Integrated Floodplain Management

Wetlands are Important Natural Resource

What is wetland?

All different types of water bodies present in the floodplains of Bangladesh are wetlands. Like: rivers, beels, haors, baors and seasonal flooded lands. Wetlands can be seasonal or can hold water round the year.

What resources we can harvest from wetlands?

Apparently, water, fish and different agricultural crops can be harvested from floodplains, but in reality, we can harvest a range of different products from a healthy wetland that supports livelihoods of many people, such as: water, fish, different agricultural crops, fuel wood, grass, aquatic fruits, plants and animals etc. That is why wetlands are of immense importance to rural livelihood. Figure 1 presents different wetland products listed from Hail Haor those are harvested and used in that region.

Fig. 1: Resources from Hail Haor

What is the economic valuation of a wetland?

Economically wetlands are of high value. A research finding shows that 1 ha land in the Hail Haor produce is equivalent to Tk.41,000. Though this calculation does not include the value of pollution abetment, ground water recharge etc. On the other hand 1 ha land produces boro rice that is equivalent to Tk.18,000 only. Besides, the benefits of a wetland go to both poor and rich, on the other hand cropland benefits are harvested by the rich land owners only.

How rural people are dependent on wetland resources?

In rural Bangladesh, people living in and around floodplains are largely dependent on its resources irrespective of their profession.

- Four families out of five are engaged in harvesting and use of different wetland resources and earn a major portion of their livelihood.
- Ultra poor can survive lean periods by collecting different products and fish from the wetlands. Wetlands are the only source of their family protein needs.

What is the ecological importance of the wetlands?

Wetlands have many ecological values that benefit our environment due to its existence:

- Provides shelter for fish, birds and many other species of wildlife.
- Abetment of pollutions.
- Acts as reservoirs to reduce extent of flooding.
- Ground water recharge.
- Reduces damage from wave and surges.

Why protect wetlands?

Wetlands are playing an important role in providing livelihood and nutritional supply to the rural poor. Wetlands are highly productive and meet day to day needs of millions of peoples, but due to our ignorance and unplanned activities, they are on the verge of destruction. It is urgently necessary to take the steps to revive our wetland with the participation of all levels of stakeholders.

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Value of Wetlands

What is the ecological value of wetlands?

Wetlands are highly productive multi-resource systems. People directly harvest and utilizes many different resources from wetlands. Fish, and many other animals and plants are harvested from wetlands and used as human food, fuel, building materials, fodder, medical purpose plants etc. During dry season, the local people use vast wetlands as cattle grazing land.

Besides these products, wetlands provide many benefits and services to people through stabilizing local environment and ecosystem. These services are indirect which is why we are not always aware of them. They are not generally evaluated in economic terms, but are very important for our environment and maintaining ecosystem productivity. That is why wetlands are not wastelands; for the wider benefit and well-being of humankind and nature, these recourses should be protected.

How do wetlands influence our environment?

How is soil fertility increased?
Regular deposition of silt and humus (degraded plant and animal bodies) increases soil fertility.

How is ground water recharged?
Ground water recharge is only possible from standing waters, not from surface flows. Without wetlands recharge of ground water would not be possible.

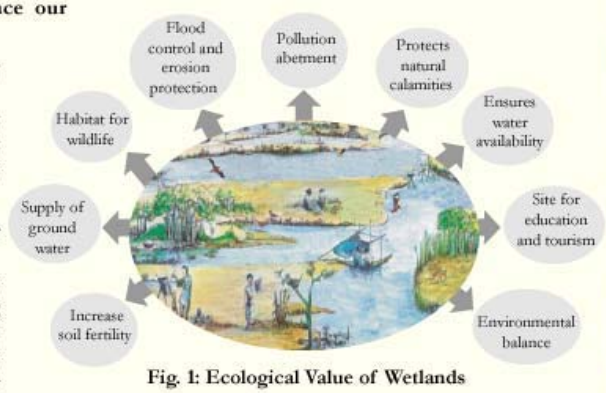

Fig. 1: Ecological Value of Wetlands

How do they provide shelter for wildlife?
Wetland forests like Hijal-Tomal, Reeds etc. are used as shelter by many wild animals including birds. These wetland forests are critical habitats for many migratory birds and when submerged or under water for fishes.

How do they work for flood control and erosion protection?
Wetlands store flood water and can reduce flooding. Wetland forests, especially reeds and similar plants, protect land from erosion.

How do they work for abetment of Pollution?
Water dilutes pollutants and gradually recycles them in the biological process thus reduces environmental pollution.

How do they protect against natural calamities?
Wetland forests play a vital role in preventing or reducing the extent of cyclones, tidal surges, and floods and protect humans and other resources.

How do they makes water available?
Stored water in the wetlands is used for irrigation or other needs besides its other benefits.

How are they important for education and recreation?
Wetlands are good recreational sites for boating, bird watching; they are also used for research and educational purposes.

How do they balance regional environment?
Depending on size wetlands influences and stabilizes local or regional environment due to its existence.

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Present Status of the Floodplain Fisheries Resources






What is the present scenario of the floodplain fisheries?

Floodplains are a natural ecosystem, so productivity is also governed by the natural systems. Man, for his own needs, harvests different resources such as fish, through different means, and tends to capture as much as possible. When harvest exceeds the natural productivity limit, resource starts to degrade with lower production and gradually the resource is exhausted. At present harvesting pressure and degradation of habitat, stresses the floodplain fisheries resources. If appropriate measures for conservation are not taken urgently, the resources will be exhausted completely.

According to fishermen and specialists, the fisheries resources at this moment are on the verge of destruction. Different studies revealed that natural habitats of fish are destroyed or converted, the process is continuing, and as a result, floodplain habitats are reduced, and production decreased significantly.

What is the habitat condition?

- Wetland area of Bangladesh is reduced by 50% during last 30 years.
- Due to FCD/Is 4 - 6 million ha of wetlands are adversely impacted.
- Due to the Farakka Barrage 50% flow reductions in the Padma.
- The 109,000 ha. of the Chalan Beel in 1909 reduced to only 8,500 ha. in 1998.
- Once very prominent fishery the Arial Beel in Munshiganj is now no longer a wetland.

How is the fisheries production and species diversity?

- Production of carps and big catfishes from natural sources reduced by 50% during last 30 years.
- Natural spawning of carps reduced by 75% during last 20 years.
- 54 species of fresh water fish are threatened at present.
- Floodplain fisheries production in many areas have reduced to 50-150 kg only, while a healthy floodplain can produce more than 300 kg of fish per hectare.
- With the decreasing production, poor peoples consumption of fish reduced by 38%.
- Total annual fish production from the inland open water reduced by 30-40%, resulting in a loss of Tk. 50-100 cr. each year.

What are the main reasons of this decreasing production?

The reasons as identified by researchers are:

- Indiscriminant fishing, fishing pressure and use of harmful gears and methods.
- Lack of dry season water facilitates indiscriminant fishing that result in a shortage of brood fish for next year.
- Loss of habitat; beel, khal, rivers are being silted up and loosing depth or changing status mainly due to aforestation and unsustainable cultivation at the hilltop.
- Aquatic pollution increasing, especially in the dry season causing high fish mortality.
- The dry season water is further reduced by irrigation for rice cultivated in the floodplains. Wetlands are being occupied and turned into agricultural land, settlements etc.

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Socio-economic Importance of Fisheries Resources

How important are the floodplain fisheries?

Deltaic Bangladesh is featured with many rivers, canals, beels and haor-baors, besides; there is a vast seasonally flooded area that remains under water for 5/6 months in a year. These vast floodplain areas are highly productive due to fertile land, nutrient rich surface inflow, seasonal and physical dimensions of the system. Researchers suggest this highly productive inland freshwater system is occupied among others by more than 266 species of fish, about 63 species of prawn and shrimp. More than 44% of the countries total fish production comes from these inland open water systems. In this respect, Bangladesh is certainly richer than many countries.

What is the socio-economic importance of floodplain fisheries?

In rural Bangladesh 60-80% of people are dependent on floodplain fisheries resources in one way or other for their livelihood and daily protein supply. Fish accounted for 63% of the country's total protein supply. In the country fish is second only to rice as a source of food, and is the primary source of protein for the poor. Fish is also the most important source of protein for pregnant and nursing women, and for children over two years old. Rural households, on an average, eat fish 3.5 days per week, compared to 2.1 days for pulses and 0.5 for meat.

Fisheries sector in Bangladesh plays a very vital role in the economy, employment generation and nutrition supply to the people. The sector contributes 5% to the GDP and, 6% for export earning of the country. About 10% of the population depend on fisheries and related activities for their livelihoods. In these context floodplain fisheries, resources are of immense importance to the people of the country. Historically fish are an important item in the daily menu and play a role in peoples socio-cultural beliefs and activities. Everybody, irrespective of wealth, likes fish.

Fish catch and species composition varies seasonally. Some species are abundant in the wet season and some in dry season. This seasonal variation leads to a difference in types of fishers, their crafts and gears and in methods. The poor can be involved in different fishing related activities year round and earn their livelihood.

Research reveals that even the members of a poor family in rural areas harvest and consume about 75 species, of fish of which most are small fishes. There are many small fishes of significantly high nutritional value. The poor normally consume small fish including small prawns.

Other research reveals that the poor who fish only for their own consumption catch 90% from the floodplains. Therefore, floodplains are playing a vital role in poverty reduction and nutrition supply to the millions of poor families.

Some aspects of the Socio-economic importance of fisheries resources in Bangladesh:

- Over a million people earn their livelihood by catching fish.
- About 11 million rural people earn a part of their livelihood from fishing.
- Fisheries contributed 6% of the GNP during 2003-'04 FY.
- Fisheries contributed 5% of the national income during 2003-'04 FY.
- Fisheries accounts for 23% of the total agricultural income.
- 5.71% of the export earning came from fisheries which is Tk. 2,572 Cr.

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Endangered Wetland Fish Species

How many species of fish in floodplains of Bangladesh?

The diverse wetlands of Bangladesh support more than 266 species of fish and 63 species of shrimps and prawns. Many countries of the World do not have such diversity in their inland waters. This diversity is important for high production and balancing the ecosystem.

What is the present condition of the fish species diversity?

Studies reveal that at present 80 - 120 species of fish are available in inland water bodies. Due to destruction of habitat and fishing pressure many species of fish are on the verge of extinction or are becoming threatened, overall production from the natural sources also drastically reduced.

Is the existence of floodplain fish under threat?

According to the researchers, 54 fish species are under threat of extinction. Among them 12 are critically endangered, 28 are endangered and 14 are vulnerable. The critically endangered fish species are: Boga Labeo, Nandi Labeo, Pangusia Labeo, Olive barb, Tor Mahseer, Rita, Garua Bacha, Batchwa Bacha, Pungas, Gangetic Goonch, Sisor Catfish and Barca Snakehead.

What are the reasons of species loss?

Both natural and man made causes are responsible for this loss of species:

- Wetlands are continuously shrinking due to siltation and occupation.
- Loss of connectivity between different types of habitats that limits fish migration for breeding, feeding etc.
- Loss of fish habitat.
- Loss of water flow due to embankments, roads etc.
- Further reduction of critical dry season fish habitats due to irrigation.
- Water pollution due to indiscriminate use of agro-chemicals and industries.
- Indiscriminate fishing and use of harmful and destructive gears and methods for fishing.

What could be done to restore fish species diversity?

- Conserve habitat and establish sanctuaries;
- Enforce fishing effort control measures viz. closed season, closed area, ban on destructive fishing methods and gears.
- Impose ban on harmful fishing gears and destructive methods.
- Diversify dry season cropping pattern in the floodplains, and replace water hungry boro rice.
- Increase dry season aquatic habitat and re-establish linkages by re-excavation.
- Bring wetlands and open water bodies under community-based management.

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Fisheries Resources versus Boro Rice Cultivation in Floodplains

Where and when is boro rice cultivated?

At present most of the floodplains and surrounding high lands are cultivated with boro rice in the dry winter season. Generally, boro rice is planted during December-January and harvested in April-May. Boro rice demands a very high quantity of water that is 3-4 times that of other rabi crops that are cultivated in the winter season. This uses the water from beels, canals and rivers and further reduces the already reduced aquatic habitat in critical dry season. That is why instead of single boro rice if diversified cropping is practiced in the floodplains, it will be beneficial for both farmers and the aquatic habitats.

What kind of problem created for fish by cultivating boro rice?

Analysis of situations suggests that boro cultivation in the floodplains has 3-fold effects on fish. All 3 effects are very harmful natural fisheries (Figure 1). It is to be noted here that 1 ha boro rice cultivation demands 10,000 cub.m. of irrigation water.

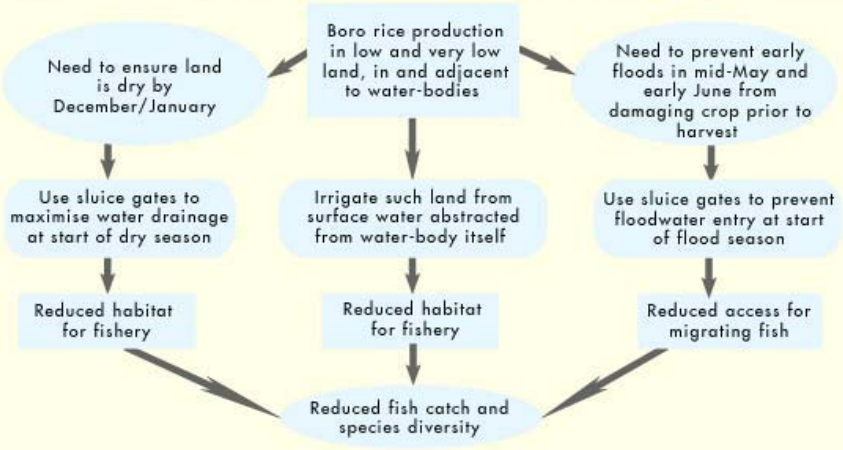
Firstly, farmers tend to drain out water to dry-up and prepare land for boro rice cultivation at the beginning of dry winter season during November-December.

Secondly, during intercultural operation farmers uses water from the beels, canals, rivers and other surface water sources to irrigate the boro rice. This further reduces the reduced aquatic habitat.

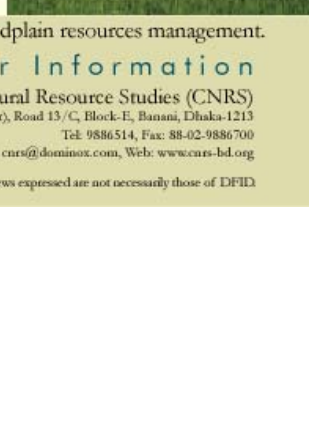
Thirdly, during the early flooding time in April-May they stops entry of early rainwater into the floodplains till the rice is harvested.

All these activities reduces and destroys dry season fish habitats disrupts fish migration. The obvious result is reduced fisheries production and biodiversity.

Figure 1: The systems implications of lowland boro rice production



Through these process wetlands are loosing their natural productivity, resulting in loss production and biodiversity of fish and other aquatic animals and plants. The question here is, whether the water will be used for rice alone or for both rice and fish.



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Rabi Crop Diversification to Protect Floodplain Fisheries

What is rabi crop diversification?

Diversification of rabi crops means here to reduce cultivation of water hungry boro rice in the floodplains and increase other rabi crop cultivation; those that need much less irrigation water. The main objective is to reduce the use of beel water, which is critically needed for fish and other aquatic life at that time. Experiments shows that there are a range of alternative crops that can be cultivated successfully in the floodplains instead of boro rice, and can benefit farmers even more using only one-quarter of the irrigation water. This will also benefit fishermen by improving fisheries.

Why is crop diversification for floodplains is needed?

The dry season is the most critical period for floodplain fish, water in the beels or other depressions becomes scarce, and sometimes dries up completely, making the habitat uninhabitable for aquatic life. That is why it is important to keep sufficient water during dry season in the beel so that at least some mother fish can be sustained. However, boro rice cultivation in the floodplains is a big obstacle in this regard. To cultivate boro rice farmers tend to drain out beel water as soon as possible, and will use up the remaining beel water for irrigation. At the end, before harvesting, they will keep the gate closed, preventing early floodwater from entering the beels. As a result, beels are dry and aquatic life under threat.

An experiment in Pabna Irrigation Project shows that after irrigating 500 ha boro rice fish production reduced drastically and fisheries completely collapsed after irrigating 700 ha boro rice (Figure 1).

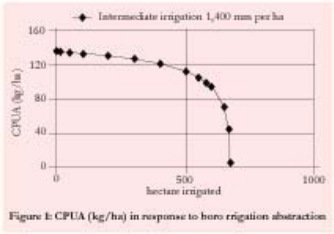

Figure 1: CPUA (kg/ha) in response to boro irrigation abstraction

What benefit for fisheries from cultivation of alternative rabi crops?

If the floodplains are cultivated with maize, wheat, potato, garlic or other rabi crops, those requires much less irrigation water, it will help keep more water in the beel for fish. Pabna Irrigation Project experiments suggest that even after irrigation of 2500 ha for wheat, it is possible to obtain a fisheries production up to 50 kg/ha. If onions are cultivated, the same amount of fish can be obtained even after irrigating 4000 ha (Figure 2).

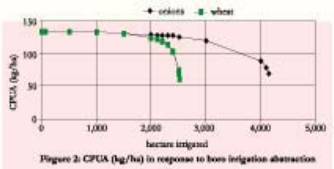

Figure 2: CPUA (kg/ha) in response to boro irrigation abstraction

This clearly shows that the beel fishery can be protected if diversified cropping pattern can be introduced.

What are the benefits of rabi crop diversification?

- If floodplains are cultivated with diversified rabi crops, it will benefit the farmers more and this will also be benefited for the aquatic ecosystem.
- Other rabi crops can be harvested 3-4 weeks earlier than boro rice thus can avoid the risk of damage by heavy rain or early flooding.
- As the crop is harvested well in advance, the sluice gates can be kept open during early flooding to facilitate fish migration.
- Diversified cropping in rabi season and deep water Amon cultivation during monsoon will benefit the farmers as well as will provide an improved habitat for fish.
- If sufficient water can be retained in beels, it is possible to increase fisheries production to a satisfactory level.

Table 1: Irrigation demand of source alternative rabi crops compaired to boro rice

Crop	Irrigation demand
Boro rice	835
Wheat	200
Maize	240
Onion	175
Garlic	150
Potato	190
Egg plant	320

What are the suitable alternative rabi crops?

Many alternative rabi crops such as wheat, maize, onion, garlic, potato and many other vegetable crops can be beneficially cultivated in the floodplains of Bangladesh. (Crop selection should be done based on soil quality) These crops need much less irrigation water (Table 1), thus keeping some more water for fisheries.

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Benefits of Rabi Diversification in Floodplains

Are there other lucrative alternatives of boro rice in Beel areas?

There are many alternative rabi crops can be cultivated with better benefits compared to HYV boro rice in the floodplain areas. Eighty-five farmers in Charan Beel, Kalihati, Tangail piloted wheat, maize, potato, garlic and vegetables in 18 ha acres of land instead by boro rice made lucrative benefits (figure 1).

Figure 1: Farmers may get 4 times higher net returns from alternative crops compared to HYV boro rice.

What are the Economic Benefits?

- Cultivating potato and subsequent jute resulted in a net return of Tk. 71133 per ha compared to Tk. 20710 per ha from boro rice.
- Cultivating wheat and subsequent vegetable resulted in a net return of Tk. 69705 per ha.
- Single crop cultivation in place of boro rice resulted in a net benefit: potato Tk. 43597, garlic Tk. 33647 and maize Tk. 26041 per ha.

What are the Ecological Benefits?

Irrigation demand for cultivated alternative rabi crops is less than 1/4 th compared to Boro rice that saved 135000 cubic meter of water in the Beel after cultivating 18 ha. If 1/4th of the Charan Beel land (344.27 ha) is cultivated with alternative rabi crops it would save 645000 cubic meter water.

Diversified cropping helps maintaining soil fertility (Potato, jute and vegetables in particular).

Allowed farmers to cultivate Jute as an addisional crop in kharip-1 (which is not possible with boro) subsequently which is more beneficial for the farmers as well as for aquatic environment.

What are the Social/Livelihood Benefits?

- Wheat harvested (March-April) much earlier than boro rice (May-June); provided food security during the crisis period.
- Harvesting of alternative rabi crops created employment opportunity in lean period.
- Wheat and maize plants used as fuel and fence, poor women thrashed wheat and got the hay instead and used as fuel.
- Alternative rabi crops harvested well before boro rice thus no risk of damage by flash flood.

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