STUDY TO DEVELOP A CO-RELATIONSHIP BETWEEN WATER QUALITY AND LAND USE PATTERN AS INDEX OF RIVERINE WETLAND WITH STATISTICAL APPROACH

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Abstract: This investigation additionally recognizes partner cooperation issue and furthermore to moderate the real issue through subjective and quantitative appraisal of riverine wetland. Considering a floodplain wetland in rustic West Bengal, the concentration was extended to perceive the type of wetland capacities as per the idea of individuals' contribution by group examination. Be that as it may, NDVI was connected to ponder the total weeds condition into the wetland to decide the connection between Water Quality Index (WQI) with Normalized Difference Vegatation Index (NDVI) and its impact on valuation. In ANOVA, which is computed by MINITAB programming, centrality level was lower than 0.05 for each case.

Introduction

A wetland should be considered all around fundamental if it contains an operator, unprecedented, or stand-out instance of a trademark or close general wetland sort found in the appropriate biogeographic locale. Wetlands are generally exceedingly gainful natural frameworks, giving distinctive basic focal points to the earth. These focal points are fundamentally flooding control, groundwater restores and tainting reducing (Bhattacharya et al. 2008) as wetlands go about as maritime filtering systems (Boyer, Polasky 2004). Some are fused inside the area of the Ramsar Convention, including Chilka, Wular, and East Calcutta wetlands, yet there are various wetlands that are not adequately studied or anchored and thus end up being a basic concentration for creators (Biswas et al. 2005). The practical employment headway of wetland bunches requires multidisciplinary and fused undertakings aiming to impediments in the distinctive zones, for instance, agribusiness, normal vegetation uses water resources, and fishing (Kangalawe, Liwenga 2005). In the context of these diverse wetland organizations and limits, various experts have recognized the development of the wetland stock and its organization for the overall population particularly. Haq et al. (2005) focused on soil-less agribusiness as a choice wellspring

of occupation in the central southwestern bit of Bangladesh, where the benefit of the wetland natural framework of perspective of a one of a kind of development is significantly higher than that of Earthbound agrarian and solid to huge water fisheries, an eco-obliging advancement. Anderson et al. (1998) and Adhikari et al. (2004) examined the connection between key family characteristics and normal property resources of a gathering based timberland in Nepal, giving an idea of assessment and progression of the connection between wetland characteristics.

Naturally and socially an interesting part of the floodplain is a wetland. The wetland is made as a result of the cutoff in the wandering course of the development stream. It manages its area by organic (like sanctuary) or sociological (work through fishing or daily business). The wetland is huge for its items and ventures, and the trademark common regard, they provide for neighborhood peoples, and also people living alongside wetland. Accomplices' help is fundamental to the security and defending of wetlands since it expect a basic part fiscally and furthermore normally in the wetland structure (Biswas et al. 2010). In the Gangetic floodplain of West Bengal, wetlands are used for various purposes and have an essential part in the businesses of the nearby people. The wetland is helping the area to redesign their condition from joblessness through work, participation and propelled a change in the achievable use of wetlands, emphasizing the financial upliftment for the picked floodplain district (Biswas Roy et al. 2016). Some paper, moreover attempts to evaluate the budgetary valuation of floodplain wetland. The focus is contacted see the status of different villages with respect to their financial structure through gathering, examination and to overhaul the amount of the working people required in different occupations to such an extent that the per capita monetary value of each village is expanded (Biwas Roy et al. 2012). On account of the course of time, the example of wetland bunch instruction moved from the coherent security of wetlands to customary strategies for protection through applying neighbourhood data and development (Biwas Roy et al. 2015). Wetland like Chupi Char is famous for the bird sanctuary in Gangetic Belt. Literature also found to evaluate the components of this wetland from various engineered crippling (Biswas Roy et al. 2016).

Fresh water is not only important for human beings but also for another animal. The surface water body acts as an important source of human activity and also for their living. So it is essential to understand the quality of water through WQI method. Regular WQI monitoring can help for understanding water quality for suitable used by water, including ecosystem health, use of irrigation and domestics' purpose. It is expressed in a single number with the help of Physio- chemical parameters of water and indicates the actual condition of the water. It can be divided into four categories. Many researchers have already used this method for assessment of WQI in different water bodies like the river, lake, wetland and pond (Jena et al. 2013). Various water testing parameters have been used to determine WQI in different lakes in Sigmoga town in Karnataka (Yogendra, Puttaiah 2008). In the case of Dokanlake, Iraq, a long time survey shows water quality gradually decline time to time (Md et al. 2010) and the Godabori river also show medium water quality which is suitable for irrigation, but result indicates the presence of heavy metals due to industrial wash out. WQI in different lakes in Nagpur city is intended that it varies from seasons to seasons. Rainy season shows better water quality than summer and winter. Water quality during summer is very poor and comparatively better in winter (Puri et al. 2011). The same condition is also found in the case of the Bhagirathi river of Uttrakhand (Pathak et al. 2015) also applicable for Rudrasagarlake of Tripura. Proper management should provide better water quality in this lake (Pal et al. 2016). WQI become a good indicator of the asses pollution load of the RudraSagar Lake, Tripura (Pal et al. 2015). The present investigation manages how human status is identified with the wetland economy, thinking about its various capacities and properties, and might be of extraordinary incentive to mainstream researchers, giving a system to bunching the occupations of partners through a participatory approach, especially in rustic India. In the perspective of wetland protection, this examination underscores the utilization of financial valuation as a motivation. Predominantly in this investigation, we found a wetland in the Gangetic hopeless delta of floodplain region. Already, this wetland is significantly more beneficial and individuals to a great extent rely upon it. In any case, after some period this wetland winds up

corrupted state of the development of weeds. Be that as it may, the neighborhood tenants still currently attempting to pull through this wetland for their help. The general goal is to break down the debased state of wetland and the issue of weeds which impeded the creation of the fishery and furthermore examine the financial state of dependants and endeavor to discover their connection. The paper likewise attempts to take some correct motivations which may exclusively be created in a coordinated participatory approach once the qualities got from these wetland capacities or occupation acknowledgment and put some eco-accommodating answer for discuss the issue.

Study Area

In the present investigation, AmdaBeel (23°10.552' N and 88°30.871' E) is a natural perennial wetland, located within the Ranaghat – I Block under two panchayet of Habibpur and NawparaMushunda. The total area of the wetland is 85.3870 ha and 64.83 ha is water area of AmdaBeel. The average length and width of the wetland is 2 km and 0.25 km (Fig. 1). The maximum depth of the wetland is 6.7–7 m (at the time of monsoon) and minimum depth is 4.6 m(during summer). This is a non-perennial wetland, which nearly dries up during the months of April, May, and June. The main wetland plants are algae, water hyacinth, and water lily. The water is used for pisciculture, domestic and agricultural purposes. Fishing is rehearsed on a business premise utilizing advanced angling actualizes. Believed that this wetland is one of the abandoned channels of river Bhagirathi. Habibpur, Aramdanga, Chandoura, DaskhinBishnupur, Beleanti, Lebutala, Musunda are the villages which surrounded the wetland. This water body
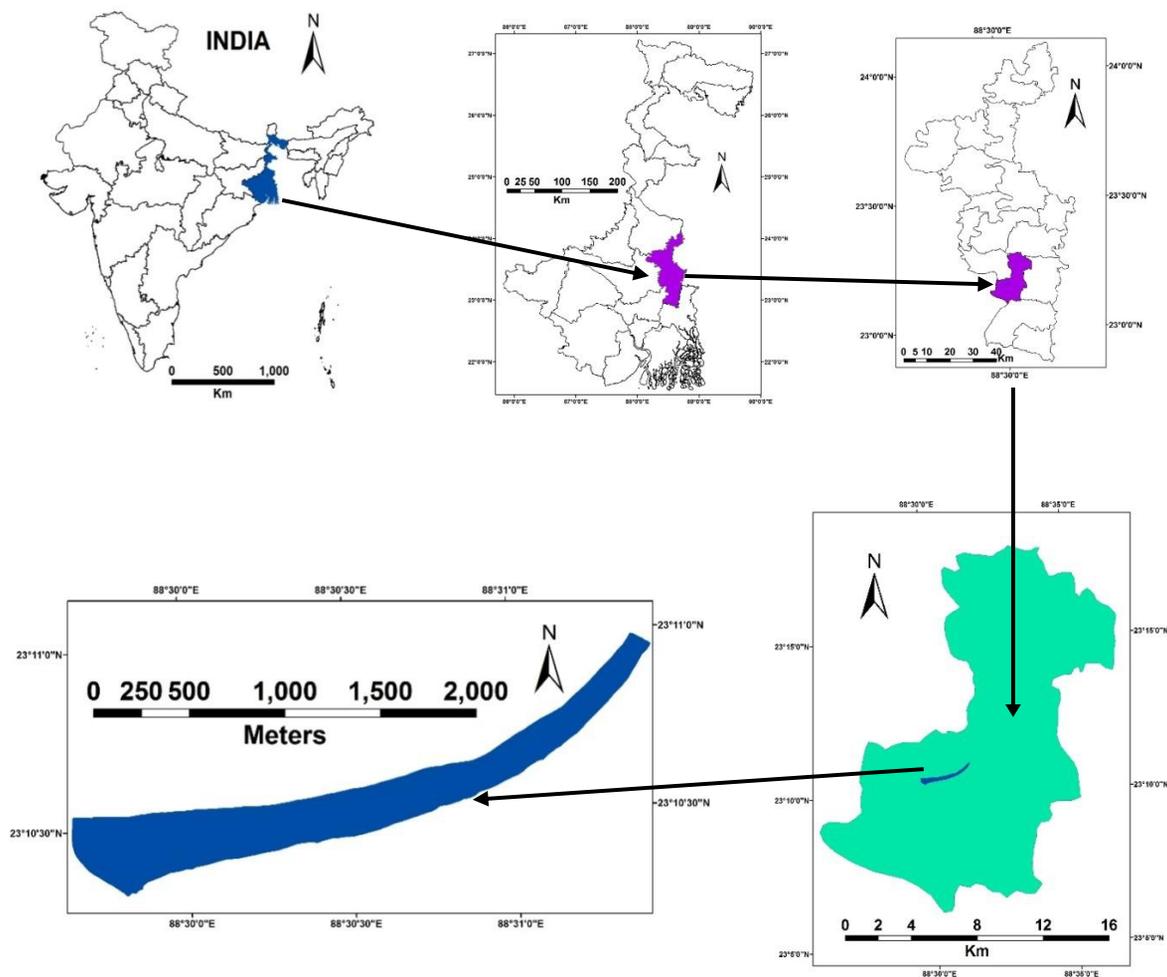

Fig. 1. Location map of AmdaBeel.

is under Govt. Ownership and managed by the DaskhinBishnupur Fishermen's Co-operative Society Ltd. It is fed by canal water flowing from an adjacent upland when there is a flood, water from the Ganges overflow in this wetland. The water of the wetland is mainly used for pisiculture, irrigation, and domestics purpose. Fishing is practiced on a commercial basis through the DaskhinBishnupur Fishermen's Co-operative Society Ltd. At present more than 495 (one member from Govt. 4 female members and the rest of them are male, 493 members belong to the category of Hindu s.c and 1 is belonging to Muslim) members are under the society.

Methodology

Three sampling locations such as bathing ghat, retting of jute and the place of beel where full of weeds have been considered for sample collection to three seasons of pre-monsoon, monsoon and post-monsoon during the period of 2015–16 assess the average water quality of Amda wetland. The PTFE (polytetrafluoroethylene) bottles are used for collection of the sample and labelled them accordingly. Water samples are analysed, including pH, TDS (total dissolved solids), BOD (biochemical oxygen demand), DO (dissolved oxygen), total hardness, calcium, magnesium, electrical conductivity (EC), total alkalinity. Four parameters, particularly pH, DO, turbidity, EC is measured in the field with the specific probe make of HATCH and other parameters are tested in the laboratory of School of Water Resources Engineering, Jadavpur University prescribed by APHA guideline. Testing results are considered for calculation of water quality index with two different methods to assess health conditions of Amda wetland with respect to the purposes.

In this survey, LANDSAT images are used. Earth observation data from Landsat image was looked over 2009–2013. For consistently (Except 2010) change area and NDVI were delivered from Landsat pictures. These images were subjected to the coordinated gathering of five classes consistently since 2009 in the portrayed between time for subsequent years. The classes were isolated as the water body, wetland vegetation, and other vegetation and unclassified. Change recognizable proof ends up finished by means of

subtracting one masterminded picture of one a greater amount of the of coming about the time stamp years. From LANDSAT picture, we made NDVI and exchange territory insights to enable us to choose vegetation quality, the status of the land and water surface inside wetlands and whole water body. Since satellite pictures gather wonder information as automated number qualities (DN), the sparkle winds up altered over into hesitance to enable us to choose the land cover unearthly stamp properties.

The primary field survey is also generated for collecting of socioeconomic data and water samples for water quality beside the villages of AmdaBeel. ANOVA (Analysis of variance one way) is used through the MINITAB software to study the dependency ratio over the socio economic condition in this area.

Result and discussion

Water Quality Index

Water Quality Index (WQI) of the present wetland is built up from different Physiochemical parameters in various seasons. Water Quality Index of the present examination for AmdaBeel was figured from vital different physiochemical parameters with a specific end goal to assess the appropriateness of water for different purposes. The figured WQI gives a simple method for understanding the general water quality and water administration. WQI has been ascertained through two water quality file, in particular the Canadian Council of Ministers of the Environment (CCME) water quality rule and Weighted number-crunching water quality record method (Horton, 1965). In this investigation, the WQI has been ascertained by utilizing the gauges of drinking water quality prescribed by CPCB.

CCME Method

The water quality for the Amdabeel has been assessed with the CCME Method.Total nine physicochemical parameters of Amdabeel for calculation of Water Quality Index (WQI) and for the seasons pre-monsoon,monsoon and post- monsoon are presented in Table 1 and 2. The WQI of the Amdabeel is established from

Table 1. Category of Water Quality.

WQI (CCME Method)	Description	WQI (Weighted Arithmetic method)	Description
95–100	Excellent	0–25	Excellent
80–94	Good	26–50	Good
65–79	Fair	51–75	Bad
45–64	Marginal	76–100	Very Bad
0–44	Poor	>100	Unfit.

Table 2. Determination of WQI using CCME method.

Seasons	pH	Turbidity	TDS	Nitrate	Sulphate	TH	TC	DO	BOD
	[−]	[mg dm⁻³]							
Pre-monsoon	8.73	79.7	108.67	0.6	2.67	86.67	133	3.93	2.30
Monsoon	7.50	63.3	99.50	0.4	2.01	80.34	120	2.98	1.89
Post-monsoon	8.15	74.8	104.67	0.5	2.45	83.23	128	3.11	2.05
Objectives	6.5–8.5	1	500	50	200	300	<2	4	3
	F1 = (2 / 9) × 100 = 22.22				F2 = (6 / 27) × 100 = 22.22				
	F3 = (nse / .01nse + 0.01) = 93.71				$WQI = 100 - \dfrac{\sqrt{F1^2 + F2^2 + F3^2}}{1.732} = 42.93$				

This value (42.93) falls within 0–44 of the classification of water quality based on CCME and WQI method as given in Table 1. This result indicates water quality is poor in AmdaBeel.

important various physicochemical parameters, namely: pH, turbidity, TDS, NO_3^- (nitrate), SO_4^- (sulphate), total hardness (TH), total coliform (TC), DO and BOD in different season (pre-monsoon, monsoon and post- monsoon).

Weighted arithmetic method

The weighted average is used for the determination of WQI of the water body. Further water quality sub index is calculated based on number reflecting the relative value in the polluted water, observed value and standard permissible value of the defined parameter. Next unit weight is estimated by a value inversely proportional to the recommended standard value of the corresponding parameter. The overall WQI is calculated by aggregating the quality rating with the unit weight with a proportionality constant.

$$WQI = 100 - \frac{\sqrt{F1^2 + F2^2 + F3^2}}{1.732}$$

Factors of CCME WQI:
– F1 (Scope): F1=(Number of failed variables/ Total number of variables)*100,
– F2 (Frequency): F2= (Number of failed tests/ Total number of tests)*100,

– F3 (Amplitude): It is calculated using the following relation F3=(nse/.01nse+0.01) where nse =/*number of test* objective.

In Weighted Arithmetic method

The calculation of the WQI used weighted arithmetic water quality index, which was originally proposed by (Horton 1965) and developed by (Brown et al. 1972). The weighted arithmetic water quality index (WQIA) is in the following equation:

$$WQIA = \sum QiWi\sum / \sum Wi.$$

The quality rating scale (Qi) for each parameter is calculated by using this expression:

$$Qi = 100\left[(Vi - \frac{Vo}{Si} - Vo)\right],$$

where:
– *Vi* is estimated concentration of its parameter in the analysed water,
– *Vo* is the ideal value of this parameter in pure water,
– *Vo* = 0 (except pH = 7.0 and DO = 14.6 mg dm⁻³),
– *Si* is recommended standard value of its parameter.

Table 3. Determination of WQI using weighted arithmetic method.

Parameter	Observed Value (Vi)	Standard Value (Si)	Unit Weights (Wi)	Quality Rating (Qi)	Wi × Qi
pH	8.73	6.5–8.5	0.160	115	18.400
TDS	108.67	500 mg/L	0.003	21.7	0.065
TH	86.67	300 mg/L	0.004	29	0.116
DO	3.93	6 mg/L	0.220	124	27.280
BOD	2.30	2 mg/L	0.660	115	75.900

WQI = ∑QiWi∑ / ∑Wi; WQI = 115.96.

The unit weight (WI) for each water quality parameter is calculated by using the following formula:

$$Wi = \frac{K}{Si}$$

where:
K = proportionality constant and can also be calculated by using the following equation:

$$K = \frac{1}{\sum(1 / Si)}.$$

This value (115.96) falls within >100 of the classification of water quality based on weighted arithmetic WQI method as given in Table 1. Proper water treatment with disinfection may be an alternative water source for the area where groundwater is contaminated with arsenic, iron and other metals. However, this WQI result reflected that it can be used for irrigation as well as other domestic purpose with short term measures. A long term measures with proper management may provide better water quality of the beel.

Environmental Problem

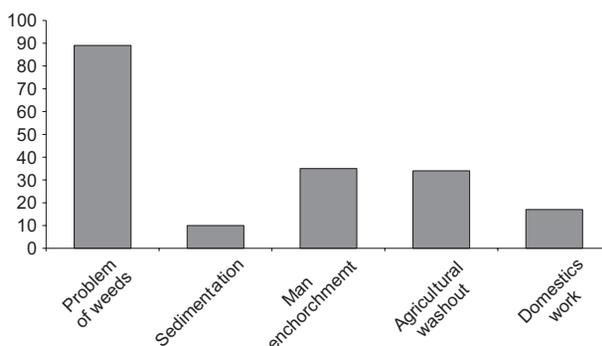Wetlands provide an abundance of valuable function and services including biogeochemical

Fig. 2. The chart shows the main problem of beel water from peoples view.

hydrological and commercial production. The estimation of a wetland lies in the advantages that it gives to the earth or to individuals, something that is not effortlessly measured. The main occupation of the residents beside this area is fishing. But the environmental condition shows that problem of weeds increases day by day. The chart also shows the main problem related to this wetland for perception analysis (Fig. 2).

Normalized Difference Vegetation Index (NDVI)

The ideal number of inspecting stations in three distinct seasons is out to analyse the required water quality parameters with the additionally financial review is completed to a built-up land use pattern to be a piece of a few pointers identified with issues of ecological debasement.

NDVI and WQI are assessed utilizing standard programming and built up the equation. The examination comes about showing that NDVI with WQI has been given a decent consent to look at the issue of natural corruption on the financial state of partners. These discoveries additionally demonstrate that pisciculture action has the lead part to elevate the financial condition with the assistance of analysis of variance (ANOVA) ascertained by MINITAB programming. To investigate the weed issue NDVI is utilized. The NDVI esteem extends from 0–1 and which is isolated into 4 classes. Among which the reasonable water is separated by the volume of 0.0, the respectably turbid (having the convergence of oceanic vegetation) the water is outlined by the volume of -0.36 and as its tending towards 1 the vegetative substance is getting higher. In Images, healthy value proves near least vegetation and the other way around in a lower esteem (Fig. 3).

From the images of 2009, it demonstrated that in the cenral part of the beel, found a tremendous centralization of weeds. But in the year 2011
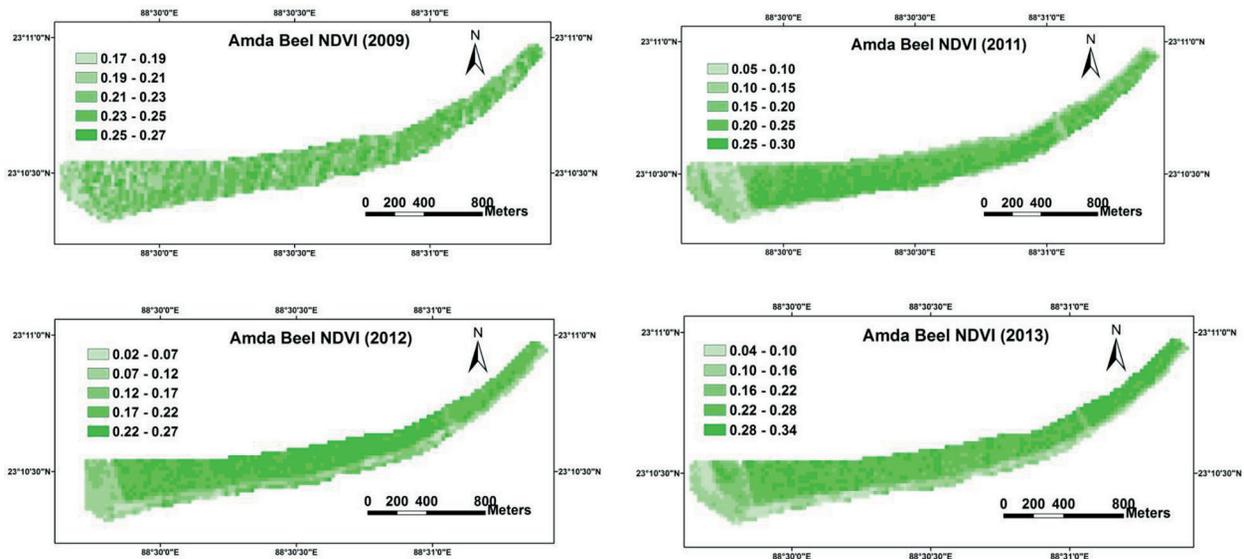
Fig. 3. NDVI maps and its temporal changes in vegetation from 2009–2013.

extensive measure of siltation and weed fixation discovered everywhere throughout the 80% of the bill. After the digging (source: individuals' discernment), in the year 2011, the bigger weed fixation found in the northern part. But the occupants other than the beel endeavour to exhume it for their work. In the present day, the weed fixation essentially found in the northern part (the year 2013) which gagged the canalized stream of river churn. But in the centre, weed focus is substantially higher (Table 1).

Aquatic weeds routinely decrease the ampleness of water bodies for the fish generation. Weeds can adopt colossal measures of the supplements from the water, diminishing their availability for planktonic green development. They may in like manner achieve a diminishment in oxygen levels and present vaporous exchange with water, realizing a disagreeable fish's age. The best weed progression may likewise give ensuring the spread with water to little fish change. It would moreover intrude with fish gathering. Albeit extreme weed, the blast may likewise offer protecting spread with water for less fish development. It could likewise mediate with angle collecting. Inside the connection between the consequence of WQI of the beel and plants develops are in an absolutely positive. WQI demonstrates the water, wellbeing condition is exceptionally horrendous. Amid rainstorm, agrarian washes out of the encompassing beel district mixing into beel water. Because of this vegetation in front of the beel district developing each day.

Socioeconomic criteria: for livelihood

AmdaBeel is most extreme utilized by fishermen for pisciculture through The Dakshin Bishnupur Fishermen's Co-agent Society Ltd. A nearby overview shows that in excess of 200 fishing families are relying upon it for their business. Along these lines, AmdaBeel assumes an essential part in pisciculture. As indicated by respondent, some creating advances have been taken by Govt. FFDA has been endorsed Rs.25 crore for the creating reasons for the beel for the benefit of neighbourhood individuals with respect to pisciculture like making a house for the general public, a network corridor. The general public utilized it to tackle the issue of siltation through digging. As the positive outcome is in the season of summer least level of water is the accessibility and negative aftereffect of its creation of random (rani fish) fish is diminished. AmdaBeel likewise assumes an imperative part to bathe and

Table 4. The variation in vegetation amount and beel area, after calculating pixel value.

Year	Wetland area	Water body amount	Vegetation amount
		[ha]	
2009	85.4	51.3	34.1
2011	85.4	37.8	47.6
2012	85.4	40.2	45.2
2013	85.4	51.4	34.0

washing purposes. Individuals who live close to the wetland zone, they utilize it. There is no Stair for showering and washing purposes and it is a noteworthy issue of neighbourhood individuals. It is additionally utilized for an irrigational reason. The cultivated land close to AmdaBeel is utilized for the irrigation. Paddy and some occasional products are developed here. The water of the wetland is utilized by neighbourhood individuals for their cooking reason moreover. As indicated by them, this water is free from the iron and appropriate for cooking. It is additionally utilized for the purpose of recreation, especially for picnic purpose. Another circuitous capacity of wetland is impacting the micro climate of the neighbourhood.

At present more than 495 (one member from Govt. 4 female members and the rest of them are male, 493 members belong to the category of Hindu s.c and 1 is belonging to Muslim) members are under the society. More than 200 fisherman families are depending on it for their livelihood.

Subsequent to finishing the family unit study of current 100 families, it is demonstrating the present status of the livelihood condition of the study area. Basically, colossal sum, respondents

falls under the classification of underneath class 4 in education criteria. The majority of the general population picks pisciculture or fisheries for their work. Mostly the income extends lying in direct section (2000–4000). Education overviews demonstrated that, the majority of the general population in the unskilled condition.

So, it is proved that whether below in literacy and educational level and availability of a nearby water body, they choose fisheries as their job from inheritance. The wild type of fish species comes into wetland during a flood (during the monsoon). Those fishes are sold in local markets. Twice in a year major catching practiced has been done here and sold in local markets of Ranaghat. The society buys fishes through the tender drop. Different type of Govt. Help is sponsored here for further development of the wetland as well as the purpose pisciculture. FFDA has been sanctioned Rs.25 crore for the developing purpose of the beel for the advantage of local people regarding pisiculture like making a house for the society, a community hall.The society used it to solve the problem of siltation by dredging.

Maximum fish was produced in the year of 2012–13 that was 29,413 kg. Average fish
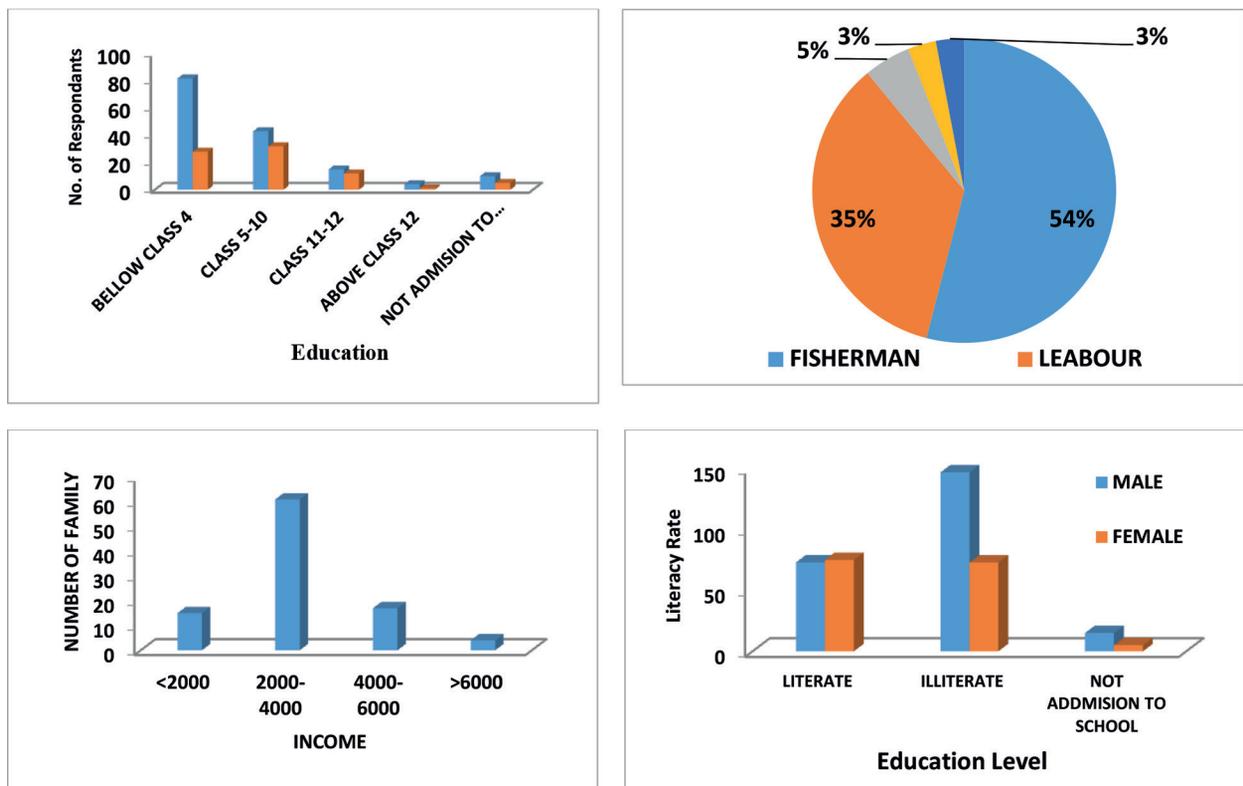

Fig. 4. Male and female wise educational, income, occupational status of the study area.
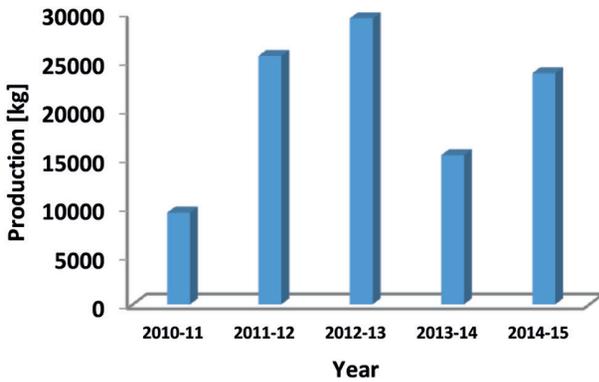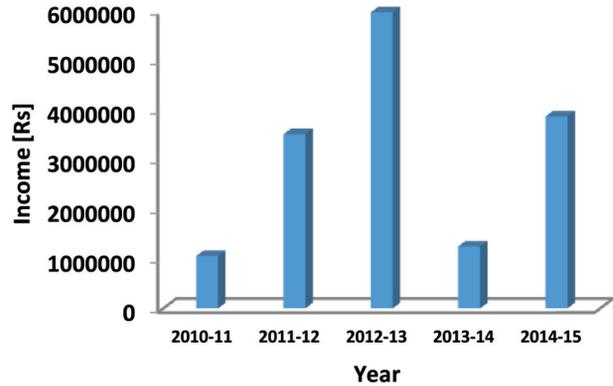
Fig. 5. Year wise fish production of the beel.

Fig. 6. Year wise selling price of fish of the beel.

production of the Beel is the 19,600 kg a^{-1}. A year like 2013–14, fish production were less than average and the rest of the year represents more production of fish than average production. According to local people, the major causes of decreasing fish production are the problem of the flood, contamination of water and another major cause is dredging of the wetland (Rani fish). Maximum sale amount of Indian major carp (IMC) has been found in the year of 2012–2013 with Rs 20,000,105 and 2003–2004 was the year the sale amount is minimum with Rs 2,000,678. The average sale amount of fish is Rs 12,000,500. A maximum number of miscellaneous fishes sale here over the year. The value of income and production plotted in one way ANOVA in MINITAB software formation (Fig. 5).

So, one of the main discussion parts of the study is a dependency variance on the production of fish and income from selling it out. In this situation, ANOVA one way change is used. The restricted investigation of change ANOVA is utilized to figure out if there are any noteworthy contrasts between the method for at

least two autonomous (irrelevant) bunches. This guide will give a brief prologue to the restricted ANOVA, including the suppositions of the test and when you ought to utilize this test. The restricted ANOVA thinks about the methods between the gatherings you are keen on and figures out if any of those methods are altogether not quite the same as each other. In particular, it tests the invalid theory:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \ldots = \mu_k$$

where μ = group mean and k = number of groups.

Assuming, notwithstanding, the restricted ANOVA gives back a noteworthy result, which acknowledges the option theory (HA), and is

Table 5. The year range wise income and production.

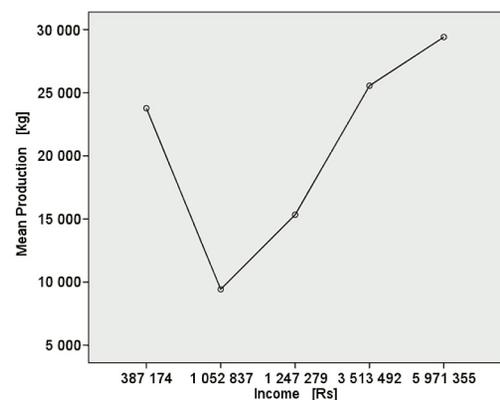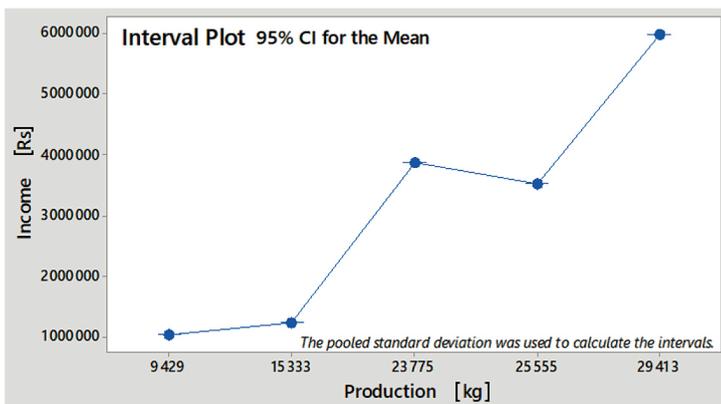| Year	Production [kg]	Income [Rs]
2010–11	9429	1052837
2011–12	25555	3513492
2012–13	29413	5971355
2013–14	15333	1247279
2014–15	23775	3871711

Fig. 7. Charts show the relation between income and production year wise.

that there is no less than 2 gather implies that are fundamentally not quite the same as each other. Now, understand that the restricted ANOVA is an omnibus test, measurement and can't let you know which particular gatherings were essentially not quite the same as each other just that no less than two gatherings were.

In this way, the after effect of ANOVA demonstrates that the registered estimation of *F* is 2.732 is significantly higher than the basic estimations of *F* at 0.05 level of centrality, which is 0.197 (Fig. 7). Hence, it ought to be taken as very huge. Thusly, the hypothesis is rejected. This esteem demonstrated that the proportion of the difference is factually immaterial. As it is a microscale examine, the connection shifted around there based on subordinate variable generation. As the generation builds the wage of respondents additionally as well. Therefore, it is discovered that the aggregate financial structure to rely upon the fishery type of production around there.

Conclusions

The time and technique for herbicide application move with the sort of weed verdure and the living space in which the weeds are to be controlled. Control of amphibian weeds by herbicides is by and large less asking for, brilliant and all things considered, more reasonable when showed up diversely in connection to mechanical frameworks. A herbicide ought to have certain judgments for its utilization in various sorts of sea conditions. It ought to have a high level of Phyto toxicity to execute weeds quick.

There are various maritime conditions where herbicides can be of help with controlling land and water, proficient weeds without cooperating with water. Alternate regions where herbicides can be reasonably used or where mechanical and other control measures are not to a great degree intense or handy (Aktaret et.al. 2009, Shivhare, Bhadoriya 2012). Most herbicides are associated with high volume showers by hand. Tractor and watercraft mounted sprayers are in like manner used depending on the zone and weed species to be controlled. By virtue of channels and drainage structures, the tractor-drawn sprayer can be used for sprinkling herbicides (ICID Report 2002, Timmons 2005).

The utilization of beel is emphatically identified with fisheries. Every one of the respondents are relying upon it for their employment. Their financial status is thoroughly pivoting around this beel.

Production of fish from this beel is identified with individuals' development of the region. So the wage, education, working criteria of the tenants change with creation.

The requirement for scientific information is exceptionally fundamental for the development of production here. So proficiency rate must be expanded and individuals should mindful of the brain drain from the zone.

The reliance and monetary efficiency of the contemplated wetland are observed to be associated with the occupation, sexual orientation, and spatial change of the neighbourhood populace in small scale as seen through quantitative and subjective investigation. There is a similar example of the instructive structure of the male and female populaces, where all the populace relies upon fisheries.

Aknowledgements

Author contribution

Dr. Malabika Biswas Roy is the Principal Investigator (PI) of this project. She examined the data of paper thoroughly and minutely. Mr. Abhishek Kumar prepared the water quality index and NDVI map of the study area. Mr. Arnab Ghosh develop the statistical examination of field data and prepare ANOVA to compare the different variable. Dr. Pankaj Kumar Roy guide us with his valuable suggestions and overall check the paper properly.

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