

Land Use and Land Cover Change, Its Impact on Ecological Balance of Wetlands: A Case Study of Urapad Beel in Goalpara District of Assam, India

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ABSTRACT

The study about the pattern of land use and land cover change has given due attention in different aspects of scientific and sustainable development in different parts of the globe. It indicates the interchangeability of different landscape attributes in a geographical arena. Land use refers to how particular land area being utilized by human, while land cover refers to the natural vegetation communities. The land use and land cover mapping describe the landscape of a particular area by assigning each land unit to a specific category or class, such as residential, forest or agricultural, etc. The land use mapping has been enjoying a pride position not only in geography but any other discipline which deals with the issues pertaining to space. From the very old days in different parts of the world, attempt has been made to prepare the land use mapping with different objectives. Today the importance of the study about the land use and how the land cover has been changing is felt in the context of the haphazard and uncontrollable development, destruction of environmental quality, loss of arable land, loss of biodiversity habitat like forest and wetlands etc.

The present paper is a modest attempt to delineate and analyze the land use and land cover change and its impact on ecological balance of an wetland called Urapad beel of Goalpara district in Assam.

Keywords: Land use, land cover, sustainable use, development, deforestation, etc.

Introduction:

Land use is the human use of land. It involves the management and modification of Natural environment or wilderness into built-up environment for example, fields, pastures, and settlements etc. It has also been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it" (FAO, 1997a; FAO/UNEP, 1999). Land use' is also often used to refer to the different types land use in zoning. Wetlands give birth to important ecosystem and its components and functions. They bear a great value in respect of animals, plants and various micro organisms. They thus give wildlife habitat, water filtration, flood protection means and cultural and economic ways. Wetlands bear high significance in respect of biological, ecological, social, values and influences. The

value and functioning of aquatic ecosystem varies from region to region. The Brahmaputra valley has nearly 3000 wetlands which are locally known as beels. All these beels provide habitats for a huge number of aquatic plants and animals of high significance of economic and aesthetic values interacting and functioning with ecosystem.

The Study area:

The Urapad beel is one of the important fresh water beel in the lower Brahmaputra valley having strong uniqueness in many respects. Located within 26°05'00.06"/ to 26°06'40.50"/N and 90°34' 00.14"/E to 90°36' 49.74"/E, it is of riverine origin and connected with two tributaries of the Brahmaputra river, namely the Jinari and Jinjiram in Goalpara District. The Jinjiram river is originated from the Urapad beel itself.

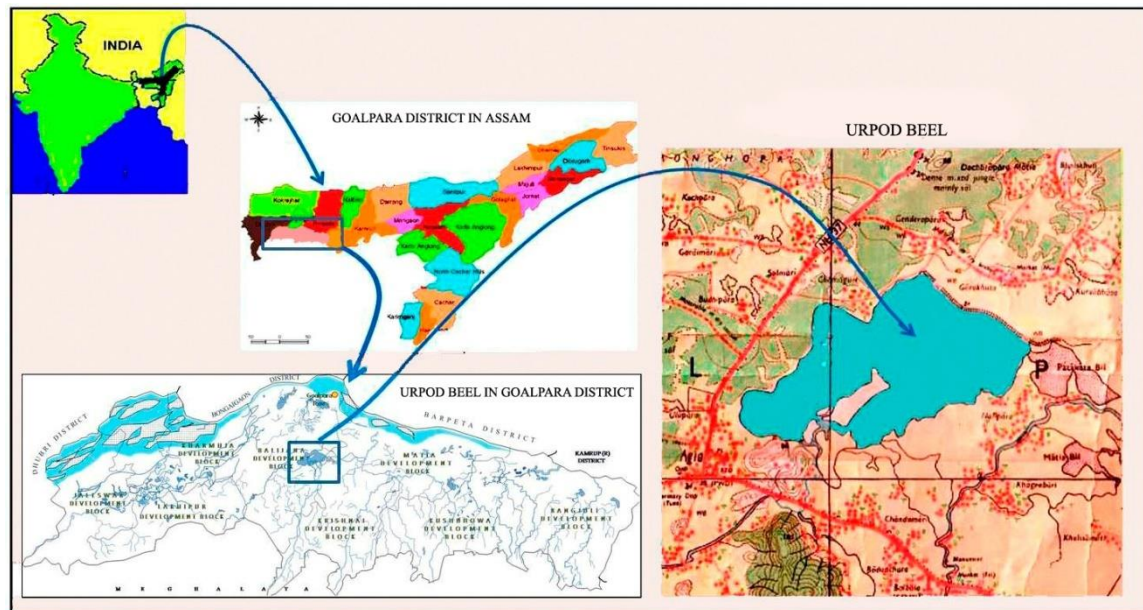


Fig. 1 Urapad Beel: Location

Objective:

The basic objective of the study is to delineate and analyze the land use and land cover change and its impact on ecological balance of wetland called Urapad beel of Goalpara district in Assam.

Methodology:

To execute the above objectives of the study an attempt has been made to analyse the changing nature of the land use and land cover pattern and its impact on the ecological balance in the Urapad wetland (locally called beel) of Goalpara District by using topographical sheet of 1968, satellite imagery of 1977-Landsat MSS November 23rd, 1986-L-5 TM October 86, 2002- Landsat November 18th, 2007-IRS P6 LISS III 12th November and GPS mapping in January, 2018. Based on both conventional and non-conventional data and information various layers have been prepared in GIS environment. Besides, the primary data and information are collected directly from the field by using various instruments like GPS, Camera etc. by using survey schedule, holding personal interview with government officials and the local people drawn from the field. The secondary information are collected from different officials. Besides, various published and unpublished documents like reports, books, journals, proceedings etc. are also consulted. The collected information after processing it properly made the final write-up of the paper.

Analysis:

The Urapad beel is one of the important 'Ramsar site, fresh water beel in the lower Brahmaputra valley having strong uniqueness in many respects. The wetland is located near Agia which is 12 km. from Goalpara town. It is of riverine origin and connected with two tributaries of the Brahmaputra river, namely the Jinari and Jinjiram in Goalpara district in Assam. Here an attempt is made to examine the present status along with the trend and causes of land use change in the Urapad Beel and its surroundings. Attempt is also made to examine the impact of the land use change towards the existence of the wetland.

Land use Pattern and Change

A map to show the pattern of land use in the Urapad beel and its surroundings in the district of Goalpara has been prepared by using topographical sheets (1:50,000) of 1968; satellite images of Landsat MSS November 23rd, 1977; L-5 TM October, 1986; Landsat of November 10th, 2002; IRS P6 LISS III 12th November 2007; IRS P6 LISS III of 25th Nov.2010 and a recent GPS data during January, 2018. An extensive field observation has also been made in order to formulate adequate base of data necessary for the explanation based on both the conventional and non-conventional data and information, various layers of map have been prepared in GIS

environment and interpreted these to get the findings.

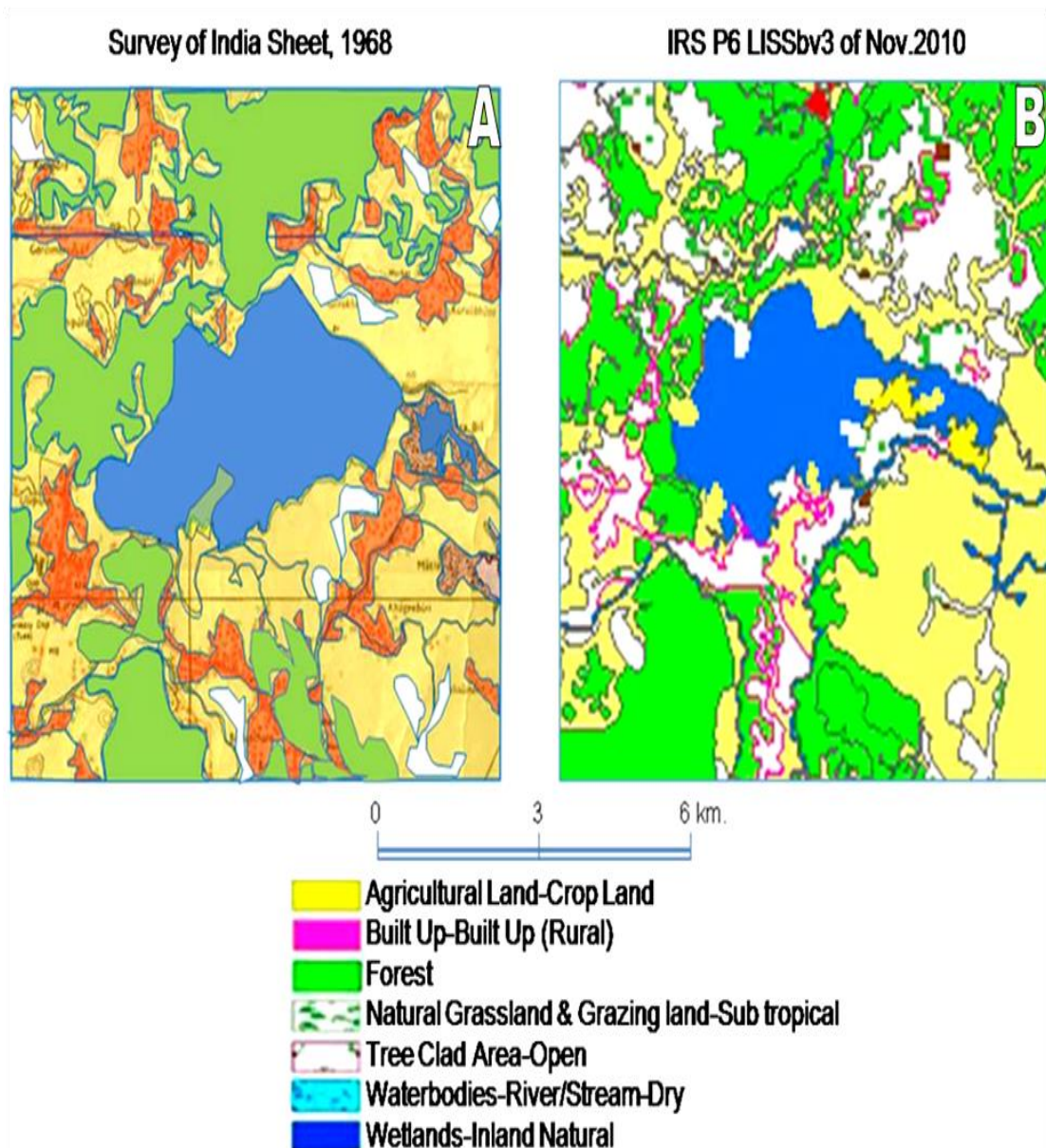


Fig. 2
Urapad Beel: Land Use Change, 1968 to 2010

Being a big and resourceful wetland the Urapad beel not only provides water but also plays a vital role in maintaining the ecosystem in and around the study area. It is the store-house of a number of aquatic flora as well as fauna including some endangered species. The Urapad beel is one of the largest beel in lower Assam. The area of the beel is however, dwindling and now it has covered only

472.25 sq km. It was as large as with an area of 680.85 sq. km. in 1968.

Fig. 2 shows the land use patterns that exist in 1968 and 2010. On the other hand, fig. 3 and fig. 4 (A and B) shows the changing pattern of water rim, change of areas of the beel during 1968 to 2010.

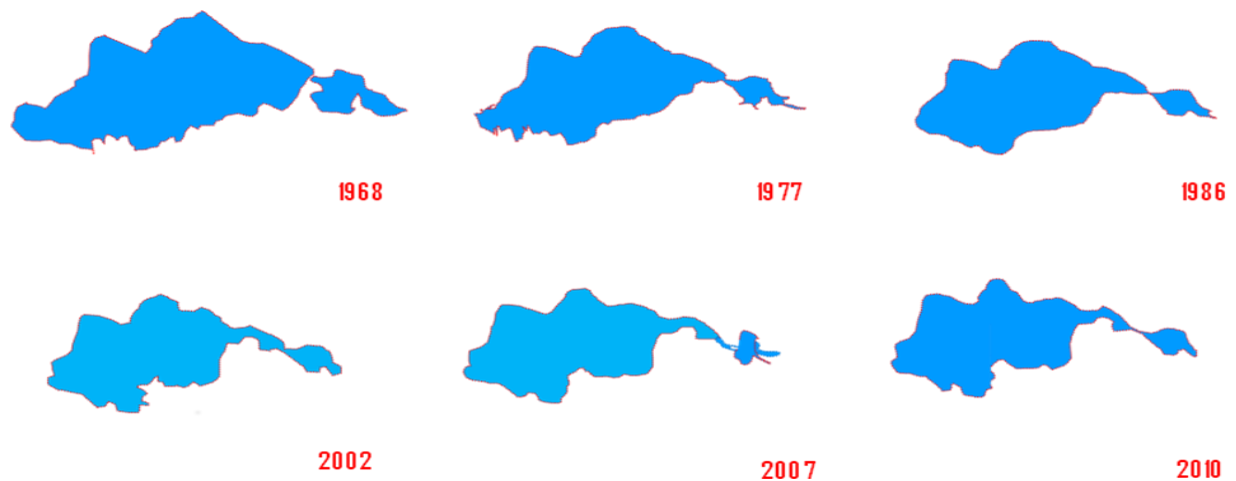


Fig. 3 Urpad Beel: Changing Water Rim of Since 1968 to 2010

Table 1
Reduction of Land Area in the Urpad Beel since 1968-2010

Year	Area in hectares
1968	680.85
1977	602.25
1983	561.00
2002	523.33
2007	499.02
2010	472.25

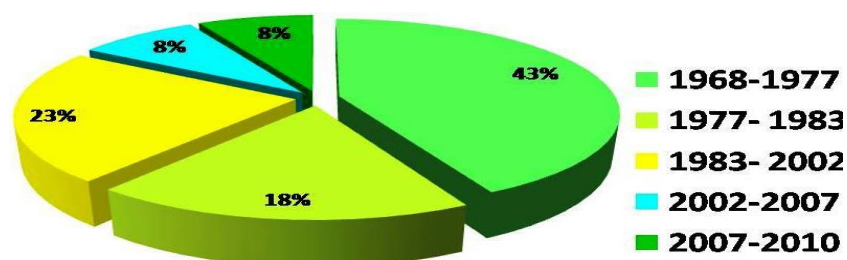
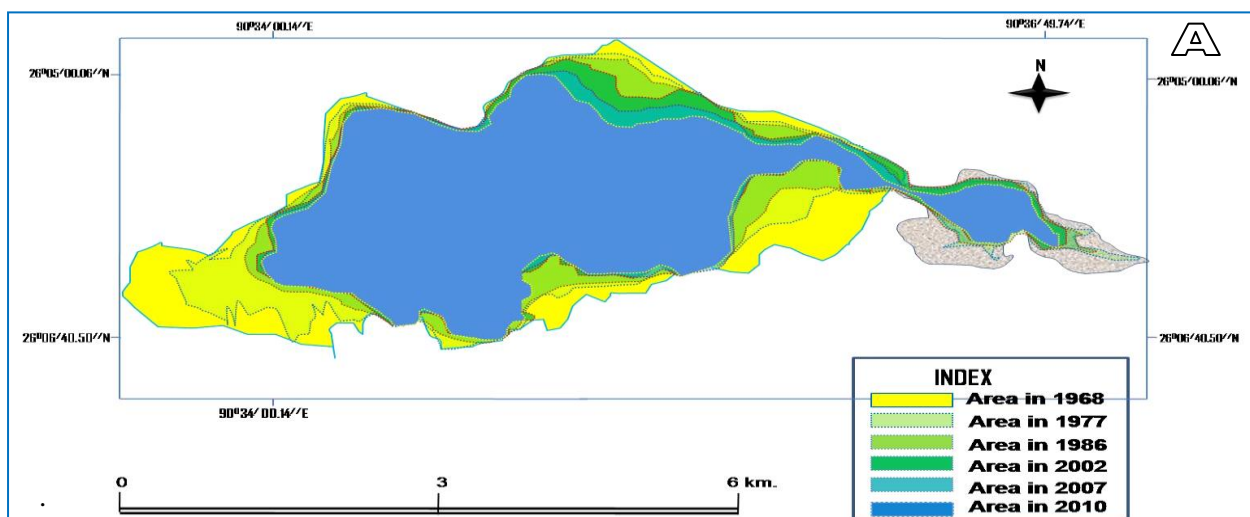


Fig. 4 (A and B) Urpud Beel: Changing Area since 1968-2010

The Urpud beel is one of the largest beel in lower Assam. The area of the beel is however, dwindling and now it has covered only 472.25 sq km. It was as large as with an area of 680.85 sq. km. in 1968. It is observed that both the areas and water rim have changed a lot during 1968 to 2010. With the change of the water rim in the Urpud beel area water areas have also changed. The water surface area has been highly reducing since 1968 to 2010 (fig. 5 and table-2).

Fig. 5 Urpud Beel: Changing Pattern of Water Surface Area in the during 1968-2010

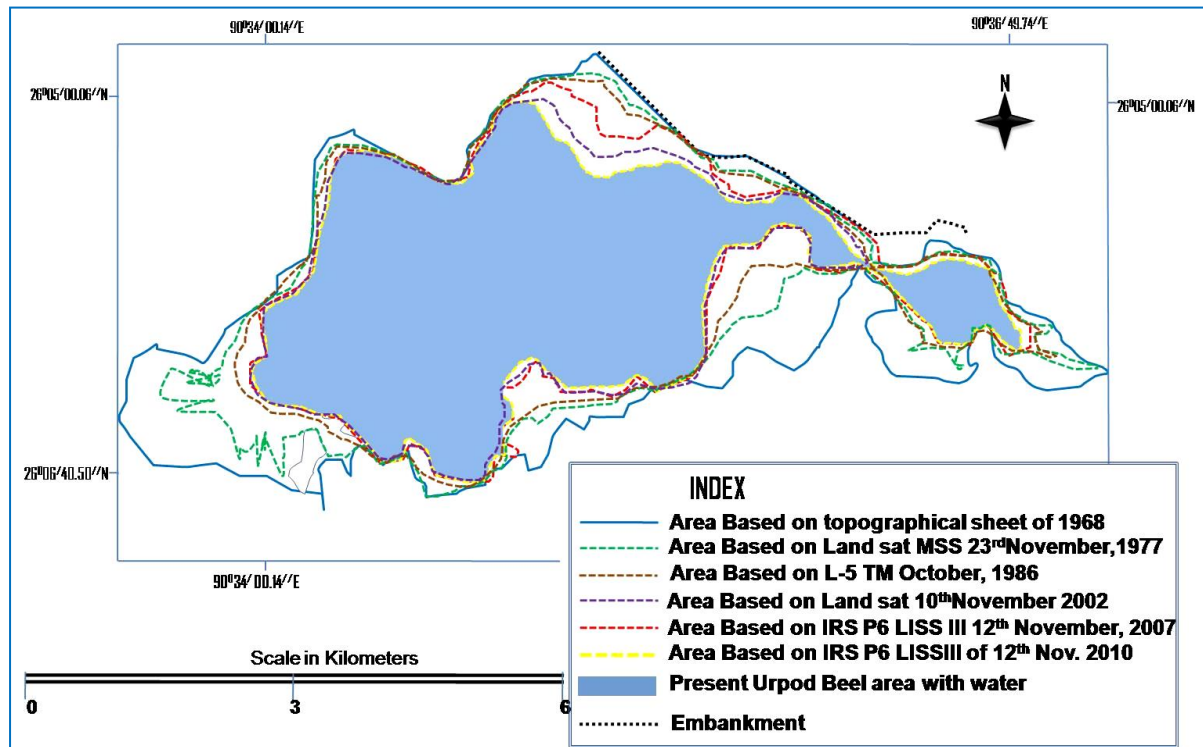


Table 2
Change in Water Area in the Urpud Beel since 1968-2010

Duration of Change	Loss of Area (hectares)	Percentage of area loss to total loss	Percentage of loss to total beel area
1968-1977	88.60	42.49	12.71
1977-1983	38.50	18.46	5.65
1983-2002	47.42	22.74	6.96
2002-2007	17.31	8.30	2.54
2007-2010	16.67	7.99	2.24
Total loss during 1968-2010	208.5	100.00	30.10
Present Beel area (water coverage)	472.25		69.90
TOTAL AREA (including areas lost)	680.85		100.00

Table 2 shows another impact dimension on change or loss of areas during different time periods, viz. 1968-77, 1977-1983, 1983- 2002, 2002-2007, and 2007-2010. There are great variabilities of loss of areas in the Urpud beel during the interchange periods.

Factors of Land use and Land Cover Change

There are various factors responsible for rapid change of land use pattern in the Urapad and its surrounding areas in the district of Goalpara. The following are the major factors listed as:

- i. Expansion and intensification of agricultural land use;
- ii. Expansion of human settlement;
- iii. Hill cutting and tree falling;
- iv. Siltation by river floods;
- v. Deforestation and unabated human encroachment;
- vi. Construction of embankment;
- vii. Exploitation of aquatic resource;
- viii. Establishment of brick industry;
- ix. Lack of government policy on ecosystem management

The Urapad beel is an important natural water reservoir in Goalpara district of Assam. The wetted perimeter of the beel has been decreasing day by day because of encroachment on land at the average rate of 6.5 hectares per year during the period 1968 to 2010. During this period 30.10 per cent of the total area of the beel has been converted to agricultural land and land put to non-agricultural activities. The beel has been the habitat for a number of endangered and vulnerable aquatic plant species and therefore serious attention should be given by the competent authorities for the preservation of this proposed Ramsar site.

Impact of land use and land cover change on ecological balance of the wetland

There is a close relation between the land use changes with the aquatic life of the beel area. The beel is rich in its plant resources as it is having about 203 species of aquatic macrophytes and about 85 species of phytoplankts which belong to families of a. Chlorophyceae, b. Bacillariophyceae, c. Euglenophyceae, etc.

The macrophytic plant species are of 7 different categories according to their place, position and relation with the aquatic environment. These are-

- a. Free floating hydrophytes: species like eichornia,
- b. Suspended submerged hydrophytes comprising of which Plants like

ceratophyllum remain submerged in water of the beel under suspended condition.

- c. Anchored submerged hydrophytes consist of the species like hydrilla, vallisnaria, etc. They remain submerged in the beel water. But their roots are attached with below the water.
- d. Anchored hydrophytes with floating shoots contain the species like ipomoea. Their roots are seen to be attached with the mud but the stems remain in floating condition.
- e. Anchored hydrophytes with floating leave include the species like nelumbo (lotus), nymphuea, etc. They remain attached with even as their leaves are floating.
- f. Emergent amphibious hydrophytes: They use to grow in just wet muddy soil as well as in more watery environment. The important species include the sagittaria, etc.
- g. Wetland hydrophytes: They are found near the water body. Species consisting of cyperus, polygonum (Biholongini in Assamese)

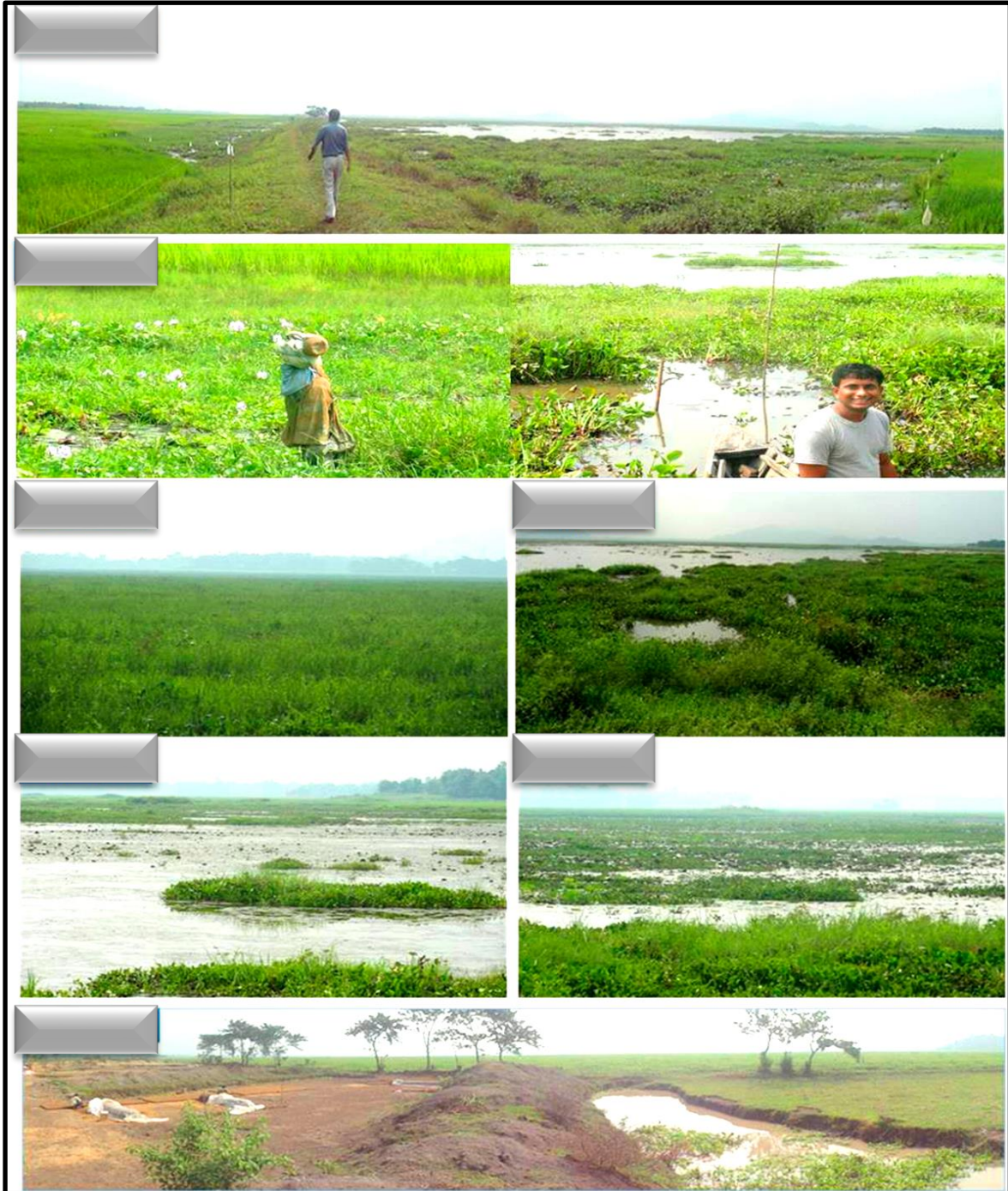
It is seen that the beel is rich in its plant resources marked by varieties of species. They bear much of importance as regards their food and medicinal values and other uses. Some species are used as vegetable. They are mainly *Chenopodium album* (jilmil sak), *alternanthera sessilis* (Mati kadumi), *stellaria media* (Thuthuni sak), *amaranthus viridis* (Bhat khutura), *oxalis corniculata* (Tengesi), *nymphaea* (Bhet), fruit of *trapa bistinosa* (Singori).

Some species available in the beel area are having medicinal properties e.g. *Centilla asiatica* (Boromanimuni), *eclipta alba* (Kehraj), *amaranthus spinosus* (Kaitia khutura), *hydrocotyle javonica* (Soru mani muni), *Nelumbo nucifera* (podum), *portulaca oleraceay* (Malbhog sak) etc.

The mat producing plant species are naturally grown abundantly in the beel area. Of these species *maranta dichotoma* (Patigoch), Species like *aeschynomene aspera* (locally called kuhila) are used for preparation of some decorative items are also seen to grow naturally in abundance in the beel area.

Besides the rich floristic diversity, the beel is also found to be rich by its faunal diversity. But the rich diversified flora and fauna of the area have been decreasing at an alarming rate due to anthropogenic activities incorporated in agriculture, encroachment, improper fishing and growth and proliferation of pollutants. At present the water body is having many such species which are enlisted as data deficit, rare,

endangered and vulnerable. These species include mainly the *Euryale ferox* (vulnerable), *Lindernia antipoda* (Data deficit), *Salmonia cantoniensis* (Data deficit), *Ceratopteris thalictroidis* (Critically endangered), *Cyperus difformis* (Endangered), *Acorus calamus* (Vulnerable), *Costus speciosus* (Vulnerable), etc.



Plates: a. Construction of Embankment, b, c and d, Lush Green Aquatic Plants and e & f, Synoptic View of Urpod Beel and g. Brick Field

Conclusion

A wetland is the store-house of a number of aquatic flora as well as fauna including some endangered species. Hence, the study about wetland is one of the most important subject matter for study about the importance of aquatic habitats, and impacts of both natural and human activities and how to get involved in conservation activities. The analysis shows that out of the total area of Urapad beel (680 hectares in 1968) presently an area of 430 hectares (63.23 percent) have been changed due to different human activities such as deforestation, agricultural land expansion, human habitation by filling up of land, road construction, brick as well as other land degradable industries, forest plantation and other land use change like-lands in transition from one land use type to another. The beel is found to be rich by its aquatic plant resources, there having as many as 203 macrophytic plant species. But due to various anthropogenic activities, the beel is facing much danger and its area is gradually getting decreased. Presently, there are many such species in the beel which are enlisted as rare, threatened and endangered e.g. *Ceratopteris thalictroides*, *Nymphaea pubesceus*, *Eurgle ferox* etc. Such a situation created problems on the ecological balance in the Urapad wetland. Hence, it is high time to aware the common people residing in the surroundings of the wetland by the responsive governmental and non-government organization to save the largest aquatic store-house in lower Assam.

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