

# *Baira* : the Floating Gardens for Sustainable Livelihood

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IUCN - The World Conservation Union  
Bangladesh Country Office  
2005

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This book is published with the financial support received from Sustainable Environment Management Programme (SEMP), Ministry of Environment and Forest, Govt. of Bangladesh UNDP.

Published by: IUCN Bangladesh Country Office



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Citation: IUCN Bangladesh, 2005. *Baira: the Floating Gardens for Sustainable Livelihood*. IUCN Bangladesh Country Office, Dhaka, Bangladesh, viii + 61 pp.

ISBN: 984 - 8574 - 08 - 5

Photographs: IUCN Bangladesh and BCAS

Design and Layout: Sheikh Asaduzzaman

Printing: Progressive Printers Pvt. Ltd.

Available at: IUCN - The World Conservation Union  
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## Foreword

A *baira* is a floating platform made up of plant materials and used to cultivate crops or to raise seedlings on it. This mode of hydroponics or soil-less culture is an age old practice in southern Bangladesh. As water hyacinth, a very common aquatic plant, dominates most of the stagnant waters, it has been the major component of *baira* for the good part of the last century. Being under water for three to four months per year, this is an effective technique to overcome the lack of dry land and continue horticultural practices for household consumption as well as commercial supply in the floodplains of Bangladesh. The people of the floodplain areas are generally poor. *Baira* cultivation could be an alternative livelihood option for them. Their livelihood sustainability could be ensured by providing assistance to them for making *baira* platforms and cultivating on them. This would consequently help them to improve their socio-economic conditions.

IUCN Bangladesh has taken such initiative in association with Bangladesh Centre for Advanced Studies (BCAS) under the Sustainable Environment Management Programme (SEMP) (Component 2.2.1/B, Community Based Floodplain Resource Management) in the Madhumati Floodplain. Under this project one of the interventions is to promote alternative livelihood options. *Baira* farming was one of the options suggested by the people of that project area. Moreover, variations could be identified in this traditional cultivation system in different parts of the country, indicating *baira* cultivation to be in an evolutionary phase here. But the information on *baira* is not sufficiently documented in Bangladesh. The purpose of the present account is to illustrate the *baira* extension initiative taken under the SEMP. This publication

documents field observations, local knowledge, and participatory planning and interventions to promote *baira* farming as an alternative livelihood option.

This report is principally based upon field data as were generated from the consultation among the project staff, local *baira* practitioners, people interested in *baira* farming and people who adopted the technique under the initiative. Nasimul Huq played an important role at the early stage of the project. Md. Tofayel Ahmed, Tapas Ranjan Chakrabarty, Abdul Karim, Md. Saiful Islam Khan, Olena Reza and Dulal Roy helped in data collection, field activities and field facilitation. IUCN Bangladesh acknowledges the assistance received from all of them. We also appreciate the contribution of Abdul Khaleque and Sheikh Asaduzzaman in the process of manuscript preparation and printing.

IUCN Bangladesh gratefully acknowledges the financial support received from the Ministry of Environment and Forest, Government of the People's Republic of Bangladesh and the United Nations Development Programme (UNDP) for supporting the Community Based *Haor* and Floodplain Resource Management Projects (SEMP Components 2.2.1/A & B) and publication of this book.

We hope that this account will encourage the expansion of *baira* cultivation as an environment-friendly livelihood options in the wetlands of Bangladesh to poverty mitigation and to adapt to the consequences of climate change.

Dhaka  
November 2005

Ainun Nishat  
Country Representative  
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## Abbreviation, 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 - August
<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
<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
<i>Guti</i>	Ball or cushion like structure made of aquatic plants used in <i>baira</i> cultivation to facilitate seed germination
IUCN	The World Conservation Union
NGO	Non-Government Organization
SEMP	Sustainable Environment Management Programme
UP	Union Parishad
<i>Upazila</i>	The lowest tier of formal administration

## INTRODUCTION

### 1.1. Background

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 wetlands of Bangladesh (see Haq *et al.*, 2002). In this method, aquatic plants are used to construct thick floating platforms on which vegetables and other crops are cultivated in monsoon. The use of such platforms made up of plant materials to grow plants dated back a few thousand years. Hanging gardens of Babylon, *Chinampas* of Aztecs in Central America and floating gardens of the Chinese are a few famous examples associated with different forms of hydroponics. At present, the use of floating platforms in farming is concentrated in India (in Dal Lake, Kashmir and in some floodplains in Assam), Myanmar (in Inle Lake in southern part of the country and are locally called *Yechan*), and Bangladesh. Till date, *baira* practice is confined in the floodplains of the southern parts of Bangladesh. *Baira* is also known as *gathua*, *geto*, *daap*, *gaton*, etc. in this country. Being one of the most common aquatic plants of the wetlands of Bangladesh, water hyacinth, locally known as *kochuripana* (Box 1), is now the major ingredient of *baira*.

Bangladesh is a land of water and wetlands. More than two-thirds of the country's landmass may be classified as wetlands according to the Ramsar definition enunciated in the Ramsar Convention. The freshwater wetlands of the country include floodplains, *beels*, *haors*, *baors*, etc. Floodplains occupy a major portion of freshwater wetlands characterizing country's landscape,

especially for some parts of the post monsoon period. The wetland ecosystems are very important to the economy and life of the people of Bangladesh whose livelihood and subsistence are very much linked with the productivity of wetlands. Unfortunately, these wetlands have been going through rapid destruction for the last few decades at an alarming rate. One of the best ways to improve the conditions of a degrading wetland ecosystem is to motivate and subsequently involve its people in every step of the initiatives taken, from the problem assessment up to the actual interventions, for reversing the situation positively. This practice ensures the sustainability of the targeted achievements of any developmental and environmental initiatives. However, such sustainability is not achievable unless the project outputs include the improvement of the existing conditions of the concerned wetland people.



*Kochuripana* in flower

**Box 1. *Kochuripana* (water hyacinth, *Eichhornia crassipes*): an interesting aquatic plant**

- First discovered in the Amazon basin in western Brazil, in 1824.
- Has spread over more than 50 countries (ISSG, 2005) including Bangladesh.
- Classified as one of the worst invasive species.

**Minuses**

- Harbors water-borne pathogens.
- Makes waters unsuitable for other aquatic organisms.
- Impedes navigation in water courses by prolific growth.
- Shallows water depth by accumulation of debris.

**Pluses**

- Used as fertilizer, fodder, fuel, etc.
- Used to make construction blocks, paper, rope, etc.
- Used to make floating stand for livestock during monsoon.
- Can trap pollutants like heavy metals from industry effluent discharge.
- Used to make floating platforms to raise seedlings and cultivate crops.

IUCN Bangladesh has been implementing the Community Based Floodplain Resource Management Project (Sustainable Environment Management Programme component 2.2.1/B) in association with Bangladesh Centre for Advanced Studies (BCAS) in the Madhumati Floodplain area in Gopalganj and Madaripur Districts. The project was initiated in the late 1998 and is expected to be completed by December 2005. One of the important characteristics of a floodplain area is that water persists here at least for 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 was to promote *baira* as an alternative income generating activity under the present project.

## 1.2. *Baira* in Bangladesh

Some communities of Gopalganj, Barisal and Pirojpur areas of Bangladesh have been traditionally in practice of *baira* cultivation for quite sometime. Table 1 lists the *upazilas* where this practice has been concentrated.

Other districts, namely Jessore, Narail, Bagerhat, Khulna and Satkhira have numerous wetlands suitable for *baira* farming. However, these area have come under organized *baira* extension only recently under a couple of environment-development projects. For example, CARE Bangladesh has initiated a project titled Reducing Vulnerability of Climate Change (RVCC) in

**Table 1. Traditional *baira* practice in Bangladesh**

<i>District</i>	<i>Upazila</i>
<i>Gopalganj</i>	<i>Gopalganj Sadar</i> <i>Muksudpur</i> (limited) <i>Kashiani</i> (limited) <i>Kotalipara</i> <i>Tungipara</i>
<i>Pirojpur</i>	<i>Pirojpur Sadar</i> <i>Sharupkathi</i> <i>Najirpur</i>
<i>Barisal</i>	<i>Banaripara</i> <i>Ujirpur</i>

southern Bangladesh including the above-mentioned five districts and Gopalganj (CARE, 2004). Bangladesh is expected to face the adverse effects of climate change such as sea level rise, water logging, poor drainage, siltation and sea water intrusion. Some of these are already there on a limited scale, and consequently disrupting the normal farming systems. The purpose of the RVCC project is to facilitate the susceptible communities in Bangladesh to adapt to the adverse affects of climate change by adopting floating garden (*baira*) as a new farming option.



Bottle gourd seedlings on *baira*

At present, in most of the areas, the main component of *baira* is water hyacinth. But the techniques of *baira* preparation and cultivation on it vary from region to region, and even from village to village in the same district. On *baira* platforms people raise vegetable seedlings and/or grow vegetables. However, raising seedlings is manifold profitable than cultivating vegetables for marketing. Over a three-four months period, three to five cycles of seedling production is possible. After the flood water recedes, the *baira* platforms are placed on a relatively higher ground (locally called *kandi*) by the water bodies. These are then broken down and mixed with the soil as organic fertilizer. Beds prepared in this manner are then used to grow winter vegetables. In this way *baira* is used as floating platform in monsoon and then as fertilizer in winter to grow seedlings and crops for almost all year round in southern Bangladesh.

### 1.3. Prospects of *baira* farming extension in Bangladesh

*Baira* cultivation is a useful technique to practice widely in the floodplains of Bangladesh. Promoting this technique is easier because it has already been practiced in the country for a long time, although in a limited scale. We have the much needed expertise in our own floodplain areas. What we need is to motivate the people of other potential areas towards *baira* cultivation, and facilitate their understanding of *baira* as an alternative and environment-friendly livelihood option.

In addition to poverty alleviation (Box 2), there are several social, economic, agricultural, ecological and environmental benefits associated with *baira* practice. Some of these are listed below.

#### Box 2. *Baira* initiatives for poverty alleviation

People in the floodplains of Bangladesh are mostly poor. These vulnerable people are constrained by not having cropping space in terms of access to or ownership of lands. In some cases, even when they do have the access, the land is submerged under flood water for around four months, restricting its use for cultivation. As a result most of the local people have to depend only on one crop per year.

Under such condition, the use of *baira* provides the farming community with additional cropping space at the time most suitable for cultivation. If the local poor community prepare *baira* and get involved into marketing of seedlings and vegetables, they would earn some additional money to improve their existing conditions. For example, if a farmer prepares five average size (30ft X 9ft) *baira* platforms, at the end of the season his net income would be around Tk 8,000-10,000, which is a good sum for a poor farmer or a vulnerable person in the *beel* areas.

#### A. Socio-economic benefits

1. Cultivation on *baira* platforms facilitates employments in the floodplain areas in rainy season.
2. It increases quality food production, which positively influences the health of the local communities.
3. *Baira* cultivation promotes the expansion of a local technique of hydroponics, thus helping in conserving indigenous knowledge.

#### B. Agricultural benefits

1. *Baira* platforms provide additional cropping and seedling-raising areas in the floodplains, especially during rainy season when the cultivable land is scanty.



2. Prime nutrient elements of plants, namely, nitrogen, potassium and phosphorus, are available in water hyacinth. A comparative study on water hyacinth and cow-dung has shown more or less similar concentrations of these elements (Aktar *et al.*, 1997). *Baira* thus cuts down fertilizer expenses considerably.
3. Crops require shorter time to mature when cultivated on *baira* platforms.
4. Increases vegetables supply in the area and the surroundings.
5. The floating platforms could be used as additional space for community nursery in the wetlands.
6. When water recedes from the *beels*, *baira* platforms are used as organic fertilizer. In this way *baira* enhances eco-friendly agriculture practice in the following winter to cultivate *robi*/winter crops.

### **C. Ecological concerns**

1. As chemical fertilizers are not used in *baira* cultivation in large amounts, this cultivation practice does not harm the environment by supplying chemical pollutants to the water.
2. Since *baira* residue could be used as organic fertilizer for winter crops, this practice cuts down pollution from chemical fertilizers.
3. *Baira* provides a good use of an invasive species like water hyacinth. This is a very effective way to control this notorious weed.

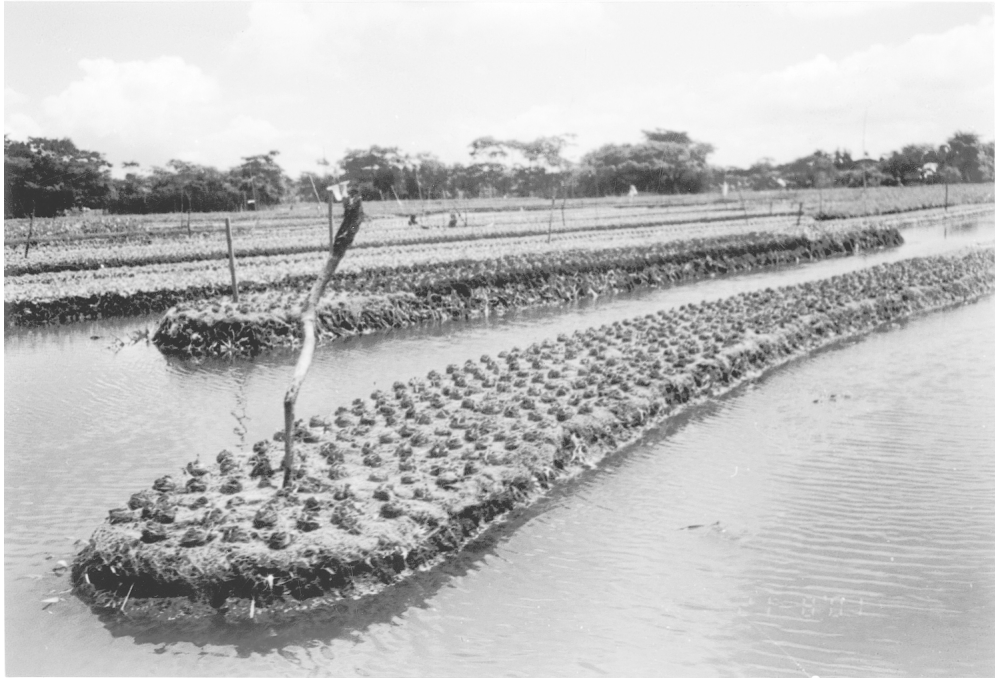
### **D. Environmental concerns**

Low-lying countries like Bangladesh are prone to the consequences of climate change and sea-level rise. These include abnormal natural calamities (e.g. unusual torrential rainfall, increased cyclones, etc.), prolonged flood-water stagnancy due to drainage problem, increased intrusion of salt water into the freshwater systems and so forth. Southern part is predicted to be the most vulnerable area of Bangladesh. One of the modes of adaptation to extended water stagnancy is to get familiar with floating platform (*baira*) cultivation techniques. *Baira* cultivation could help to continue farming in unusually long post monsoon period.

## **1.4. Scope of the report**

This report documents the *baira* extension initiative under the SEMP in the Madhumati Floodplain. It shares the participatory approaches taken under this initiative. It subsequently

documents different aspects of *baira* preparation, seedling-raising and growing crops on these floating platforms, and pest management. This account records the motivation, organization and capacity building of the local people as carried out in the field in respect to *baira* extension. This report further comments on the sustainability, constrains and suggests recommendations for future *baira* initiatives.



An anchored *baira* with newly placed *gutis* in Pirojpur

### APPROACH OF THE *BAIRA* EXTENSION INITIATIVE

The wetlands of Bangladesh are going through a rapid degrading phase. One of the best ways to stop or reverse this damaging trend is to involve the local resource users at all stages of natural resource management projects. In this approach, the central focus is on the people who themselves should be managing their natural resources and improving the prevailing unacceptable degrading conditions. IUCN Bangladesh, in association with BCAS, has been actively pursuing this principal in the Chanda *Beel* area of Gopalganj District under the SEMP. Some major interventions of this project includes establishment of a baseline on physical, biological and socio-economical components, participatory problem identification and prioritization, undertaking restoration of habitats, promoting awareness, organizing people into groups and promoting appropriate farming practices. The last intervention includes promotion of integrated pest management, encouraging the use of bio-fertilizer and other eco-friendly options like *baira* cultivation technique. *Baira* farming has been a traditional agricultural technique in this area, but exists in a limited area only. There was good potential of this practice to be a useful alternative livelihood option for the local people of Chanda *Beel*, especially the poor and the vulnerable women. This chapter describes the approach taken under the SEMP to promote the extension of *baira* farming in the project area.

#### 2.1. Project area

Chanda *Beel* (between latitude 23°08' and 23°15' north and longitude 89°15' and 89°59' east) is one of the most important *beels* in the Madhumati River Floodplain ecosystem in the south

of Bangladesh (Map 1). 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 Madaripur Beel Route (MBR) canal. The Kadambari - Chowaribari *Beel* complex is a smaller area on the eastern side of the MBR canal where some SEMP interventions were taken place. The total project site spreads over 31 villages, eight unions (Ujani, Kasalia, Nanikhir, Satpar, Jalirpar, Khalia, Kadambari and Rajoir), three *upazilas* (Muksudpur, Gopalganj Sadar and Rajoir) and two districts (Gopalganj and Madaripur). The population of the project area is more than 30,500.

The water level of Chanda *Beel* is mainly governed by the water levels in the MBR canal, 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 flood water. Most of the area of the *beel* becomes dry during the winter season. But its canals and comparatively low areas near the central parts of the *beel* retain small amount of water as perennial pockets. The ecology is massively influenced by the alternation between aquatic and terrestrial phases.

Like other floodplains of Bangladesh, the project area remains under flood water for four to five months a year. People thus cannot cultivate or get farming jobs in the rainy season. It is really difficult, especially for the poor and the vulnerable, to depend upon single crop a year. Some farmers of Nanikhir village in the Chanda *Beel* area of Gopalganj District first started to cultivate crops on *baira*, and secured good income over wet seasons. Later on, encouraged by this success, this cultivation technique had been extended to other villages. In the rainy season, most of the *beel* is covered with water hyacinth within a few days because of its rapid vegetative reproduction. Thus, raw materials for preparing *baira* platforms are naturally available in this area, and the actual preparation does not need huge investment either. Nonetheless, this farming practice has not been expanded in this area up to its full potential; hence, an initiative to encourage eco-friendly farming practice like *baira* would be very useful.

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*.

## **2.2. Approaches**

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, namely i) assessment, ii) planning, iii) interventions and iv) monitoring and evaluation, for the present *baira* program.

### **2.2.1. Problem assessment and option ranking**

#### **(a) Needs assessed**

At the beginning of the SEMP project, initiatives were taken to establish the baseline of the natural resources of the project area by Participatory Rural Appraisal (PRA). This also included an inventory of plant resources. The initial assessment of the natural resources and socio-economic status of the people of the project area were shared with the local communities through group discussions and community workshops. Representatives from local NGOs and local administrative bodies (e.g. Union Parishad) were also invited to those programs. During those meetings, a number of community members and local organizations (e.g. Swadesh Unnoyon Sangstha, an NGO and Bishwa Manob Kalyan Sangshtha, a welfare society) suggested to address the problem caused by water hyacinth and its mitigation through promoting *baira* technique in the project area. It was further realized that such initiative would also enable local communities, particularly the vulnerable and the poor, to be engaged in productive livelihoods.

While conducting a participatory assessment in Nanikhir village, a number of villagers were found engaged in *baira* cultivation. A total of 23 families of this village were identified who shared their learning and experience with the SEMP project staff (see Appendix 1 for details). It was also learned that these *baira* practitioners also used the remains of water hyacinth platforms as organic fertilizer to grow vegetables in dry seasons.

Nanikhir village is the first village in this area to start *baira* cultivation. The *baira* practitioners of this village are expert nursery operators. Their primary drive is to market the seedlings of various vegetable crops as early as possible in the season. Vegetable crop producers, particularly farmers who grow vegetables on a commercial basis for markets in urban centers like Dhaka, have a preference for quality seedlings of a range of vegetable plants, beginning from August each year. The competition among these farmers to be the early starters is motivated by the early season premium prices the vegetables fetch. This enables the farmers to negotiate a premium wholesale price while selling their crops to the middlemen. So, the supply of seedlings (in terms of types and quantity) is a critical issue in this larger commercial vegetable supply chain. As a result, very few of the *baira* seedlings are sold in the local

community. The *baira* operators carry their seedlings to *haats* (village markets) as far as ten kilometers. *Haats* are well known meeting places for commercial farmers and seedling traders.

***(b) Actions identified and prioritized***

A series of community level meetings and workshops were held to discuss the problems of water hyacinth and the ways and means to tackle those by converting this plant into *baira*. In addition to tackling a weed, the community members would also be benefited, in terms of



Group discussion on *baira* practice

livelihood as well as nutrition, from the vegetables they produce. Another important point brought into the discussions was the existence of local expertise and know how on *baira* cultivation within the project area. Finally, there was a consensus among the participants that adoption of this practice is an opportunity to engage the local people in meaningful work during monsoon as very few jobs could be found in the floodplains then. This encouraged the inclusion of *baira* initiative under SEMP activities.

The following action points were identified and prioritized in the community workshops in the early 2000:

1. Facilitate local communities, particularly poor and vulnerable households, toward adoption of *baira* as a livelihood option;



2. Facilitate community organization for experience sharing, community development and to assist the micro-credit financing;
3. Facilitate the development of adequate capacity within the local community to promote, undertake and sustain *baira* program;
4. Facilitate shared learning and experience among practitioners, within the community as well as outside the project area;
5. Facilitate understanding on appropriate inputs (natural products like water hyacinth, *durali* (*Hygroryza aristata*), seeds, pest control, etc.) and their effective and efficient utilization in *baira* preparation and farming including farmers' experience on different input options;
6. Facilitate knowledge of markets for seedlings and vegetables produced on *baira*.

### **2.2.2. Participatory planning**

By mid 2000, the *baira* extension program was designed through participatory planning. This included mobilization of the local community into extension committees after the establishment of centers dealing with *baira* extension. Grassroots NGOs involved in local capacity strengthening and sustainability were invited along with the local government (UP) for endorsing the project. Participation of poor and vulnerable women was also ensured with especial consideration during such planning.



A *baira* is ready for seedling raising

The local communities were facilitated to take the following points into their consideration during the planning stage.

- The program would require successful demonstration of farming options based on *baira* that would be viable, replicable and sustainable. This would encourage adoption by relevant community members inside and outside the project area. Also, lessons from this experience would be useful for government planners, policy makers, as well as donors and NGOs involved in designing programs and projects for poverty alleviation, sustainable livelihoods and alternative income generation.
- Effective capacity building can only sustain if relevant and appropriate local institutions emerge to enable demand driven responses from *baira* cultivators;
- Sharing of know-how, expertise and cropping experience need to be introduced among the *baira* adopters as well as among the potential adopters, both within the SEMP project area and other areas with *baira* tradition.

Based on the planning considerations described above, the following goal and purpose were determined for the *baira* program.

**Goal**

Develop and establish a sustainable community based program on *baira* cultivation.

**Purpose**

Establish *baira* as a viable and sustainable option for livelihood in the floodplains particularly for poor, vulnerable and marginalized households.

**2.2.3. Planned interventions**

The major interventions included,

1. Selecting villages for *baira* extension.
2. Identifying local experts on *baira* cultivation.
3. Identifying poor and vulnerable people interested in *baira* cultivation.
4. Institutionalizing *baira* initiative in selected villages as *Baira* Extension Centers.
5. Coordinating *baira* experts and interested community members into *Baira* Extension Facilitation Committees in every selected village.
6. Facilitating the committee members to practice *baira* (by trainings, *baira* kit distribution, supplying seeds, establishing demonstration plots, etc.).



7. Mobilizing fund for *baira* extension committees.
8. Improving local NGOs' capacity in terms of *baira* farming.

#### **2.2.4. Monitoring and evaluation**

Each *Baira* Extension Committee was responsible to review the status of each local plot operator (committee member) once a month, and share the findings with responsible SEMP team member(s). The team members also helped the committee to document these findings and physically visited the plots. A record book for all adopters was maintained and updated.

Several performance indicators were identified to assess the achievements of the *baira* initiative under the SEMP.

- Demonstrated awareness among local community on benefits of floating water hyacinth-based seedling and vegetable crop gardening;
- Interest generated among households, particularly the poor toward *baira* farming, as well as among local NGOs, social, religious organizations, schools and UPs who would facilitate adoption of *baira* practice;
- Desire to participate in the program expressed by all relevant parties, particularly the poor households, and learning from the lessons and experience of the program taking place;
- Actions undertaken through establishment of *Baira* Extension Centers and *Baira* Extension Facilitation Committees at community level to ensure capacity building and extension of this wise use option among adopting households and communities.
- Actions at macro- (community) level includes facilitating local villagers and local NGOs and other social organizations to plan and perform *baira* farming.
- Actions at micro-level include removal of water hyacinth from floodplains, preparing the platforms, preparing the seed pods (*gutis*), placing the pods on *baira* platforms, maintenance and care, crop protection, pest management, etc.
- Improved communication channels between and among the communities to share lessons learned.

## **BAIRA PREPARATION AND CULTIVATION TECHNIQUES**

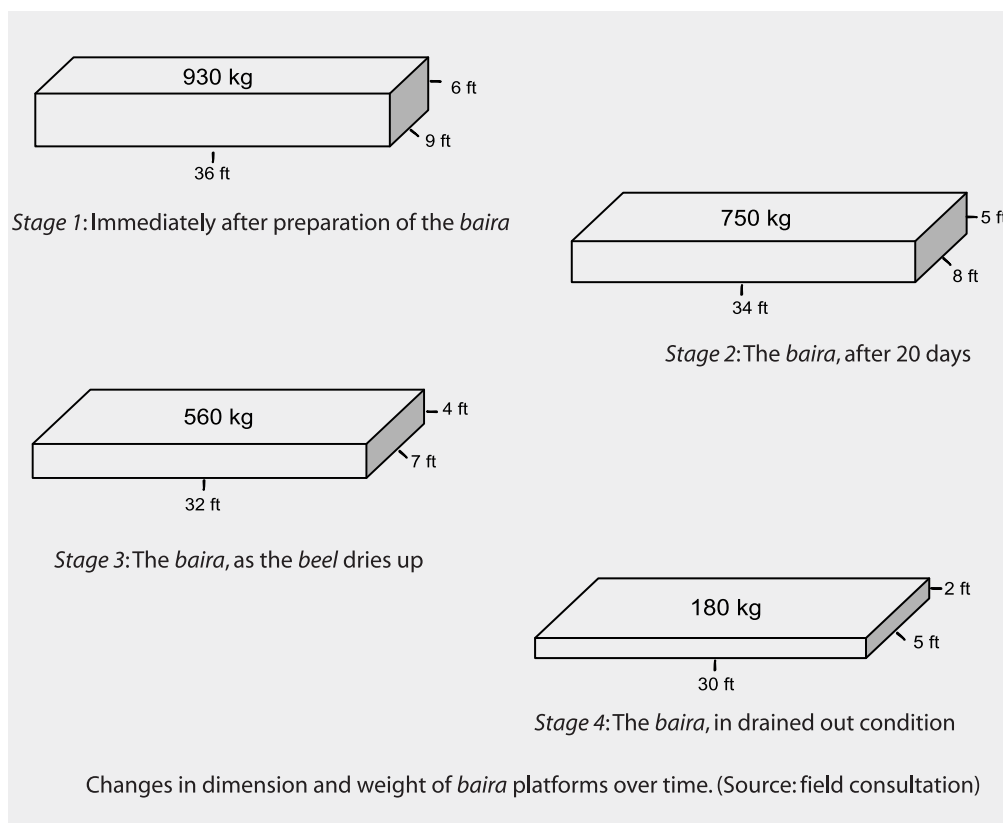
*Baira* preparation and cultivation varies a lot, broadly between the main two regions in Bangladesh, namely Gopalganj and Barisal-Pirojpur Districts. Moreover, differences could be seen among different villages of the same area. The variations depend upon the availability of the materials to make *baira*, start of monsoon, stagnancy of water, wetland area possessed by the farmer, his capital and so forth. This chapter is based upon field experience in the SEMP project site in Gopalganj, and Haq *et al.* (2002).

### **3.1. *Baira* preparation**

#### **3.1.1. Collection of materials**

Paddy stub was the main item for making *baira* probably till 40 years ago. Local varieties of *amon*, *aus* and *boro* give long straw. In early days, when the *amon* rice was harvested (in November) the stubs were left in the field to decompose. In winter, the stubs were collected, mound up and left on the side of the fields. In monsoon, these used to float on flood water and these floating masses were used as *baira* for cultivation in the rainy season. The introduced improved varieties, like IRRI varieties, produce short straws, which decompose easily. Their use is thus very restricted. Moreover, long straws are now used for household purposes. So, now-a-days *amon* paddy stub is not used to make *baira* in a large-scale. Although included in the late sixties, water hyacinth has become the main material for preparing *baira* in most of the areas especially in Gopalganj for the last 30 years or so.

The *baira* preparation mostly starts in May-July. However, in areas where winter vegetable cultivation is the main purpose of *baira* farming, *baira* preparation starts as late as September. It, however, fully depends upon the availability and maturity of water hyacinth. About 60 days are required for water hyacinth to mature and the two-month old plants are appropriate for *baira*-making. *Baira* could also be made from immature plants, but in that case the floating platforms will not be strong and compact enough. Water depth, however, is not a crucial factor for preparing *baira*.



Other aquatic plants required for *baira* cultivation include *durali* (*Hygroryza aristata*), *topapana* (water lettuce, *Pistia stratiotes*), *khudipana* (duckweeds, *Lemna*, *Spirodela*), *kanta shaola* (*Hydrilla verticillata*), *idurkanipana* (salvinia, *Salvinia* sp.) and *dholkolmi* (*Ipomoea fistulosa*). Other plant materials used include coconut husk and bamboo. The use of materials varies from place to place like the *baira*-making techniques. Boat, chopper and other gardening tools are also used. In most of the areas one can still get the desired plant materials from nature. But because of increasing demands and rarity of certain species, some aquatic plants are purchased from the nearby floating markets for aquatic plants (e.g. in Najirpur Upazila).



Marketing of planting materials for *baira* in Pirojpur

### 3.1.2. Making of floating beds

The *baira* preparation technique varies from place to place in Bangladesh. Below, an effort has been made to describe a technique that is largely practiced and convenient to replicate.

- i) At the beginning, a long bamboo is horizontally placed on the floating bulk of mature water hyacinth along the desired length of the *baira*.
- ii) A man stands on the bamboo and starts pulling water hyacinth from both sides on the bamboo. He subsequently flattens the plants under his feet. Other semi-decomposed plants (*topapana*, *salvinia*, *kanta shaola*, etc.) could also be used as construction materials.
- iii) This process continues along the bamboo until the bed reaches desired length, breadth and height.
- iv) After a week or so, water hyacinth is further dumped on the already prepared floating bed. In some areas (e.g. Pirojpur-Barisal), in this second stage of dumping, other decomposable aquatic plants are used instead of water hyacinth.
- v) It normally takes 15 to 30 days for aquatic plants (water hyacinth and others) of a platform to rot.
- vi) After placing a *baira* in the desired place, farmers often vertically anchor bamboo poles on the *baira* edges/in the middle to stop the platform from floating away.



A newly constructed *baira* in the middle of Chanda Beel

In many places, farmers just pile up water hyacinth without using a bamboo as a support. When the pile is big enough, one or two persons stand on it and pull in water hyacinth to extend that pile to a desired length and breadth. In some areas, if the final height of *baira* is 6 ft, after compiling 4 ft, a layer of *dholkolmi* is placed to give the *baira* sufficient strength. After completion of a *baira*, a layer of rotten water hyacinth or other semi-decomposed aquatic plants is spread over. In some places, one layer of soil is spread on *baira* as it would be useful for cultivated plants' nutrition.

### 3.1.3. Size of the beds

In Gopalganj area, *baira* platforms are 50-155 ft long, 5-7 ft wide and 2-3 ft high (Haq *et al.*, 2002). In Pirojpur/Barisal region, it would be maximum 180 ft long, 6 ft wide and 3 ft high. Length often depends upon the length of the water body it is built on. A *baira* is usually narrow because, 1) it is easier to operate from the country boats and 2) it is easy to bring them from the place of making to the desired place where farmer wants them.

In the present project area (Chanda Beel), the length and the width of a *baira* also vary a lot: the length ranges from 15-45 ft and the width from 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 (diagram in Section 3.1.1).

### 3.2. Crop selection

People raise seedlings or cultivate a large number of crops on *baira* platforms. These reflect the needs of the local people as well as years of experience of the local *baira* practitioners. These species include about 30 species of vegetables, spices and other crops (Table 3).

**Table 3. Crops grown on baira**

Local name	English name	Scientific name	Family	Summer*	Winter*
Ada	Ginger	<i>Zingiber officinale</i>	Zingibaraceae	+	
Badhakopi	Cabbage	<i>Brassica capitata</i> var. <i>oleracea</i>	Brassicaceae		+
Barbati	Cowpea	<i>Vigna sinensis</i>	Papilionaceae		+
Begun	Eggplant/ Brinjal	<i>Solanum melongena</i>	Solanaceae	+	+
Chalkumra	Wax gourd	<i>Benincasa hispida</i>	Cucurbitaceae	+	
Dhan	Rice**	<i>Oryza sativa</i>	Poaceae	+	+
Dhaniya	Coriander	<i>Coriandrum sativum</i>	Apiaceae		+
Dheros	Ladies finger	<i>Abelmoschus esculentus</i>	Malvaceae	+	
Dhundal	Smooth/ sponge luffa	<i>Luffa cylindrica</i>	Cucurbitaceae	+	
Fulkopi	Cauliflower	<i>Brassica oleracea</i> var. <i>botrytis</i>	Brassicaceae	+	
Gajor	Carrot	<i>Daucus carota</i>	Apiaceae		+
Holud	Turmeric	<i>Curcuma longa</i>	Zingiberaceae	+	
Kochu/Mukhi kochu	Taro	<i>Colocasia esculenta</i>	Araceae	+	
Lalshak/ Daata	Chinese amaranth	<i>Amaranthus tricolor</i>	Amaranthaceae	+	+
Lau/ Kodu	Bottle gourd	<i>Lagenaria siceraria</i>	Cucurbitaceae		+
Mistikumra	Pumpkin	<i>Cucurbita maxima</i>	Cucurbitaceae	+	
Morich	Chili	<i>Capsicum frutescens</i>	Solanaceae	+	
Mula	Radish	<i>Raphanus sativus</i>	Brassicaceae		+
Olkopi	Kohlrabi	<i>Brassica oleracea</i> var. <i>gongylodes</i>	Brassicaceae		+
Paat	Jute**	<i>Corchorus capsularis</i>	Tiliaceae	+	
Palongshak	Spinach	<i>Spinacea oleracea</i>	Chenopodiaceae	+	
Puishak	Ceylon spinach	<i>Basella alba</i>	Basellaceae	+	+
Shalgam	Beet	<i>Brassica campestris</i>	Brassicaceae		+
Shim	Hyacinth bean	<i>Lablab purpureus</i>	Papilionaceae		+
Tometo	Tomato	<i>Lycopersicon esculentum</i>	Solanaceae		+

\* Summer crops are cultivated or their seedlings are raised on floating *baira* platforms. Seedlings of winter crops are raised on floating *baira* platforms and the crops are mostly cultivated on the vegetable plots made up of *baira* residues after water recedes.

\*\* Rice: to raise seedlings; Jute: leaves of young plants are used as vegetables.



### 3.3. Cultivation on *baira* platforms

*Baira* farming includes raising seedlings as well as cultivating vegetables/crops. In both cases germination of seeds is the first step. There are two methods widely used in Bangladesh to germinate seeds on *baira* platforms (Haq *et al.*, 2002). In the first one, a ball or cushion like structure (*guti*) made of aquatic plants is used where seeds are placed in. In the other method coconut husks are used on the *baira* to ease seed germination. Before going into details of seed germination or seedling raising, let us describe the preparation of *gutis*.

#### 3.3.1. Preparation of *guti*

The pod-like seed germination structure or *guti* (also known as *tema* or *daula*) is made from aquatic herbs like *durali* (*Hygroryza aristata*, aquatic creeping grass) or *indurkani pana* (*Salvinia*, a fern). Haq *et al.* (2002), however, recorded that *guti* is usually made from *durali lata* (*Potamogeton alpinus*), a species not recorded by Khan and Halim (1987). These aquatic plants help in rapid seed germination. The *guti* also acts as a container to hold the seedlings planted on the *baira*, and later on to carry the seedlings picked out for marketing. The plants grow



Drying of *durali* under the sun



Preparation of *guti* from *durali*

naturally in wetlands of Bangladesh, thus are collected from nature in most places. However, in some wetland areas, natural supply is not adequate. There, these have to be brought from local aquatic plant markets (Pirojpur-Barisal area). Below the *guti* preparation method practiced in the SEMP project area in Gopalganj is being described.

After collection, *durali* plants are dried in the sun for 3-4 days. In one day a person can collect sufficient *durali* to prepare 2000 *gutis*. Before making a *guti*, water is sprayed on the dried plant to

make it soft so that it does not break while making *guti*. It also creates moisture needed for seedling growth. Farmers often spray chemicals (*chhitka*) to protect a pile of *gutis* from insect attack. There is



Freshly prepared *gutis* containing seeds covered with rotten water hyacinth

no definite size and shape for *guti*. Usually 7-8 ft long *durali* is required for one *guti*.

### 3.3.2. Seedling raising

When *guti* is used, a number of steps are followed to obtain seedlings of marketable size.

- i) Selected crop seeds are inserted in each *guti* and covered with a bit of rotten water hyacinth. The

number of seeds per *guti* varies. For example, in case of gourd and beans it is two or three seeds per *guti*. The logic behind putting more than one seed is, if one seed does not germinate the others will, thus the *guti* will not be wasted. But in some cases it is one seed per *guti*.

- ii) *Gutis* with seeds are piled up in a shed for 3-4 days.



Spread out *gutis* for seed germination. Surrounding net is to protect the seeds from rats.



iii) After that the *gutis* are spread on the open ground to allow germination.

iv) The seeds start to germinate after the 5th day. After nine days, when the seedlings attain 5-6 inches, the *gutis* are transferred to *baira*.

v) The distance between *guts* preferably is eight inches. A farmer can transfer two thousand *gutis* per day.



Seedlings ready to be planted on *baira*

In the cultivation technique where coconut husks are used (mainly in Pirojpur-Barisal area) the tasks are quite different.



A farmer lying the final planting layer on a *baira*

- i) Coconut husks are spread over the floating *baira* platform making an additional height of 6-8 inches.
- ii) Seeds are sown within the husk layer on the platform and covered with the husk. The husk retains moisture and acts as heat insulators, thus creating an optimum seed germination condition on the platform.

Standard maintenance and caring like watering, weeding, pest control, etc. are done as necessary while raising the seedlings. Although chemical fertilizers are not required for seedlings, farmers sometimes use urea to make the seedlings greener to get better price. We, however, do not encourage such practice. It takes around 20 days to market the seedlings.



Transplantation of seedlings on a *baira*

### 3.3.3. Growing vegetables

From the economic point of view, seedling raising is more lucrative than vegetable growing in *baira* cultivation (see Section 4.4.1.). People, however, grow vegetables on *baira* to meet their family needs and also to sell the surplus in local markets. Usual



Maintenance of seedlings on *baira* platforms

maintenance and proper care is needed for the plants. Although the cultivation is done in wet season, but if needed, regular watering is done. A limited amount of fertilizer (urea) is applied occasionally to facilitate plant growth. Weeding is generally not needed for *baira* cultivation. Insect, disease and other pest infestation are usually low in this cultivation practice. However, different

preventive measures should be in hands as discussed in the Section 3.5.

### 3.3.4. *Baira* for producing winter crops

In winter the *baira* residues are used as organic fertilizer to cultivate winter crops.

- i) When flood water recedes in late autumn (October-November), the platforms settle on higher land (locally known as *kandi*) or are pulled to a higher ground or near the homestead area.

- ii) These platforms are dismantled, mixed with soil and gardening plots are prepared.
- iii) Water is often added to the prepared plots and left like that for two-three weeks to allow further decomposition of the organic matters.
- iv) These are then used to cultivate winter crops, like cauliflowers, kohlrabi, spinach, etc.



### 3.4. Crop rotation

*Baira* platforms are used to make winter vegetable plots

One of the important features of *baira* is that it shortens crop's life cycle. It takes only 15 to 25 days to attain marketable seedlings when *guti* is used on *baira*. It was seen that from two to five crops and/or products like seedlings could be obtained from one *baira* in one year. On average



Farmers in their winter vegetable garden made from *baira* residue the seedlings sometimes require longer time and additional nutrients to attain desired size.

two to three crop cycles are common in *baira* farming. In Appendix 2, a number of practiced crop rotations are listed. If only seedlings are produced on a *baira*, normally three-five seedling cycles could be completed over three months (June / July to September / October). In the latter cycles nutrient deficiency occurs in the *baira* as



### 3.5. Pest management

Like traditional agriculture practices on land, *baira* farming also faces crop losses from pests and diseases (Haq *et al.*, 2002), which is, however, relatively low. Important pests include aphids, cutworms, beetles, stem and fruit borers, and white flies. Mentionable diseases caused by fungi, bacteria, viruses and other parasites are damping off, wilt, die-back and mosaic diseases. Among higher animals, rat is a notorious pest damaging seedlings and crops. A few bird species also cause damage to fruits, especially of the pumpkin group.

In traditional *baira* cultivation practices, the use of insecticide is common to protect the crops from insect attack. But farmers often are not sure about the appropriateness of the pesticides or its doses. The common pesticides are Agrimycin, Nagos, Seembush, Malithion, Fuladon, Basudin and Syfanon (Haq *et al.* 2002). Traps, electric shock, netting and poisons are used to catch/kill rats. Ants sometimes take seeds out of the *guti*. So in some areas e.g. Chanda *Beel*, a mixture of neem leaf extract and water or a mixture of mahogany seeds powder and water or kerosene is used to treat the seeds to avoid the problem.

No research has been carried out on *baira* cultivation in Bangladesh including on tackling the diseases. So, at the moment it is not known how to minimize crop losses from severe infestation. Integrated pest management (IPM) is apparently the appropriate preventive measure to deal with pests and diseases. Intensive crop rotation is an in-built element of *baira* cultivation and is a good way to address the crop loss. Some people spread ash to protect the plants from insects, a traditional eco-friendly way of plant protection.



## CHAPTER 4

### **BAIRA EXTENSION INITIATIVE IN ACTION**

The participatory action plan designed by the local people pointed out several specific steps essential to materialize intended *baira* extension initiative in the Madhumati Floodplain under the SEMP. The actual *baira* extension interventions started in 2000 included institutionalization of the whole initiative by organizing the local experts and interested people into various committees under several extension centers. Such organization was followed by facilitation of the *baira* cultivation extension program by providing the committee members and other local people with training, accessories (*baira* kit, seeds, etc.) and arranging field visits to places where *baira* is traditionally practiced. People were also advised on crop selection and crop rotations which is necessary to obtain maximum benefit from *baira*. The establishment of demonstration plots and conducting research on economic outputs and cropping on *baira* could also provide useful information to support *baira* extension initiative. Financial support from different sources including environmental fund further could help local poor communities to undertake *baira* cultivation. The present chapter details out these aspects of the SEMP *baira* initiative.

#### **4.1. Institutionalization: *Baira* Extension Centers and *Baira* Committees**

Since 2000, the local communities in the SEMP project area have been facilitated for the extension and adoption of *baira* as an eco-friendly farming option. At the beginning, three villages were selected for establishing *Baira* Extension Centers and *Baira* Extension Committees to give the whole initiative an organizational structure. Later on, it was replicated in eight more villages of the project area.

In 2000, several meetings were held with community members in three locations in the project area: Singa and Nanikhir villages in Chanda *Beel* and Kolabari village in Baghair *Beel*. The objective of these meetings was to consult and promote the practice of floating gardens as a wise-use option of natural resources among local villagers. Initially, the SEMP team facilitated the meetings to identify the farmers who were willing to adopt this practice. Primarily, over 150 farmers from three villages expressed their willingness towards *baira* cultivation.

In June 2000, three community-run *Baira* Extension Centers were established in these three villages to provide knowledge and skills to the potential *baira* adopters (Table 2). Kolabari (Baghair *Beel*) is outside the SEMP project area. This area was included in the extension program to compare the activity impacts among the three areas. Later on, another six centers were established in six villages of Chanda *Beel*, namely, Beel Chanda, Betgram, Barampalta, Goalgram, Patkelbari and Rahuthor in 2001 and in two more villages, Daria (in Chanda *Beel*) and Ramnagar (in Baghair *Beel*), in 2003 (Table 2).



Nanikhir *Baira* Extension Committee

Each center was run by one *Baira* Extension Committee named after the respective village (Table 2). A center, thus its committee, was guided by a resolution prepared to make it operational. Among the committee members, at least the senior members (the President and the Secretary) were expert *baira* practitioners themselves. They ensured the mobilization of necessary inputs, including the preparation of floating platforms as a part of their services. They also advised the *baira* plot owners on best practices from their own experiences. An Extension Committee was expected to prepare respective center's action agenda, which would be helping interested members of the community to prepare floating gardens and produce crops on them.

**Table 2. *Baira* Extension Centers and *Baira* Extension Committees**

No.	Name	<i>Baira</i> Extension Committee Member	Established
1.	Nanikhir <i>Baira</i> Extension Center	20	June 2000
2.	Singa <i>Baira</i> Extension Center	10	June 2000
3.	Kolabari <i>Baira</i> Extension Center	15	June 2000
4.	Patkelbari <i>Baira</i> Extension Center	18	Sept. 2001
5.	Barampalta <i>Baira</i> Extension Center	25	Sept. 2001
6.	Rahuthor <i>Baira</i> Extension Center	25	Sept. 2001
7.	Bedgram <i>Baira</i> Extension Center	10	Sept. 2001
8.	Goalgram <i>Baira</i> Extension Center	10	Sept. 2001
9.	Beel Chanda <i>Baira</i> Extension Center	14	Sept. 2001
10.	Daria <i>Baira</i> Extension Center	15	Jan. 2003
11.	Ramnagar <i>Baira</i> Extension Center	15	Jan. 2003

## 4.2. Facilitation

At the initial stage, assistance was provided to the *Baira* Centers/Committees to motivate and train poor household members to adopt *baira* cultivation. Such facilitation included training, demonstration plots, supply of '*baira* kits' and seeds/seedlings, knowledge gathering excursions, and fund allocation.

There were a number of ways the SEMP facilitated motivated people to cultivate on *baira*. An individual member could practice *baira* farming on a stand-alone basis. On the contrary, a group of people might operate collectively through their *Baira* Committees under the project. Apart from organizing training programs, these groups were assisted to learn how to make *baira* and cultivate on them from visits to area where the practice is well established, e.g. Nanikhir village. Some of the group members were engaged in the preparation of the floating platforms from water hyacinth, while others with the necessary skill prepared planting materials (*guti*). Financial support was also provided from the SEMP to pay wages to the members of the committees who provide direct services (e.g. making the water hyacinth platforms, preparing the *gutis* and beds, etc.). Regular meetings were held with all *Baira* Committees for strengthening their capacity and facilitating their problem solving. A multi-colored poster was also published on *baira* cultivation to enhance awareness among the local communities.

### 4.2.1. Trainings

In total, 15 training programs were conducted to educate *Baira* Committee members and other interested people (including staff of local NGOs) about *baira* cultivation (from June 1999 to April 2002). A total of 246 men and 151 women participated in those training programs. The training topics included



Training program on *baira* cultivation techniques



methods of *baira* preparation, crop selection, crop rotation and so forth. The resource persons for those trainings were local *baira* experts and project staff. Mobile on-site training and demonstration were also occasionally arranged. In October 2001, data collection procedures (input, production and output) on *baira* practice were discussed and shared with the *Baira* Committees.

#### 4.2.2. Demonstration plots

In total, about five hundred demonstration plots were established in 11 villages with *Baira* Extension Centers in 2000-2003. The purpose of these display plots was to encourage farmers in *baira* cultivation, to show interested people how *baira* cultivation techniques work and to facilitate the extension of *baira* initiative. These were sometimes used as training spots. Specific studies were carried out in some demonstration plots as described in the Section 4.4. The experiences from *baira* demonstration plots were shared among the adopters and community members over the reporting period.



A demonstration *baira* plot in Nanikhir village

#### 4.2.3. *Baira* kits

The project supported the *baira* adopters with tools mainly used for preparing the floating water hyacinth platforms, like rope, bamboo, seeds, record books and stationery, a boat to carry water hyacinth or pull *baira* platforms to deliver to the sites of local community/service clients and so forth. On many occasions, many of these items were supplied in the form of a *baira* kit necessary to start *baira* cultivation (Box 3). The poor households of the project area were supplied with about one thousand *baira* kits during 2000-2003.

**Box 3. Items of a 'Baira kit'**

1. A floating water hyacinth plot: 36 ft (long) X 9 ft (wide) X 6 ft (thick)
2. Germination/planting materials (e.g. *durali* etc.)
3. Seeds or seedlings
4. A record book
5. A signpost

**4.2.4. Seeds and seedlings**

In August-September 2001, seeds of Chinese amaranth, ladies finger, spinach, bean, kohlrabi, cabbage, cauliflower and gourd were disbursed among about 200 committee members and poor vulnerable women. In October 2001, large amount of seeds of vegetables were disbursed among 340 members of the women groups of Rahuthor village.



Seed distribution for *baira* cultivation

**4.2.5. Financial support**

The *Baira* Extension Centers established in 11 villages were also financially supported under the SEMP project. The financial support was of two types, the first was given from the fund allocated for demonstration activities and the second was from environmental fund allocation.

The Nanikhir *Baira* Extension Center received Tk 10,000 and each of Beel Chanda, Betgram, Barampalta, Goalgram, Patkelbari, Rahuthor and Singa Centers received Tk 5,000 as seed money to establish the centers and to help the members in *baira* cultivation. The centers of Daria, Kolabari and Ramnagar villages received financial support from the environmental fund provision in 2003. Each of these committees received Tk 15,000 and used the amount as a revolving fund. In both cases a *Baira* Committee allocated money among its members and was also responsible for the whole financial management. In March 2005 the balance of revolving fund of these three committees of Daria, Kolabari and Ramnagar were Tk 15,028, Tk 6,580 and Tk 10,629, respectively.

#### **4.2.6. Experience from field visits**

##### ***(a) Within the project area***

Nanikhir has been praised as Nanikhir *Baira* Adarsha Gram (Nanikhir *Baira* Ideal Village) because of its long tradition of *baira* cultivation in the area. In September 2001, over 80 members of different *Baira* Committees visited this ideal village to witness the *baira* practice and gain experience.

##### ***(b) Outside the project area***

In August 2001, a SEMP team consisting of five members of *Baira* Committees and project staff visited Barisal (Banaripara *Upazila*) and Pirojpur (Sharupkati and Najirpur *Upazilas*) districts where *baira* has been traditionally practiced. The purpose of this visit was to share knowledge and experience with the traditional *baira* practitioners in different districts. Such visit



Cross-visit of a SEMP team to Pirojpur

enhanced the capacity of the people associated with the *baira* extension initiative. The lessons learned from this excursion were found useful to improve the understanding of *baira* farming and practice it in the SEMP project area. Table 3 presents a brief comparison between *baira* cultivations in Barisal-Pirojpur and Chanda Beel (Gopalganj) as identified during the excursion.

**Table 3. A comparison between *baira* cultivation in Barisal-Pirojpur area and that in the SEMP project area as learnt from the cross-visit in 2001**

Barisal-Pirojpur	Chanda Beel (Gopalganj)
1. <i>Baira</i> preparation begins at the end of May.	1. <i>Baira</i> preparation begins at the end of June.
2. Size: Length 90 - 200 ft Width 2 - 3 ft Thickness (fresh) - above water surface 3 - 4 ft below water surface 4 - 5 ft	2. Size: Length 30 ft Width 9 ft Thickness (fresh) - above surface 1.5 - 2 ft below surface 3 - 4 ft
3. Water hyacinth is not available locally in most areas in the desired matured state at the time <i>baira</i> are prepared.	3. Water hyacinth is available and abundant in most areas.
4. All <i>baira</i> preparation materials have to be purchased, e.g. water hyacinth, <i>durali</i> ( <i>Hygroryza aristata</i> ), <i>guripana</i> ( <i>Lemna</i> sp.), <i>kanta shaola</i> ( <i>Hydrilla verticillata</i> ), <i>topapana</i> ( <i>Pistia stratiotes</i> ), <i>indurkanipana/indurkanti</i> ( <i>Salvinia</i> sp.), etc.	4. <i>Baira</i> making materials like water hyacinth, <i>durali</i> are naturally available and can be collected; no purchase required.
5. The <i>baira</i> cultivators have to lease the land on which they float their <i>baira</i> .	5. No such payments involved.
6. Seedlings/crops are produced from seeds on average four times. In dry season, <i>baira</i> residue is used as fertilizer on land, and cabbage cauliflower, kohlrabi, egg plant, chilies, bean, ladies finger, etc. are planted and harvested for sale and consumption.	6. Seedlings/crops are produced from seeds on average two to three times. In dry season, <i>baira</i> residue is mixed with soil as a fertilizer, and cabbage, cauliflower, kohlrabi, egg plant, chilies, bean, ladies finger, etc. are planted and harvested for sale and consumption.
7. <i>Guti</i> is prepared from <i>indurkanti</i> . In case of gourd and bean two seeds inserted in each <i>guti</i> .	7. <i>Guti</i> is prepared from <i>durali</i> . Three seeds of gourd or bean are inserted per <i>guti</i> .
8. No fixed distance between two <i>guti</i> .	8. Distance between two <i>guti</i> is about eight inches.

### 4.3. Capacity building of local NGOs

Bishwa Manob Kalyan Sangstha, a local welfare society in Rahuthor village of Chanda Beel, showed interest in the SEMP *baira* initiative. They requested the SEMP project team to train 20 of its groups made up of poor women of Rahuthor village. From 2000 to 2003, a total of 369 members of 20 groups were trained through five training programs. Each of these members had two or more *baira* operating in monsoon. A list of these groups is given below. The number of the group members is mentioned in the parentheses.

1. Ashosta Modhumita Group (23)	11. Pachkhania Karobi Group (14)
2. Haishur Kanthhal Group (17)	12. Pachkhania Shalik Group (22)
3. Haishur Sheuli Group (21)	13. Pachkhania Bokul Group (28)
4. Haishur Shapla Group (15)	14. Pachkhania Koyel Group (11)
5. Haishur Shimul Group (17)	15. Pachkhania Padma Group (18)
6. Haishur Nibedita Group (20)	16. Pachkhania Shama Group (15)
7. Hatiara Shephali Group (15)	17. Rahuthor Rajaniganda Group (15)
8. Pachkhania Doyel Group (21)	18. Rahuthor Notun Bazar Padda Group (16)
9. Pachkhania Champa Group (18)	19. Rahuthor Shati Group (15)
10. Pachkhania Jaba Group (25)	20. Rahuthor Sridurga Group (23)

Along with trainings, they were also given seeds and seedlings to cultivate on *baira*. This further speeded up this initiative at local level, and contributed to the sustainability of this program.

Another local NGO, Swadesh Unnoyon Sangstha, also showed interest in SEMP *baira* activities. Their staff participated in different training programs and other events organized under this initiative. This also helped them to improve their skills and understandings of *baira* practice, and in turn ensured the extension of this livelihood choice in the area.

### 4.4. Studies on *baira* practice

*Baira* farmers have been cultivating vegetables and spices on *baira* in a traditional way for many years. However, no study as such was carried out on *baira* farming. A participatory action research program was carried out under SEMP *baira* initiative in the Chanda Beel area, which was the first of its kind. The aim of this was to improve the understanding of the economic aspects and production processes in *baira* farming by studying a large variety of cropping options practiced by the local community.



#### **4.4.1. On income from *baira* cultivation**

##### **(a) Growing vegetables**

With the help from the *Baira* Committee members, economic analysis on *baira* was carried out. Plots of 46 ft X 9 ft dimension grew 150-200 vegetable plants per plot, with yields ranging 60-100 kg of leafy-vegetables, 100-200 kg of fruit-vegetables and 55-60 kg of chili. Based on the local market price, the sale output was estimated between Tk 1,200 and 2,600 per plot. The variation depended upon the quantity consumed, as well as price levels prevailing at the market at the time of sales (see Case Studies 1 and 2). Net income from each plot varied between Tk 500 and 2,000 over a three/four-month period beginning in July.

##### **(b) Growing seedlings**

A study on the seedlings rearing of seven varieties of five winter vegetables was carried out in October 2001 on selected demonstration and culture plots (Table 4). The net income from selling seedlings was on average Tk 800 per *baira*, where the lowest range was seen in tomato (Tk 350-450 per *baira*).

In another study it was revealed that a *baira* of 30 ft X 9 ft dimension required 0.5 kg of gourd seeds that produce about 1,900 seedlings. By selling these seedlings at one taka each, a farmer can easily earn Tk 1,900 from such a *baira* platform. From seeding to marketing the whole process takes only about 20 days. So over four months there would be five to six seedling raising cycles per *baira*.



Bottle gourd seedlings ready to market



Table 4. Seedling raising of some winter crops on *baira* platforms (size 30 ft X 9 ft), based on a study conducted in 2001

No.	Names of Vegetables and Varieties	Seeds		Seed germinate rate (%)	No. of seedling (in pones)	Duration of seed inundate (hrs)	Duration of seed germination (days)	Gap between seedling & marketing (days)	Marketable seedling size (inches)	Price/ Pone (Tk)	Net income from a <i>baira</i> (Tk)
		per <i>baira</i> (gm)	Price (Tk)								
1.	<b>Kohlrabi</b>										
	Mollicka	20	160	90	25	5 - 6	3	15 - 20	3 - 4	30	700 - 800
	Challenger	20	140	90	24	5 - 6	3	18 - 20	3 - 4	25 - 30	700 - 800
	Baiskim	50	50	75	200	3 - 9	3 - 4	15 - 20	3.5 - 4.5	4 - 5	800 - 900
2.	<b>Cabbage</b>										
	Atlas-70	20	220	90	20-22	2 - 3	3 - 4	20 - 25	3 - 4	35 - 40	800 - 900
3.	<b>Cauliflower</b>										
	Cashiri	20	460	85	20-23	3 - 4	3 - 4	20 - 25	3 - 4	35 - 40	800 - 900
4.	<b>Tomato</b>										
	Bankim	10	20	90	20-25	5 - 6	5 - 6	25 - 30	4 - 5	15 - 20	350 - 450
5.	<b>Bringal</b>										
	Deshi/ Shoila/ local	10	25	80	22-23	24	6 - 7	25 - 30	3 - 4	7 - 8	500 - 600

\*1 pone = 80 pieces

## CASE STUDY 1

"We will never have to sit idle during monsoon" Amrita Lal Sarkar, Singa, Muksudpur

"I started *baira* farming on 30 July 2000 when I made two *baira* platforms. Each was 33 ft long, 11 ft broad and 4 ft high. On the first plot I started cultivating *lalshak/daata* (Chinese amaranth). Fifteen days later, I started selling *daata*, and eventually earned Tk 525 from the crop. My family was also able to eat the vegetables and some were given to the neighbors."

Next, Mr. Sarkar planted some *puishak* plants (Ceylon spinach) in one section of the first *baira*. Over the next month, he applied fertilizer twice, at an interval of 15 days. After 45 days cultivation, he started selling *puishak* at the market. He also planted seedlings of *dherosh* (ladies finger) around this *baira*. Within five days of planting, he noticed the seedlings grown by almost two inches in length. After regular nurturing for 50 days, he started selling the vegetables.

On his second *baira* Mr. Sarkar cultivated *dhundal* (smooth/sponge luffa) and *mistikumra* (pumpkin). In the *dhundal* area he had to spread some pesticides over the plants to protect them from pests. He planted *mistikumra* seedlings on another section of this *baira*, and after 70 days started harvesting the fruits. He harvested total 45 *mistikumra* fruits over the season. He also planted *kochu* (taro) stalks around the perimeter of the second *baira*. He started to harvest it after two and a half months and it was consumed by his family only.

Once the water receded, he broke the platform down, and mixed it with the topsoil. After 15-20 days he started planting cauliflower seedlings on one side and potato on the other. Taking all expenses into consideration, his net income was Tk 1,900 from selling potato and cauliflower. From the two water hyacinth platforms, Mr. Sarkar's net income was about Tk 3,000 for the entire year.

".....I have benefited from the training provided and have earned beyond my expectation from these two plots. ....We will never have to sit idle during monsoon."

Annual performance of two *baira* platforms of Amrita Lal Sarkar in 2000

Earnings	Taka	Expenses	Taka
<i>Floating stage</i>			
<i>Baira 1</i>		Making charge*	480
From sale of <i>lalshak</i>	525		
From sale of <i>puishak</i>	325	Fertilizer	12
From sale of <i>dherosh</i>	425	Related expenses	125
Total income	1,275	Total expenses	617
<b>Net income/profit</b>	<b>658</b>		
<i>Baira 2</i>		Making charge*	480
From sale of <i>dhundal</i>	375	Pesticide	45
From sale of <i>mistikumra</i>	560		
Total income	935	Total expenses	525
<b>Net income/profit</b>	<b>410</b>		
<i>Post water recession stage</i>			
Net income from selling cauliflower and potato	1,900		
<b>Total net cash income</b>	<b>2,968</b>		
Non-cash income			
Market price <i>kochu</i> consumed	150		
*Labor charge was Tk 60 per person per day.			

**(c) Profits from vegetable cultivation and seedling raising**

It is a general understanding that seedling raising is much more profitable than vegetable cultivation on *baira*. Hence, people especially of Nanikhir village are basically engaged in seedling rearing. Two case studies can exemplify the differences between the economics of seedling raising and vegetable cultivation.

Mukunda Mollick of Nanikhir village spent Tk 725 on three seedling raising cycles. His gross income from selling these seedlings was Tk 2,300 with a profit of Tk 1,575. In case of vegetable cultivation, his profit was Tk 400 (expense Tk 600 and income Tk 1,000). Again, Gouropada Mandal of the same village profited Tk 2,900 from one *baira* after three cycles of seedlings (expense, Tk 1,000 and income from selling Tk 3,900). On the other hand, cultivating vegetables like cauliflower, egg plant, chilies and tomato, he earned Tk 1,300 after spending Tk 600. So his profit was Tk 700 from one *baira*. Thus profit from seedling raising is almost four times greater than vegetable cultivation over shorter period, provided the prime price for seedlings is captured.

**(d) Contribution of baira to the family income**

As a part of the research an assessment was made on 22 members of Nanikhir, Singa, Beel Chanda and Rahuthor *Baira* Extension Committees (Table 5). The data were collected through interviewing the members. The number of *baira* per person varied from one to eighteen. Gurudas Sikdar of Rahuthor village had 18 *bairas* in 2002. Income from these *bairas* covered 60% of his family income, whereas 20% was from paddy and the remaining 20% from trading. Similarly, Bishwanath Mandal of Nanikhir village also had 60% of his income from *baira* and the rest



Gourd seedlings on a *baira*

from paddy. In some cases the family effort complemented the income generated from *baira*. For example, in case of Amar Krishna Sarkar of Singa village, (with 12 *bairas*) both the share of family effort and the share of total income were 50%. On the other hand, in case of Ganapati Ghosh (with 10 *bairas*), although the family effort was 50% the share of income was only 20% from *baira*.

Table 5. Profile of some selected Baira Committee members in Chanda Beel area collected in 2002

No.	Name	Baira Committee	No.	Share of family effort (%)	Source of income		
					from baira (%)	from paddy (%)	from other sources
1.	Bishwanath Mandal	Nanikhir	9	40	60	40	-
2.	Palash Dhali		5	60	20	40	40%
3.	Mukunda Mollick		13	60	30	50	20%
4.	Punya Charan Mridha		6	50	40	30	30%
5.	Bhajan Bala		8	30	40	40	20%
6.	Tulshi Baroi		4	30	20	50	30%
7.	Sukhdev Dutta	Singa	8	40	40	60	-
8.	Bidhan Sarkar		2	20	30	70	-
9.	Kumud Sarker		3	50	40	60	-
10.	Mintu Sarker		2	50	30	50	20% Trading
11.	Utsav Thakur		3	30	30	50	20% Van-pulling
12.	Amar Krishna Sarkar		12	50	50	30	20% Shop-keeping
13.	Dele Sikdar	Beel Chanda	1	30	not yet	70	30% Jute craft, poultry
14.	Roma Kunda		2	10	10	60	30%
15.	Elio Mojumder		3	5	5	55	40% Fishing
16.	Shisudan Adhikari		1	10	20	60	20%
17.	Juran Adhikari		6	10	10	30	60% Son's earnings
18.	Gurudas Sikdar	Rahuthor	18	80	60	20	20% Trading
19.	Bibek Mondol		1	2	2	90	8%
20.	Chittaranjan Biswas		13	20	20	20	60% Teaching
21.	Shibu Biswas		2	25	25	55	20% Trading
22.	Babu Ganapati Ghosh		10	50	20	60	20% Trading

## CASE STUDY 2

"I never imagined one could earn so much and eat vegetables as well from *baira* culture"

Sudhir Biswas, Singa, Muksudpur

"I put together my first pair of *baira* platforms on the 1st of September 2000 and the third one, two weeks later. The size of each *baira* was 20 hands long, 6 hands wide and 3 hand high (1 hand = 1.5 ft). It took 18 person days to make those three *baira* platforms. On the day it was done, the *kochuripana* (water hyacinth) mattress was 2 hands below the water and 1 hand above the water. I planted on the *baira* 35 days after it was prepared."

Mr. Biswas paid Tk 1,080 as labor charge for the preparation of three *baira* platforms. On 19 October 2000 he started spreading 50 gm of *lalshak* (Chinese amaranth) seeds on the outskirts of each *baira* platform and planted seedlings of *lau* (bottle gourd) and *chalkumra* (wax gourd) in the middle. He earned Tk 400 from selling *lalshak*. He also sold Tk 300 worth of *chalkumra*. He sent some of the vegetables to his relatives as well.

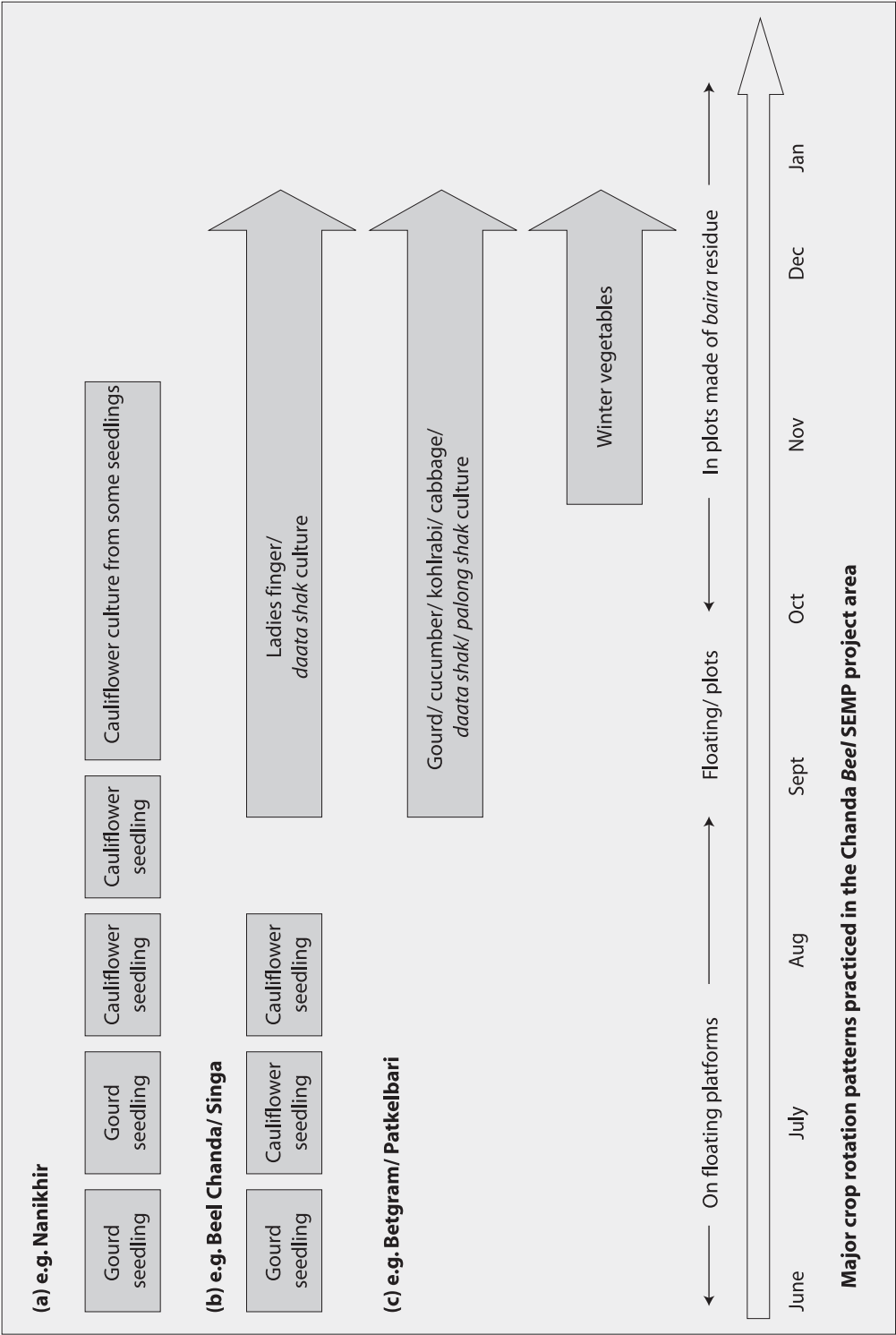
As water drained out from the *beel*, he steered the platforms to one side of his house which was never used for cultivating crops before. The platforms were dismantled and spread all over the designated area. After a few days the remnant of the platform was mixed with soil and later a lot of water was added to create a semi liquid form.

"I planted *olkopi* (kohlrabi), *fulkopi* (cauliflower) and *palongshak* (spinach) on this ground. A few *mistikumra* (pumpkin) seedlings were also planted. I sold *olkopi*, *fulkopi* and *palongshak* for Tk 2,500. Later on, I sold the *mistikumra* harvest for Tk. 500. Further, I did not have to buy any vegetables from the market, and we ate as per our desire. The program (*baira* initiative) has shown me a sure way to earn money. I earned Tk 2,320 in cash from three *bairas* in one year. I never imagined that one could earn so much from *baira* and also be able to eat so many vegetables at home. This year (2001) I have planned to have more *baira* under culture than last year."

**The cost and income of farming on three *baira* platforms by Sudhir Biswas**

Income (returns)	Taka	Cost (expenditure)	Taka
From <i>lalshak</i>	400	Chinese amaranth seeds 50 gms	10
From <i>chalkumra</i>	300	<i>Baira</i> making labor charges	1,080
From ( <i>lau</i> , <i>olkopi</i> , <i>fulkopi</i> , <i>palongshak</i> )	2,500	Other seeds ( <i>lau</i> , <i>mistikumra</i> , <i>chalkumra</i> , <i>fulkopi</i> , <i>olkopi</i> , <i>palongshak</i> )	190
From <i>mistikumra</i>	500	Pesticides	100
<b>Total cash income</b>	<b>3,700</b>	<b>Total</b>	<b>1,380</b>

Note: Consumption of considerable quantity of all vegetables at home and gave to relatives and neighbors.





#### **4.4.2. On cultivation techniques**

There is a good scope for doing research on the cultivation techniques of *baira*. But not many were possible in the present project tenure. Among a couple of studies, the practiced crop rotation on *baira* in the project area was documented. In total, 22 crop rotation cycles were identified of which a few examples are give in Appendix 2. A few major patterns are presented in the diagram on page 44.

In October 2001, a study on seedling raising of several winter vegetables was carried out (Table 4). Among the studied species, seed germination rate ranged from 75% to 90%. Seed germination duration usually was ca 3 days, however for tomato and bringal it was almost double. The minimum gap between seed sowing and marketing of seedlings was 15 days and the maximum was 30 days. Marketable seedling length ranged from 3.5 to 5 inches.

#### **4.4.3. Comparing villages in the project area**

*Baira* cultivation technique, including the preparation of the platforms, can vary among different villages of the same wetland area. Preliminary data collected from the SEMP project site in Chanda Beel also supported such assumption. The Table 6 compares different villages/zones in the SEMP project area in terms of different aspects of *baira* platforms, cropping and management. Major difference can be seen between Nanikhir-Singa with Kolabari-Barampalta in terms of starting of *baira* preparation (latter use *baira* mainly for winter cropping) and materials used (use of straw).

Such differences can be further elaborated if we consider villages located on the periphery of the *beel* with good communication system and villages near the middle of the *beels* without good communication facilities. People of the villages of latter type were found preferring to cultivating vegetables on *baira* rather than raising seedlings. Therefore, these *baira* practitioners, for example of Patkelbari and Betgram villages, normally start *baira* preparation in September to cultivate winter vegetables for their own consumption. In many cases there is only one *baira* platform per household and is kept by their homesteads on their own land. Here women are involved in *baira* preparation along with men. If the water level is high, the platform remains floating, otherwise it settles down on the land of the owner. They do not raise seedlings or usually do not sale vegetables as it is not cost-effective to transport the seedlings/vegetables to the markets located far away. They put least effort for maintenance of their vegetables in terms of watering and pesticide application.

On the other hand, people of Nanikhir, a village on the *beel* periphery with good communication, were found raising seedlings on their *bairas* only. The operators often make their *bairas* away from their home where water hyacinth is available, thus need to transport these near their home by trawlers. One trawler can pull three to four *bairas* at a time. Here, only men are involved in *baira* preparation. They sometimes keep some of the seedlings from the last cycle to grow vegetables for their own consumption and for saving seeds for the next year. If the water is deep enough they leave the *baira* floating otherwise, more commonly, transfer seedlings to their homestead gardens. The seedlings require much attention like watering, weeding and application of insecticide, and sometimes fertilizer. Such maintenance demands three to four hours of work from a person per day.

**Table 6. Comparative study on *baira* practices in different locations in the SEMP project area in 2000**

Name of area/zone	Size of <i>baira</i>	<i>Baira</i> preparation begins from	Major crops	Major crop rotation	Material used	Pest control
Nanikhir (Beel Chanda)	30'×9' (Max.)	End of June or 1st week of July or depending on maturity of water hyacinth	Gourd, cabbage cauliflower, egg kohlrabi, egg plant, bean, chili	Gourd seedlings from seeds → gourd seedlings from seeds → cauliflower seedlings → cauliflower cultivated	Water hyacinth, <i>durali</i>	Rat control by net surrounding <i>baira</i> / electric shock, pesticides
Singa	24'×7' (Max.)	August	Cabbage, cauliflower, kohlrabi, egg plant, bean	Seedlings from seeds → cabbage, cauliflower, kohlrabi, etc. cultivated	Water hyacinth, <i>dholkolmi</i>	Pesticides, insecticide for insect, urea used to get greenish color of seedling
Kolabari	24'×7' (Max.)	September	Ditto	Ditto	Water hyacinth, IRRI crop residue, <i>dholkolmi</i>	Rat control by poison mixed with food
Barampalta (Betgram)	30'×9' (Max.)	September	Ditto	Ditto	Ditto	Ditto
Self-help <i>baira</i> groups of SEMP	No fixed size	September	Gourd, cucumber, kohlrabi, cabbage, <i>daatashak</i> , <i>palongshak</i>	Residue of <i>baira</i> mixed with soil and seedling of winter crops purchased from market and cultivated	Water hyacinth, straw	Ditto

In Betgram, the *baira* residue was seen used as fertilizer for rice cultivation in dry season. The villagers appreciated the benefit of *baira* residues even for high nutrient demanding IRRI varieties. In contrast, *baira* residue is used as compost in Nanikhir for winter vegetables. In addition to the use as organic fertilizer, there are a couple more utilization of *baira* residues, which also differ in these two villages. The upper portion of a *baira* platform remains less decomposed at the end of the rainy season. In both villages these are dried and used as fuel. However, in the



Water hyacinth for erosion-proofing in Betgram

villages inside the *beel*, these less rotten parts are piled up on the edge of homestead and are used as erosion-proofing materials. These are effective in protecting homesteads probably because of their spongy structure. Moreover, in many homesteads here, they pile up fresh water hyacinth on the edge of homestead without making *baira*. When water recedes, the rotten water hyacinth is used as vegetable growing media at the edge of homestead. The mounds of water hyacinth actually increase the area of their homesteads as soil is scarce. People here also use water hyacinth as platforms to keep their cattle or to build cow-sheds. Despite the need for fuel in the in-*beel* areas, people were found to prefer *baira* residue to be



Water hyacinth platform for cattle

used as erosion-proofing material to fuel. On the contrary, Nanikhir villagers only use the residue as fuel.

#### **4.5. Monitoring and evaluation**

As a part of the standard assessment of project activities, regular meetings were arranged between project staff and each *Baira* Committee. Among others, issues included sharing of views on *baira* cultivation, problem faced and possible resolutions. Discussions covered the activities of the committees. Suggestions were made regarding the functioning of the *Baira* Extension Centers, financial activities and other relevant issues. An economic assessment of the input-output regime of the SEMP *baira* initiative has been done and is described in Box 4.

In the late 2000, SEMP facilitated the monitoring of the progress and the review of the results (production) with the practitioners and new adopters for the establishment of an effective monitoring system. Since then regular evaluation of the initiative was carried out. Such assessment revealed that:

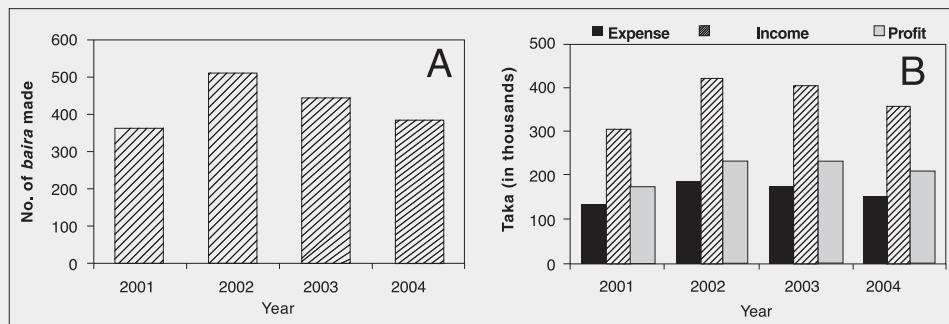
1. The community people were duly sensitized and were aware of the benefits of *baira* cultivation techniques.
2. Interest was shown by the local people, NGOs and other groups/organizations who were potential adopters or facilitators of *baira* cultivation.
3. Local community was directly involved in problem assessment, planning and actual interventions under this initiative. Involvement of poor and vulnerable, especially women, was also ensured.
4. Institutionalization was initiated by establishing *Baira* Extension Centers and *Baira* Extension Committees.
5. *Baira* Committee members were facilitated from the project to resume or to take up *baira* farming through necessary trainings, advice, tools, and financial support.
6. The practice of *baira* cultivation in the project area has expanded and increased moderately since the middle of 2000.
7. Demonstration plots and studies were found effective in understanding *baira* cultivation.
8. Interactions between local experts and interested adopters increased significantly.
9. Feedback of organized trainings and workshops was satisfactory as demonstrated by interviewing the participants and also by the *baira* cultivation adopted by them.
10. People expressed their appreciation towards the whole initiative, which has improved their employment patterns, earnings, health, and living conditions.

#### Box 4. An assessment of the *baira* initiative

The impact of the SEMP *baira* initiative is found satisfactory. People have shown enthusiasm and *baira* cultivation has extended in the project area. *Baira* Committee members now get loan in early season for *baira* preparation and return within a pre-fixed tenure, usually at the beginning of winter.

Under this initiative, a total of 1700 *baira* platforms were prepared by about 180 members from 2001 to 2004 (Figure A). The total expenditure was about 652 thousand taka (making of *baira*, cost of seeds, transport, etc.) and the members earned almost Tk 1.5 million by selling seedlings and vegetables (Figure B). The cumulative profit was about Tk 844 thousand. On average, the profit was about 130% of the investment.

The figures of income and profit from *baira* should be far greater as the farmers sold the vegetables after meeting their family needs and distributing among relatives and neighbors. Almost five hundred winter crops plots were established in the reporting period by the committee members using *baira* residues.



If the yearly figures (Figures A & B) are considered, maximum community participation can be seen in 2002, but a gradual slight decrease can be detected in 2003 and then in 2004. The difference is apparently not significant among these three years. However, a lack of a considerable increase in 2003 and 2004 needs explanation. In 2001, all the members of the *baira* committees practiced *baira* independently without any support from the project. The significant increase in 2002 was basically a result of providing fund to eight *baira* committees. In 2003 and 2004, only three *baira* committees had revolving funds for *baira* cultivation and the other eight committees practiced *baira* as they used to do before the project initiative. Thus, a slight decline was seen in those years. It is possible that *baira* had been practiced in those selected areas to an optimum level or *baira* practice was restricted by a lack of fund. Thus, financial incentive facilitated extended *baira* practice. In some villages, remotely located in the middle of the *beels*, *baira* had been practiced to grow vegetables for house-hold consumption only as transportation of seedlings was costly and growing seedlings like other villages (e.g. Nanikhir) was not financially viable.

There were some additional outcomes of the *baira* initiative. For example, in November and December 2001, a total of about 80 thousand seedlings of kohlrabi, cauliflower, cabbage, tomato and egg plants produced on *baira* were disbursed among 380 poor and vulnerable women of Beel Chanda, Betgram and Kadambari areas. Such intervention provided local people with much needed seedlings for winter vegetables cultivation and helped them to earn additional income.

## THE FUTURE

The improvement of the quality of degraded ecosystems is strongly connected with the development of its people. For this reason, one of the major interventions under the SEMP is to facilitate alternative livelihood options among the resource users in the project area. *Baira* farming was identified by the community people as one of the best alternative livelihood choices for the Chanda *Beel* area. The reason is not only the availability of the materials to make *baira* platforms, but more importantly, the presence of the local expertise to help the extension process. Because of that the initial outcome of this *baira* extension initiative was satisfactory. However, there remains the vital question of the sustainability of such a site-suitable, well-timed and rewarding initiative.

### 5.1. Sustainability of the initiative

Sustainability is crucial for any community based program like *baira* initiative. From the experience of *baira* initiative, a number of issues were identified which should be considered when judging sustainability of any *baira* project.

1. The community should be positively motivated to alternative livelihood options. People have to be facilitated to identify their needs. They should be sufficiently encouraged so that they can decide upon an option considering their current conditions. Ideas should not entirely be prescribed by an external agency.



2. The suitability of the promoted option and its advantage over other similar choices should be well understood. It is always easier to facilitate a livelihood choice if it is already present in the area in some form or at least, known to the people. If the expertise to promote this option is locally available, it makes the promotion and continuation much easier.
3. Involvement of the local government and non-government agencies should be ensured. Local government bodies (e.g. UP) or government agencies (Agriculture Extension Department), should be invited in the participatory planning and decision-making processes of any community based initiative. In this way the project initiative will get their endorsement. They will then be aware enough to extend their help in case of using government resources, land, seeds, etc. Local NGOs can also help for the sustainability of an initiative by incorporating this initiative into their agenda and also by sharing their experience.
4. The participating community should be well trained so that they can carry on the interventions with a strong sense of ownership.
5. Efficient revolving funding option should be designed through the *baira* groups/committees. Any allocated fund should circulate among the participating groups and thus continue helping them. This sustains the project support beyond the project tenure. The groups should be registered with the government authorities as cooperatives. They should have a practical guideline in place. Their ability to function without the assistance from the project must be tested before the project termination.
6. Emphasis should be given on the togetherness in the initiative rather than individualism among the adopters.

## **5.2. Constrains**

However, a number of constrains could be identified in the *baira* cultivation system itself in Bangladesh (Haq *et al.*, 2002). The lack of fund to support the poor farmers to initiate *baira* practice, the cultivation system is supposedly labor intensive, the lack of raw materials to prepared *baira*, scarcity of quality seeds, an absence of connection with agricultural institutes for necessary supports, not equipped for massive insect-attack, the lack of lands for winter cropping for landless farmers, an absence of good transport facilities and not benefiting from under-developed marketing system are the important ones. Most of these are true for the present SEMP project site. However, some additional issues were identified during the present study.

1. *Baira* is made in the area of a village with adequate water hyacinth and it could be far from the farmer's house, thus bringing *baira* near to the farmer's house for close observation could cost extra money and risk of breaking the platforms.
2. Planting material (*durali*) occasionally get scarce.
3. *Baira* may be blown away in storms from its original site.
4. It takes long time (20-35 days) for water hyacinth to decompose and ready for planting.
5. If it rains hard, *baira* platforms get excess water that rots seedlings' root and they die. Rain also can lessen vegetable quality due to water-logging.

In terms of marketing, people of Chanda *Beel* said that they can't compete much with the seedling production made in Pirojpur and Barisal where they use special type of plant materials (probably *kanta shaola*) for *guti*. However, this explanation has not been confirmed. Moreover, according to them, the *baira* adopters in Pirojpur take *baira* as their sole means of income, thus are more professional than the peoples of Chanda *Beel*.



A farmer and his seedlings raised on *baira*

### 5.3. Recommendations

On the basis of present *baira* initiative and constrains mentioned above, following recommendations are being suggested.

1. **Research:** At present the *baira* cultivation practice is quite diverse in Bangladesh. This indicates that the farming system is still evolving. There is a good chance for standardizing the system. Thus, further research on *baira* practice (preparation and cultivation techniques) is needed to obtain maximum benefit from this useful farming option. Potential studies on *baira* farming systems include issues like, reduce the period of decomposition of water hyacinth in a *baira* platform, acceleration of rooting on *baira*, sustaining the *baira* cultivation year-round, efficient production regimes for spices like ginger and turmeric, obtaining good quality and quantity of crops, shortening crop life cycle, and early harvesting and marketing.

Alternative *baira* construction and planting materials need to be used in areas where water hyacinth and *durali* are scanty. In addition, people of Chanda Beel often do not have a clear idea why certain plant materials are used and why not the others. For example, they could not explain confidently why *durali* is used for *guti*-making instead of other aquatic plants. Thus *baira* cultivation system needs further exploration and studies.

2. **Institutionalization:** Institutionalization and capacity building of the local people, as piloted under SEMP, could help overcoming the funding problem for the poor and the absence of contact with agricultural institutes for necessary support (technical, seeds, etc.).



Turmeric cultivation on *baira*

3. **Monitoring system:** If institutionalization is made, strong participatory monitoring and evaluation system should be in place. It would help monitoring the planned activities and evaluating the impacts of the project on the local community.
4. **Pest control:** Integrated pest management systems should be widely practiced. The system should be equipped for preventing the *baira* from massive insect attack. In addition, local knowledge of crop protection should be documented and encouraged in the potential *baira* farming areas.

5. **Marketing:** Sale of seedlings is very lucrative. Vegetable seedlings come to seedling markets (e.g. in Tekerhat) from distant places (e.g. Barisal). But often there are areas suitable for *baira* cultivation nearby the markets (e.g. Chanda Beel). Seedlings supply from the latter sites will be lower in price because of low transportation cost. If a strong market system can be established within such site, the local farmer will be able to capture the nearby seedling market.



Marketing of vegetable seedlings raised on *baira*

These recommendations deal with specific aspects of *baira* farming as such, and could be useful for improving this farming system. But for expansion of *baira* practice and sustaining its success in Bangladesh, a holistic approach is needed. Large scale program is essential in the south and the south-west of Bangladesh involving more than one implementing agencies (government and non-government) in association with local community and local NGOs. The goal of such a project could be confronting climate change consequences or encouraging an alternative livelihood option for the wetlanders. Initiative is also needed to introduce *baira* in northern wetlands, like in *haor* areas, where lack of agricultural land in rainy season causes joblessness, thus negatively impacts on local poverty level. Finally, by establishing an effective market system, *baira* initiatives may find its niche beyond the national boundary, as global market for free-trade and organic foods is increasing in western markets.

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## APPENDICES





Appendix 1. Preliminary data on *baira* cultivation in Nanikhir village, August 2000

No.	Name	Started (years ago)	Starts from	Vegetables/seedlings produced on <i>baira</i> *				No. of <i>baira</i>	Size of <i>baira</i>	Labor required per <i>baira</i>	Sources of seeds used
				Go, Ca, Cf	To	Ep	Ch				
1.	Gauropada Mandal	40	July	+				+	36ft × 9ft	6	Gourd seeds saved by them (personal), other seeds from Gopalganj (G), Khulna (K) and Takerhat (T)
2.	Bishawnath Mandal	38	"	+	+	+	+	+	30ft × 8ft	6	Gourd - personal, others - GKT
3.	Bimal Mandal	5	"	+	+	+	+	+	27ft × 5ft	6-7	GKT
4.	Basan Bala	20	late June	+	+	+	+	+	36ft × 8ft	8	GK
5.	Mukonda Mollick	10	July	+	+	+	+	+	45ft × 9ft	4	GK
6.	Dulal Tali	5	"	+	+	+	+	+	15ft × 6ft	6-7	Gourd - personal, others - GKT
7.	Juran Mandal	8	"	+	+	+	+	+	30ft × 7ft	2-3	GK
8.	Purna Mirda	12	"	+	+	+	+	+	30ft × 9ft	7-8	Gourd - personal, others - GKT
9.	Gauro Byne	5	"	+	+	+	+	+	24ft × 6ft	6	GT
10.	Manaranjan Mandal	6	June/ July	+	+	+	+	+	30ft × 7ft	6	Gourd - personal, others - GKT
11.	Tulsi Baroi	7	"	+	+	+	+	+	24ft × 8ft	5	GT
12.	Ranjan Bala	7	"	+	+	+	+	+	30ft × 6ft	6	Gourd - personal, others - GKT
13.	Bangkim Mollick	7	"	+	+	+	+	+	30ft × 9f	7	GT
14.	Sudir Ghoari	2	"	+	+	+	+	+	36ft × 8ft	7	GT
15.	Kiran Bala	2	"	+	+	+	+	+	30ft × 8ft	6	Gourd - personal, others - GKT
16.	Biren Kirtonia	2	"	+	+	+	+	+	22ft × 7ft	5	GT
17.	Manaranjan Kirtonia	11	"	+	+	+	+	+	36ft × 8ft	7	GT
18.	Bimal Sarkar	6	"	+	+	+	+	+	30ft × 8ft	6	GKT
19.	Din Baroi	4	"	+	+	+	+	+	30ft × 9ft	6	GT
20.	Ratan Tikadar	2	"	+	+	+	+	+	36ft × 9ft	7	GT
21.	Bhabatosh Barey	2	"	+	+	+	+	+	30ft × 9ft	6	GT
22.	Pachu Byne	4	"	+	+	+	+	+	30ft × 9ft	6	GT
23.	Sadan Tali	11	"	+(no Cf)	+	+	+	+	36ft × 9ft	7	GT

\* Go = gourd, Ca = cabbage, Cf = cauliflower, To = tomato, Ep = eggplant, Ch = chili and Ko = kohlrabi

