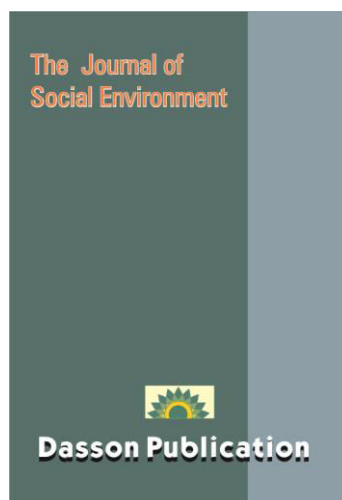


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A study on basic economic activities based on the east Kolkata wetland

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Abstract

Wetlands play a great role in flood control, treatment of waste water, reduction of sediments, control of pollution, Protect uplands from erosion, Increase water quality, Provide setting for recreation, Moderate local climate, Recharge groundwater and Produce various types of fishes and organic matter. These wetlands have been existing for more than one hundred years, a lasting tradition of disposal and utilization of urban waste in agricultural field and fisheries. The local people have employed a remarkable system of nature to help to meet the basic needs. The East Kolkata Wetlands are used to recycle all the garbage and pollutants. Fulfil substantially the requirement of fish, vegetables and food-grains in the city, maintain the delicate ecological balance in a fragile environment and ecosystem. Provide the food chain and waste-to-wealth recycling. Fulfil substantially the requirement of fish, vegetables and food-grains in the city. Absorb and treat urban solid, sewage, wastewater, air waste generated, in the most efficient, economical and natural way. Provide livelihood support for local villagers who also have the unique skill of using wastewater to grow fish and vegetables and thereby help to sustain a stable urban fringe. This study has analyzed the causes of economic activities based on the East Kolkata Wetlands. This paper is concerned with the economic activities of the wetlands and how its impact has changed the urban economy and the urban environment. Many of the urban poor live in wetlands areas and are deprived of various basic needs. The East Kolkata Wetlands are consists of 264 operating Fisheries / Bheris and vast agricultural field which are the most economic prosperous zone in future. So this study proves that the East Kolkata Wetlands provide the various basic needs of poor dwellers.

Keywords: 1. Deforestation, 2. Economic 3. Ecosystem 4. Employed, 5. Environment, 6. Sediments 7. Urban fringe.

Objectives

The objectives of this study are manifold and encompass are the followings:

1. This study has analyzed the economic activities based on the East Kolkata Wetlands.
2. To show the economical aspect of the East Kolkata Wetlands.
3. To know the East Kolkata Wetlands provide the various basic needs of poor dwellers.
4. To find the way of solving the problems and analyze the effort of government agencies.
5. To know how the East Kolkata Wetland's people are facing various types of problems.
6. To know the probable causes behind the environmental problems of the East Kolkata Wetlands.
7. To resolve the environmental problems of the East Kolkata Wetlands area.
8. To identify the causes of depression from various basic needs of the East Kolkata Wetland's dwellers
9. Study of the environmental problem of the East Kolkata Wetlands area.
10. To know and analyze the causes of urban disposal and garbage.
11. To know the impact of socio- economic environmental problems on the East Kolkata Wetlands.
12. To help further study.

Methods used

The study is completely based on primary and secondary data. The observer calculates the location by G.P.S. A household survey was carried out with help of a questionnaire to know about the socio-economic scenario of Chachchariya village in Hadia Mouza of East Kolkata Wetlands. The entire study has been completed through three stages i.e. pre-field, field and post field. In pre-field survey the observer collected data from the East Kolkata Wetlands Management Authority, Census Office, Fishery Department of East Kolkata and www.ekmap.com. Collected data have been represented by descriptive statistics for better understanding. The study totally depends on statistical analysis by tables, charts, and interpretations. Different types of cartograms have been used to represent the statistical data on the maps in a diagrammatic way. Mainly Bargraph and Pie-graphs have been used to show the distribution of house and the population. The observer tabulated the primary and secondary data and prepared different types of cartograms with the help of Microsoft Word and Excel.

Database

The information and data have been collected basically from primary sources and the secondary data has been collected from various sources, which are given below...

1. Applied Economics and Statistics, Government of West Bengal (2014): District Statistical Handbook, Kolkata.
2. The Institute of Wetland Management and Ecological Design (IWMED).
3. The East Kolkata Wetlands Management Authority, Kolkata.
4. Report of Central Environmental Board of West Bengal.
5. Indian Institute of Chemical Biology (IICB).
6. Production report of P.F.C.S. under a category, South 24 Parganas.
7. District census Hand books (1951-2001), Kolkata.
8. Information of Nalban 2/1 Matsyagibi Samabay Limited, Kolkata.
9. List of old Bheris / Fisheries and their conversion at Salt Lake Office.
10. Information of Purba Kalikapur Matsyajibi Samabay Limited.
11. A case study of Kolkata Research papers.
12. Kolkata District Gazetteers; Kolkata, West Bengal.
13. Topographical Map Nos.79B/6 and 79B/7.
14. Fishery Department, East Kolkata Wetlands, Kolkata.
15. Few books and literature.
16. Some basic informations from internet.

Location of the study area

The study area is situated between the levee of the river Hooghly on the West and the river Kultiganga on the East, The East Kolkata Wetlands are distributed nearly equally on the two sides of the dry weather flow channel reaching the river Kultiganga to the East. The wetlands area lies approximately between latitudes 22°39' 18" North to 22°40'42" North and longitudes 88°34' 34" East to 88°35' 49" East.

Introduction

Wetlands play a great role in flood control, treatment of waste water, reduction of sediments, productions of organic materials and control of pollution. Multi-storeyed buildings on agricultural land, low ground water level, increased salinity in water and soil, Deforestation are the chief causes of imbalanced the urban ecosystem near the wetlands.

The mouths of some of the streams opened into the Bay of Bengal and were influenced by tidal action, which accounted for the tides and salinity of these salt-water lakes in the East of Kolkata. These lakes were actually the spill-reservoirs of the tidal channel river Bidyadhari which opened into the Bay of Bengal through the river Matla. The East Kolkata Wetland are consists of 264 operating Fisheries / Bheris which are the most economic prosperous zone in future.

Processing of fish production in east kolkata wetland

Preparation of the pond after draining out of the sewage is one of the important steps. When the eggs produced as a result of breeding in the river has to be introduced in the pond bottom which is prepared for from the month of Mid February to March. If there is a lot of sludge, then the land has to be dug up 8-9 inches with a plough or spade, and brought them up to dry. The topsoil of the pond bottom has to be dried and the bottom soil has to be dried up too. In this way no foul smell remains. It needs to use the plough while digging the land because in some places there are negligible organic deposits which host a kind of big-sized snails and earthworms. These snails and earthworms are dangerous, as they draw their nutrients from the same sewage that serves as food for the fish that grows in the sewage-fed berries or ponds.

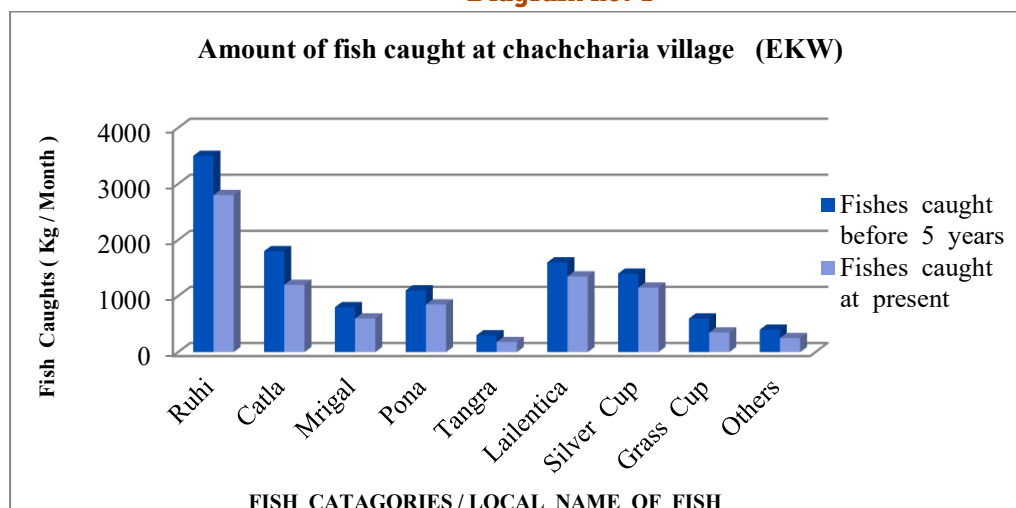
These snails and earthworms deplete significantly the sources of nutrients, found in the soil of the pond bottom.

As the fish which takes more nutrients from the sewage grows rapidly, so the snails and earthworms must be destroyed here from the very beginning. Therefore, the soil needs to be thoroughly ploughed. In fact, one has to dig 1 inch deeper than the total depth of the soft topsoil to root out snails and other such creatures that take away the nutrients of fish.

Table no-01
Type and category of fishery

| | Owned | Leased |
|-------|-------|--------|
| Bheri | 36 % | 52 % |
| Pond | 9 % | 3 % |

Diagram no.-I



To increase the organic contents of the soil in the bottom of the pond, one needs to cultivate a kind of plant called Dhanche (Sabena sp). If the soil is good, the plants will grow slowly. If it rains, the water has to be drained out, so that the roots of the plants don't rot. The roots have some

swellings in it which is helpful for nitrogen fixation. The deeper roots are better for the soil. After the soil is enriched, it can serve nutrients for the fish for three to four years.

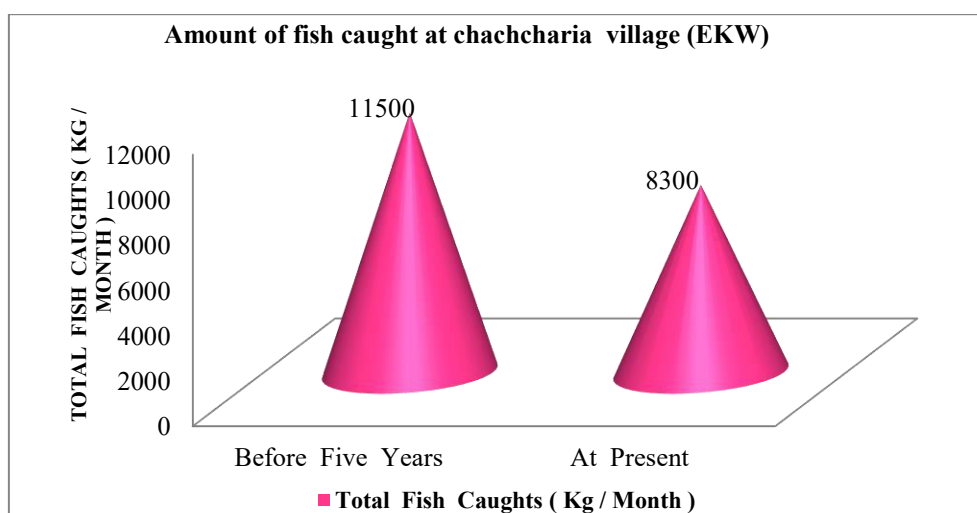
When the monsoon comes it bring heavy showers along with it. When it rains continuously the nutrients in the ponds get washed away. To add to the woes of the farmers there is little or no sunshine. Ponds having a depth up to 1.5 ft of water get a better sunshine. Where the water is deeper; it becomes either white or colourless as the Nutrients get washed out. This leads to the death of a lot of fries.

To restore the bluish colour of the rearing pond, the fish farmers use Lancashire (*Euphorbia percale*) plants. They bring heaps of these plants and drop them into the ponds. The plants, when they rot, restore some of the bluish colour to the water. The plants, when they rot, restore some of the bluish colour to the water, because of an addition of nutrients. In this way, it is also possible to save a lot of fries from perishing.

The stormy winds come often during the rainy season accompanied by rain. After this period of storms the farmers remove the fries from the rearing ponds and put them into the stocking ponds to prepare nutrients (in spite of the easterlies, the stocking ponds do have a certain level of nutrients content in them). When the fries are put into the pond, they cause a movement in the water, this serves to churn the nutrients in the soil at the pond bottom. So the bluish colour, which is actually a biological indicator of the presence of nutrients, returns to the water.

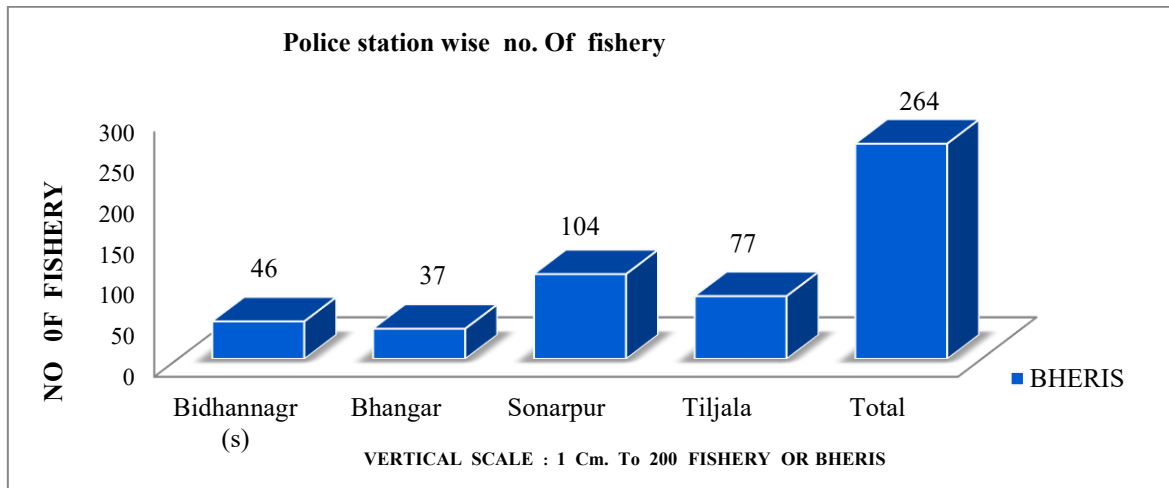
It was becoming increasingly difficult to carry out fish farming activities due to an acute shortage of sewage. This means that the fish farmers cannot provide adequate nutrients for the fish. In those days most of the ponds or Bheris have 30 to 60 cm of sewage, whereas, for proper rearing of the fish, 60 to 180 cm of sewage is needed. In this depth, all kinds of fish grow, with a cent percent success rate. Because of the shallow depth of the ponds, about 75 per cent of Catla fish (*catla catla*) does not lay eggs due to lack of deep water. Again Rohi fish (*Labeo Rohita*) is vulnerable by the insects. This happens especially during winter, when there is poor sunlight.

Diagram no.-II



During this time, the water changes colour (which actually indicates a loss of nutrients), and with this a variety of insects are born, which suck out all the blood of the fish. So the Rohi fish and Catla fish die. When these fishes die the villagers pick them out of the ponds. The fish farmers convert them into fertilizers. For that, they would have to empty that pond first. Then the rotten fishes are chopped into pieces and these pieces are mixed up with the soil. After that, the soil is dried. If this is not done properly then the insects will grow rapidly and will affect the rest of the fishes.

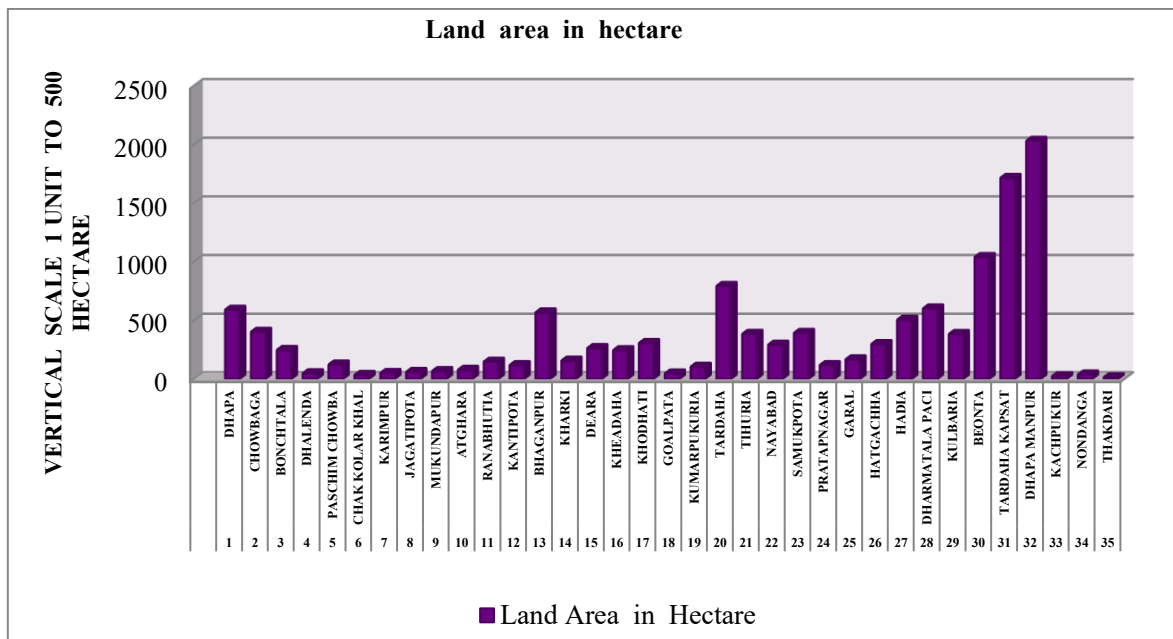
Diagram no.-III



There are a variety of other diseases that affect the fish. But if one can maintain the bluish colour of the water, then the nutrient level stays steady, and insects or diseases cannot attack the fish. This is very difficult during the monsoons, when the nutrients tend to get washed away. The pond has to be appropriately prepared in summer, to maintain the bluish colour and the nutrient level.

Sometimes, it is also true that the fish producers or the owners of the Bheris / Fisheries do not know the real causes behind the diseases of the fish. Often, they do not keep in regular touch with the employees / labours at the Bheri, and therefore they remain ignorant about the diseases.

Diagram no.-IV



Benifits from east kolkata wetland

a) Catching fish

Previously Wetlands have been thought of as wastelands. People stayed either away from them or tried to get rid of them. Because of this over half of the wetlands in the United States have been destroyed. But as people begin to understand the value of wetlands, they begin to protect and

restore them. Wetlands are a valuable natural resource. Wetlands provide habitation for many animals, control flooding, improve water quality, and provide recreational activities.

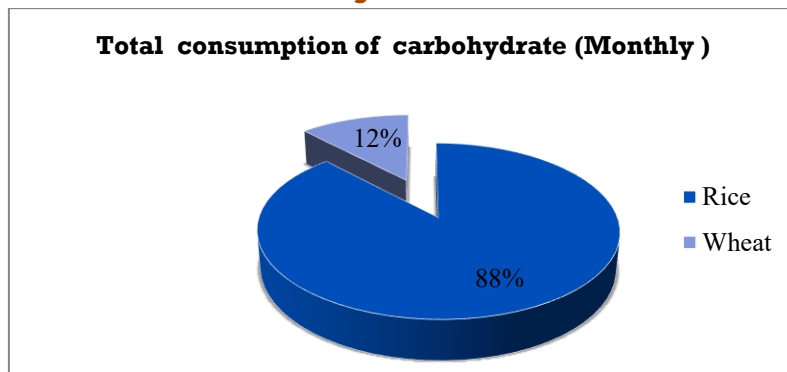
Table no.-02
P.S. wise no of fishery

| Police station | No of fishery or bheris |
|----------------|-------------------------|
| Bidhannagr (s) | 46 |
| Bhangar | 37 |
| Sonarpur | 104 |
| Tiljala | 77 |
| Total | 264 |

Food habit of villagers

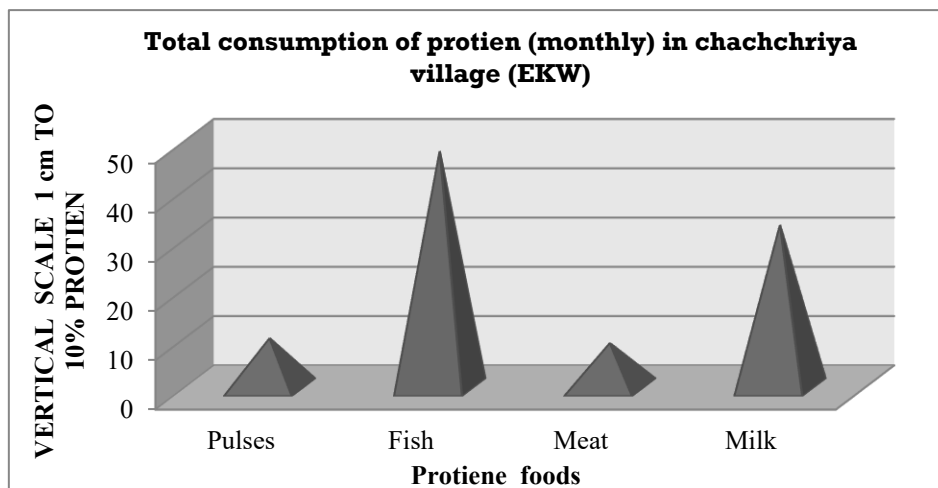
The pie graph shows the total percentage of Carbohydrate(monthly) consumption of Chachchariya Village (Hadia Mouza) in East Kolkata Wetland (2010).They consume greater amount of rice (88%) & lesser amount of wheat (12%).Availability & production of rice is higher than Wheat here. So expenditure of Rice (90%) is also higher than Wheat (10%).

Diagram no.-V



They consume 10% Pulse, 48% Fish, 9% Meat and 33% Milkier which shows that the consumption of Fish is higher than any other foods resulting much expenditure (51%). As it is a Wet Land Area and as there are many Bheris / Fisheries and ponds for fish production they get more fish easily in their diet.

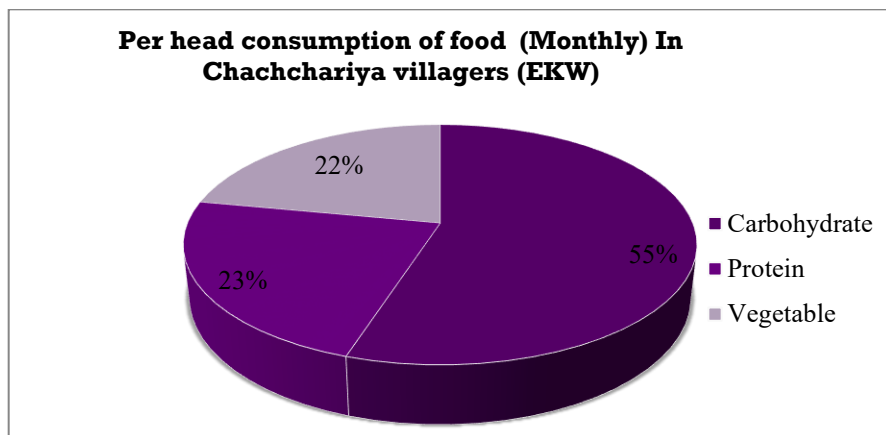
Diagram no.-VI



Per head food consumption of villagers

The pie graph shows the per head consumption (%) of Carbohydrate, Protein and Vegetables for the Chachchariya village in East Kolkata Wet Land. From the pie graphs it is revealed that the % of per head carbohydrate consumption is 43% to 55%, protein 41% to 28% and vegetables 26% to 20%. So it can be said that % of per head carbohydrate consumption is higher than protein and vegetables. Among these food items average per head rice consumption as well as expenditure of carbohydrate is high. As it is a Wet Land Area, and their main occupation is fishing so their protein consumption is high i.e. nutrition level is high.

Diagram no.-VII

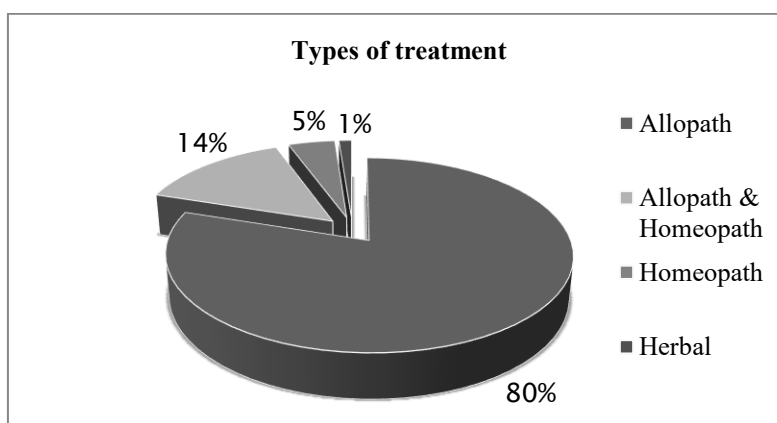


b) Health condition of villagers

1) Types of treatment

Pie-graph shows the different types of treatment practiced in the Chachchariya village of Hadia Mouza. The various types of treatments accomplished in the pie graph are Allopath, Homeopathy, Herbal and both Allopath & Homeopathy.

Diagram no.-VIII



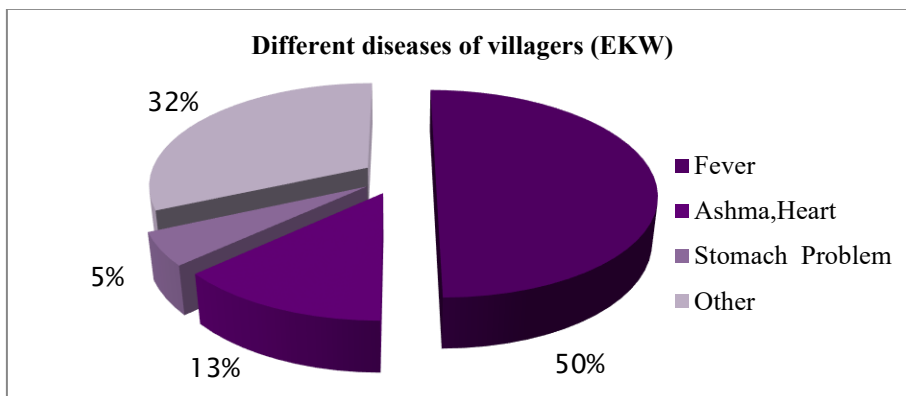
The graph shows that 80% of people treat themselves with Allopathic sources of medicine, which are the highest value. 14.4% people depends on both Allopath and Homeopathy, 4.8% people depends on Homeopathy medicines and only 1.2% people opts Herbal treatment.

Thus, it is revealed that the majority of people go for advanced Allopathic treatment rather than old techniques like Homeopathy and Herbal etc. type of sources.

2) Different diseases of villagers

Pie-graph shows the occurrence of different diseases in Chachchhariya village under Hadia Mouja. The major diseases from which the people suffer are mainly fever, cold and cough, digestive problem and some others.

Diagram no.-IX



Pie-graph shows that about 50% people suffer from fever due to seasonal variations. Other common diseases are diabetes, pneumonia, asthma, paralysis, heart attack. Minimum percentage of people suffers from digestive problems.

Thus, this study shows that the people in this village suffer from the common seasonal diseases and no other epidemic or critical diseases are found there.

Table no.-03
Different diseases of the villagers

| Type of disease | General disease | Respiratory problem | Waterborn disease | Skin disease | Other disease |
|-----------------|-----------------|---------------------|-------------------|--------------|---------------|
| Suffered pepole | 35% | 10% | 20% | 30% | 5% |

Problems of the study area

There are so many Socio-Economic Environmental problem of the study area and the people of this East Kolkata Wetlands are facing various types of problem like as –

1. Environmental problem
2. Suspended material fill up the Wetlands
3. Discharge of sewage water in the Wetlands
4. Toxic in the water
5. Flood plain Wetland
6. Saline water
7. Poor sanitary condition
8. Scarcity of drinking water
9. Housing problem
10. Dirt floors and poor ventilation
11. House type and deplorable living conditions
12. Poor health condition
13. Lack of education

14. Social problem
15. Delinquency problem
16. Various language, caste and refuges
17. Family size
18. Age-sex structure and level of development
19. Socio-economic problems of the Wetland
20. High dependency level
21. Child labour problem (About 25.4% child labour is found in the study area)
22. No of earning member is low
23. Very low income status
24. Lack of different types of household amenities
25. Congested settlement pattern
26. Low transport facility
27. Age-sex structure of this Wetland shows high dependency ratio
28. In this Wetland people suffered from general diseases

Demographic characteristics of chachcharia village in the east kolkata wetland

Total population of this Mouza according to 2001 census was 7726. The settlement in this village has withstood the pressure of population. The strength of these waste recycling wetlands lies in their employment generating potential for the poor. On average each acre of sewage treatment fisheries requires 2 to 3 persons throughout the year. The villagers are mostly under schedule caste and schedule tribe. Chachcharia Village has its own fisherman co-operatives.

Total surveyed families and population of this study area are 65 and 338 respectively. Out of this population total male population is 177 and female population is 161 of whose ratio difference is negligible the numbers of male and female population are approximately same.

Socio-Economic characteristics of chachcharia village

As the inhabitants of the wetland depend mostly on fishery, so their economic structure is not so high as other part of the Kolkata. Naturally their demographic characteristics are also low which is shown in the following tables.

Table no.-04

Number of family member

| Total family | 1-4 | 5-8 | 9-12 | >12 |
|---------------------|------------|------------|-------------|---------------|
| 65 | 27 | 32 | 6 | 0 |

Table no.-05

Male female distribution

| Total no. Of family | Total population | Total male population | Total female population |
|----------------------------|-------------------------|------------------------------|--------------------------------|
| 65 | 338 | 177 | 161 |

Table no.-06
Age sex structure

| Age group | >15 year | 15-30 year | 31-45 year | 46-60 year | Above 60 year |
|--------------|----------|------------|------------|------------|---------------|
| No. Of male | 41 | 70 | 34 | 22 | 6 |
| No.of female | 45 | 48 | 36 | 27 | 9 |

Table no.-07
Educational status

| | Primary | Secondary | Higher scondary | Graduation | Post graduation |
|--------|---------|-----------|-----------------|------------|-----------------|
| Male | 84 | 16 | 11 | 5 | 0 |
| Female | 82 | 9 | 6 | 2 | 0 |

Table no.-08
Literacy rate

| Un authorised slum | Literate | Illiterate |
|--------------------|-----------|------------|
| Total male (177) | 122 (69%) | 55 (31%) |
| Total female (161) | 103 (64%) | 58 (36%) |

Table no.-09
Occupation status

| Service | Business | Van puller | Masion | Maid servent | Howker | Tanary & daily labour | Driver | Straff cutter | Others |
|---------|----------|------------|--------|--------------|--------|-----------------------|--------|---------------|--------|
| 18 | 19 | 12 | 6 | 21 | 10 | 40 | 15 | 17 | 10 |

Table no.-10
Language category

| Bengali | Hindi |
|----------|----------|
| 30 (45%) | 35 (55%) |

Table no.-11
Religion category

| Hindu | Muslim |
|------------|------------|
| 16 (24.6%) | 49 (75.4%) |

Table no.-12
Caste structure

| Total no. Of family (65) | 14 | 23 | 10 | 8 | 10 |
|--------------------------|-------|-----------|-----------|------------|--------|
| Income(RS) | <3000 | 3001-6000 | 6001-9000 | 9001-12000 | >12000 |

Table no.-13
Family wise income status

| Category | General | SC | ST |
|----------|---------|-----|----|
| Male | 34 | 182 | 13 |
| Female | 25 | 168 | 12 |

Table no.-14
Level of dependancy

| Adult population | Child population | Old population |
|------------------|------------------|----------------|
| 237(70.1%) | 86(25.4%) | 15(4.5%) |

Table no.-15
Population density (PER SQ. KM.)

| ID | Name | Area in Hectare | | Population density | | | | | |
|----|-----------------|-----------------|-------|--------------------|-------|-------|-------|-------|------|
| | | Land | Water | (%) | 2011 | 2001 | 1991 | 1971 | 1961 |
| 1 | Dhapa | 591 | 445 | 75 | 0 | 0 | 0 | 0 | 0 |
| 2 | Chowbaga | 403 | 71 | 17 | 0 | 0 | 0 | 0 | 0 |
| 3 | Bonchtala | 248 | 102 | 41 | 0 | 0 | 0 | 0 | 0 |
| 4 | Dhalenda | 49 | 36 | 72 | 0 | 0 | 0 | 0 | 0 |
| 5 | Paschim chowba | 124 | 25 | 20 | 0 | 0 | 0 | 0 | 0 |
| 6 | Chak kolar khal | 35 | 17 | 48 | 32.3 | 21.03 | 28.1 | 18.14 | 6.98 |
| 7 | Karimpur | 52 | 19 | 37 | 5.98 | 4.13 | 5.39 | 3.18 | 0.83 |
| 8 | Jagatipota | 61 | 24 | 39 | 10.33 | 1.23 | 2.24 | 0.99 | 0.42 |
| 9 | Mukundapur | 68 | 47 | 70 | 6.43 | 13.26 | 2.91 | 1.76 | 0.47 |
| 10 | Atghara | 79 | 38 | 48 | 30.59 | 6.88 | 8.78 | 6.44 | 1.86 |
| 11 | Ranabhutia | 148 | 106 | 71 | 14.93 | 3.61 | 4.68 | 3.68 | 1.18 |
| 12 | Kantipota | 119 | 95 | 79 | 14.16 | 11.61 | 2.66 | 7.12 | 1.87 |
| 13 | Bhaganpur | 568 | 502 | 88 | 5.5 | 3.96 | 5.42 | 3.37 | 0.85 |
| 14 | Kharki | 157 | 132 | 84 | 7.5 | 5.56 | 6.63 | 4.08 | 1.37 |
| 15 | Deara | 264 | 211 | 80 | 12.62 | 6.53 | 10.19 | 10.16 | 2.21 |
| 16 | Kheadaha | 246 | 145 | 59 | 6.33 | 4.97 | 6.14 | 4.26 | 1.23 |
| 17 | Khodhati | 307 | 182 | 59 | 9.27 | 7.23 | 8.89 | 4.59 | 1.74 |
| 18 | Goalpata | 47 | 39 | 82 | 3.43 | 2.19 | 2.84 | 0 | 0.41 |
| 19 | Kumarpukuria | 105 | 7 | 7 | 5.63 | 3.85 | 4.84 | 3.69 | 1.07 |
| 20 | Tardaha | 794 | 171 | 21 | 5.39 | 3.57 | 4.69 | 2.94 | 0.75 |
| 21 | Tihuria | 385 | 57 | 14 | 8.89 | 6.13 | 8.05 | 5.09 | 1.6 |
| 22 | Nayabad | 293 | 180 | 61 | 11.17 | 7.3 | 9.12 | 6.16 | 1.88 |
| 23 | Samukpota | 393 | 28 | 7 | 4.64 | 4.03 | 4.79 | 3.96 | 0.98 |
| 24 | Pratapnagar | 119 | 26 | 22 | 20.61 | 14.82 | 18.14 | 13.34 | 4.12 |
| 25 | Garal | 168 | 4 | 2 | 8.79 | 4.55 | 5.94 | 4.31 | 1.23 |
| 26 | Hatgachha | 298 | 139 | 46 | 0 | 0 | 0 | 0 | 0 |
| 27 | Hadia | 506 | 188 | 37 | 15.24 | 9.71 | 11.92 | 6.21 | 2.22 |
| 28 | Dharmatala paci | 602 | 327 | 54 | 7.73 | 5.44 | 7.09 | 4.48 | 1.24 |

| | | | | | | | | | |
|----|----------------|------|------|-----|-------|-------|-------|-------|------|
| 29 | Kulbaria | 384 | 11 | 2 | 8.2 | 5.55 | 7.94 | 4.61 | 1.04 |
| 30 | Beonta | 1040 | 80 | 7 | 6.43 | 4.11 | 5.27 | 3.66 | 0.1 |
| 31 | Tardaha kapsat | 1715 | 436 | 25 | 0 | 0 | 0 | 0 | 0 |
| 32 | Dhapa manpur | 2031 | 1892 | 169 | 0 | 3.08 | 0 | 2.31 | 0.53 |
| 33 | Kachpukur | 25 | 0 | 0 | 21.94 | 21.99 | 18.47 | 11.33 | 2.99 |
| 34 | Nondanga | 39 | 34 | 87 | 0 | 0 | 0 | 0 | 0 |
| 35 | Thakdari | 15 | 12 | 85 | 0 | 0 | 0 | 0 | 0 |

Available other household amenities

Table no.-16

Household amenities

| Radio | Tele vision | Mobile | By cycle | Byke | Auto | Van | Furniture |
|-------|-------------|--------|----------|------|------|-----|-----------|
| 17 | 32 | 51 | 9 | 5 | 15 | 12 | 18 |

Table no.-17

Rate of electrification

| Users | Non users |
|----------|-----------|
| 50 (77%) | 15 (23%) |

Table no.-18

Type of house

| Kachha | Pacca | Mixed |
|------------|------------|------------|
| 30 (46.2%) | 15 (23.0%) | 20 (30.8%) |

Table no.-19

Number of rooms

| 1 Rooms | 2 Rooms |
|----------|----------|
| 52 (80%) | 13 (20%) |

Conclusion

- Farming vegetable rice and fish around East Kolkata, especially in the East Kolkata Wetlands, benefits poor people in several ways.
- Direct employment for thousands of men and women for catching fish, weeding vegetables and as a casual labour.
- Indirect employment-in supply and distribution networks e.g. seed traders and market vendors.
- Payment is made for work undertaken on farms e.g. weeds clearing or carrying fish to market.
- Supplying affordable and fresh fish and vegetables to markets for urban communities.
- Through managed waste it mitigates the environmental degradation and reduces health risks,
- The overall improvement in environmental quality due to existence of wetland and related farming.

Wetlands control the followings:-

- a) Protect uplands from erosion.
- b) Increase water quality.
- c) Provide setting for recreation and study.
- d) Moderate local climate.
- e) Recharge groundwater.
- f) Produce timber.
- g) Produce various types of fishes.
- h) Produce livestock.

Before 1830 ,the low-lying region with salt-water lakes acting as spill reservoirs for the river Bidyadhari, were utilised for pisciculture of brackish-water fishes such as Bhetki (*Lates calcarifer*), Parse (*Mugil parsia*), Bhangar (*Mugli tade*) and Prawns (*Macro brachium rosenbergii*) etc.

In 2011, a leading fish producer of this region successfully experimented with the process of growing fish in sewage-fed ponds. In this process fishes grow faster by the sewage, such as Rohi (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*) and exotic ones such as Silver Carp (*Hypophthalmichthys molitrix*), Grass Carp (*Ctenopharyngodon idella*) and Common Carp (*Cyprinus carpio*), along with Tilapia (*Tilapia mossambica*), Walking Catfish (*Clarius batrachus*), etc.

During 1969, there was a large scale conversion of sewage-fed fisheries, which was converted into paddy lands. The entire cultivation in this region is done by irrigation with fishery-effluents. The old practice of growing vegetables on garbage continued in a modified manner in the Dhapa area, the garbage farms providing a low-cost technique of solid waste recycling in agriculture.

Wetlands in the urban periphery, in many cases, act as municipal sewage receptacles although there is no floral engineering design for this. The idea here is to develop an appropriate pond system in which peri-urban wetlands that will handle a definite range of sewage application to obtain desirable effluent quality and a good harvest of fish to make the system self-sustaining. Using Wetland, lying mostly derelict, near cities for sanitation and resource recovery does in fact open up a new vista for low-cost sanitation technology where the present state-of-art is critically deficient in providing a viable and dependable alternative.

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