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Dr. Pradip Sarkar
Assistant Professor, Swami
Vivekananda Centre for
Multidisciplinary Research in
Educational Studies,
A University of Calcutta
Recognised Research Centre of
Ramakrishna Mission
Sikshanamandira (CTE),
Belur Math, West Bengal,
India

Socio-ecological development of Bariti-Malati bills in the district of North 24 parganas, West Bengal: A case study

Dr. Pradip Sarkar

Abstract

The proposed project work intends to highlight the Bariti-Malati Bill, situated in the north western part of North 24 Parganas district which is under stress and degradation due to anthropogenic impact. Very little study has been done on this important wetland of our state which has an immense contribution towards its neighbourhood for its rich bio-resource and water resource, and it helps to maintain the climatic condition also. Bariti bill has great importance from geographical point of view because Geography deals with socio-economic problems in our day-to-day life. This project work indicates clearly that it has interdisciplinary relevance as it is to be worked out from different aspects of geography and from different geographical points of view. Bariti-Malati Bills are facilitating a wide range of physical, biological and chemical process which help improve the quality of the water.

Keywords: Socio-economic status, human rights, problems, suggestive measures

Introduction

A case study of Bariti-Malati Bills in the District of North 24 Parganas, West Bengal. It is located north-west lower part of this District. There are so many bills in the district of north 24 parganas. Bariti Bill is one of such important wetlands in this district.

The bills are the depressed part of the land where surface run-off accumulate or is collected from the vicinity. Wetlands like, bills and baors are generally originated from old riverine courses when they shift their position, the loops of the meandering riverine courses get severed from the master river and left as isolated lotic water body or wetland named as bills and baors. The river is a lentic wetland with flowing water. The main components of the bills are biotic and abiotic factors i.e., swamp marshes and reeds etc. It is a wetland which plays an important role for mankind and their future generations. Now a days these wetlands are exploited un-scientifically (by human beings) due to population explosion without maintaining the aquatic ecosystem. Most of the people of this area depend on the bills and gets involved with their daily performances throughout the year for fishing and cultivation, herding of livestock, harvesting different types of fishes and agriculture. With the change of time and increase in population pressure, Bariti bill also faced the change of climate, the change in multiple activities of the inhabitants leading to degradation of this wetland. Water resource of the Bariti bill is the backbone of the economy of these areas. The loss of bill areas leads to environmental degradation or create ecological problems instead of socio-economic benefit. Bariti bill also sustain all the necessary types of aquatic life and perform peaceful functioning in the maintenance of ecological balance. Wetlands directly or indirectly support peoples' interest of the vicinity in many ways. The direct benefits of Bariti bill are the products like fish, water resource for agriculture and recreation. The indirect benefits of Bariti bill are maintenance of ground water table and ground water level, control of flood and natural filtration of sewages by the canal or small river. That is why; we should conserve the bill type wetland areas for maintaining the ecosystem. Bariti-Malati Bills are facilitating a wide range of physical, biological and chemical process which help improve the quality of the water.

Corresponding Author:
Dr. Pradip Sarkar
Assistant Professor, Swami
Vivekananda Centre for
Multidisciplinary Research in
Educational Studies,
A University of Calcutta
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Ramakrishna Mission
Sikshanamandira (CTE),
Belur Math, West Bengal,
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Origin of the Research Problem

The origin of the research problem in the North 24 Parganas derives its name from the number of Parganas or revenue districts ceded to the British East India Company in 1757 by the Nawab of Bengal.

North 24 Parganas has emerged as a separate district on the day of March 1986, bifurcating the erstwhile 24 Parganas district. It lies between 22°01'06" north latitudes and 88°02'05" east longitudes. This is bounded by Nadia district and Bangladesh in the North, South 24 Parganas in the South, Howrah and Hooghly in the West and Bangladesh in the East. It covers an area of 4094 sq. km. The Bariti-Malati Bill is situated between Barrackpore-I and II blocks in the West and South and Amdanga Block in the North. The Bariti-Malati Bill is situated between 22°04'09" North latitudes and 22°04'02" North latitudes and between 88°02'09" east longitudes and 88°02'02" east longitudes. The Sonai River is flowing within this area. The Sonai River originates from Ichhapur region from Hooghly River and flows through out the Bariti-Malati Bill and goes towards South and meet with Sunti River at Rajarhat, further flowing towards South-East and meets Vidyadhari River.

Bariti-Malati Bills and adjacent areas are marked by the occurrences of varied natural resources like water, land, vegetation etc. Which provide many advantages or opportunities for sustaining of livelihood of the local people in many ways. Recent population pressure and encroachment to the Bariti-Malati Bills area by the people including the migrated people (mainly from Khulna, Bangladesh) have caused a serious threats and challenges to the Bariti-Malati wetlands. This area has got a potential for further utilization for the future development. If the resources are conserved and utilized in a scientific and sustainable manner. This calls for a comprehensive geographical study to achieve the proper socioeconomic development of the Bariti-Malati Bills and adjacent areas.

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International Status

Bariti-Malati Bill plays a vital role to safeguard the degrading environment from the geographical point of view. But it is almost completely unknown to many people till now. There is no published research work recorded by any scholar. Hence, this case study is supposed to attract people and draw their attention all over the world. We should protect the Bariti-Malati Bill from the ecological degradation and conserve the total ecological environment of this important wetland and properly maintain its ecosystem for human benefit so that a world-wide awareness is developed as regards the conservation of wetland.

National Status

It is only our recent times that the value of bills and baors increased for surface water reservoirs which have direct responsibility to maintain the balanced underground water table. Gradually underground water table is going down quickly. So, in near future we have to face the scarcity of drinking water. That is why, we should draw the attention of State Govt. as well as Central Govt. for protection and preservation of Bariti-Malati Bill in the national interest as early as possible and take some proper measure to save this aquatic environment.

Objectives of the study

i) Primary objectives

To investigate the following:

- A. Improvement of west water quality
- B. Flood control and water storage
- C. Drainage management
- D. Wildlife conservation including habitat for fish spawning
- E. Reduction of environment pollution
- F. Conduction scientific enquiry and desirable land use studies.

ii) Secondary objectives

To study the following:

- a) Production of commercial reeds and other crops (including bio-fertilizers and cattle fodder)
- b) Using bills as buffer between industrial and other urban activities or saline and non-saline segments
- c) Reduction of soil erosion
- d) Preservation of the existing biodiversity.

Materials and Methods

The entire research work has been carried out in terms of three distinct steps also with the help of data and information obtained both from primary and secondary source. These steps include -

i) Prefield method: This method involved the details study of the Bariti-Malati Bills of Barrackpore-I & II and Amdanga block in the district of North 24 parganas, and their significance, its impact on environment and the study of the physical setting of the study areas. In this stage, all the secondary information were collected i.e., Maps, data, reference books, census reports and other information were collected from Govt. and Non-Govt. Organization.

ii) Field method: In these stages involved field study and field survey were undertaken in all part the wetlands to collect the primary data i.e., Name of the house hold, total family member (male & female), educational qualification, land use, hydrology, soil, flora and fauna. All these data were collected through questionnaire. Personal interview was conducted in these regards.

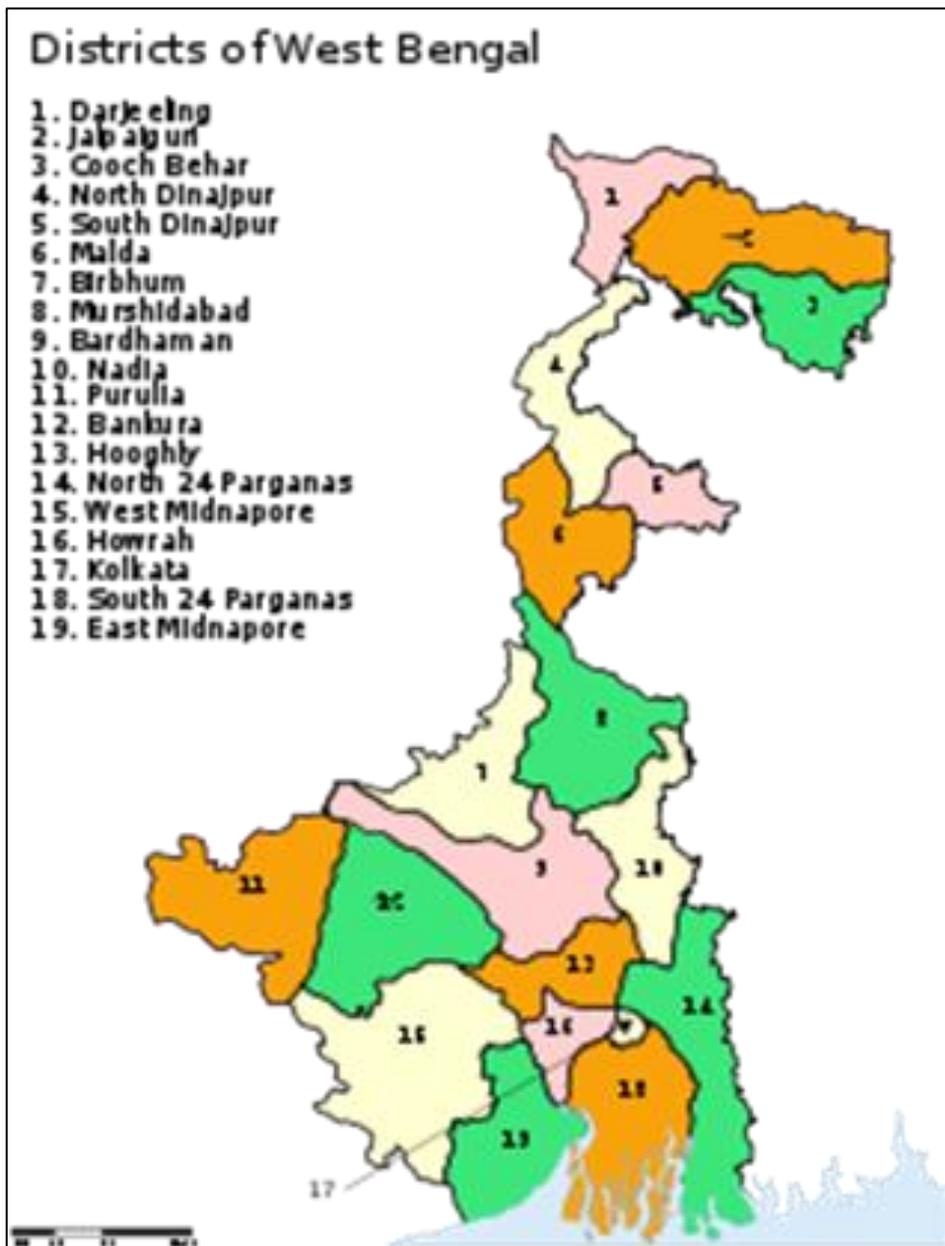
iii) Post field method: This method would involve compilation, computation, processing and analysis the data aiming at drawing some concluding remarks in order to evaluate the impact of wetland environment and human being.

With due emphasis has been laid on modern methodology like GIS techniques use of satellite imagery as well as incorporation of information from topographical sheets provided by Survey of India like 79B/5/6/9/10.

Area and location

The study area is situated between Barrackpore-I & II block in the south-west and Amdanga block in the north-east in the North 24 Parganas, West Bengal. It lies between 22 degree 11'06" to 23 degree 01' 06" north latitude and 88 degree 20' to 89 degree 05' east longitude covering an area about 4 00sq km.

India





Geology of Bariti-Malati Bills

The north 24 parganas is the youngest of the deltaic district of west Bengal. The study area embraces the moribund delta and a depressed zone of brackish marshes. The Bariti-Malati bills is the lower part of the Ganga delta, covered by recent to sub-recent alluvium. The recent and sub-recent are the thickest of all formations. Through paleontological evidence the floor of the Pleistocene in bore holes is placed at depths of 914mts near Barasat. An examination of bore hole logs reveal a succession of coarse to fine grained sand mixed with clay, clay mixed with sand and kankar and clay within a depth of 450mts. Below land surface. The deposition of these alluvial sediments has been classified into two groups:

a) An older alluvium and

b) A newer alluvium

a) An older alluvium: The older alluvium are essentially flood-plain deposits and they occur above the level of present flood-plains indicating that there have been differential movements between the Pleistocene and Recent time. They comprise coarse clay, silt etc. with boulders, pebbles and gravels, which are locally cemented and red in colour.

b) A newer alluvium: The Recent to sub-Recent newer alluvium is mostly confined to the banks and beds of present-day river channels. They consist of typically dark and loosely compact sediments having high water content and a good amount of organic matter. The boundary between the new flood-plain alluvium and sediments of deltaic origin has not yet been precisely demarcated. They display strong lithological similarity; but the latter is always distinct by sedimentological characters peculiar to deltaic formations.

Climate

The climate of the study area is tropical, like the rest of the Gangetic West Bengal. Monsoon season runs from early June to mid-September. The weather remains dry during the winter (mid Nov. to mid Feb.) and humid during the summer. During the months of April and May, thunderstorms, sometimes accompanied by hail, frequently occur at dusk. Winter prevails for a short period with chilling dry wind coming from the north-east.

Average rainfall ranges from 150-200 cm per year and it generally fluctuates from year to year. Heavy rainfall caused floods in this study area in 1978 rendering many people homeless for several months.

Vegetaton (Flora)

The vegetation of the study area may be classified as follows:

a) Vegetation on cultivated areas

Various types of weeds are common on agricultural fields. The cultivated crops consist of vegetables of various kinds cereals like-rice, pulses, fiber plants like-jute, oilseeds like-mustard and til etc. The most common vegetables are tomato, potato, pumpkin, gourd etc. Many algae and angiosperms are also common i.e., pteridophytes, ceratopteris thalictroides etc. Hygrophila auriculata (kulakhara), ipomoea acuquatica (kalmi), utricularia stellaris (pata jhajhi) are the common angiosperms.

b) Vegetation on waste places and along roadside

Around settlements and along roads many exotic varieties and indigenous trees are found i.e litchi chinensis (litchi), magnifera indica (mango) ficus bengalensis (banyan tree), coconut, bamboo groves etc.

c) Vegetation in wetlands

Different kind of wetland vegetation found within the study areas which are given below-

1. Rooted submerged hydrophytes, which grows at various depth e.g. hydrilla, ottelia, vallisneria etc.
2. Some hydrophytes rooted in the mud but their leaves float on water surface e.g. nymphaea (shaluk), nelumbo (padma), trapa (panifal) etc.
3. Some free-floating hydrophytes are salvinia (pana), lemna (cherapata) pistia etc.
4. Vegetation on freshwater pools, ponds and rivers:

In the fresh water (ponds, pools and rivers) various pteridophytes and angiosperms are found.

Local Fauna

The study area has great diversity in fauna. The ecosystem of this area has been disturbed by the reason-sprawling conurbation, deforestation, extension of agriculture and irrigation, reclamation of swamps and control of natural drainage like such disturbances have wiped out some of the species. Population due to the industrial wastes and also in salinity in the wetland parts caused much changes in the biota. The common species are as follows:

Birds Species: Dighi hansh (anasacuta) migratory, Bali hansh (nettapus) migratory, Choto Pankauri (Phalacreorox niger) resident, Baro Pankauri (Phalacreorox carbo) resident etc.

Fish Species

Major Carps: Catla, Silver carp, Mrigal (cirrhinus mrigate) etc.

Minor Carps: Punti (Tuntiusstigma), Tit Punti (Puntius Ticto) etc.

Chaniformes: Shole (Ophicephalus Striatus), Lata (Ophicephalus Punctattus) etc.

Osteoglossiformes: Chital and

Silurifprmes: Tangrs, Boyal etc.

Data analysis and interpretation

Relief

The Bariti-Maloti Bills is a part of the mature delta region of river Ganges. The quantitative measurement of vertical elevation changes in a landscape. The relief of Bariti-Maloti Bills is likely a saucer shaped depression of landscapes forming swamps and lakes or Bills. The highest elevation is found in the block Barrackpore-I, nearer to Kanchrapara and Naihati (56ft) in the North and west part of the Bariti Malati Bills. The elevation of the relief gradually decreases from North to South. The mid-point elevation of Bariti-Maloti Bill is 10ft.

Table 1: Elevation

Elevation	
Block (Barrackpore-I&II)	& Amdanga
Station	Elevation in ft.
Kanchra-	56
Naihati	56
Bhatpara	51
Shyam-Nagar	48
Kankinara	46
Kaki rd jun	46
N.K.rdJunc	45
Ichhapur	45
Barrackpore	41
Kaugachi	37
Palta	37
K.Bkp Rd jnc	33
Mid. B. bill	10
Sankarpur	21
Sankarpurmore	25
NH34.kaki.rd.jn.	34
Santoshpur	35
Basatra	36
Ayur.College	36
Awalsiddi	39
Nilgunj	40
Amdanga	42
Ramchandrapur	53

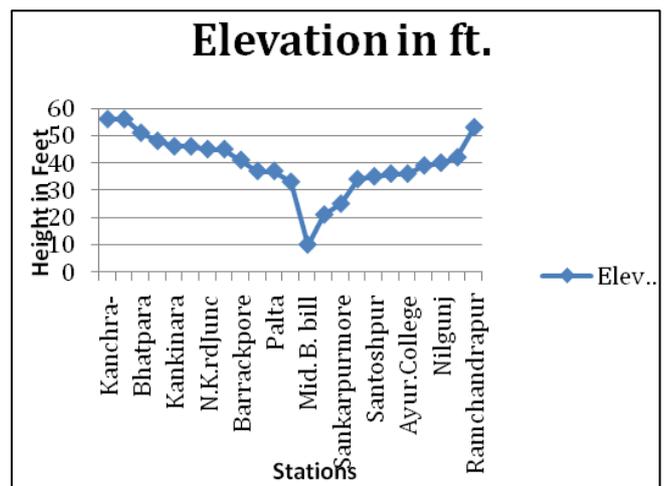


Fig 1: Elevation in ft.

Rainfall and temperature

Rainfall is maximum even in the year 2009-10. The rainfall decreases abruptly in the next year and they're after rainfall increases slowly. Maximum temperature all most remain same down the years but the minimum temperature decreases up to 2012 and they're after increase very slowly.

The area is vulnerable to heavy rainfall. Here tropical monsoons climate is found. Annual rainfall varies in different parts of the state. In this areas rainfall is Varies about 150–200 cm. the entire region experiences a warm tropical monsoon climate. Monsoon influence in the region makes the climate there moderate and pleasant. The summer temperatures range from 26 °C to 43 °C while the winter temperatures range from 10 °C to 19 °C.

Relative Humidity

Maximum relative humidity during the four years shows that it is very low in 2012-13 but almost maintains high profile on the preceding years. Maximum relative and humidity is almost same over the years. The ratio of maximum relative humidity and minimum relative humidity almost same over the years.

Table 2: Rainfall, temperature and Relative Humidity

↓ →	Average	Average	Average	Average	Average
Year	R.F in mm	Temp.max.	Temp.min.	R.H.Max	R.H.Min
2009	6.38	32.03	24.13	93.27	58.22
2010	3.74	31.91	23.4	92.09	54.61
2011	4.1	31.61	22.7	93.65	55.46
2012	4.64	31.97	24.18	88.58	55.72

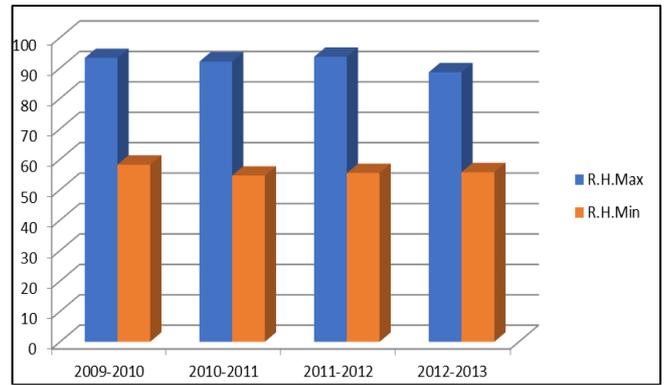


Fig 2c: Relative Humidity

Table 3: Rainfall status

Month ▼	Barrackpore-1950	No. of years of Data	Month	Barasat-	No. of years of Data
	Rainfall in mm.	50		Rainfall in mm.	50
January	9.9		January	13.5	
February	27.2		February	26.7	
March	36.1		March	35.1	
April	50.5		April	57.1	
May	120.1		May	128.5	
June	262.1		June	256.8	
July	334.8		July	312.4	
August	324.9		August	324.4	
Sept.	208.3		Sept.	210.6	
Oct.	104.7		Oct.	119.9	
Nov.	27.2		Nov.	19.6	
Dec.	7.4		Dec.	3.6	

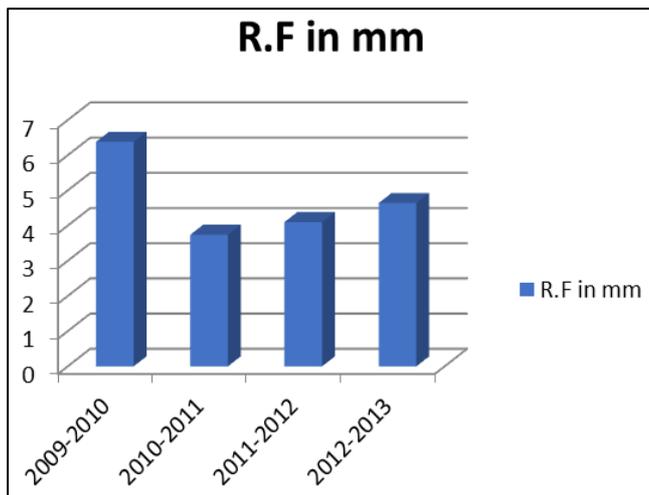


Fig 2a: Rainfall

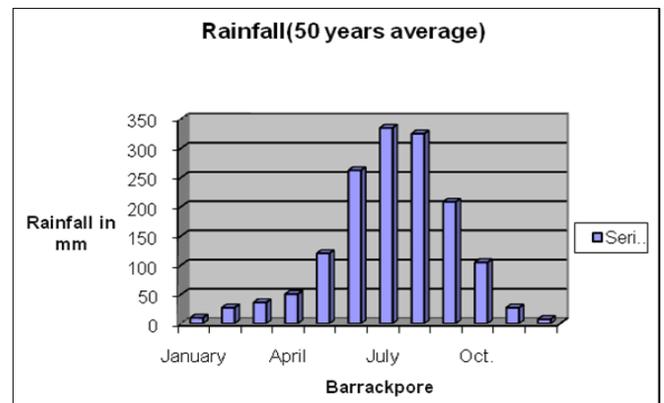


Fig 3a: Rainfall (50 years average) in Barrackpore

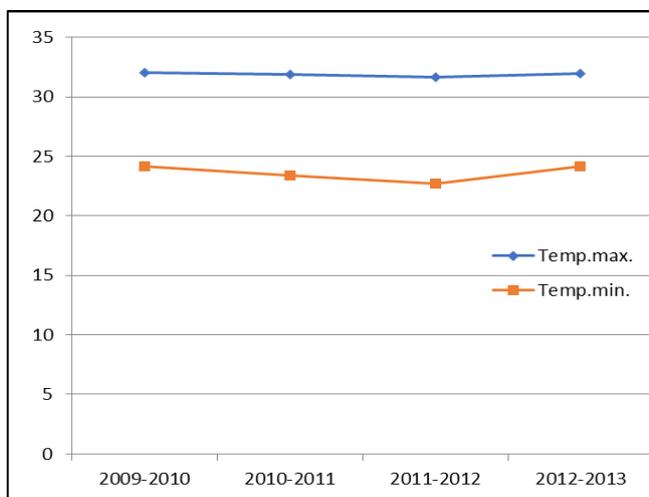


Fig 2b: Temperature

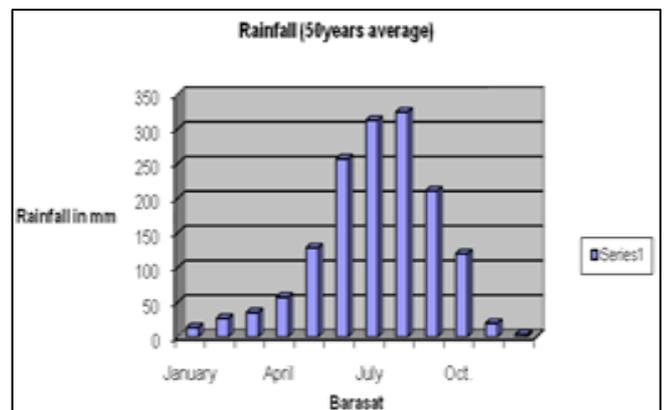


Fig 3b: Rainfall (50 years average) in Barasat

Table 4: Annual rainfall in the study area

Station ▼	Annual Rainfall in mm.	Year	Date
Barrackpor	1513.2	1878	22Sept.
Barasat	1508.2	1878	22 Sept.
DumDum	1687.3	1888	24 Aug.
Basirhat	1623.1	1900	20 Sept.
Bangoan	1613.9	1948	21-Apr
Alipur	1624.8	1900	20 Sept.

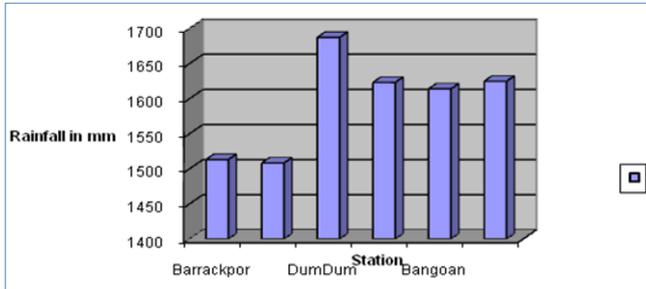


Fig 4: Annual rainfall in the study area

Table 5: Heaviest rainfall in 24 hours in the study area

Station ▼	Heaviest Rainfall in 24Hrs.	Year	Date
Barrackpor	377.7	1878	22 Sept.
Barasat	312.9	1878	22 Sept.
DumDum	313.9	1888	24 Aug.
Basirhat	327.4	1900	20 Sept.
Bangoan	147.1	1948	21-Apr
Alipur	369.1	1900	20 Sept.

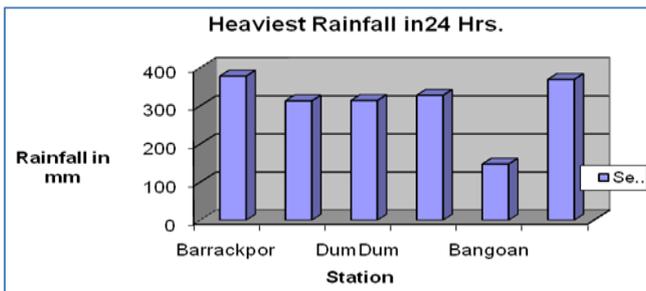


Fig 5: Heaviest rainfall in 24 hours in the study area

Age-Occupation

The % of engagement is maximum during the age span 41-55 years and the maximum concentration of the occupation area is agriculture. Some occupation area which required physical fitness and ability is almost nil-like fishery, mason etc. and it may be observed that job areas involving physical fitness are almost nil. When incumbent maintains the age range is 71-86.

Table 6: Age-Occupation

Age ►	Age-Occupation			
	25-40	41-55	56-70	71-85
Occupation ▼				
Agriculture	26.66	31.33	17.33	2
Fishery	0	0	1.33	0.66
Service	0.66	0	0	0
Labour	2.66	2.66	2	0
Business	3.33	5.33	2	0
Mason	0.66	0	0	0
Carpenter	0	0.66	0	0
Subsidiary	14.66	20.66	9.33	0
Other	1.33	2	0	0
Percentage	44.96	62.64	31.99	2.66

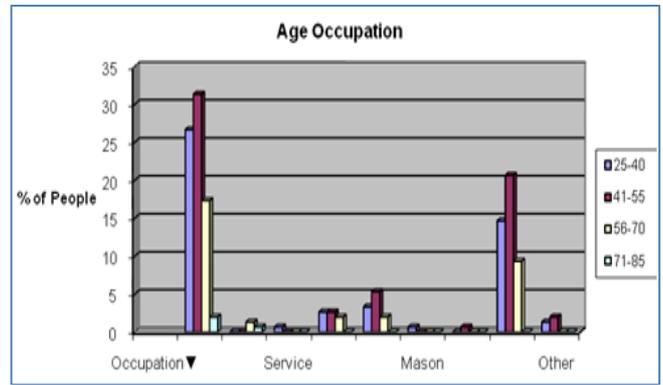


Fig 6: Age-Occupation

Table 7: Age-Education

Age-Education				
Age ►	25-40	41-55	56-70	71-85
Education ▼				
Illiteracy	4.66	5.33	7.33	8
I-IV	5.33	8.66	4	0.66
V-VIII	12	15.33	7.33	0.66
IX-X	7.33	6.66	2	0
XI-XII	1.33	2	0.66	0
Above	3.33	2.66	0	0
	33.98	40.64	21.32	9.32

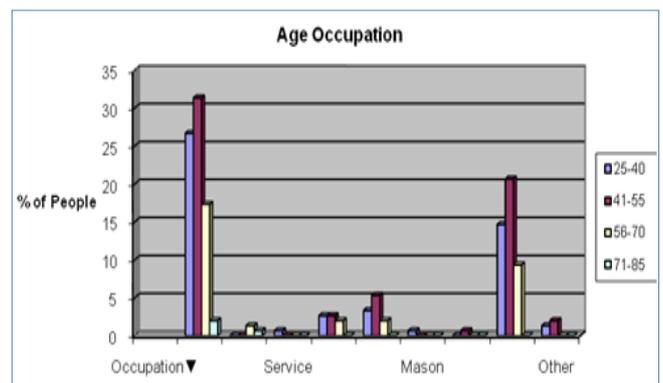


Fig 7: Age-Education

Homestead

In the case of 37.33% cases homestead land varies between 0.21-0.40 bighas. In 35.33% cases homestead land varies between 0.1-0.20 bighas. In other cases, homestead land increases as the % decreases. In the large number of cases homestead land is small but the area gradually decreases as the % of cases gradually falls.

Table 8: Land use

Landuse	
Area in Bigha ▼	Homestead % of user
0.1-0.20	35.33
0.21-0.40	37.33
0.41-0.60	17.33
0.61-0.80	4
0.81-1.00	5.33
>1	0.66

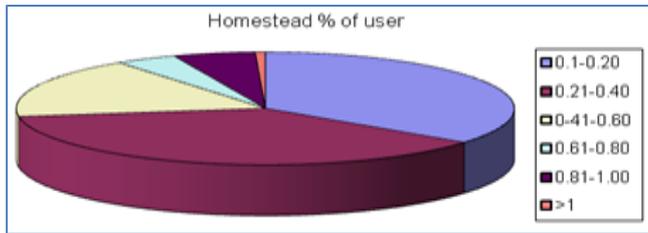


Fig 8: Homestead use in percentage

Table 9: Land use for different crops

Landuse				
Ext.of landuse▶	Land <1Big	Land 1-5Bi	Land6-10B	Land 11-15B
Landuse▼	% of user	% of user	% of user	% of user
Pasture	12	5.33	0	0
Gro v e	19.33	9.33	0	0
Jute	10	69.33	5.33	0
Paddy	9.33	69.33	8	2
Potato	8.66	64.66	3.33	0
Pulse	16.66	45.33	0	0
Onion	10	58.66	6	0

Table 10: Post monsoon Water Table

Depth in Ft	19-39	39-59	59-79
Pre-monsoon	23.33	69.33	7.33

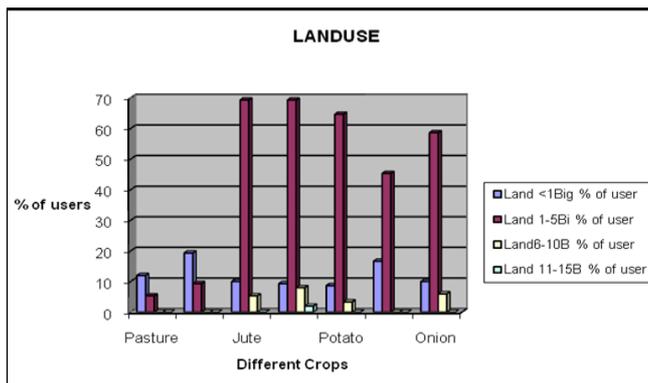


Fig 9: Land use for different crops

Table 10a: Depth of water table in Monsoon:

Depth in Ft	004-006	006-008	008-0010
Monsoon	67.33	26.66	6

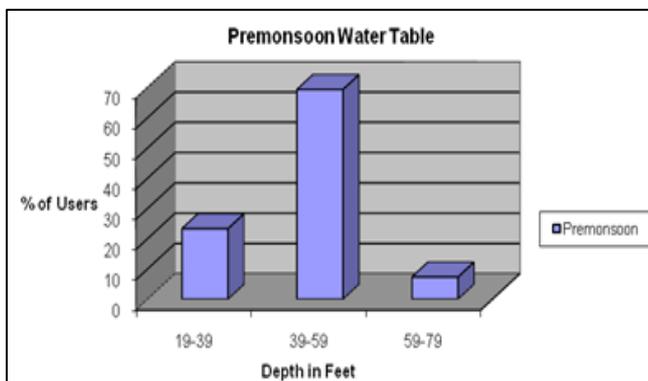


Fig 10: Premonsoon Water Table

Table 11: Depth of water table in post monsoon

Depth in Ft	0010-0015	0015-0020	0020-0025
Post Monsoon	34.66	49.33	16

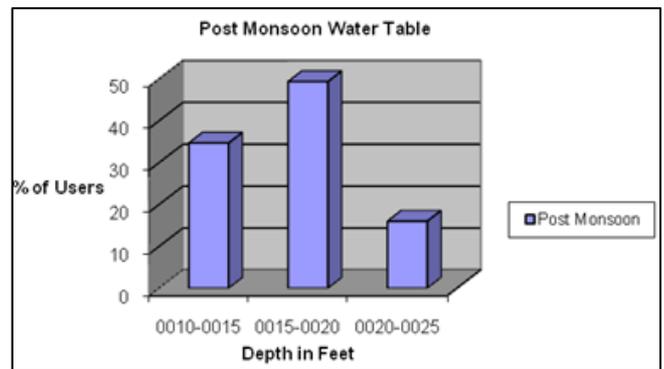


Fig 11: Post monsoon Water Table

Water use

The maximum number of cultivators that is 30.66% used water in the range of Rs.550-650/bigha. Percentage of cultivators using water in the range of cost Rs.950-1050 is least i.e. 2%. Most of the cultivators want to use water in optimal way for irrigation.

Table 12: Water use

Unit▶	004.49-005.48	005.49-006.48	006.49-007.48	007.49-008.48	008.49-009.48	009.49-0010.48
Water Use	16.66	30.66	21.33	11.33	7.33	2

*Expressed in 100 Rs Unit.
Per Bigha Cost*

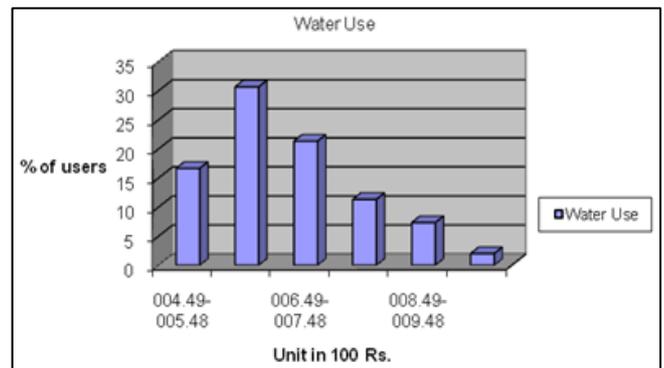


Fig 12: Water use

Table 13: Production of crops vs price.

Production	2011-2012	2012-2013
cost in Rs		
Seeds (3bags)	38.51	53.49
Fertilisers (5bags)	25.32	34.8
Pesticides (30-35Kg)	2.28	2.42
Tractor (at least 3days)	5.34	5.34
Labourers (40days)	28.53	35.66
Total:	100	131.74

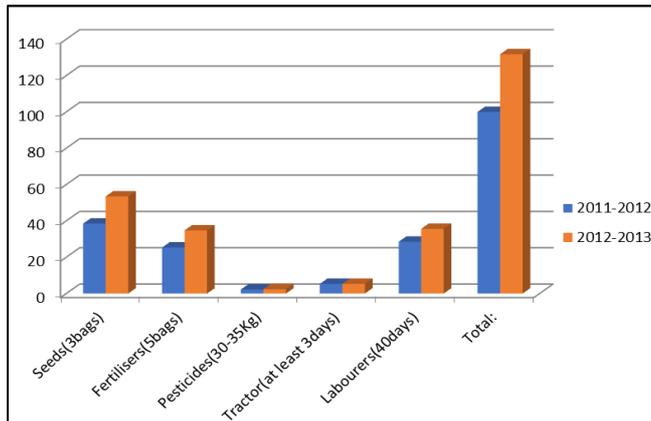


Fig 13: Production of crops vs price

Findings

The main findings of the study area are as follows:

1. The Bariti-Malati wetlands are owned by the Fishing Dept. Of West Bengal and fishing right is given to the Co-operative Societies.
2. Untreated effluents from factories and sewage are directly released into the Bariti-Malati wetlands through canals i.e., Ichhapur Canal, Chandanpukur Canal etc.
3. Heavy metal released from effluents after reaching Bariti-Malati wetlands, water is transferred to vegetables and fishes and finally to human beings through food chain.
4. Due to high rate of siltation leading to gradual changes of land use over a period of time has led to conservation of the large fish farms from pisciculture to agricultural land.
5. All these findings lead to profound effects on biodiversity and human beings.

Recommendations

1. People should avoid the use of heavy machinery in wetlands such as tractors as these disturb the structure of the soil and destroy the majority of plant species.
2. Pesticides and fertilizer must be avoided because these have got negative effects on water quality and also, they lead to death of many animal species such as fish.
3. Community should be involved in the preparation and implementation of wetland management plans and regional wetland strategies.
4. Govt. should provide training programme on wetland identification and management to communities as well as school children.
5. A wetlands GIS user group should be established to prepare maps and gives related information to the community.

Concluding remarks

The drainage network by Barrackpore I & II and Amdanga block the local people connected their domestic and as well as industrial effluent drains into these laid sewers which should be purified chemically and re-use in the wetland to avoid the damage caused by the prevailing / occurrences of pollution. Health, education and transportation and communication system should be developed.

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