

Biodiversity of Wetlands under Different Environmental Condition

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ABSTRACT

'Wetland' a relatively new term occupies a significant position as natural resources in our state. The importance of wetland has been increasing day by day due to its role on environment and economy of a region. But the growing pressure of human interference has been degrading the wetland environment constantly and it has posed a serious threat to the biodiversity of the wetland. An attempt has been made in this paper to know the status of wetland and analyze its environmental degradation. The study tries to put forth some eco-friendly measures of conservation and management for sustainable development of the wetland habitats and the people around the wetland. The study is based on both primary and secondary data.

Keywords: Conservation, environmental degradation, natural resource, sustainable development, wetland.

Introduction

Wetlands locally known as 'Beels' are the most common and an integral feature of the fluvial landscape of Assam. The riverine tracts of the Brahmaputra and Barak Valley provide favorable geoecological conditions and tectonic revolution of the region, hydrologic and fluvio-geomorphic behaviours of the rivers and the pattern of landuse and human occupancy in the river valleys. As revealed from satellite data analyse by the Assam Remote Sensing Application Centre (ARSAC) Guwahati in 1997, the total number of wetlands in the state is 3513. These wetlands cover an area of 1,01,231.60 hectares accounting for 1.29 percentage of the total geographical area of the state. Wetland is a complex natural system. Assam is gifted with numbers of swampy areas or lakes locally known as beels. The beels in Assam are water bodies of different sizes and shapes generally connected to the rivers the Brahmaputra, Barak and their tributaries. Some of the beels are under the control of the Government while others are in private hands. Statistics presented in the table 1.1 will indicate the number of different categories of beels in Assam. Wetland harbours a wide variety of flora and fauna, all of great economic, aesthetic and scientific importance. The direct and indirect derive from wetlands are numerous. These can be broadly put in three categories.

i. Benefits directly cognizable in monetary terms such as fishing water supply, power generation, agriculture, tourism, transport etc.

- ii. Indirect hydrological and ecological benefits of great economic value through not directly encashable –such as ground water recharge, flood control through holding, flood waters, water quality improvement wildlife habituate etc.
- iii. Aesthetic benefits – providing sights to behold, creative stimulus mental reservation etc.

Table.1: State level distribution of wetlands in Assam

Wetlands Class	Wetland Type	No.	Area	Present of total area of natural wetland
Natural Wetland	Lake, pond	690	15494.00	15.30
	Ox-bow lake/cut of meander	861	15460.60	15.28
	Waterlogged seasonal	1125	23431.50	23.15
	Swamp, marsh	712	43433.50	42.92
	Total	3388	97819.60	96.65
Man made Wetland	Reservoir	10	2662.50	2.61
	Tanks	115	749.50	0.74
	Total	125	3412	3.35
	Grand Total	3513	101231.60	100.00

Source: ARSAC

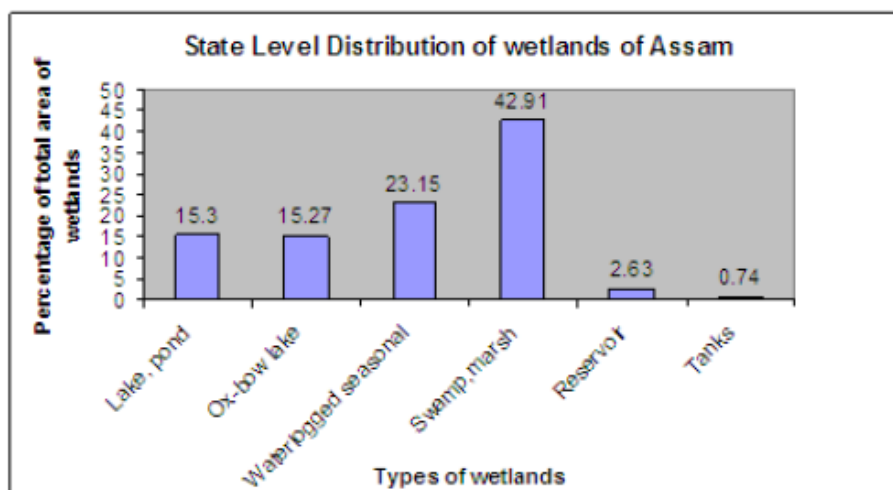


Fig. 1 State level distribution of wetlands in Assam

The study area Dora Beel is a wetland of Kamrup district. It is a floodplain wetland in the south bank of river Brahmaputra. It lies near Kukurmara under the Palashbari Revenue Circle. The Beel is very rich in biotic communities. The Beel lies between 26053/76// N latitude and 91027/99// E longitude. According to the Survey of India, 1971 the total area of the Beel was 297.96 acres which has shrunk to 278.41 acres according to Land sat imagery 2005. The Beel is surrounded by following villages- Rajapukhuri, Nahira, Bhakatpara, Tezpur, Rampur, Majpara, Kuldung, Dhantola, Bortari and Khidirpukhuri.



Fig. 2: Aerial Photo of the Study Area

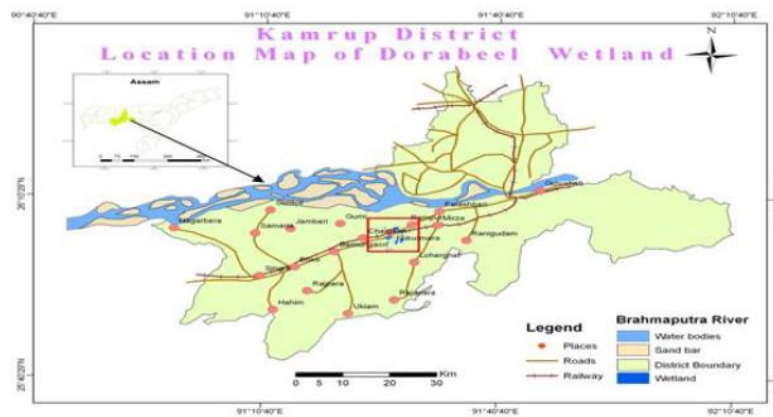


Fig. 3: Location map of Dora beel

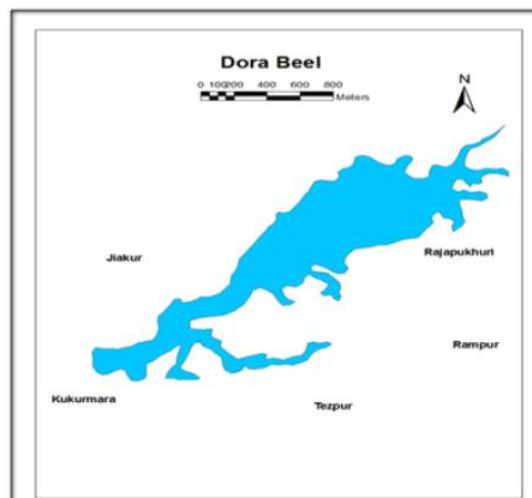


Fig. 4 Dora Beel (Map of the study area)

Objectives of the Study

The main objectives of the study are

1. to understand the biodiversity of wetlands under different environmental condition.
2. to examine the nature of human interference on wetland environment.
3. to suggest some eco-friendly measures for conservation and sustainable development of wetland.

Database and Methodology

For identification of wetland boundary, Survey Of India topographical sheet at 1:50000(78N/8) has been used. An outline map of the study area was prepared with all possible details and specific field sites necessary for our study which is collected from Palashbari Revenue Circle Office. The primary information is collected through field survey of Dora beel. The information regarding the wetlands (availability of fish, fauna, domestic and migratory birds, impact of floods, impact of aquatic flora etc.) are collected through interaction with local villagers and fishermen. Different species of flora and fauna have been collected and different herbariums have been prepared for identification processes. Some existing taxonomical literature has been consulted and a certain amount of secondary data has been also used to fulfill the objectives of the study.

Physical Background

The Beel is fed by the River Kulsi locally known as Kolohi River originating from Meghalaya Plateau and other small streams and Nala of the surrounding area. The river Kolohi which is the main inlet of the Beel also act the role of outlet too, it is in such a manner that when the water level of the Beel rise up to such extend that it does not have enough room for further inflow and rather it serve as the path for the outflow of water from the Beel that finally pour down to Brahmaputra. Climatically the area is characterized by hot wet summer and cool dry winter. The average annual rainfall is about 1113.5 mm. June, July, August and September are considered as the wettest months. On the otherhand, December and January record the scanty rainfall.

Biodiversity of the Wetland

The wetlands are potentially very rich and ecologically very important features. They have very high carrying capacity in respect of wetland type vegetation, aquatic birds and different species of fishes. The wetlands act as huge store house of aquatic flora and fauna. The human beings are also an inherent part of this system. The current problem of biodiversity concerns the relation between biodiversity and ecological services obtained from the living sphere by man. The biodiversity of Dora Beel wetland is the true testimony to the richness of wetland biodiversity of the floodplain of Brahmaputra Valley. The Dora Beel present a visual delight during the monsoon period at the full storage level as it abounds with a variety of aquatic flora. But during the post-monsoon period when the wetland is in the drought storage level mostly water hyacinth can be found in the Beel and a major part of the Beel becomes grazing ground for cattle. The common aquatic vegetation found in Dora Beel is as follows: Free floating hydrophytes mainly Eichhornia crassipes and Lemma minor are found in the wetland. Besides of these, some anchored submerged hydrophytes, namely Hydrilla verticillata as a dominant one are found in the beel.

From the high water depth at interior of the wetland towards the bank, a significant variation of vegetation coverage has been seen. The major varieties of species found at highwater depth in the beel are *Clinogyne dichotoma* (Family Marantaceae), *Arundo donax* (Family Poaceae), *Ipomea eriocarpa* (Family Convolvulaceae), *Nymphaea alba* (Family Nymphaeaceae), *Monochoria hastata* (Family Pontederaceae), etc. On the bank slope, some other varieties of vegetation are found. These are *Ziziphus mauritiana* (Family Rhamnaceae), *Sagittaria sagittifolia* (Family Alismaceae), *Ziziphus jujube* (Family Rhamnaceae), *Magnifera indica* (Family Anacardiaceae), *Bombax malabaricum* (Family Bombacaceae), *Solanum indicum* (Family Solanaceae), *Jatropha gossypifolia* (Family Euphorbiaceae), *Musa domestica* (Family Musaceae), *Grewia multiflora* (Family Tilaceae), etc. Some good number of endangered species of medicinal plants and varieties of bamboo are found on the bank side of the beel. Besides all of these, water hyacinth, water grass, water lily, water Lily, dalgrass, Lotus are found in the beel. On the account of bird diversity in the wetland, varieties of aquatic birds are found in the beel.

It attracts large number of migratory birds in winter months especially from December to March. The birds found in the beel are Redwattled lapwing (*Vanellus indicus*), Bronzewinged Jacana (*Meopidicus indicus*), Greyheaded lapwing (*Vanellus cinereus*), White eyed pochard (*Aythya nyroca*), Shoveller (*Anas clypeata*), open bill stork (*Anastomus oscitans*), etc. On the other hand, different types of bird found in the beel are Gadwall (*Anas strepera*), Pintail (*Anas acuta*), Pintail snipe (*Gallinago stenura*), Garganey (*Anas querquedula*), Fereginus Marbled teal (*Marmaronetta*), etc. The different species of fish include a large numbers of air breathing fish, minor carps, cat fish and ornamental fish are also found in the beel.

Table 2. Name of some of the fishes found in Dora Beel

Sl. No.	Local name	Scientific name
1	Rohu	<i>Labeo rohita</i>
2	Kuriha	<i>Labeo gonius</i>
3	Bhagan	<i>Labeo bata</i>
4	Bhakua	<i>Catla catla</i>
5	Mirika	<i>Channa argus</i>
6	Silver carp	<i>Hypophthalmichthys molitrix</i>
7	Grass carp	<i>Ctenopharyngodon mola</i>
8	Common carp	<i>Cyprinus carpio</i>
9	Moa	<i>Amblypharyngodon mola</i>
10	Darikona	<i>Eromus downii</i>
11	Bariola	<i>Aspidopoma muriei</i>
12	Senduri puthi	<i>Puntius sophore</i>
13	Ghona puthi	<i>Puntius ticto</i>
14	Japani puthi	<i>Puntius javanicus</i>
15	Lauputi	<i>Danio aequipinnatus</i>
16	Chela	<i>Chela labuca</i>
17	Salkona	<i>Salmostoma bacilla</i>
18	Botia	<i>Botia derio</i>
19	Botia	<i>Lepidocephalus guntea</i>
20	Bali botia	<i>Nemacheilus botia</i>
21	Bogitingra	<i>Mystus cavarius</i>
22	Kalitingra	<i>Mystus vittatus</i>
23	Aari	<i>Aerichthys seenghala</i>
24	Magur	<i>Clarius batracus</i>
25	Singhi	<i>Heteropneustes fossilis</i>
26	Pava	<i>Ompok pava</i>
27	Selkona	<i>Alia coila</i>
28	Tinkata	<i>Gagata cenia</i>
29	Kokila	<i>Xenotodon canila</i>
30	Sal	<i>Channa marulius</i>
31	Soul	<i>Channa straitus</i>
32	Korati	<i>Gadusia capra</i>
33	Goroi	<i>Channa punctatus</i>
34	Besa	<i>Setipinna phasa</i>
35	Kholihona	<i>Calisa lalia</i>
36	Kawoi	<i>Anabus testudineus</i>

37	Kholihona	Colisa fasciata
38	Patimutura	Glossogobius giuris
39	Chanda	Chanda nama
40	Chanda	Chanda ranga
41	Gedgedi	Nandus nandus
42	Kanchanmati	Badis badis
43	Tilapia	Oriochromis mossambica
44	Khanduli	Notopterus notopterus
45	Chital	Notopterus chitala
46	Gangatop	Tetradon kutkutia
47	Bami	Mastacembulus armatus
48	Turi	Macronagrus aculeatum
49	Cuchia	Amphiopnus

Source: R. Borthakur, 2008

Dora Beel acts as habitat for fish, birds, reptiles and amphibians many of which are of economic value in terms of subsistence and commercial fishing, hunting and trapping. Community fishing is also carried out in the wetland for economic purpose.

Human interference on Wetland Environment

Human activities can have some positive and negative impact upon the wetlands. Human interference can enhance or reduce the abilities of the wetland to provide the essential goods and services. The physical, chemical, and biological component of the wetland is altered due to human interference. Increasing population has resulted in encroachment upon the wetland for the purpose of settlement and agriculture. The lands in around the beel are normally used for agriculture. But during summer, agricultural activities are disrupted due to flood and the areas are covered by water bodies. Fishing is then widely practised by the local people and fishermen. Regarding the land use of Dora Beel, the local people filled the land for settlements. Construction of motorable road from north to south is found at eastern side of the wetland. People practice agriculture at the side of wetland when the water of the wetland recedes. Using the wetland for grazing land, dumping of domestic waste, garbage, etc. are prominent at the Beel site. Besides these, construction of Brewery industries at the Beel has been laid down by government that will further deteriorate the existing vulnerable condition of the Beel. In our 29 household survey, 48% people are not interested in farming and 52% people are found as interested. Those who are interested in farming, some of them do subsistence and some do both subsistence and commercial. 53% do subsistence and 47% do both.

Table 3. Agricultural Landuse (Subsistence/Both)

Raw labels	Farming
Subsistence	8
Subsistence and commercial	7
Grand total	15

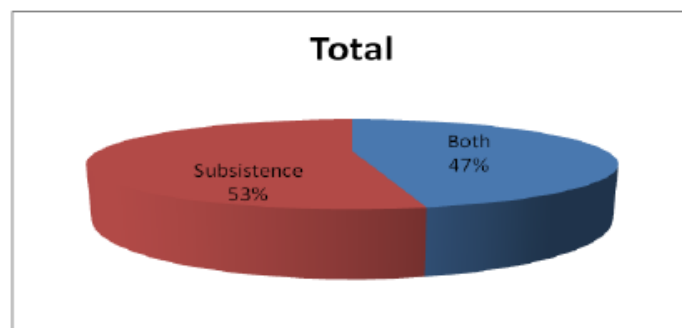


Fig. 5: Agricultural Landuse (Subsistence/Both)

The development of agriculture of the study area still depends mainly on the performance of rice cultivation. 27% are found as None and 73% are found as Rice and Vegetables.

Encroachment Activities

In our survey of the study area, we asked people about encroachment, settlement/agriculture/livestock rearing activities. People said 14% as agricultural activities. 3% cannot said anything, 31% as no encroachment. 21% as settlement and agriculture and rest 31% as all of them. People have a long and intimate association with wetlands. It's a relationship that's easy to understand when one considers the benefits or ecosystem services that wetlands provide to humanity. In addition to contributing to the life-support system that sustained us, wetlands also provide many people with a livelihood, or a means of earning a living. Often it is poor people, especially in rural areas, who are directly dependent on wetlands for their livelihoods. Fish capturing and selling is the main activity of local people to earn livelihood.

Problems related to Dora Beel and suggestion:

Unfortunately, at present the wetland is considered as the most threaten habitats plagued by many problems. The wetlands face both natural and anthropogenic problems. Some of the problems faced by Dora Beel are as follows:

1. The local people are not aware about the importance of this valuable resource.
2. The local people do not have much knowledge about the need for conservation and proper management of the wetland.
3. Economic backwardness of the local villagers which leads to overexploitation of wetland resource and indiscriminate fishing and hunting, trapping and killing of aquatic birds.
4. Population pressure leading to large scale encroachment within the Beel area.
5. The constructions of dyke and embankment on Gumi River have degraded the condition of Dora Beel.
6. Lack of adequate sanitary facilities which leads to pollute the wetland environment and creating unhygienic condition in the area surrounding the wetland. Dumping of domestic waste and garbage into the wetland creates a serious threat to the ecosystem. In Bortezpur,

4 households are found as they disposed their rubbish in Beel, and 6 disposed their rubbish in Open space area, In Horutezpur, 2 households disposed their rubbish in Beel. In Jiakur., 3 disposed in Beel and 3 disposed in Open space area. In Kukurmara 1 household is surveyed as rubbish disposed in Kolohi River. In Rampur, 7 households disposed their rubbish in Beel, and 3 disposed in Open space area.

7. Practice of agriculture in the wetland during winter season which leads to degradation of the wetland ecosystem and also a threat to the fish fauna.

8. Recently heard about setting up of a Brewery industry in the area. If it will do, it effects on water level of wetland, its biodiversity. Both physical and social environment will be polluted by such kind of unsocial things.

The above mentioned problems can be mitigated through some concrete effort of the government machinery, NGO's and local people. The following measures have been suggested to eradicate the problems.

1. Effort should be made to educate the local people and create awareness among them about the importance and the need for conservation and management of this valuable wetland.

2. Alternative means of livelihood should be generated for the people who depend upon the wetland for their survival. This will reduce the exploitation and killing of fish and avian fauna.

3. Steps should be taken to protect the wetland from illegal encroachment and strict laws should be implemented for their protection from such encroachment.

4. The eradication of weeds in a scientific manner should be taken up so that it may increase nutrient status and phytoplankton.

5. Adequate infrastructure should be provided to the people so that the Beel environment is not polluted.

6. Ecotourism potential of the wetland should be enhanced so that it may create job opportunity for the poor local people and also help in generating revenue for the maintenance, conservation and management of the wetland.

7. The ornamental flora fauna provides great economic potentials. So they should be protected and strategies should be formulated for gaining economic benefits.

8. Control of commercial fishing and exploitation of aquatic products.

Conservation and Management

The wetlands are very complex and fragile ecosystem. Therefore, conservation and management is very essential. The Government all over the world had now formally adopted the sustainable development policy objectives to protect the wetlands. They have also imposed a range of national conservation measures and designation which complements the Ramsar Convention. Conservation and management of wetlands has received insufficient attention in Assam. However in recent times the government has implemented certain laws to protect this degrading resource. There are various steps which are ensured by the government agencies for the conservation and management of wetlands. They are as follows:

1. Identify the various problems associated with a wetland.
2. Mapping the wetland after proper identification and field survey.
3. Establish the principles for wetland resource utilization on a sustainable basis.
4. Stop the conversion of wetlands for other purpose and to protect them from degradation.
5. Conservation and management of wetland should be done through proper landscape planning and by taking into account the wetland hydrology.
6. Application of scientific techniques for aquatic weed control.
7. Create environmental awareness among the local people.
8. Involve the local community in the conservation and management of wetlands.
9. Adopting sufficient measures for controlling the level of pollution.
10. Take measures for wildlife conservation in the wetland.
11. Adopt suitable plans for sustainable fisheries development.
12. Application of environmental impact Assessment for identifying, predicting and mitigating the impact of any development work within the boundary of wetland.

The conservation and management of wetland is very essential since they play an important role in regulating and improving the water quality, controlling floods, supporting diverse flora and fauna, recharging aquifers and reducing surface run-off and ensuring other service necessary to the health and wellbeing of people and hope that the desired initiative shall be taken by the government agencies supported by people's participation to restore the wetland before it is too late.

Conclusion

The wetland plays a vital role in maintaining the healthy environmental condition of the area. Because of the unique ecological habitat base for a variety of flora and fauna, Dora beel area has recognized as rich biodiversity site. Yet it has not been given the importance it deserves in recent years. The Dora beel wetland has been experiencing serious anthropogenic threat. Wetland is under threat from agricultural intensification, pollution, infested by invasive weeds etc. The wetland exerts a great role, contributing to the life support services in rural areas, the local people of the area directly dependent on wetland for their livelihood. The lands in an around the beel are normally used for agriculture. But during summer, agricultural activities are disrupted due to flood and the areas are covered by water bodies. Fishing is then widely practiced by the local people. It becomes grazing ground for cattle like cow, goat in winter season also. Some areas area left as open space area which are not used for any activity due to some unfavorable condition those areas are recognized as government lands. It is expected that the study would highlight the gravity of the problems and provide a framework for the better management and development of Dora beel wetland. Thus there is an urgent need for their conservation. The changing land use system and the livelihood has a great impact to the degrading biodiversity of the wetland which is a matter of concern. Thus it would be beneficial to bring the local people/community to monitor and manage these ecosystems and save them from the irreparable damage caused due to lack of our concern.

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