



**CHANGING ECOLOGICAL SYSTEM AND PROBLEM
OF SUSTAINABLE WETLAND UTILIZATION
AND ITS MANAGEMENT IN GOALPARA
DISTRICT OF ASSAM - A CASE STUDY OF
'NAITARA- CHAUTORA' WETLAND
AND NEIGHBOURHOOD**

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Abstract:

The ecology, which exists in an abstract form is a delicate concept of all biotic and abiotic components of a particular area. The geographical location, physiography and climate are the basic parameters of an area for evaluation from the ecological point of view. The precinct of ecological studies has widened with the changing nature of ecosystem which is mainly due to human activities. Sustainable use means the use that does not interfere with the ecological integrity of any living thing or their ecosystem and which are socially equitable to people. Wetland are the multifaceted ecosystems that have an interface between land and water. They may be termed as the 'kidneys' of the biosphere. According to an estimate 6 Per Cent of the total land surface of the earth is covered by wetland (Bazilevich et al., 1971). As per estimate of Wetland Directory, 1990, Ministry of Environment and Forests, India's wetland area accounts for about 4.1 million hectares. In North East India, Assam accounts for the highest numbers with 1394 natural wetlands occupying an area of 86.35 thousand hectares. The sustainable wetland utilization and management is well established as a concept within the framework of Ramsar Convention held at the Third Conference of Contracting Parties(COP 3) at Regina, Canada. The study area-' Naitara-Chautara' wetland is located in the northern part of Rangjuli Revenue Circle. This wetland is one of the biggest wetlands in Goalpara district. The pressure of ever increasing population has tremendous impact on land, water, biotic components and economy of the wetland. The sustainable wetland utilization and management in the study area is a major issue in the wake of changing ecological system. The present study is found to be relevant to the study area as the neighboring fishing community having their caste-based economy is threatened due to such man-environment contradiction.

KEYWORDS:

ecology, ecosystem, kidney, sustainable, caste-based, contradiction.

INTRODUCTION:

Sustainable development refers to a neo-concept of development where development can sustain without incurring maximum environmental losses. Sustainable use means the use that does not interfere with the ecological integrity of any living thing or their ecosystems and which are socially equitable to people. The concept is perceived from the United Nations Conference on Environment and Development

(UNCED)- the Earth Summit- in Rio de Janeiro from 3 to 14 June, 1992. Of late, the concept has (2)

evolved to such an extent that any sort of developmental issue is ought to think over the sustainability.

Wetlands are the multifaceted ecosystems that have an interface between land and water. These ecosystems contribute substantially to ecological functions and human welfare. A number of functions such as hydrological, ecological, climatic, habitat and water quality control, etc. are performed by wetland ecosystems. According to Ramsar Convention definition, which is internationally accepted and used through out the world, wetlands are ' areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static, flowing fresh, brackish or salt, including area of marine water, the depth of which at tide does not exceed six meters' (IUCN,1971). Wetlands are the multifaceted ecosystems that have an interface between land and water. They may be termed as the 'kidneys' of the biosphere as they regulate the flow of nutrients and silt from land to water by trapping them. Global hydrological cycles are maintained by wetlands. Besides, wetlands are the habitats of substantial proportion of biodiversity. According to an estimate 6 Per Cent of the total land surface of the earth is covered by wetland (Bazilevich et al.,1971). As per estimate of Wetland Directory, 1990, Ministry of Environment and Forests, India's wetland area accounts for about 4.1 million hectares. In North East India, Assam accounts for the highest numbers with 1394 natural wetlands occupying an area of 86.35 thousand hectares out of 1.33 lakh hectares (Wetland Directory, 1990).

Sustainable wetland management is well established as a concept within the framework of Ramsar Convention of Contracting Parties (COP 3) at Regina, Canada, 27th May to 5th June, 1988 wherein it has been adopted as the principle of the "wise use of wetlands"(Parikh and Datye ,2003). Sustainable utilization of wetland may be defined as "Human use of wetland so that it may yield the greatest continuous benefit to present generations maintaining its potential to meet the needs and aspirations of future generations".

In the present study an attempt has been made to decipher a highly stressed ecosystem of Naitara and Choutora wetland which was earlier a picturesque as well as endowed with rich avifaunal resources. The study also attempts to highlight the changing socio-cultural milieu of the Scheduled Caste people who have been the resource user as well as the exploiter of this wetland eco-system. This wetland is situated about 9 Kms from NH 37 towards north. The wetland is one of the biggest wetland in Goalpara district and covers 267 hectares of land. In Goalpara district Urapad beel (516 hectare) records the highest wetland followed by Kumri (274 hectares), Hashilla(214 hectares) etc. Besides, Dhamor (66.66 hectares), Shukrasha(71 hectares), Borjeng (34 hectares) and Pandoba beel(30 hectares) are other smaller wetlands of ecological importance. The area under study lies in between 26 Degree 2min. 35 second to 26 Deg. 3min 7 sec. North latitude and 90 Deg. 59min. to 91 Deg. 1min. East longitude.

OBJECTIVES:

The main objectives of the study are:

- (i) To study the ecological background and nature of changing ecological system of the Naitara-Chautora wetland and its neighborhood;
- (ii) to assess the problem of sustainable wetland utilization and management in Naitara-Chautora
- (iii) to examine the socio-economic structure of the scheduled Caste people inhabiting in the fringe of wetland;
- (iv) to study the problems and prospects of rural economy and sustainable development in the context of changing ecological scenario and
- (v) to suggest measures for restoring the changing ecological system and to formulate plan to ensure sustainable development of the fringing SC people.

DATABASE AND METHODOLOGY:

The study was conducted with a view to generate primary data and information relating to the study area as well as to relate them with secondary data. The primary data related to wetland ecosystem as hydrometeorology, water table and quality of water, vegetation, plankton, fishes, avifauna, birds, mammals etc. have been collected from the wetland and the neighborhood. A sample survey was conducted in 3 selected Scheduled Caste fringing villages of the study area with a purposively designed survey schedule. The study of topographical characteristics and land use / land cover is carried out using topographical map

and satellite imagery (IRS P 6 LISS III, November 2009). GPS was also used during the survey. Besides, GIS software Erdas 9.1 was the purpose.

Geo-ecological background of Naitara-Chautora wetland and its neighborhood:

Naitara-Chautora is a tropical fresh water wetland located in the flood plain of the Brahmaputra river valley in south bank. The formation of this wetland is related to geomorphic processes and tectonic history of the East Garo Hills of Meghalaya foothills and alluvial plains of Rangjuli- Tilai-Goruchatka of Goalpara district. The physiography of the neighboring areas are characterized by landform units such as (i) hills, (ii) foothills and (iii) flood plains. (i) Hills: This physiographic unit represents as a source of water and sediments being deposited in Naitara-Chautora wetland. A number of water originate from this hilly part located in upper reaches of East Garo Hills of Meghalaya where elevation ranges in between 200-500 meter above the mean sea level. Among the rivers mention may be made of Korno, Juria, Deosila, Marky etc. coming out from this hilly terrain. The gradient of hills is from south to north. This hilly terrains have significant geo-ecological influence in the formation and transformation of wetland ecosystem in the flood plain areas. (ii) Foothills: This is a small strip of landform stretching east to west along the Meghalaya hills, covering a distance of about 10 Kms from south to north. The relief amplitude decreases towards the north direction. This physiographic unit is dotted with isolated hillocks along with 'beels' and swamps. But most of the hillocks are subjected to rapid denudation due to erosional works of the rivers coming down from Meghalaya. On the other hand, the swamps and 'beels' have been under accelerated deposition by waterborne sediments. Among the isolated hillocks strewn in this area mention may be made of

Ghagrapahar, Kuhiyarbari-Maspara, Shitolmari, Ganeshpahar, Buragahain, Dudhkanwar hill etc. (iii) Floodplains: The plain situated in the south bank of the Brahmaputra is small and irregular in shape and size. This alluvial plain has an average relief of 40 meter above mean sea level. The stretch of the plain has been built up by the detritus brought down continuously by the Brahmaputra, its tributaries and backwaters. This wetland has been under the influence of this flood plain.

Drainage: Naitara-Chautara wetland is drained by two rivers, namely Korno and Juria coming out from the East Garo Hills of Meghalaya through Rangjuli in the western part and Dhanubhanga in the eastern margin of the wetland. The Korno river being originated from Rajashimla at an elevation of 500 meter above mean sea level in East Garo Hills of Meghalaya and being a turbulent river carries huge water load and sediments during summer season.

Soil: The nature of soil cover influences the process of landscape modification. Soil as a resource is having much geo-ecological significance in the process of development (Mathur and Binda, 1990). The soil characteristics of Naitara-Chautora wetland presents a unique ones in three physiographic units. The hilly part of East Garo Hills of Meghalaya and foothills of the region have ultisols, Plinthoquats, Plinthudults (Lateritic soils) and haplustalfs (red loamy soils) (Singh, 1996).

Existing Land use/Land cover and change:

The wetland and neighboring areas of the present study is a significant so far the forest land use in Goalpara district in concerned. During the seventy's this part of the district had high forest coverage in the areas like Deoshila (408.90 hect.), Chitolmari (336.80hect.), Budulung (287.04hect.), Buraburi (291.00hect.), Awoimari (92.63hect.), etc. In the last couple of decades, the forest areas have been severely degraded and encroached upon by the new dwellers. Illegal felling of trees still continues unabated. Table: 1 shows land use and land cover under different categories in the wetland and its surrounding areas.

Table:1
Land use in Naitara-Chautora Wetland and its neighborhood under Rangjuli Revenue Circle:

Land Use Class	Area in Hactor
Dense Forest	1336.42
Open Forest	844.5
Scrub Forest	1196.48
Settlement	323.56
Cropland	3647.33
Water Body	661.44

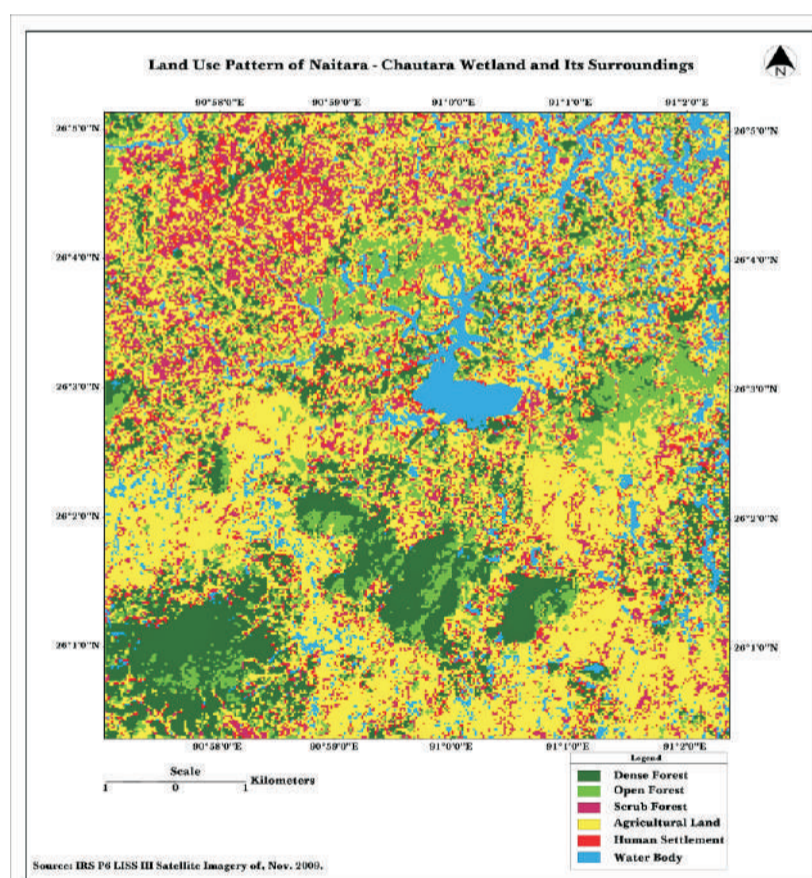


Fig.: 1

ECOLOGICAL CHANGES OF NAITARA-CHAUTORA WETLAND:

The wetland lies immediately parallel to the north of Shitolmari hillocks and Buragohain isolated hillocks which are at an elevation of 150 meter above mean sea level. It is a wetland or 'beel' of geographical, ecological and legendary importance. The Shitolmari and Buraagohain hillocks once covered with thick forest cover with varieties of flora and fauna are at present time have become a degraded forest. In summer season wetland forms an elongated feature and covers 10.5 Sq. km. when the Brahmaputra and its tributaries are in spate. The backwater of Jaljali and the Brahmaputra 'suti' highly influence the wetland during summer. It is drained by two rivers namely Kornoj and Juria coming out from

the East Garo Hills of Meghalaya through Rangjuli in the west and Dhanubhanga in the east.

Flora and Fauna: The geo-environment of Naitara_Chautora wetland provides a wide scope and the luxuriant growth of flora and avifauna along with fauna of neighboring hills. It may be mentioned that until recent past the wetland was almost uninhabited except a sizeable Scheduled Caste people (Koibrotos) having their caste based occupation of fishing. The wetland in the past happened to be one of the resourceful ecological setting with vast water reserve, maximum depth of 10-15 ft., plenty of plants and micro organisms. Despite the depletion of its resourceful biotic components with the changing human environment, the wetland is still endowed with the substantial biological diversity. The biological diversity of Naitara-Chautora wetland can be grouped as follows:

(i) Plant species, (ii) wild life, mammals, micro-organisms and fish fauna and (iii) birds.

The primary plant species of this wetland which are the main producers and found in floating or suspended or rooted conditions are algae and other aquatic plants. Among the aquatic flora mention may be made of water star, water hyacinth, lily (Nymphaea naucheli), lotus (Nymphaealotus), Nymphaea steleta, azolla, Potamogeton, Pistia, Wolffia, Lemna, Jussiaea, Salvinia (Brachiaria Pseudointarpetra), hydrilla (Hydrilla verticillata), Borpuni (Eichhornia crassipes), Bholongi (Polygonum sp.) etc. Besides, a large number of plants and grasses are grown on the edge of wetland. Among the endemic dominant species worth mentioning are Arundo donax, Imperata cynrica, Birina (Andropogon Spontaneum), Arati (Cyperus iria), Kahuwa (Sacharum Spontaneum), buffalo grass, Ekra (Erianthus ravennal), Khagori (Phragmites Korka) etc. Apart from these a wide ranging species of trees, medicinal plants, creepers, shrub, herbs and grasses are found in the wetland and the fringing hillocks. The endemic species of trees are Sal (Shorea robusta), Teak (Tectotona grandis), Simul (Bombax malabricum), Gomari (Gmelina arborea), Makar sal (Shorea assamica), etc.

(ii) Wild life, mammals and micro-organisms :

This wetland ecosystem has a large number of zooplanktons, insects, amphibians, reptiles and mammals. Among zooplankton and insects rotifers, water beetles, water boatmen, pond skater (Gerris lacustris), etc. are worth mentioning for their adaptability. Snakes, monitor lizards, turtles more than 6 species of leeches, etc. form the reptile and mammals of this wetland. It is imperative to note that the wetland and its neighborhood is rich in mammals, arthropod and mollusk. With the changing ecological condition arising out of population pressure and habitat loss mammals and other aquatic animals are disappearing from the wetland and neighboring hill forests.

Fish fauna: So far the fish fauna of this aquatic ecosystem is concerned a wide ranging species are found. Out of 155 species of fishes found in Eastern Himalaya region as many as 45 fish species are still found in this wetland. But quite a few fish species which were once formed dominant variety like Aari (Aorichthys seenghala), Barali (Wallago attu), Shol (Channa stratus), Sal (Channa marulius), Chitol (Notopterus Chitala), Korati (Gudusia), etc. are fast dwindling in this wetland. Besides, Pabho (Orupak), Garua (Beguribusguribus), Kakila (Xenentodon Cencilia), etc. have become endangered species.

(iii) Birds: Naitara-Chautora wetland in the recent past happened to be abode of exotic birds like peacock, hornbill, short nacked swan, Bengal florican, Crane, etc. But these bird species have become rare visitor of this wetland now. Of course, indigenous species like Panikaouri (Phalacrocorax), Sarali (Demdrocygna), Bagali (Egretta garzetta), Kingfisher, Dauk (Amouroris Phoenjurus), Pintailed duck, Deoha (White winged Duck) etc. are abundantly found in this wetland.

Hazard of changing ecology: The source of ecological change of Naitara-Chautara wetland may be attributed to the following aspects:

1. Population Pressure: The pressure of ever increasing population has tremendous impact on land, water, biotic, components and economy of the wetland. The expansion of habitable places in the wetland has led to exploitation of forest cover in Shitolmari, Buragohain and Arakhowa hillocks and cutting of hill slopes for quarrying and farming. Stone quarrying which is taking place in a half a kilometer away from the wetland poses a great threat to the wetland. Besides, extensive cutting of earth for new farming lands in the surrounding areas of the wetland has led to soil erosion and siltation.

2. Siltation: High rate of silt deposition is observed in the wetland. According to an estimate 5 lakh tones of silt is annually deposited in Naitara-Chautora wetland through two rivers namely Korno and Juria.

Besides, cutting of hill slopes in the immediate neighbor of wetland that is Shitolmari, Buragohain hillocks also contributing high amount of silt. The wetland has 4ft. height of silt bed.

3. High growth of aquatic plant: As the level of nutrients and sediment deposition is high and taking place unabated, there is high growth of aquatic plant in the wetland.

4. Threat to wetland: Some of the major threats to Naitara-Chautora wetland are : i) Anthropogenic pressure mainly due to over fishing. The wetland is encompassed by people of fishing community(SC) and low income group people of Muslim communities in the fringe areas especially in Ulubari, Naitar beel village (SC), Muslim fishermen in the northern margin, Ulubari, Panbori, Bagan, Lalghat (all Muslim) and Goruchatka (SC and Muslim) in the southern periphery of the wetland. About 500 country boats were used for fishing purposes in the recent past. Still 200 boats are in used for fishing, transportation, early paddy cultivation activities during winter. About 500 fishermen are engaged in the 'beel' throughout the day. The fishing activities also take place throughout the year round. The intensity of over fishing is so high that the wetland has serious level of eutrophication. ii) Alteration of wetland to other land use for agricultural use i.e winter rice cultivation. The Boro rice cultivation in winter season is taking place in such a way that major portion of the shallow parts of the wetland have been converted into such a field and the nearby Scheduled Caste and Muslim farmers are more interested in agricultural activities as the production of fishes have been dwindling in recent years. One third of the wetland has so far been encroached upon by the people in the fringe. iii) Illegal trapping of avifauna and birds. iv) Silt deposition due to deforestation and soil erosion in the upper reaches of the river basin. v) Excessive stone quarrying during the last fifteen years and so in the nearby hillocks. vi) Pesticide contamination due to use of chemical fertilizers in the paddy cultivation has been posing a serious threat to fishes and other aquatic species of the wetland. Pesticides like Aldrin and other organochlorine compounds such as DDT, enclosulfan etc. are used in cropping.

Socio-economic structure and problem of sustainable development: A case of three fringing S.C(fishing community) villages in Naitara-Chautora wetland –

The economy of Naitara-Chautora wetland is also changing with the changing condition of the wetland and its neighborhood. In the past 500 fishermen brought fish in the market and revenue collection was to the tune of Rs. 5000.00 to 6000.00 per day but at present it is only Rs 2000.00 to 3000.00. The average income of fishing community is about Rs. 8,000 per annum. Most of the households are below poverty line. Their economy is based on fishing. However, a substantial proportion of households are also engaged in agriculture based occupations. In the wake of changing ecological scenario village economies are gradually shifting from fishing to agriculture and allied activities.

The village namely Bhakatpara(Tiplai Part-III) under Tiplai G.P, Ulubari Naitar Beel (Ambari GP) and Goruchatka Part-II (Ambari GP) are model Scheduled Caste villages for changing ecological as well as the socio-economic structure of the people(Table: 2, Fig.: 2).

SOCIO-ECONOMIC PROFILE OF BHAKATPARA(SC) VILLAGE:

The village Bhakatpara is a small linear pattern settlement situated on the northern margin of Naitara-Chautora beel. This village is one of the age- old village inhabited by the Scheduled Caste communities belonging to the Kaibrotos, the Hiras and Bansphors. The majority of population of the village are the Kaibrotos engaged occupationally in fishing since the establishment of the settlement in the area. The total population of Bhakatpara is 3,412 of which Scheduled Caste total population is 780 (400 male and 380 female) according to 2001 Census. Out of the total households of 70, a number of 20 households are surveyed in the village. The surveyed households have a total population of 118; having an average family size of 5.9(=6). The male population (58.00 %) is higher than that of the female population(42.00 %). Age group wise population shows high proportion of workable population of 21- 50 years of age. The village has high percentage of literate population (77.47). The main occupation of the village is fishing. The table reveals that 35.00% of the households are embracing fishing as their occupation, 20.00 % depends on agriculture, 15 % goes to business while another 15 % to service. The village has high proportion of land holding (1.21 hectare) for agriculture and other purposes.

SOCIO-ECONOMIC PROFILE OF ULUBARI NAITARA BEEL VILLAGE:

This is a small size Scheduled Caste village of nucleated type with a total population of 345(175 male and 170 female) according to 2001 census. The village is located in the north eastern margin of Naitara-Chautora beel. It is a landlocked village inhabited by 'Namasudra' Bengali fishing community. In the eastern part of the village Muslim community form another village under the same revenue village. The

Scheduled Caste people have their caste based fishing occupation. Out of 48 households, 19 households are surveyed in the village. The surveyed households have a total population of 134, having an average family size of 7.05(=7). The female population (52.98%) is higher than that of male (47.01%) counter part. Age group wise population reveals high percentage of working population(36.53%), 21-50 years of age. So far the literacy rate is concerned the village has low level of literate population (26.11%). The village had not a single matriculate even up to the year 2006. The village represents a state of backward economy. As the people have no adequate share of agricultural land, they have to depend only on fishing. But in recent decades their occupational structure have been changing from fishing to other means of livelihood. It is observed from Table that fishing activities support only 26.31 % while wage labour (40.10 %) supports substantial population.. This village is backward in every aspect of development. Most of the households are under poverty line. It is worth mentioning that a sizeable proportion of the households is recognized as landless having no or little (0.07 hectares) land. The villagers are in constant search of new shallow part of 'beel' periphery for paddy cultivation.

SOCIO-ECONOMIC PROFILE OF GORUCHATKA VILLAGE:

Goruchatka is another SC village situated in the southern fringe of Naitara-Chautora wetland. The village is under Goruchatka Part-I revenue of Tiplai Goan Panchayat. This village is also one of the age-old villages inhabited by SC communities belonging to Koibrotos. The people of the this community solely depend on fishing and selling of fishes. The total SC population of Goruchatka is 318 Persons(155 male and 163 female) according to 2001 Census. It is important to note that the SC population of this has been decreased in comparison to the total population of 1991 census (345 persons, male 179 and female 166). Out of 63 total households 30 which are actively engaged in fishing are surveyed. Surveyed households have a total population of 132, having an average family size of 4. The occupational structure of the village shows that still fishing occupies a high percentage of 33.33% while wage labour (36.66%) forms another major occupation. The changing wetland ecosystem scenario compels the fishermen to shift their way of earning other activities. The fishermen also engage in agricultural activities to a substantial proportion (13.33), while operational holding reveals higher number of households under landless, marginal and small categories.

The village is socio economically very backward. The literacy rate of the village is 32.52 percent, while is quite below the neighbouring villages and the district.

ECONOMY OF THE VILLAGES:

Fishing activities form a major sector of economy of the three representative villages and surrounding other villages of Naitara-Chautora wetland. The wetland with its rich fish-fauna in recent past continued to provide ample economic opportunity to the inhabitants particularly to the fishing community. In the changing decades fishing economy has also changed its structure and dimension. The fishing economy of Naitara-Chautora 'beel' is controlled by the fishermen of this locality. These people among themselves have fishermen, sellers, middlemen, agents and Mahaldars (Contractors). Fishing activities here take place as a commercial activity. It occupies a major percentage share of economy of these S.C. villages (Table: 2). Agriculture also occupies another major sector of economy for the Scheduled Caste fishing community of Naitara-Chautora Wetland. Agriculture as it is a major source of economy; various crops are cultivated as to meet the need of the people. Among the various crops cultivating in this area rice is predominant crop which is operating by the maximum number of the households. The production of rice is in subsistence level. In recent years Boro rice in winter season is most popularly cultivated in this area. Besides, paddy cultivation, other farming activities like horticulture, livestock farming etc. are also gaining importance as subsidiary source of income.

Table: 2
Socio –economic characteristics of Bhakatpara, Ulubari and Goruchatka S.C village

Name of Surveyed Village	Location	No. of Surveyed Household	Total Population of Surveyed Household	Household under different occupations				
				Fishing	Agri/ Poultry	Wage labour	Business	Service
Bhakatpara	Low-lying plain	20	118	7 (35%)	6 (30%)	1 (5%)	3 (15%)	3 (15%)
Ulubari	Low-lying plain	19	134	5 (26.31%)	5 (26.31%)	8 (42.10%)	1 (5.26%)	NIL
Goruchatka	Built-up Plain	30	132	10 (33.33%)	4 (13.33%)	11 (36.66%)	4 (13.33%)	3 (3.33%)

Source : Based on socio-economic survey by researcher, 2009

Table: 3
Occupational Structure of Bhakatpara, Ulubari and Goruchatka S.C village

Name of Surveyed Village	No. of Surveyed Household	Total Population of Surveyed Household	Household under different occupations		
			Primary	Secondary	Tertiary
Bhakatpara	20	118	14 (70%)	4 (20%)	2 (10%)
Ulubari	19	134	18 (94.74%)	1 (5.26%)	NIL
Goruchatka	30	132	25 (83.33%)	4 (13.33%)	1 (3.34%)

Source: Based on socio-economic survey by researcher, 2009

Table: 4
Socio –economic characteristics of Bhakatpara, Ulubari and Goruchatka S.C village

Name of Surveyed Village	Location	Community	No. of Surveyed Household	Total Population of Surveyed Household	Literacy	Household under different occupations		
						Primary	Secondary	Tertiary
Bhakatpara	Low-lying plain	S.C (Assamese)	20	118	77.47%	70%	20%	10%
Ulubari	Low-lying plain	S.C (Namsudra) (Bengali)	19	134	26.11%	94.74%	5.26%	NIL
Goruchatka	Built-up Plain	S.C (Assamese)	30	132	32.52%	83.33%	13.33%	3.34%

Source : Based on socio-economic survey by researcher, 2009

CONCLUSION:

The existing physical framework, socio-economic attributes including population dynamics, socio-cultural attitudes of the fringing Scheduled Caste villages as well as other resource users of neighboring villages have far reaching impact on the pattern and processes of ecological system and associated problems of sustainable development of Naitara-Chautora Wetland. The wetland ecosystem like other major ecosystem of the state and that of the country is facing the problem of environmental degradation and ecological change since the beginning of sixties. The foregoing analysis depicts that the wetland ecosystem of Naitara-Chautora has been changing due to over exploitation years together. The Scheduled Caste people inhabiting in the fringe have to suffer as their primary occupation of fishing has no longer been a major occupation.

It is observed from the analysis that the villages especially the Scheduled Castes in the fringing areas of wetland who are the active resource users and exploiters of the 'beel' have been experiencing the acute problem of sustainability. Besides, the problem of ecological change may create hazardous consequences in the near future. Hence, a concerted effort to check the changing ecological condition should be made through appropriate strategies before it is too late. The research study of this area would be more appropriate if a team of biologists, ecologists, environmentalists and Geographers examine the micro ecosystem in detail with reference to the problem of sustainable development of the fringing villages.

From the findings of investigations and observations the following suggestion and recommendations for management can be put forward so as to offset the changing ecology and problem of sustainable development issues.

- (1) An integrated development programme for Naitara-Chutora wetland may be formulated taking into consideration of the need of fringing Scheduled Caste inhabitants.
- (2) Stringent measures should be taken to conserve the wetland by checking siltation from the rivers and stone quarries near the hills of wetland.
- (3) Anthropogenic threat to wetland by indulging in overfishing and killing of avifauna and birds should be checked with imposition of restrictions.
- (4) This wetland should be brought under supportive and appropriate legislation and appropriate legal as special area.
- (5) The transformation of shallow part of the wetland into paddy field in winter season must be checked in order to keep intact the wetland area.
- (6) Certain conductive areas of wetlands should be reserved as feeding grounds or nursery or caves for fish and other avifauna.
- (7) Mass awareness and special awareness programmes for fringing Wetland inhabitants should be initiated so as to conserve the wetland in meaningful and sustainable way.

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