were established in Maluchi, Trishal, Kapasia and Chanda *Beel*, and a good number of private/community nurseries were also established with support from the floodplain component (Table 13.1). The local communities were motivated and organised in order to ensure their active participation in nursery development. These nurseries were provided with seeds, polybags, earthen pots, fertilizer, and fencing materials from the project to encourage plantation activities. The seedlings raised in these nurseries were sold, used in plantation programmes or distributed among the communities (see below). At the *haor* sites, saplings of swamp trees were also collected from the wild to use in the plantation programme.

Table 13.1. Information on the central and community nurseries at different floodplain project sites (values in numbers), based on the Floodplain Plantation Report.

Project Site	Nursery	Plant species	Sapling raised	Sapling sold/ planted/ distributed		Present stock
				planted	distributed	
Central nurseries						
Padma-Jamuna	1	76	185,316	52,420	111,046	21,850
Brahmaputra-Shitalakshya	2	112	121,403	19,243	20,390	61,051
Madhumati	1	48	212,881	151,236	36,645	25,000
Total	4		519,600	222,899	168,081	107,901
Community-based nurseries						
Padma-Jamuna	7	ca. 30	97,090		46,713	50,377
Brahmaputra-Shitalakshya	10	ca. 30	32,435		23,800	8,635
Madhumati	28	ca. 50	1,637,479		1,420,972	216,507
Total	45		1,767,004		1,491,485	275,519

Medicinal Plant Nurseries

Central medicinal plant nurseries were established under the project at each site to demonstrate medicinal plant conservation, which has been described in Chapter 10 of this report. The seedlings raised in these nurseries were distributed among villagers or fed the plantation programmes.

At the Padma-Jamuna Floodplain project site, a total of 11,850 seedlings were raised in 11 medicinal plant plots (2 central/demonstration, 2 community and 7 private). In Trishal, a total of 14 medicinal plant plots were established where 115,340 seedlings were raised and among them, about 27,000 seedlings were sold to the local people. The stock here was 88,230 in early 2005. The project provided saplings, compost, IPM, equipment support, and logistic support to the gardeners.

In the Padma-Jamuna Floodplain, about 63 villagers established village level medicinal plant plots wherein about 14,300 seedlings were raised with up to 108 species in a single plot. On the other hand, at Trishal site, a total of 102 village level medicinal plant plots were established, wherein 12,500 various medicinal plant seedlings were raised.



Medicinal plant nursery in Arua, Manikganj

In the Madhumati Floodplain, 52 medicinal plant plots were established at the community level as well as in the premises of the local government offices. Some medicinal plant gardens at the community level included those in Nanikhir High School (by Golap Environmental Club in 2002), Baptist Church, Kabi Nazrul College and Goalgram Asram premises. The average number of species per plot was 62 and a total of 23,640 saplings were raised.

Plantation

Both block and strip plantations were undertaken at the project sites. A block plantation is characterized by trees planted compactly within a certain area. It is distinguished from other plantation types by its greater width-length ratio (usually more than 1:2). Strip plantation along the roadside is a very encouraging opportunity for both environmental and livelihood development. The site selection for plantation was done in consultation with the community. For a block plantation, fallow, barren lands (e.g. *kandas*) and unutilized spaces in religious, educational and administrative institutions were preferred. The sites selected for strip plantation were roadsides, river/canal banks, banks of re-excavated sites, *kua* embankments, etc. This plantation was also done around erosion-prone villages as an erosion-proofing measure.

Table 13.2. Block plantation (homestead, institutional and swamp forest restoration) in the project area; based on the Plantation Reports of the CBHFRM projects.

Project Site	Area (in ha.)	Species (no.)	Planted sapling (no.)
Pagnar & Sanuar-Dakuar	101.41		287,220
Hakaluki	71.72		146,093
Padma-Jamuna	0.95	6	2,000
Brahmaputra-Shitalakshya	0.30	10	1,470
Madhumati	12.54	15	47,882
Total	186.92		484,665

Data on block and strip plantations at different project sites are given in Tables 13.2 and 13.3. At the Pagnar and Sanuar-Dakuar *Haor* sites, swamp tree saplings (*hijal* and *karoach*) were mostly planted in 17 villages of Jamalganj *Upazila* as block plantations. Both *ejmali* and *khas* lands were considered. Here the main aim of the plantation programme was restoring the swamp groves, which once existed but had been destroyed due to uncontrolled exploitation. In addition, timber tree and fruit tree saplings/seedlings were planted on roadsides and homesteads. A large number of saplings were also planted in the project area of Hakaluki *Haor*.

Table 13.3. Strip (roadside, river bank, etc.) plantation in the project area; based on the Plantation Reports of the CBHFRM projects.

Project Site	Road (no.)	Approx. length (km)	Species (no.)	Planted sapling (no.)
Pagnar & Sanuar-Dakuar		11.15		20,312
Hakaluki		35		42,082
Padma-Jamuna	25	25	53	52,420
Brahmaputra-Shitalakshya	11	12	41	19,243
Madhumati	8	34	35	103,575
Total	44	117.15		237,632

In the Padma-Jamuna Floodplain, block plantations were raised in order to generate village woodlots, which would increase the tree cover with a view to improving the environmental quality and facilitating local timber supply. Roadside plantations were implemented in order to protect the roads from erosion and provide shade on the roads.



Strip plantation along the canal bank in Chanda Beel

Limited swamp plantation was carried out here along the bank of the Ichhamati River with mainly *kash* (*Saccharum spontaneum*). In the Madhumati Floodplain, the total 34 km plantation varied in a number of rows, which was equivalent to 280 km in terms of a single row.

The indicator of successful plantation is its survival rate. At the Jamalganj *Haor* site, it was 65%, while for the Hakaluki *Haor* site, it was 78%. At the Padma-Jamuna Floodplain site, the survival rate of the planted seedlings was 70-80%. In the Brahmaputra-Shitalakshya Floodplain, it was more than 50%. The survival rate of the plantations in the Madhumati Floodplain after the devastating flood of 2003 was 65%. Vacancy filling was carried out throughout the project tenure at all the sites.

Various approaches were taken for taking care of the planted trees and of these, the most useful was awareness raising programmes. Constant motivation of the local elite, UP members, cowboys, lessee, local (*beel*) guards, and adjacent land owners through counselling, meetings, knowledge sharing workshops and staging folk dramas were carried out. Paid guards were engaged to protect saplings through the first couple of years of the plantation, and in *haors* also during the dry season when *kandas* emerge as the grazing ground for cattle. The VCs were responsible for nursing, guarding and maintenance of the plantations, including climber cutting, watering, etc. with their own as well as project contribution. They invested their time in planning and supervising all these activities.

Management

The CBHFRM projects aimed at developing sustainable practices for ecological restoration through plantation activities. Therefore, the local people were informed of the necessity of nursery establishment which would be followed by plantation programmes to restore the ecosystems as well as provide the local communities with economic benefit. Different management plans were prepared or considered for different project sites with more or less similar approach. The focus was on appropriate benefit-sharing, because the plantation would not be successful unless the concerned stakeholders agreed with regard to the ownership of the resultant plant stand and sharing benefits among themselves rationally.

At the *haor* sites, the stakeholders were persuaded to divide a block plantation into five sections of which one portion would be left undisturbed as a conservation site for wildlife



Partial view of plantation of swamp trees in Hakaluki *Haor*

and birds. The remaining four sections would be harvested by pollarding, following a standard protocol e.g. a four-year rotation. Benefits will be distributed as follows:

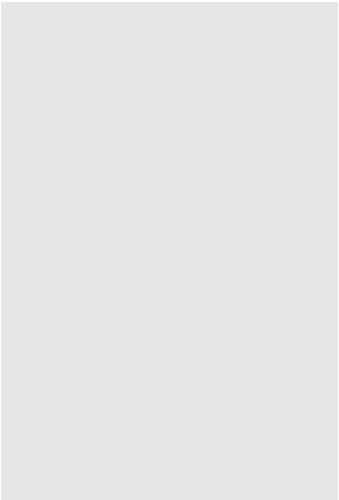
- 60% would be equally distributed among all households of the village
- 25% would be saved for generating reserve fund for the VC. This fund would be used for social pro-poor development purposes
- 15% would be reserved for the landowner or the UP

In the Padma-Jamuna Floodplain, a practical management plan for the plantation sites was prepared. The benefit generated from the plantations in *khas* land was to be shared by the owner of the land, usually the UP and selected local groups (Nature Club, VEC, FRMC, etc.). A signed ToR was prepared for formalization of the plan. The plantation sites, viz. roadside, riverside, institutions, etc. that were in the care of the local villagers were all governed by an agreement on sharing the output (80% planters and 20% landowner).

At the Madhumati Floodplain project site, there was an agreed MoU between the landowner and the VC to ensure access to the plantation sites. The landowners varied from private to public. In case of *khas* lands, an MoU was signed between a registered VC and relevant government department. The MoU clearly stated the benefit-sharing mechanism of the plantation outputs. Generally, the beneficiary group would get 55%, landowner 20%, relevant government department 10%, and 10% would accrue to the project revolving fund. The remaining 5% of the benefit was secured for investment in future plantation programmes.

Impacts

Impacts of plantation were multifaceted. Socio-economic impact included increased household income from selling of seedlings raised in the nurseries at village/community level. Conservation of rare plant species was done through creating or restoring swamp forest habitats or increasing forest cover in the area in general. This was accompanied by improved aesthetic values of the project area including the promotion of ecotourism. Nursery raising and plantation of medicinal plants increased the availability of herbal medicines in the locality. Erosion-proofing, a necessity in the *haor* areas, was accomplished through plantation of swamp trees and shrubs like *patipata* in some selected areas. Finally, swamp forest plantation was an important intervention showing the strength of the VCs who managed the whole undertaking from planning to aftercare and management. Phases, plantation was also envisaged as the source of financial support for the sustainability of the SEMP project as a whole, especially at the *haor* sites.



CHAPTER 14

PHYSICAL INTERVENTIONS

In the past, various development interventions causing siltation have obstructed the pathways between water bodies necessary for fish migration. Such migration is very important for fish to complete their life cycle which ultimately influence the fish production in the wetlands. Moreover, during the last 30 or 40 years, the natural resources in the wetlands have depleted seriously due to erosion at upper catchments, conversion of wetlands into agricultural land, dewatering of water bodies for fishing and over-harvesting. Therefore, re-establishment of these wrecked pathways by excavating the dysfunctional canals, *beels*, *kuas*, etc. is necessary in many wetland areas.

Wave erosion of the village mound in the *haor* area, on the other hand, is an age-old problem. With the increase in population in the *haor* area, the wave impact increased. Increased population is causing greater exploitation of *haor* forests of *hijal-karoch*, which otherwise would act as shield against wave action in *haor*. Over-exploitation of these trees is, therefore, reducing this positive effect rendering the homesteads vulnerable. In addition to regenerating swamp forests, some physical measures are also needed for protecting the already vulnerable homesteads in the *haors*.

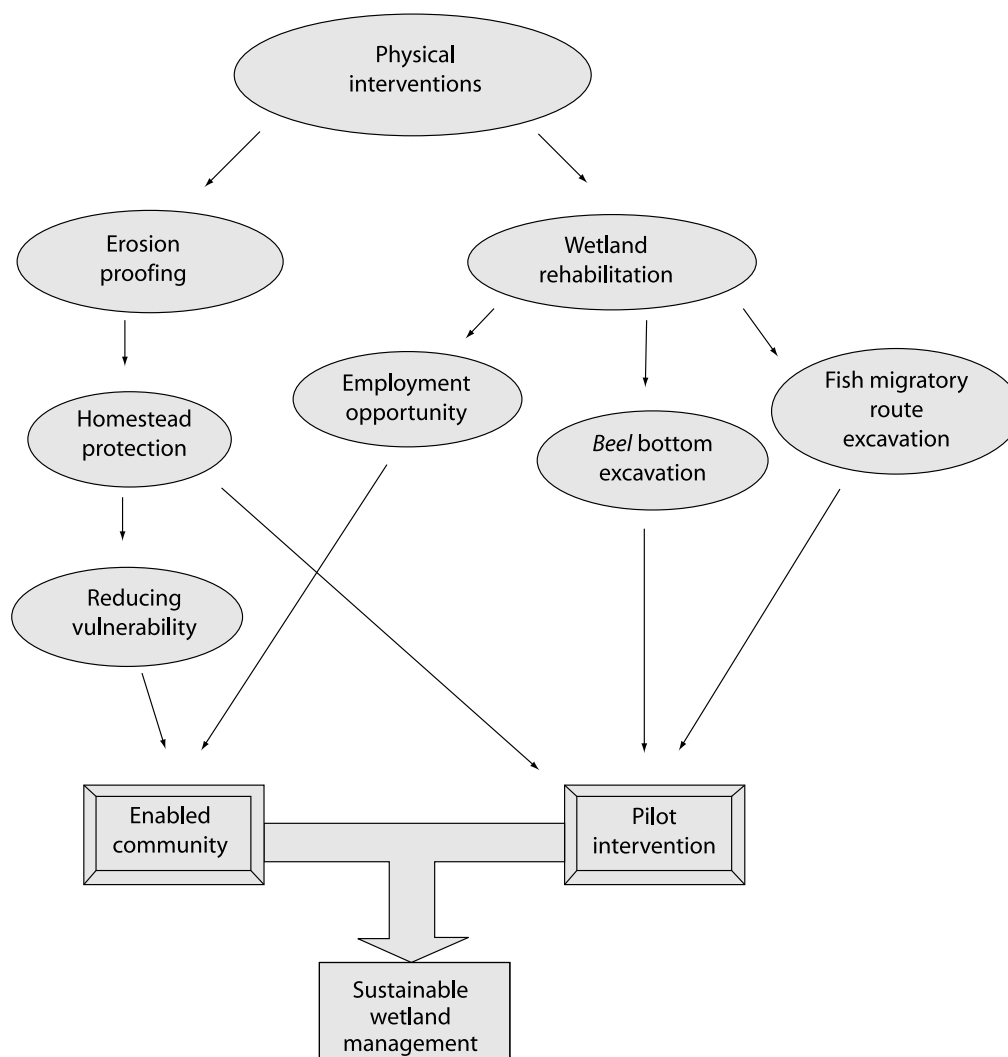


Figure 14.1. Schematic diagram of wetland rehabilitation

Under the CBHFRM projects, two types of physical interventions were undertaken, viz. 1) wetland re-excavation and 2) erosion-proofing. Figure 14.1 schematically presents these interventions and their impacts both on environment as well as the local communities. Details about these activities could be found in separate reports (Hassan *et al.*, 2005; Hussain *et al.*, 2005). In the present chapter, these are briefly described.

Wetland Re-excavation

In addition to re-establishing the fish migration pathways, other important objectives of the re-excavation measures were, to protect wetlands from siltation, to re-establish connectivity

among rivers, canals, *beels* and floodplains, to increase the availability of irrigation water, and to improve the livelihood conditions of the local community as a whole.

Land ownership status for most of the water bodies in the project areas was found to be *khas* and leased out to parties by the Union Parishad and the Deputy Commissioner's Office. Legal difficulties were there in attempting any improvement measures for these water bodies. Nonetheless, the community people showed interest in the water bodies where general people had common access for fishing and domestic uses, and they urged any developers in adopting rehabilitation measures to restore and protect the same.



Canal re-excavation in the Boka *Beel* area, Trishal

The CBHFRM projects emphasised resource development and conservation through community participation where the local resource users took active role in planning and implementation. At all the project sites more or less similar approach was followed with some adjustments according to the local needs. The re-excavation or restoration of degraded sites required careful planning to ensure that the implementation would be carried out in a comprehensive, cost-effective and timely way. During the landuse surveys, resource mapping and problem census workshops, the degraded areas were identified and subsequently, re-excavation plans were proposed by the villagers in the PAPD workshops and village meetings for improving the situation. The planning activities further involved project budgeting, awareness campaign, biodiversity monitoring and activity impact assessment.

The implementation started with the development of site specific action plans, formation and operationalization of the VCs, formation of project implementation committees with local representatives, site selection, orientation of the labourers, actual re-excavation, and re-vegetation to stabilize the banks.

The following factors were considered before undertaking the rehabilitation measures.

- Community consensus
- The wetland/component of wetland is not under government leasing arrangement

- Access of the poor to the water bodies exists
- Whether managed by the community/mosque/school/ *madrasah*
- Possibility for enhancing fish migration as well as production exists
- Irrigation and drainage
- Important as dry season water reservoir and fish refuge
- Consensus on establishing fish sanctuary
- Delineated benefit-sharing

Re-excavated sites

The villagers of Pagnar and Sanuar-Dakuar *Haors* with assistance from the project staff selected, six different *beels*, canals and rivers for the re-excavation programme, viz. Ganger Agar, Bhatigaon, Maranadi, Barirlama *Beel*, Fenaída Beel *Dair* and Maragang. In these two *haors*, the total volume of earth re-excavated was estimated as 120,553 m³ with a total surface area of



Beel re-excavation at the Jamalganj site

14.63 acres. In the Hakaluki *Haor*, two canals were re-excavated namely, Birali (945 m long section) and Charua (610 m long section) *Khals* with a surface area of 2.87 acres and 9,482.5 m³ of earthwork. Most of the water bodies located in the both *haor* project areas were *khas* land and leased out to parties, except Birali *Khal*. In this *khal*, there were lands of both categories,

ejmali and *khas*, to demonstrate the impact of habitat restoration and conservation of fishery resources among the community. A total of 17.5 acres of *haor* area was re-excavated under the *haor* component of the SEMP. Out of this, 7.23 acres were designated as fish conservation areas in the Jamalganj site by the respective VCs.

In the floodplain sites, two types of excavation were suggested by the communities. One type was suggested with a view to restoring the fish migration channels, and the other type was suggested for establishing fish conservation sites by excavating the *beel* bed.

At the Manikganj site of the project, Bahadurpur canal in Gopinathpur Union was taken for re-excavation; the total area excavated was 2.51 acres with 14,906 m³ of earthwork. A canal and a fallow wetland patch, located in the Boka *Beel* area, Trishal were re-excavated with a total surface area of 4.12 acres and 32,220 m³ of earthwork.

Seven degraded canals (Ranapasa canal) and *kuas* (Dodhara *kua*, Bhennabari *kua*, Kadambari Asram *kua* -1, Kadambari Asram *kua* -2, Beel Chanda *kua* and Patkelbari *kua*) in the Chanda *Beel* and Kadambari-Chowaribari *Beel* Complex located in Rajoir and Muksudpur were included in the re-excavation programme of the Madhumati Floodplain site. The total excavated area was 7.6 acres with an estimated 59,512 m³ earthwork.

Associated issues

A number of additional activities were associated with re-excavation interventions for its success. To stabilize the river and stream banks, apart from developing tree cover, under story vegetation cover was initiated to protect the stream banks from soil erosion due to surface run-off. After the re-excavation of *beels* and canals, the banks/embankments were properly covered with local grass (e.g. *chailla* in *haor*) and other native plant species.

Conflict resolution was another issue dealt with during the re-excavation period. A series of village level meetings were conducted where all the members from the community were invited to participate and contribute equally in the resolution process. Specific issues discussed included that of the local influential persons trying to control the project activities, deposition of excavated soil on lands adjacent to the water body, motivating encroachers to give up their land, and members of re-excavation implementation committees expecting to gain personally from the project, etc. Conflict resolution sometimes took long deliberations and delayed the actual work.

Early flash floods and excessive rainfall in mid-April 2000 disrupted the re-excavation work at some sites, when power pumps and manual dewatering were carried out to assist with the work. As a result, the work could not be completed within the stipulated time.

Impacts

Some vital impacts were noticed as a result of the re-excavation interventions. The excavations not only increased and facilitated normal flow of water in canals but also increased the livelihood opportunity, ensured biodiversity conservation, ensured better agricultural production, eased water transportation and reopened migratory routes for fish. People of the project area were able to draw and use water for household chores and other purposes through the year. Increased employment opportunity, although for a limited period, was a positive aspect of the excavation activity. For example, a total of 44,769 man-days work opportunity was created through the re-excavation activities in the Hakaluki *Haor* area and in Jamalganj. On the other hand, in Chanda *Beel* and Kadambari-Chowaribari *Beel* complex re-excavation, 27,000 man-days were engaged. Temporary job opportunities were also created in the rural areas as demand for agricultural labour increased. Twenty new settlements were established in and around the Ranapasa canal site, in the Madhumati Floodplain, to avail of better job opportunities, ensured water source and other livelihood supports all the year round. Livelihood security was enhanced for professional boatmen with increased water-way connectivity.

Fish diversity and quantity were enhanced through the establishment of the fish conservation sites. The project opened some of the original migratory routes of fish and other organisms, and maintained micro-sanctuaries essential in sustaining the proper functioning of the local ecosystems. In addition, increased diversity of birds and other aquatic animals depended upon fish and aquatic animals was also noted. At least 200 families from the Madhumati Floodplain and 300 fishermen households in the Padma-Jamuna Floodplain were benefited from the increased fish harvesting, fish processing and fish trading at the project sites.

As a result of re-excavation of different *beels*, drainage of excess water through the canals resulted in rendering more land under cultivation. For example, it was now possible in the Hakaluki *Haor* intervention area to irrigate about 30 acres of *boro* land sufficiently while keeping 4 ft deep water in the canal ensuring habitat for fish in the peak of the dry months.

Food security has been enhanced through better irrigation, more crop production, and fish catch increase. In addition, value of land also increased in some areas (e.g. Madhumati Floodplain area).

Erosion-proofing

The village mounds in the *haor* have always been subject to erosion due to wave action during the monsoon. The *beel* area in floodplains does not face such events. That is why erosion-proofing activity under the SEMP was confined in *haor* areas only.

Traditionally, the *haor* people are used to protecting their homesteads by binding the vulnerable mound-faces using *chailla* (*Hemarthria protensa*, a kind of grass) and by deploying other indigenous techniques. Due to the current scarcity of *chailla*, villagers find it hard to protect their homesteads against wave erosion. Nonetheless, two types of traditional wave protection methods based on *chailla* are in practice in *haor* areas, (1) *Maita bundh* and (2) *Khuti bundh*.



Erosion proofing with *chailla* in *khuti bundh*

Maita bundh is built by compacting 3" to 4" thick layers of earth and *chailla* alternately. The profile of the *maita bundh* is vertical. The protection is generally 10 ft high. Some times temporary stoppers are placed to stop the waves.

Khuti bundh is, in fact, a modification of *maita bundh*. *Khuti bundh* is also built by raising alternate layers of 3" to 4" thick soil and *chailla*. But these layers are only 6" deep into the village mound. The *chailla* is placed parallel to the wall face and is protected by a bamboo fence. Hence, the layer of *chailla* dampens the wave attack and the *chailla* layer is kept in place by the



Protection measure with boulders in *haor*

bamboo fence. Although the cost of bamboo for *khuti bundh* is high, it is getting popular as availability of *chailla* is decreasing. Nonetheless, to the question of the effectiveness of these two techniques, the local people responded quite differently.

Boulder protection is another mode used in *haor*, and a good example can be seen in village

Badarpur in Halir *Haor*, Jamalganj. But this method is very expensive compared with the traditional *chailla*-based techniques.

Increased population is now causing over-exploitation of *chailla*. As a result, protection measure with this grass is also decreasing in the *haor* areas. After analysing the situation prevailing in the project area in Jamalganj, the following were listed for effective, long term solution for protection against wave erosion.

- Restore swamp (*hijal-karoch*) forests
- Increase *dholkalmi* (*Ipomoea fistulosa*) plantation around the village
- Start using *binnya* (vetiver grass, *Vetiveria zizanoides*) instead of *chailla*
- Use geo-textile in combination with *binnya* and sloping platform bank
- Use 1:10 cement-sand bag



A karoch (*Pongamia pinnata*) plantation in haor area



Homestead protection in haor using sand-bags

Under the SEMP project, restoration of swamp forest was undertaken, which is detailed out in Chapter 13. In the following section, we will briefly discuss other erosion-proofing measures taken under the project, including geo-textile, for saving the homesteads in haor.

SEMP interventions

Under the SEMP project, a pilot scale activity was undertaken in four villages of Pagnar and Sanuar-Dakuar Haors deploying an erosion-proofing technique using bamboo and water hyacinth together. Sometimes *chailla* was also used along with water hyacinth. Here a fence of bamboo was built in front of the village mound and the space between the fence and the platform was packed with water hyacinth. On the village platform near the experimental intervention platform, the slope was away from the protection so that rain during the monsoon

did not create any drainage problem leading to gully formation or erosion. Since this was an experimental intervention, sufficient bamboo and brush wood were stocked to meet any emergency situation.

In *maita bundh*, the *chailla* provides the necessary reinforcement (at least immediately after construction). But the strength of this reinforcement rapidly diminishing. *Chailla* does not grow on the soil wall and as a result, every year the *chailla* bonded soil wall has to be rebuilt. Moreover, an appraisal report estimated that a village platform recedes 4-5/ft per year and many of the poor villagers cannot rebuild the platform on its previous line. As a result, poor people's homestead platform stands somewhat behind the front line. It may, therefore, be considered to make some provision for additional earthwork.



Use of geo-textile for homestead protection in Rajapur, Jamalganj



Geo-textile layers covered with vetiver grass in Rajapur

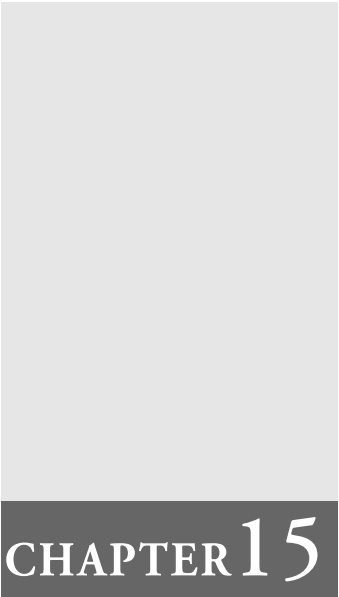
Geo-textile may be used to provide the necessary reinforcement to the soil wall and the construction method will remain more or less the same as that of the *maita bundh* by using *chailla*. Soil layers will be placed with a thickness of about 40 cm. The soil layer will be placed on geo-textile 1 m deep into the village platform. After placement of soil, the geo-textile sheet will be turned around the soil edge and cover the soil up to 2 m inside. The soil layers of 40 cm should be placed in sublayers of not

more than 15 cm and each sublayer should be manually compacted before placing another. In reality, this depth of 1 m or 2 m have to be adjusted with experience.

Each layer of soil will be offset by 15-25 cm and the offset area will be filled up with soil, and vetiver grass or similar grass will be planted. This will provide a green flavour or character to the protection. But this is also important because geo-textile, a polymer based material, degrades after a period of exposure to direct sunlight.

Major Interventions for Sustainable Wetland Resource Management

Two thousand five hundred feet of geo-textile along with *chaila* was used to protect Rajapur village in Jamalganj under the SEMP at two sites. On the other hand, bamboo-water hyacinth based erosion-proofing technique was used in Matargaon, Fenerbak, Hatamara and Rajapur villages of the Jamalganj project site.



CHAPTER 15

BIODIVERSITY CONSERVATION

Biodiversity conservation was a very important element of the SEMP project in *haor* and floodplains. A significant part of SEMP awareness campaign was dedicated to generate consciousness among the local community towards biodiversity around them, its importance, how people's livelihoods and existence are dependent upon plants and animals of wetlands. In other words, biodiversity conservation at the project site was primarily done through awareness campaigns. Consequently, people were concerned about the degradation of wetland ecosystems and their biological components, which was reflected in the PAPD workshops. In those action plans, both *in situ* and *ex situ* measures were suggested for biodiversity conservation. *In situ* measures included establishment of biodiversity/wildlife conservation areas, fish conservation areas, snail conservation spots, safeguarding old trees, demarcation a dolphin conservation site, nesting for Pallas's fish eagle, etc. *Ex situ* conservation measures covered establishment of turtle hatchery and ponds. In the following sections, brief descriptions of these measures are given.

Biodiversity Conservation Areas

These conservation areas are demarcated areas without any human intervention. A number of such areas were established at different project sites. In 2002, a 515-hectare area was

demarcated and conserved in the Hakaluki Haor area (Bhatera and Bhukshimail Unions) for the natural growth of various herbs and shrubs as well as *nal khagra* (*Phragmites karka*), *shatomuli* (*Asparagus racemosus*), *ban tulshi* (*Ocimum americanum*), *hijal*, *karoach* and *borun*. The purpose was to conserve and protect those local swamp species which were abundant once but now are either rare or locally threatened. The villagers were aware of the intervention and consequently, this area became a natural forest through natural regeneration with increased wildlife diversity. The number of snakes also increased. The local people even complained that they were afraid of these snakes when they went to the field for work.



A conservation area in the regenerated swamp forest in Jamalganj

In total, eight biodiversity conservation areas were established in the Manikganj project area, viz. four in Arua Union, two in Gopinathpur and two in Kanchanpur. The total area was 12 acre. These were managed by respective VECs. At the Trishal-Kapasias site, eight biodiversity conservation areas were established. Of these, three were in Kanthal Union, two in Bailor and three in Durgapur. Respective VECs were managing these sites (only Ichhamati Nature Club managed Uttar Singrail Biodiversity Conservation Area) with initial assistance from the project. At both project sites, the activities involved implementation of the Wildlife Conservation Act, improving the habitat for wildlife in general, and banning of hunting, egg-collection and disturbing birds and other animals. These sites were well-marked with signboards, and people were made aware of their existence and purpose through community meetings and discussions.

For *in situ* biodiversity conservation in the Madhumati Floodplain, five conservation sites were established (Table 15.1). Local people were made aware of these sites through awareness campaigns. Students and interested people were taken to visit these areas, and were also encouraged to visit those places for educational purposes.

Table 15.1. Biodiversity, fish and snail conservation sites in the Madhumati Floodplain project area.		
Conservation site	Established	Area (acre)
Biodiversity conservation area		
Kadambari Ganesh Pagal Asram conservation area	2001	8.0
Luxmipur biodiversity conservation area	2001	3.0
Mesobhita biodiversity conservation area	2001	2.6
MBRC (Madaripur Beel Route Canal) dolphin conservation site*	2002	14.9
Ranapasa biodiversity conservation area	2003	7.6
Fish conservation area		
Khetbila fish conservation area	2002	5.2
Nayakandi fish conservation area	2002	2.0
Dodhara native fish conservation area	2003	1.5
Ranapasa canal fish conservation area	2003	2.4
Snail conservation area		
10 snail conservation spots in Chanda <i>Beel</i> area	2001-02	18.5
8 snail conservation spots in Kadambari-Chowaribari <i>Beel</i> complex area	2001-02	9.5
Betgram snail conservation area	2002	4.0

*In six spots: Jalirpar ghat, Ranapasa canal mouth, Bowsher canal, Satpar ghat, Gainsdasur, and Bowltai.

Reed Conservation Spots

Reeds are very important for ecosystem of floodplains. These support aquatic and terrestrial animals with shelter and food. With increasing farming practices, these natural reed lands are depleting away. Extinction of the reed lands will virtually eliminate a very vital structure of the floodplain ecosystem. Recognizing the situation, efforts were made to conserve reed lands along with fishing *kuas*. Integration with *kuas* would help sustain the conservation area, since incentive would be generated from fishing. Ten such reed conservation spots were established in Chanda *Beel* of the Madhumati Floodplain. In the Padma-Jamuna Floodplain, more than 10 km long Ichhamati River bank has been planted with *patipata* or *murta* (*Schumannianthus dichotoma*).

Conservation of Old Trees

Old trees are components of tradition as cultural, social and religious programmes are held under the shade of such trees. Day by day, number of such old growth trees are diminishing. The phenomenon has another impact on the ecosystem since these old trees are habitats and food source of a large variety of wildlife, specially reptiles and birds. Considering these, two old trees (one banyan, *Ficus benghalensis* and one *kadom*, *Anthocephalus chinensis*) were given support in the Padma-Jamuna Floodplain by providing earth-filling at the base and construction of brick-walled protection.



Protecting an ancient *kadom* tree in Gopinathpur

Fish Conservation Areas

Fish catch in the wetland system using harmful gears are detrimental for fish biodiversity and fish production. During the dry season, traditional and seasonal fishermen dewater the deeper parts of the *beels* and catch all fish without keeping brood fish, which is a very negative practice in terms of future fish generation. To address these issues, fish conservation areas were established for protecting the brood/mother fish and their multiplication during the dry season.

A conservation area is usually the deeper part of a *beel* or canal where depth of water is sufficient for survival of fish during the dry season. The conservation area also provides support to other aquatic



Fish conservation area in Manikganj

flora and fauna for keeping the ecosystem functioning. Some parts of the areas were excavated for the development of fish conservation areas (Hassan *et al.*, 2005; Hussain *et al.*, 2005). Fishing in such pockets remained suspended through the stipulated time frame. The local community groups managed these conservation sites successfully.

A total of 14.63 acres of canals/rivers/beels were re-excavated in 2000, 2002 and 2003 at six sites of Pagnar and Sanuar-Dakuar *Haors* in Jamalganj as a part of wetland restoration. Out of the total re-excavation work, some portions were chosen by the respective Village Committees to establish fish conservation areas. Eight such conservation areas were established in Jamalganj with a total area of 7.23 acres. The habitats included rivers, canals and *beels* with surface area ranging from 0.50 to 1.02 acres.

At the Padma-Jamuna Floodplain project site, five fish conservation areas were established with a total surface area of 700 decimals. These were the Ichhamati River at Bawlikanda village (a secondary river), an area of the Padma at Bahadurpur village, Gopinathpur *Beel* (200 decimals area), Bawlikanda (a floodplain area) and Boiddakandi-Mohammadpur (a *beel* area). In the first two, bamboo and branches of trees were used to establish *kathha*. In the latter three, lease money was also required to establish the conservation areas. Respective VECs or FRMCs managed these areas which were used as demonstration areas for fish conservation as well.

Sluice gate fish conservation area was established in a canal in the Singrail-Baliarpar villages of Kanthal Union in Trishal. The objective was to implement the Fish Conservation Act, to improve the habitats, and to implement banning of fish fry/mother fish catch. This site was managed by the Boka *Beel* FRMC.

In the Madhumati Floodplain, four fish conservation areas were established during 2002-03 (Table 15.1). These have been managed by the respective VCs.

As a result of establishing fish conservation areas, fish biodiversity and production increased. For example, studies revealed that species diversity and fish catch were greater in the conservation areas than in open areas at the Jamalganj *haor* site. Moreover, the locally threatened species like *Ekthota* (*Dermogenys pussillus*), *Teri puti* (*Puntius terio*), *Meni* (*Nundus nundus*), *Rani* (*Botia dario*), *Gora gutum* (*Somileptis gongota*) and *Kuna kumirer khil* (*Doryichthys cuncalus*) also became available in those protected sites.

Turtle Ponds and Hatcheries

In Bangladesh, turtles are highly threatened animals, which need immediate attention for conservation and protection. As pilot interventions, a number of hatcheries and some conservation ponds were established at three SEMP project sites to protect these species.

To create awareness among the local community for the conservation and restoration of freshwater turtles, a turtle conservation pond was established in Ujjalpur village, Jamalganj *haor* site. The pond harboured five Indian Flapshell Turtles (*Lissemys punctata*) (nationally 'Vulnerable') and an Indian Roofed Turtle (*Kachuga tecta*). The pond was clearly marked as a conservation site, and visitors, especially young people, were encouraged to visit it.

In the Padma-Jamuna Floodplain area, a turtle breeding hatchery was established in an artificial pond to demonstrate the feasibility of turtle rearing and reintroducing them in nature. This hatchery was established at Bawlikanda village of Arua Union with turtles collected locally and also from outside. In 2001-02, 175 turtles hatched in this hatchery. In total, about 250 individuals of turtle were released in the floodplains in 2002-03. The species in this *ex situ* conservation pond were *Daira kasim* (*Aspideretes hurum*), *Holdey kaitta* (*Morenia petersi*), *Kori kaitta* (*Kachuga tecta*), *Sada kaitta* (*Kachuga tentoria*), *Shundhi kasim* (*Lissemys punctata*) and *Vaittal /Smithi kaitta* (*Kachuga smithi*).

A turtle pond was established at Goalgram Asram (a Hindu shrine) in Goalgram village, Nanikhir, Chanda *Beel* with active help from the Asram committee. A total of 118 small turtles of four species were released in that pond. But during the flood of 2004, many individuals were lost.

Pallas's Fish Eagle Conservation

Pallas's Fish Eagle is enlisted as a Vulnerable bird species all over the world. In Bangladesh, it is now Critically Endangered and seen only in a few floodplain and *haor* areas. The general belief about the Pallas's Fish Eagle among the different communities is positive. Therefore, when this bird species was sighted at Pagnar and Sanuar-Dakuar *Haors* and Manikganj sites, initiatives were taken to conserve the few remaining pairs.

Specific interventions were undertaken for conserving this globally important bird.

- a) Assessment, mapping and identification of nests and conservation plan development,
- b) Building secured nests for the bird,
- c) Raising awareness and creating understanding



Pallas's Fish Eagle in *haor*

among the local community about the importance of this prize species, and

d) Regular monitoring.

Under the present project, the population status (pairs and nests) was recorded and threats were identified. Awareness programmes at school (10) and community (11) levels were conducted, and VEC (8) and FRMC (2) meetings were organised for this species conservation. Three signboards were erected to raise awareness on Pallas's Fish Eagle among the local communities. Whenever the birds, especially the chicks, were in distress, help was provided by the local community in association with the CBHFRM project personnel.

Snail Conservation

Snails have both economic and ecological importance. They play a vital role in ecosystem functioning in aquatic and terrestrial systems, and avian food chain. Snails are also significant in maintaining ecosystem balance by playing the role of nature's cleanser in the water and thereby maintaining water quality. Nonetheless, this natural resource base has been depleting quite alarmingly in the most recent past, as there has been no regulation imposed regarding harvesting of snails. Prompt and effective conservation and management measures have to be taken to stop and reverse this trend of depletion.

Under the SEMP, several conservation measures were taken for snail conservation in the Chanda Beel area. A comprehensive awareness campaign was undertaken in this area for the conservation of snails. In community awareness meetings the importance of snail in general and importance of sustainable harvesting from an economic point of view were communicated with all walks of people of the community. Emphasis was also given on snail's importance and conservation measures in 12 meetings of environment clubs established under the SEMP. In total, 10 billboards bearing attractive sketches of snails along with the urge to conserve snails for their outstanding ecological and economic importance were placed in different places of Chanda Beel area. Snail conservation issues were also highlighted in the folk dramas performed by the local cultural groups.

Eighteen conservation spots and one conservation site, focusing on protection of snail habitat, were established in the Madhumati Floodplain (Table 15.1). Each conservation spot was about 500 sq m in size. All sites were marked with bamboos, red flags and signboards. No snail could be collected from the conservation sites, which were important refuge for the snails. Moreover, local people were motivated enough to put snail eggs in the conservation sites, if found in vulnerable condition.

Dolphin Conservation

Ganges River Dolphin (*Platanista gangetica*), a threatened aquatic mammal of Bangladesh, is found at least in three SEMP project areas, namely, the Madaripur Beel Route Canal (Gopalganj), Ichhamati River (Manikganj) and Surma River (Jamalganj). The population size, composition, distribution and threats to dolphins were recorded at those sites along with people's perceptions of the species, in consultation with the local people.

The conservation initiatives of dolphin mainly consisted of awareness campaigns. Awareness camps were organised in educational institutions in the locality. This included primary schools, high schools, colleges and *madrassahs*. The activities were slide and video shows, lecture and debate sessions, open discussion forum, rally, nature walk, environmental dramas and visit to dolphin watch tower established under the project at the Madhumati site. River cruises along dolphin trail were also arranged for the villagers, particularly for the school children in some sites. Local tourists were also invited occasionally to join the river cruise. Importance of dolphins in nature and need for their conservation were highlighted in those activities. A large number of people participated in those programmes often organised to observe the environment related days or other relevant occasions throughout the year.



A dolphin watch tower in Chanda Beel

Besides, part of the Madaripur Beel Route Canal was declared as a dolphin conservation area. Colourful and pictorial billboards and signboards depicting slogans on dolphin conservation were hoisted along the riverbanks and suitable public locations.

Bat Conservation

Under the CBHFRM projects, conservation efforts were made to conserve bats and their colonies/habitats in three unions under two *upazilas* of Manikganj. Bat conservation initiatives were urgent in those areas, because the loss of bats could seriously threaten the survival of local vegetation since they are important seed dispersers and pollinators of many plants, especially trees.

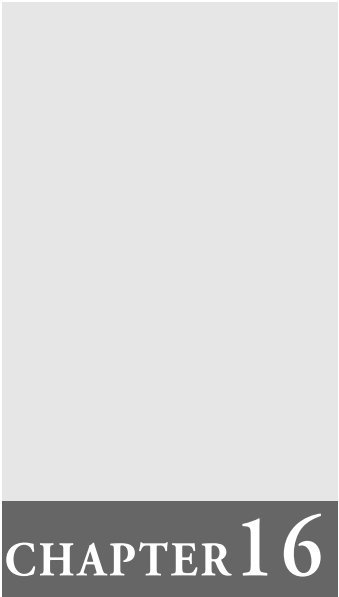
Conservation efforts on bats at CBHFRM sites mainly focused on:

- a) Identification and census of bats population;

- b) Determining the population status of bats, through locating roost sites and undertaking colony counts;
- c) Establishing local support for conservation efforts, through presentations in schools, and seminars for local authorities and other stakeholders; and
- d) Supporting the development of village-based environment clubs that undertake active measures to protect local bat roosts.

Effective bat conservation programme relies on gathering information to identify changes in populations that are of conservation concern. Brief information could be found in Chapter 7.

There was widespread mobilization of public support for conservation of bats, with an increased recognition of bats as an important cultural and natural resource unique to the project site, and in particular, the project was successful in directly involving the local community and school children in conservation. As a result of direct dialogue with communities and local authorities, which resulting in a local consensus, the regulations on hunting/killing bats or destruction of bat habitats/colonies were strengthened. Therefore, the bat survey helped to obtain information on the location of key roosting sites needing protection.



CHAPTER 16

MONITORING AND EVALUATION

Project Monitoring and Evaluation (M & E)

To achieve the goals and envisaged objectives, project activities should be monitored and evaluated on a regular basis. These can be done by the internal M & E unit of the implementing agency or by employing an external body. The frequency depends upon the project size (based upon the outputs and activities) and tenure (short-term/long-term). As a result of conducting the M & E, the project team identify their shortcomings, obtain guidance, are able to improve their approach, and revise their activities. Consequently, better outputs are possible.

A number of M & E methods are available. These can be qualitative and quantitative. The latter is always appreciated especially when targets/milestones are identified at the inception of the project. This is also less time consuming, effective and user-friendly. Almost all of the methods consist of target and achievement matrix. Nonetheless, qualitative monitoring is also done, but mostly to assess the impacts of the activities undertaken that are not quite concrete.

Under the CBHFRM projects, project activity monitoring was done by IUCN Bangladesh's internal monitoring team. From time to time, they visited the project sites, consulted the local

community and the project staff about the project and finally submitted their reports on the progress. An M & E guidelines has been published highlighting important aspects of community based resource management (Waliuzzaman *et al.*, 2003).

The quarterly progress reports of the projects also functioned as the tools for evaluation of the project activities. Monthly/weekly meetings of the project teams also evaluated the constraints and weaknesses of the projects and were provided with necessary guidance. Meetings of the Management Committee and Steering Committee also evaluated progress of the project and supported with necessary supervision.

The project included one mid-term review which was done in 2001 by an external team invited by the UNDP. The team visited the project sites and evaluated the progress achieved then. Another review was done in the same year by the MoEF for all the SEMP components during the nine month inertia. Audit of the project fund management was a regular task, done by IUCN Bangladesh's mandatory auditing practice. The UNDP and MoEF also launched audit for the SEMP components with which the *haor* and floodplain components of the SEMP complied.

At the end of the project, in late 2005, an in-house M & E was done by IUCN Bangladesh to have an overall assessment of the CBHFRM projects' achievements. IUCN Asia Regional Office also launched another M & E, appointing an external expert at the same time, mainly to focus on the sustainability of the project interventions.

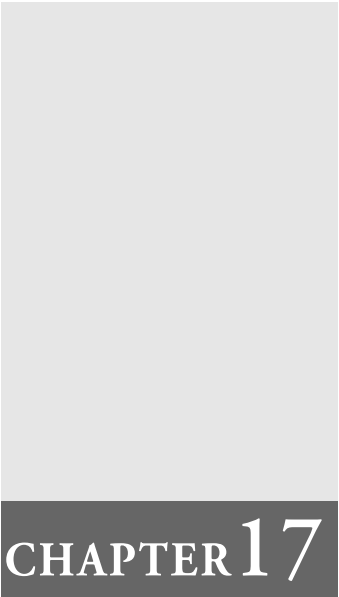
It is expected that a final evaluation of the components will be carried out by UNDP before closing the current SEMP activities.

Participatory Monitoring

Participatory monitoring and evaluation is a process of collaborative problem solving through the generation and use of knowledge. It is a process that leads to corrective action by involving all levels of stakeholders in shared decision-making. Participatory monitoring includes stakeholders of communities and project staff, and in the process, the resource users or community-based organisations actively participate in important activities like fish biodiversity and other aquatic resource management. The participatory monitoring is a mechanism to keep the communities updated on interventions undertaken with a view to empowering the stakeholders.

At the beginning of the CBHFRM projects, baseline studies on flora and fauna were conducted following both participatory and statistical survey methods. Later, to assess the impacts of project activities, community people participated in fisheries, plants and wildlife monitoring activities. Environment or nature clubs comprising schoolboys monitored the wildlife and

environmental entities around them, and subsequently shared their observations in the periodical meeting with the project staff. While carrying out regular monitoring and evaluation of the project activities, abundance or depletion, and diversity of flora and fauna were monitored continually to record an understanding of the changes in the light of various interventions conducted under the projects.



CHAPTER 17

REPORTING AND DOCUMENTATION

Documentation of the project activities started right from the beginning. It started with the review of existing literature. The subject knowledge bank was further enriched through field level observation, data collection and analysis of those data which provided necessary information to write up reports and documents. In many cases, the information upon which the reports were based were gathered from the community through participatory processes. Project activities were documented along with the experience gathered during the project implementation. The approach of project activity documentation was to cover both success and failure. These lessons learned would guide the project team and interested people to take right steps in the future through replication of successes and adaptations for unsuccessful endeavours. All activities were also framed as photographs. In some cases, video recording was also done. Some of the reports/documents were made available in digital format by producing compact disk versions as well.

Project Documents

Project Support Document (PSD) and TAPP

These were prepared in 1998 for the whole SEMP, and included the outline of all the components including budgetary provision. Later on these were translated into project specific implementation plans.

Project Implementation Plan (PIP)

The CBHFRM projects were initially planned for five years (October 1998 to September 2003) and accordingly PIPs were prepared with detailed site specific workplans and Logical Framework Analyses (LFAs) maintaining connections among the goal, purpose, outputs and activities of the project. The first PIP was developed for both *haor* and floodplain resource management components together, and was a part of the Inception Report. From then on, separate PIPs were prepared for the two components, revised from time to time in accordance with the improved project scopes (e.g. extension of the project intervention areas, incorporating new site specific activities, etc.) as realised during the field activities and in accordance with the changes in budget allocation. The first major revision was done in late 2001 after the nine months of inertia over the project was over. The latest PIPs for the components were developed in late 2004 with a view to extent site level activities until December 2005. The main focus of the new PIPs was to address the sustainability issues (IUCN Bangladesh, 2005a).

Progress reports

Progress reports for a project can be of different temporal scales, namely monthly, quarterly, annual, etc. For both *haor* and floodplain components of the SEMP, 27 quarterly progress reports apiece have been prepared till October 2005. These mandatory reports captured the planned activities and achievements of the current quarter, and also contained workplans for the next quarter. In addition to that, occasional annual progress reports were prepared and submitted to the PMU as requested. A brief on progress was prepared in 2001.

Project reports

A project brief was published in the early stage of the project in 2001. A folder containing a summary of achievements was published in 2004. There are other site specific reports on various activities, programmes and experiences. Some of the major site level reports include information on:

1. Household Census
2. Socio-economic Baseline Survey
3. Physical Resource Survey
4. Participatory Landuse Survey
5. Plant Survey
6. Fish and Wildlife Survey
7. Fish Catch Monitoring and Household Fish



Consumption Monitoring

8. Agriculture Practices
9. Problem Census
10. Participatory Action Plan Development
11. Awareness Programmes
12. Plantation
13. Wetland Habitat Rehabilitation
14. Environment Fund
15. Monitoring & Evaluation

Besides, a number of consultant reports have also been prepared under the projects which are listed in Chapter 7.

Publications

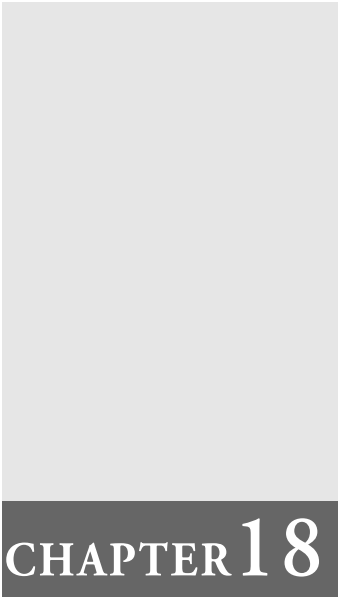
Several documents have been published under the project and a few more are expected to be published by December 2005. Published documents are listed in the bibliography section of the present book with asterisks. A list of envisaged publications is given below with tentative titles.

1. Report on Plantation Activity in *Haor*
2. Approach for Medicinal Plant Conservation
3. A Report on Agricultural practices of Chanda *Beel*, Gopalganj
4. Brahmaputra Floodplain: A Socio-economic Baseline Report
5. Community Initiative in Threatened Species Conservation: Pallas's Fish Eagle
6. Report on Butterfly at Arua areas
7. Community Initiative in Threatened Species Conservation: Ganges River Dolphin
8. Community Initiative in Threatened Species Conservation: Bat
9. Fish Catch Assessment and Monitoring in the *Haor* Areas



10. An inventory of Fish and Wildlife of Nali *Beel* and its Adjacent Areas, Kapasia
11. Report on Solar Electrification
12. Hydro and Meteorological Characteristics of Hakaluki *Haor*
13. Community Based *Haor* and Floodplain Resource Management: A Wildlife Assessment
14. Wetland Resource Management: A Training Manual
15. Wave-erosion of Homestead and Village Platform in *Haor* Areas: An Appraisal
16. Strategy for Sustainable Financial System of Community Organisation





CHAPTER 18 CONCLUSION

Wetlands of Bangladesh have, of late, been suffering rapid degradation. Given people's dependence on wetlands and their resources, comprehensive initiatives are crucial and urgently needed to reverse the negative trends (Figure 18.1). Projects like CBHFRM, first of its genre in Bangladesh, are examples of such attempts. These projects were participatory in all senses. Resource inventorying, problem identification, solution prioritisation, planning needed interventions, and finally implementation of those in the field - all were done through the participation of all concerned stakeholders. These projects, however, only offered the opportunity to pilot a range of interventions deemed appropriate for improving the existing conditions prevailing in some selected *haors* and floodplains. Major interventions included baseline data establishment, PAPD, community organisation, enhancing livelihood options, financial incentives, awareness raising, demonstration, alternative energy options, plantation, wetland restoration, and biodiversity conservation.

But this is not the end of this novel initiative. Like any other development projects, a major challenge in the CBHFRM projects too lies in sustaining the project achievements after the 'phasing out' stage. During the implementation of the projects, the resource users at the five

project sites were motivated, organised and urged to involve themselves in the whole development process with a view to strengthening their capacity to ensure the well-being of the ecosystem and as well as their livelihood even after the project tenure. In addition, the project also attempted assessing needs and developing programmes for enhancing the capacity of the NGOs and local government bodies/agencies.

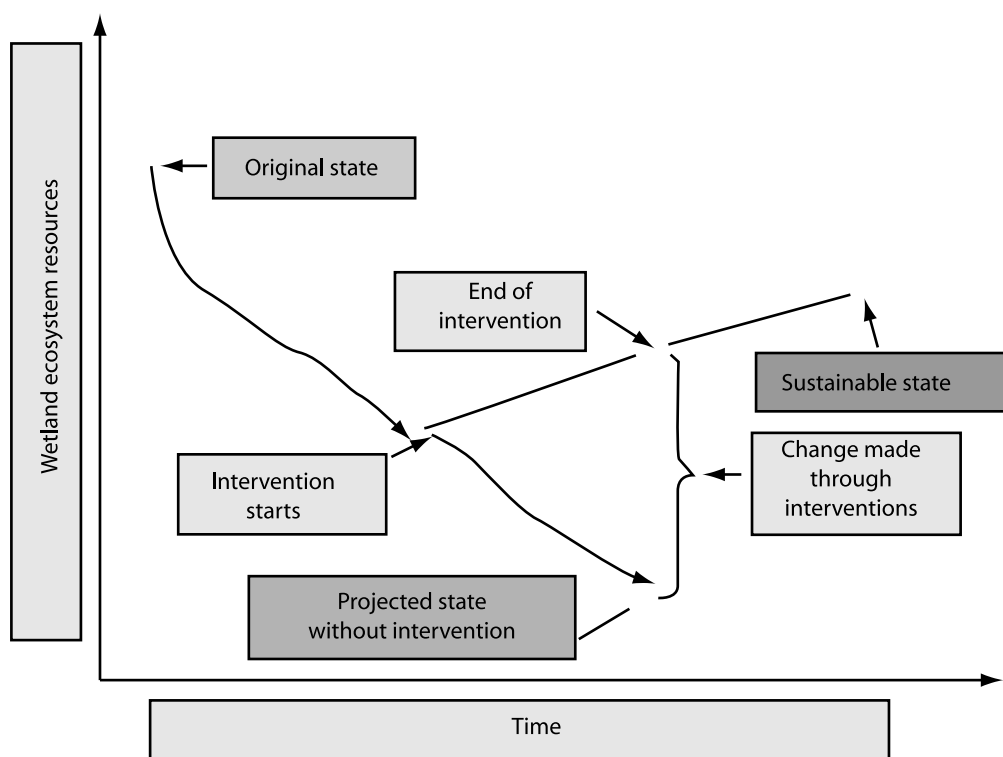


Figure 18.1. Schematic presentation of the sustainability concept of interventions for wetland resource management

To ensure the sustainability of the CBHFRM project outputs, a series of workshops was organised from the field to the national level. Workshops were held at *haor* and floodplain sites to develop linkages between CBOs and other stakeholders including government officials. A national level workshop was organized in 2002 for developing the exit strategy for the CBHFRM projects. In March 2005 another workshop was organised to finalise the exit plan and delineate the activities to be taken, up to sustain the SEMP initiatives. The exit strategy is detailed out in a separate document.

It is expected that a replicable, comprehensive model on participatory wetland resource management practices will be developed after the completion of this medium-term project. It is envisaged that lessons learnt from these projects will present the government with an opportunity to replicate such initiative in other areas of the country. Such replication will certainly ensure the access of the poor to the natural resources, thereby affording the local communities the much-needed uplift in their quality of life and livelihoods, and at the same time wetlands shall be sustainable in a wiser manner.

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