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"Seasonal nature of Wetland and its effect on Livelihood pattern" – A case study on Bhatra Beel, Malda.

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Abstract:

Wetland is a traditional zone keeping a balance dry and wet/pre and post monsoon season. Bhatra beel is great example where this features is seen in widespread form. Bhatra beel remains wet during the rainy season and dry when the water recedes after the rain, this seasonal character is the parameter of selection for this study. Due to this seasonal nature LULC, economy and environment also changed with arrival and departure of monsoon. Literally Bhatra beel convert from an agricultural land to vast wetland in pre to post monsoon period. In order to adopt this condition, people lives and livelihood have to change. Thus people are subject to change their occupation to keep up with it. This paper has given an in depth and analytical observation on the causes of season nature of Bhatra beel and its impact on livelihood.

Key words: DEM, MSL, LULC, USGS, Beel.

Introduction:

The relationship between wetlands and water is not always simple and uniform. Plants and animals living there must adapt themselves in order to survive alternate periods of flooding and desiccation and the consequent to this lack of uniformity, put survival at stake. The dynamics of wetlands are ever changing and function of ecological and environmental factors. Wetlands change its shape, size and water chemistry and other attributes depending on different factors including anthropogenic, climatic and ground water table etc

The most acceptable definition for Wetland as defined in the Ramsar Convention is as fallows "*wetland are low areas , which are seasonally or permanently flooded with water , whether natural or artificial , static or flowing , fresh brackish or salt , including marine water , the depth of which , at low tides not exceeding six meters".* Here *beel* is a lake like wetland with static water as opposed to moving water in rivers and cannels-typically called khaals in Bengali. The colloquial term in the study area of wetland is *beel.*

The area under wetlands is 25162 hectare which is 6.74% of the total geographical area of Malda district. In respect to total area under wetlands of West Bengal, it is only 2.27%. By

classification of wetlands, there are 4939 wetlands in this district out of which 502 are large (area above 2.25 hectares) and 4437 are small (area below 2.25 hectare). Out of 502 large wetlands, 382 are natural and the rest are man-made (National Wetland Atlas, West Bengal). According to this statistics Bhatra beel of our study is a large Wetland with seasonal in nature.

Livelihood pattern of any region is the reflection of economy and environment of that area so any change in these two components directly affects.

Here in this study, the seasonal nature of Bhatra wetland is highlighted to measure the effect on livelihood of the local people.

Objective:

To know about the Change occurred in LULC and livelihood pattern of the people of Bhatra beel area due to seasonal nature of the beel.

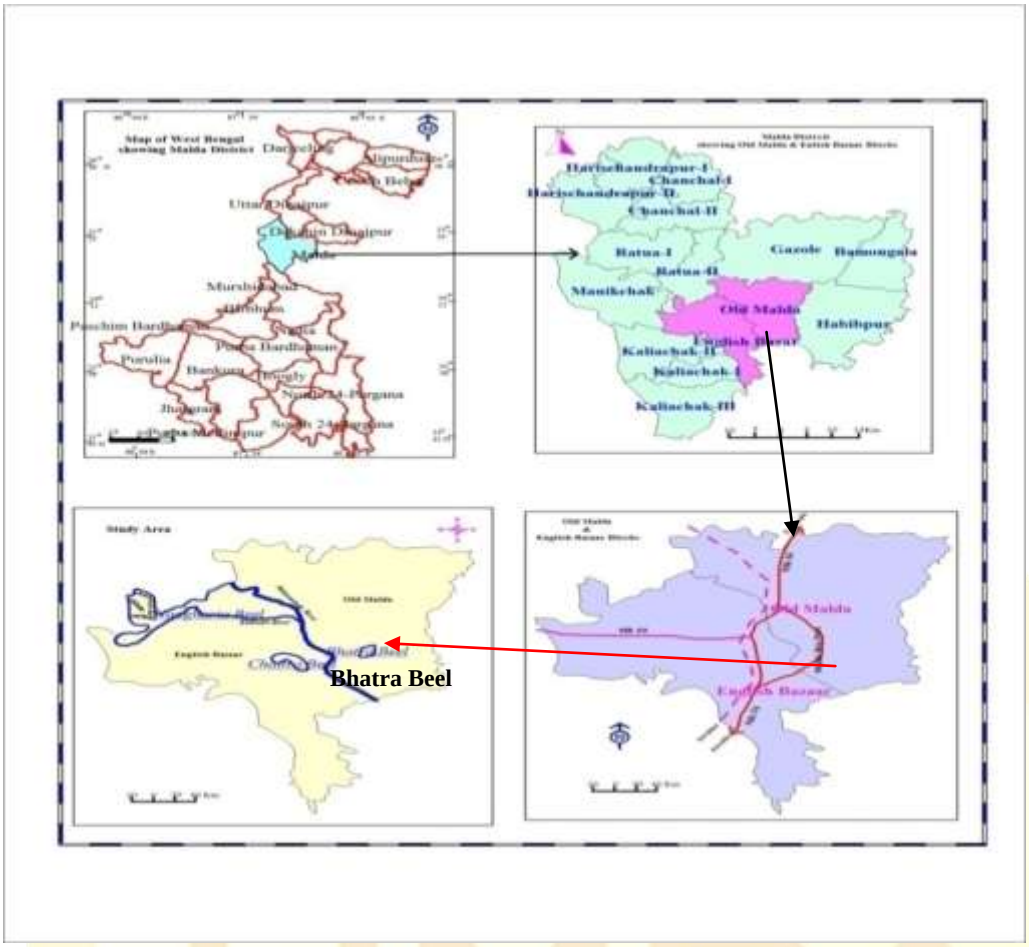
Methodology:

1. Elevation Map and Slope analysis map of Englishbazar and Old Malda Block has been prepared using DEM SRTM 1 ARC SECOND GLOBAL Software based on Topographical Map no-78C/4
2. Using Primary household survey method to know about the changing livelihood pattern. Secondary sources also used to endorse the primary survey report.

Location:

The Bhatra beel is located in the Jatradanga Gram Panchayet of Old Malda Block within latitude 24° 59′40" N to 25°12′5"N and longitude 88°11′09"E to 88°12′39"E. The beel is under the administrative jurisdiction of Kaluari(JL No-82), Madhaipur (JL No-86), Morgram(JL No-87), Rasiladaha(JL No-107), Dakshin Bhatra(JL No-114), Jalkarbithan(JL No-115),Sadhali(JL No-116) mouza of Old Malda Block

Map no 1: Location map of the study area

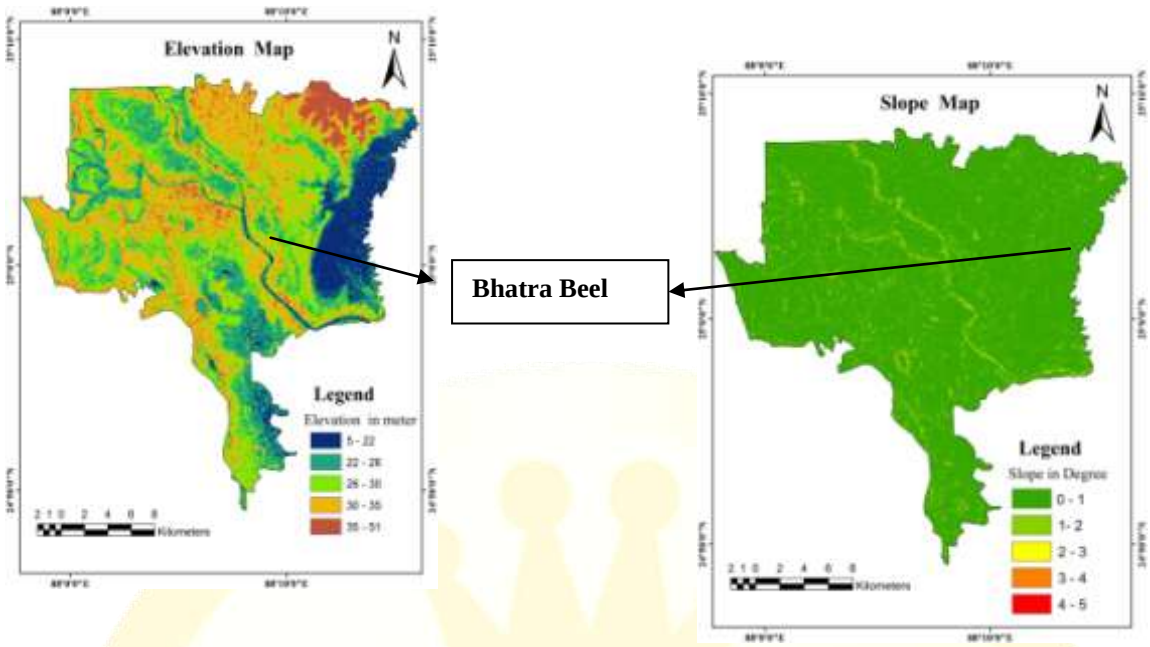


Source: From Google Earth prepared by researcher.

Physical background of Bhatra Beel:

Physiographically Bhatra beel is located in Barind region in THE northeast direction of Malda district. The Barind land is an upland tract, in the northern part with a height around 40-50m above MSL remaining as the highest elevated zone of the district. The region between River Tangan and Punarbhaba has the lowest elevation where during rainy season, multiple wetlands, such as Jalkarbithan, Jatradanga, and Bhatra, merge with the River Tangan and form vast lowland area with an elevation between 5 to 20 meters from MSL and sloping towards south. During rainy season, vast lowland area including Bhatra beel remains flooded from May to January (Toposheet No 78C/4).

Map no2: Elevation map and Slope analysis Map of study area



Source: USGS

The Bhatra beel follows only 0 to 1 degree slope, though it resembles varied slope direction and the slope structure varies from one another within a striking distance. The slope pattern region wise differs from north to south and east to west from 1degree to 5 degree respectively. The principal rivers of the district, The Ganga, Mahananda, Kalindri, Punarbhava and Tangan are flowing towards S and SE direction, following general slope trend of the district.

Genesis:

As per topographical map no $78\frac{c}{4}$ (published in 2002) and administrative map of Malda district (published in1875 by Thuiller) the sequence of genesis of the Bhatra Bill can be visualized. The district map of 1875 has no trace of Jalkarbithan or the Bhatra bill. The map established the fact that there was only a beel covering approximately 1.5 -2 sq. km. named Rasiladaha and many small beels. The origin of Jalkarbithan is from Rasiladaha. From 1982 (Toposheet No $78\frac{c}{4}$) the first appearance of Jalkarbithan was established, leaving Rasiladaha as agricultural land and the area was extended up to Meherpur towards northeast. It used to remain flooded in May to January, both by rainwater and the water of River Tangan. The origin of Bhatra beel as proved is practically from Jalkarbithan, extended towards Dakshin Bhatra covering –Dakshin Bhatra, Madhaipur, Sadhali, Jalkarbithan, Morgram, Kaluari and Rasiladaha mouza.

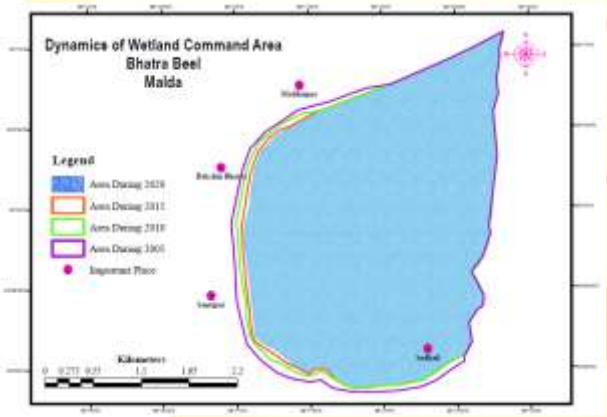
Seasonal Nature of Bhatra Beel:

The area of Bhatra wetland has increased gradually and in the months after monsoon its appearance is just like sea after merging with the great Jalkarbithan. Basically, this area is extensive lowland between River Behula in west and river Tangan in east. Tangan River flows from NE to SW and has become the principal source of water for Bhatra beel. Behula River is a feeder from Tangan River drying up in summer season .But during rainy season it carries huge amount of water and the excess water usually transferred to Bhatra bill and after monsoon period is over water returned to river course. The whole region dried up and turned into agricultural land.

Plate 1: Bhatra Beel In Post Monsoon period (August, 2020)

Plate2: Bhatra Beel In Pre Monsoon period (March, 2020)

Figure No 2.2.3: Overlay analysis map of Bhatra beel (2005 -2020)



Source: From Google Earth prepared by Researcher.

Bhatra Beel		
Year	**Area (in hectares')**	**Areal change (%)**
2005	939	-
2010	897	-4.47
2015	878	-2.11
2020	866	-1.36

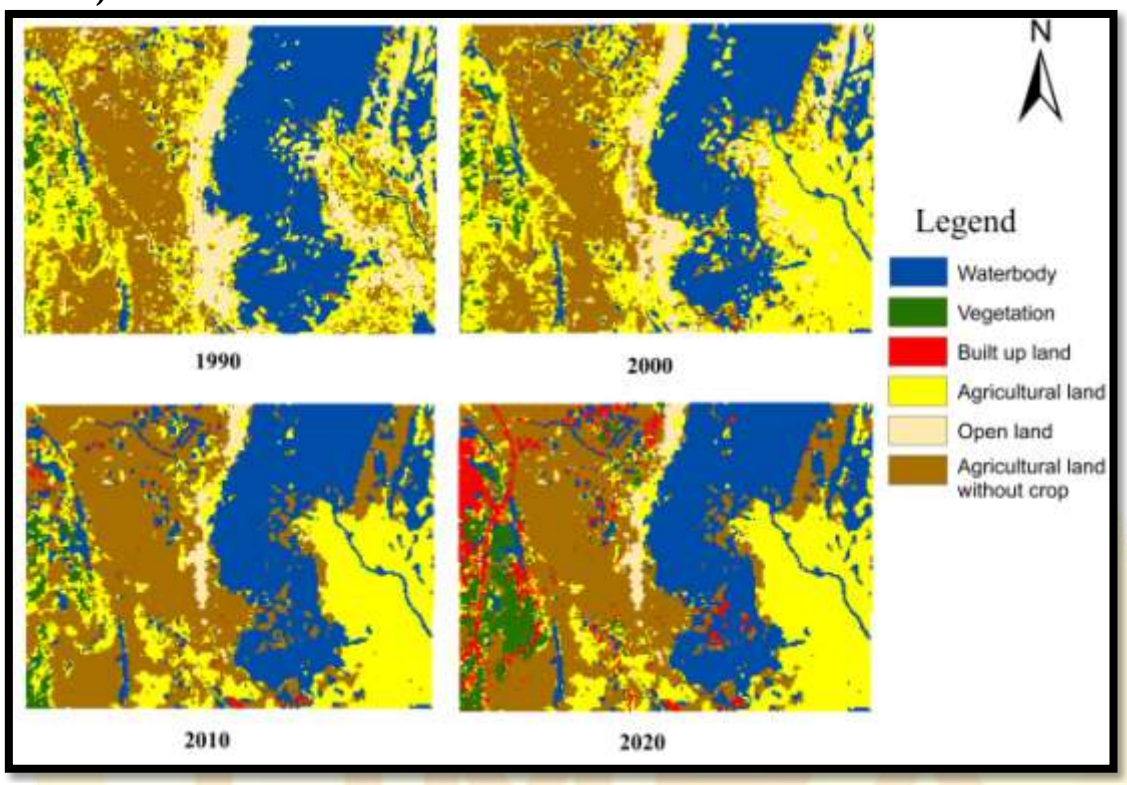
Table no 2.2.4: Areal Changes of Bhatra Beel (2005-2020)

Source: from Google Earth calculated by researcher

From Table No 2.2.4 it is evident that there is not much encroachment in this part of the beel, between 2005-2020.The area reductions of Bhatra beel is not significant, only 7.77 % in last 15 year.

Landuse and land cover change of Bhatra Beel Area:

Fig no 2.3.6: LULC map of Bhatra Beel Area (from1990 to 2020 –Post Monsoon Period)



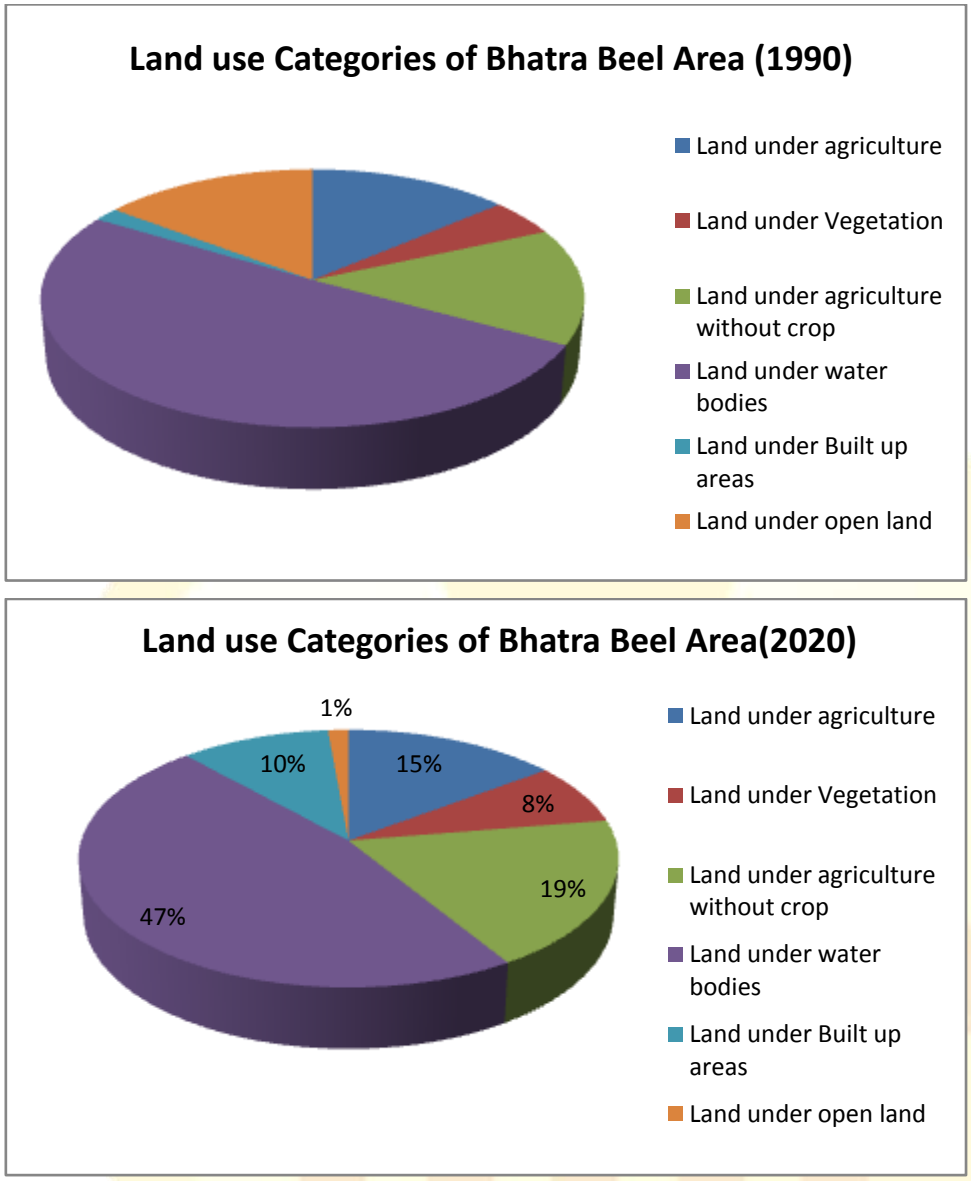
Source: USGS

Table No 2.3.3: Land use categories of Bhatra Beel Area (From 1990 to 2020)

Sr No	Categories of land use (Bhatra beel)	1990		2000		2010		2020	
		%	Change (%)	%	Change (%)	%	Change (%)	%	Change (%)
1	Land under agriculture	13.7		13.7	0	14.6	6.56	14.7	0.68
2	Land under Vegetation	4.7		6.6	40.42	6.9	4.54	7.7	11.59
3	Land under agriculture without crop	14.6		16.7	14.38	18.3	9.58	18.8	2.73
4	Land under water bodies	50.6		50.3	-0.59	49.1	-2.38	47.1	-4.07
5	Land under Built up areas	1.7		2.7	58.82	5.3	96.29	10.3	94.33
6	Land under open land	14.7		10	-31.97	5.8	-42	1.4	-75.86

Source: USGS

Fig No2.3.7: Land use categories of Bhatra Beel Area (From 1990 to 2020)



As the beel is seasonal in nature, not much activity is noticed in these years except the encroachment in the fringes of the beel which is about 14%. The other activity that is slowly making its mark is that land under agriculture has increased by almost 20% from its previous years.

Seasonal change in LULC of Bhatra beel:

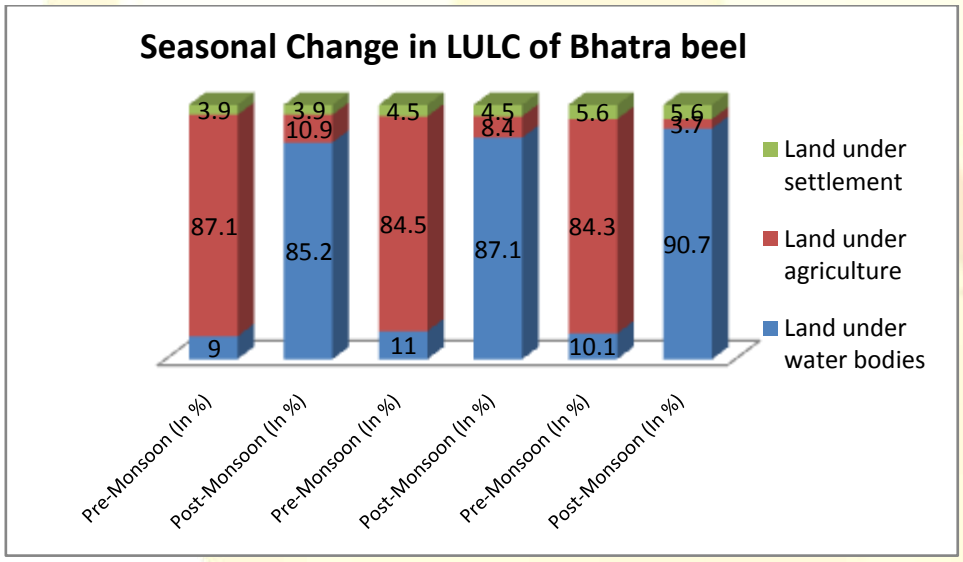
Bhatra bill is a seasonal wetland, and the land use pattern of the area is changed in every six month with the arrival and departure of monsoon.

Table No. 2.4: Changing pattern of land use around Bhatra bill (1991-2011):

		2000			2010			2020		
		Pre-Monsoon (In %)	Post-Monsoon (In %)	Seasonal Change	Pre-Monsoon (In %)	Post-Monsoon (In %)	Seasonal Change	Pre-Monsoon (In %)	Post-Monsoon (In %)	Seasonal Change
1	Land under water bodies	9.0	85.2	+76.2	11.0	87.1	+76.1	10.1	90.7	+80.6
2	Land under agriculture	87.1	10.9	-76.2	84.5	8.4	-76.1	84.3	3.7	-80.6
3	Land under settlement	3.9	3.9	No Change	4.5	4.5	No Change	5.6	5.6	No Change
4	Land under road	Nil	Nil		Nil	Nil		Nil	Nil	

Source: District Census Handbook

Figure: Seasonal Change in LULC of Bhatra Beel



The character of Bhatra Bill changes in every 6 month. In the first 6 month of the year the beel area becomes agricultural land and turns to wetland for the next 6 months with a complete change in the livelihood and ecosystem. Before the onset of monsoons, the people of the region are completely dependent on agriculture, however in the next six months the beel acquires the status of wetland. Fishing becomes the main source of income for the local people. But after the monsoon, people are forced to work in various unorganized sectors on a daily wage basis. Over the last 20 years, the number of settlements on the west side of Bhatra Beel has increased and new villages named Dakshin Bhatra, Madhaipur, Pathar Madhaipur, Shantipur have been originated which have

narrowed the western boundary of the beel and extended human encroachment. The Bhatra Bill is bounded on the north by the Jatradanga beel and on the south by the Jalkarbithan Beel. However, during the monsoon season, houses on the banks of the Beel in Dakshin Bhatra, Madhaipur village regularly submerge, forcing the people to evacuate their houses for a couple of months.

Changing Workforce Pattern of Old Malda Block:

To endorsed the livelihood pattern of Bhatra Beel area it is very necessary to compare it with block livelihood pattern

Table No-3.2.2: The changing pattern of Workforce of Old Malda Block (1991-2011)

	1991	%	2001	%	2011	%
A)Main Workers	38281	28.78	40893	31.15	44438	28.43
i)Cultivators	14185	10.66	13657	10.4	10391	6.64
ii)Agricultural labour	13429	10.09	17889	13.62	13868	8.87
iii) Household Industries	2100	1.57	2304	1.75	1374	0.87
iv) Others	8567	6.44	7043	5.36	18805	12.03
B) Marginal Workers	10438	7.84	11562	8.8	18686	11.95
Total Workers	48719	36.64	52455	39.96	63124	40.38
Non Workers	84280	63.36	78800	60.04	93241	59.62
Total population	132999		131255		156365	

Source: District Census Handbook, Malda

Figure.5: The changing working profile of Old Malda Block (1991-2011)

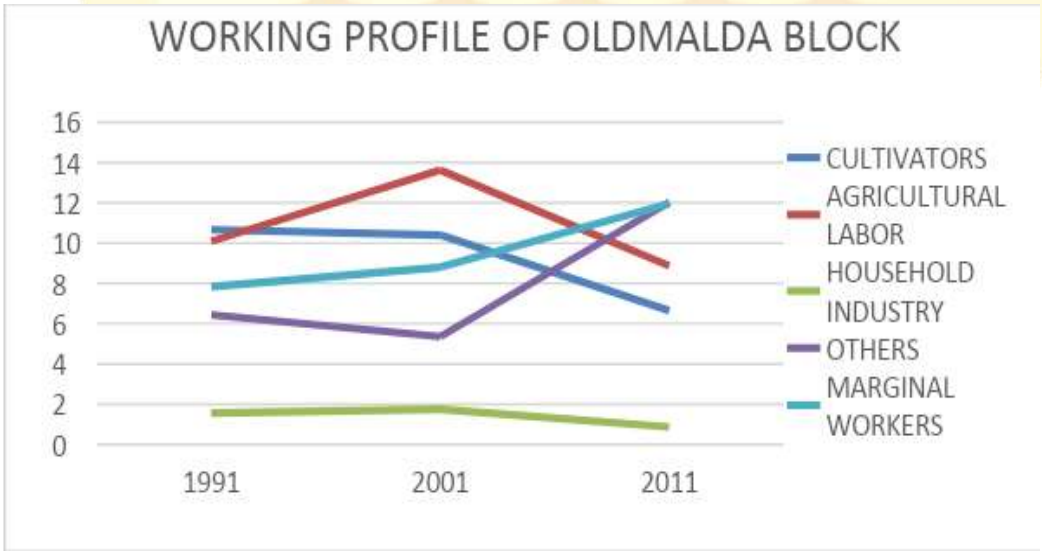
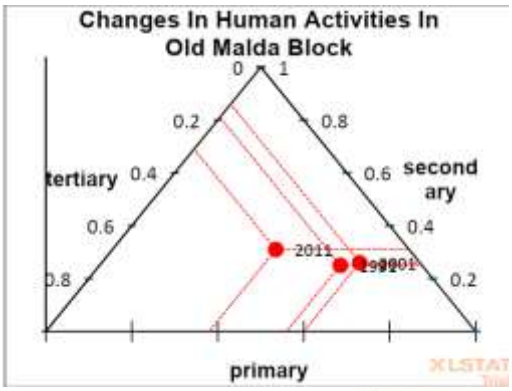


Figure .6: The changes in Human activities in Old Malda Block (1991-2011)



The above figures 5 and 6 signify the fact that the percentage of agricultural labour and cultivators have declined gradually from 1991 to 2011 about 5 percent whereas the percentage of marginal workers have increased more than 2 fold. The workers engaged in household industries remain more or less same up to 1991 to 2001 and after that a slow decline. Until 2000 agriculture was the mainstay of the people and approximately 60 % of the Block population engaged with it. But since then gradually agriculture has started to lose its importance. According to the 2011 census approximately 62% people are now engaged with secondary and tertiary activity which is a serious concern for the district economy. In reference to Bhatra beel which is a seasonal wetland controls the livelihood pattern of local residents. From November to May this area is agricultural land, different crops like paddy, mustard, jute, corn, kalai etc are cultivated here. And from June to October inhabitants are subject to change their occupation as this agricultural land is converted into a huge water area. In this season local residents are engaged as unorganized labor in different sectors in different district and few of them choose fishing as their occupation in Bhatra beel.

Seasonal Change in Livelihood Pattern of Bhatra Beel Area:

Pre-Monsoon Period:

At the end of December the water of Bhatra beel area began to dry and at the end of January Super Minicate paddy was sown. High level of soil moisture and thick layer of alluvial soil transported flood water from Tangan River supports agricultural practices. Except paddy, oilseeds, gram, pulses, corn, jute are cultivated here. However, advance monsoon or excess rainfall floods the area and then the farmers have to face a great loss. Nearly thousand families are completely depending on agriculture and have shifted their occupation.

Post monsoon period:

In the post monsoon period the entire area usually converts into an extensive wetland, overlapping three wetlands Bhatra, Jalkarbithan and Jatradanga. Due to wet seasonal nature of Bhatra beel from June to December the beel is given on lease for pisciculture by Malda Zilla Parisad. Different fishing co-operative society has to pay an amount of Rs. 500000-700000 as lease amount. During these period local residents has no access to the beel. The fishes caught in beel are sold to Englishbazar Bazar municipal Market and old Malda municipal market. A few amounts of fish caught by the local people illegally and sold to local market .Net profit earn per year from fish production is 250000/- to 300000 /- by co-operative society. Ruhi(*Labeo rohita*), Katla(*Catla catla*), Aar, Koi(*Cyprinus rubrofuscus*), Pabda (*Ompok bimaculatus*), Tangra (*Mystus*) are mainly cultivated here. However, the local people also catch fishes, crabs, shrimp, by fish hook or small net for their families in post monsoon period and the primary workers have to shift from their traditional agriculture changing their workforce pattern as the LULC has become changed totally and they used to work in Brick kilns, construction sites, work as toto(Battery operated Auto-rickshaw) driver in transportation sectors.

Conclusions:

Bhatra bill is a seasonal wetland which changes its characteristics in pre monsoon and post monsoon period every year. Thus Bhatra beel affects the livelihood and existence of the local inhabitants and thus local people are forced to change their livelihood pattern in both the seasons with the extension and reduction of wetland periphery with the changing land use pattern. In pre monsoon period agriculture also affect by pollution. Four agro based industries (paper mills and spinning mills) located along NH-34 in Narayanpur discharge large amount of effluents which gets mixed up with Behula and Tangan River and finally goes to Jalkarbithan and Bhatra beel, polluting the soil and water of the beel.

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