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STUDY ON WATER AND SOIL QUALITY PARAMETERS OF GHER AND DYKE IN BUFFER ZONE OF SUNDARBANS UNDER SHYAMNAGAR THANA, SHATKHIRA

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Bachelor of Science Degree

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Study on Water and Soil Quality parameters of Gher and Dyke In Buffer Zones of The Sundarbans Shyamnagar thana, Shatkhira

This thesis (Course No: FWT-4114) has been prepared and submitted to the Forestry and Wood Technology Discipline, of the partial fulfillment of Bachelor of Science in forestry in Khulna University, Khulna.

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জাহির হোসেন
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....
Md. Jahir Hossain

Dedicated to

My

Beloved Parents

Abstract

Satkhira is situated in the southwest region in Bangladesh having a significant portion of Sundarbans. Sea salt is accumulating here and agricultural crop and plant are not seen regularly in the study area rather ghers and shrimp cultivation. The area of 10 km from the Sundarbans is the buffer zone often inundated by tidal water with high salinity. Due to saline water intrusion salt is accumulated there. The average salinity of three regions is 6.73 ppt in water and 6.19 ppt in soil. In case of both soil and water ORP value is higher in Gabura. Amount of carbon percentage is higher (2.743%) in Iswaripur. In water of Gabura it has low salinity 6.725 and has low Na Concentration 1.69 g/l. In Shatkhira there is no plantation in dyke. If any salt tolerance plant species or small sized trees or shrubs may introduce in that area it will bring benefit to the local people. Water and Soil quality (ORP, Carbon, N, P, K and Na) of Gher and dyke were tested from three administrative areas (Union) namely Gabura, Padma Pukur and Iswaripur.

Keywords: Water quality, Soil Quality, Gher, Dyke, Buffer Zone, Sundarbans

DECLARATION

I hereby declare that the project thesis is based on my original work except for quotation and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Khulna University or other institutions.

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APPROVAL

The style and format of the project thesis submitted to the Forestry and Wood Technology Discipline, Khulna University, Khulna, Bangladesh, in partial fulfillment of the requirements for the 4-years professional B.Sc. (Hons.) degree in Forestry has been approved.

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List of abbreviation

N	Nitrogen
P	Phosphorus
K	Potassium
Na	Sodium
ORP	Oxidation Reduction Potential
TDS	Total dissolve Solids
EC	Electric Conductivity
Gher	Fish Farm
UV	Ultra violet
mV	Millivolt
ppt	Parts per thousand

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Chapter 1

Introduction

Introduction

Bangladesh lies on the coastal zone and the shape of the Bay of Bengal is funnel shaped in the southern part. It is highly vulnerable to natural calamities due to its position. Tidal effect has a great impact on this part. Sea salt accumulates here at a higher level. Most of the years it faces with the storm. Due to salty environment the area has low plant cover and vegetables. Most of the people depend on the gher (fish farm) basically tiger prawn. Dyke of the fish farm has no plan due to its small size and salt.

Land use change is known to influence the biochemistry of watersheds (Deocampo, 2004; Tardy et al., 2004; Grimm et al., 2003). The coastal and offshore area of Bangladesh includes tidal, estuaries and river floodplains in the south along the Bay of Bengal. Agricultural land use in these areas is very poor, which is roughly 50% of the country's average (Petersen & Shireen, 2001). Salinity causes unfavorable environment and hydrological situation that restrict normal crop production throughout the year. The freshly deposited alluviums from upstream in the coastal areas of Bangladesh become saline as it comes in contact with the sea water and continues to be inundated during high tides and ingress of sea water through creeks (Haque, 2006). The impact of salinity on crop production as well as aquatic environment is well documented (Karim et al. 1990, Uddin, 2005). Bangladesh coastal region is affected by different degree of salinity (Karim et al.1990). Salinity effect is not same in all area (Sayma et al., 2012).

This status report focuses on the available nutrients and some other properties in the shyamnagar southern part of Bangladesh. The study target is to determine the soil water quality with the salinity.

For measuring the soil quality I measured N, P, K and Na as nutrients and for some other properties pH, salinity, and ORP and carbon percentage. For measuring the water quality I measured N, P, K and Na as nutrients and for some other properties pH, salinity, ORP, TDS and EC. Here two most important factor pH and salinity has a great impact on soil and water quality. And other properties affect this factor.

1.1 The Objectives of the Study is

- ✓ To explore the soil quality of dyke and
- ✓ To explore the water quality of Gher

Chapter 2

Literature Review

Literature Review

2.1 Study Area

Bangladesh is basically an agricultural country. A majority of rural population nearly 85% of them are dependent on agriculture for their employment and income (BBS, 2002). Shymnagar upozila have 1968.23 sq. km. of total area. Among them 1534.88 sq. km. is under reserve forest and riverine area. There are 72,279 households and 318254 of population and the population density 162 per sq. km (District statistics 2011). Sanitation 44.84% (rural 43.10% and urban 80.71%) of dwelling households of the upazila use sanitary latrines and 47.47% (rural 42.35% and urban 2.36%) of dwelling households use non-sanitary latrines; 7.69% of households do not have latrine facilities. Shyamnagar has an average literacy rate of 28.2% (7+ years), and the national average of 32.4% literate.

2.2 Gher farming system

There are two prawn farming systems in Bangladesh: pond and gher. Approximately 71% of farmers are involved in gher systems and the remainder in pond systems (Muir, 2003a). The introduction of cropping on the dyke of shrimp farm has been an important innovation by Practical Action, although it was practiced a while back. However, dyke cropping was neither very common, nor systematic. Practical Action, Bangladesh, under its Climate Change Programme in the South Western Coastal District Satkhira demonstrated some livelihoods technologies including Dyke Cropping following an improved method (Alauddin, 2014). Vegetable cultivation on pond/gher banks is part of integrated cultivation which ensures maximum utilization of land and at the same time help maintains environmental balance as well as be economically profitable since multiple crops are produced from a single piece of land. For example, paddy fish/prawn and poultry, paddy-fish and vegetables, fish and livestock etc. Integrated agricultural management may be new to Bangladesh but in many countries it has been historically practiced for many years. It is important to make integrated agricultural management popular in rural Bangladesh (Islam. et al 2011)

2.3 Soil and water quality

The Optimum fish production is totally dependent on the physical, chemical and biological qualities of water to most of the extent. Water quality is determined by variables like temperature, transparency, turbidity, water color, carbon dioxide, pH, alkalinity, hardness, unionized ammonia, nitrite, nitrate, primary productivity, BOD, plankton population etc.

(Anita 2013). Water quality is determined by various physico-chemical and biological factors, as they may directly or indirectly affect its quality and consequently its suitability for the distribution and production of fish and other aquatic animals (Boyd, 1979).

2.3.1 Salinity

Salinity is a measure of the total salt concentration, comprising mostly of Na+ and Cl- ions as well as small quantities of other ions (eg Mg_2 $^{+}$, K^{+}, or SO_4 $^{2+}$). It is the total of all non-carbonate salts dissolved in water, was expressed in parts per thousand (1ppt = 1000mg/L or 1g/L) but is now generally expressed in parts per million (ppm) (Chapman et al 1992, Johnson et al. 1999).

2.3.2 pH

pH is the negative logarithmic measure of hydrogen ion concentration in any substrate. The pH value ranges between 0-14. pH is measured mathematically by, the negative logarithm of hydrogen ions concentration. The pH of natural waters is greatly influenced by the concentration of carbon dioxide which is an acidic gas (Boyd, 1979).

2.3.3 ORP

ORP stands for oxidation-reduction potential, which is a measure, in millivolts, of the tendency of a chemical substance to oxidize or reduce another chemical substance. Evaluated the effect of multiple ORP conditions on the rate of chemical oxygen demand (COD) reduction by heterotrophic bacteria (Chen et al. 2001). ORP systems may favor the growth of certain species of microorganisms over others, and may cause the bacteria to alter their metabolic pathways in response to changes in the physical environment (Tempest et al.,1984).

2.3.4 Soil Carbon

Rapid climatic changes may thus alter soils from sinks to sources for atmospheric carbon (Davidson & Janssens 2006). The large carbon storage capacity of soils suggests a potential function for soils to dampen increasing atmospheric CO2 concentrations. To date, however, the mechanisms that regulate soil carbon sequestration remain unclear, and extrapolation from shortterm empirical studies to long-term projections of worldwide carbon balances remains uncertain (Rustad 2006).

2.3.5 Water TDS and EC

Salt concentrations and total dissolved salts (TDS) can be expressed on a weight basis or a volume basis (Blaine Hanson, 2006). Plants respond to the total dissolved solids (TDS) in the soil water that surrounds the roots. The soil water TDS is influenced by irrigation practices, native salt in the soil, and by the TDS in the irrigation water. Assessing the salinity hazard of water on soil solution requires estimating the TDS. Since direct measurements of salt are not practical, a common way to estimate TDS is to measure the electrical conductivity (EC) of the water. Different chemical, physical, and biological properties of a soil interact in complex ways that determine its potential fitness or capacity to produce healthy and nutritious crops. The integration of these properties and resulting level of productivity often is referred to as "soil quality." Soil quality can be defined as an inherent attribute of a soil that is inferred from its specific characteristics and observations (e.g., compact ability, erodibility, and fertility) (Parr et al 2009). Total Dissolved Solids, many important components of healthy aquatic ecosystems are in the form of dissolved solids. Nutrients such as nitrates and phosphates, and dissolved salts such as sodium chloride, contribute to total dissolves solids.

2.3.6 Available Nutrient

The environmental losses of many agricultural pollutants are proportional to their loading to the soil system; e.g., the loss of phosphorus (P) in runoff is related to the loading/ concentration in the soil surface and the loss of nitrate in leachate to groundwater is related to the N loading to the soil (NRC, 1993; Baker and Laflen, 1983; Hallberg, 1987; Sharpley et al., 1993).

Nitrate: is an essential nutrient for aquatic plants and animals and is the form in which plants utilize nitrogen, therefore can have a great influence on the amount of plant growth in water.

Phosphates: phosphorus is an essential nutrient for aquatic plants and animals. Excess phosphorus in water can be harmful by stimulating plant and algal growth. Sewage, detergent use and fertilizer runoff are common sources (Chapman et al 1992, Johnson et al. 1999).

2.4 Buffer zone

In mangrove forest buffer area indicates the zone between the mangrove forest and other areas. A buffer zone is an area lying between two or more others and serving to reduce the possibility of damaging interactions between them (Cunningham, 1996). A buffer zone serves to provide an additional layer of protection to a World Heritage property. The concept of a buffer zone was first included in the Operational Guidelines for the implementation of the World Heritage Convention in 1977. In the most current version of the Operational Guidelines of 2005 the inclusion of a buffer zone into a nomination of a site to the World Heritage List is strongly recommended but not mandatory (World Heritage Convention,2010). Buffer zones have a separate ecosystem. And it is different from the other two zones.

Chapter 3

Materials and Methods

3. Materials and Methods

The greater part of Bangladesh lies within the delta of the combined Ganges-Brahmaputra-Meghna River System, and is endowed with fertile soils capable of sustained high yields. On the basis of their geological origin and properties the soils of Bangladesh have been broadly classified into seven tracts. Soils of each tract have some common characteristic properties different from those of other tracts.

3.1 MAP

The circles in map indicate the sample plot from where the sample was collected. The communication system is very low that is the transportation media is motorbike. Even this also is not found.

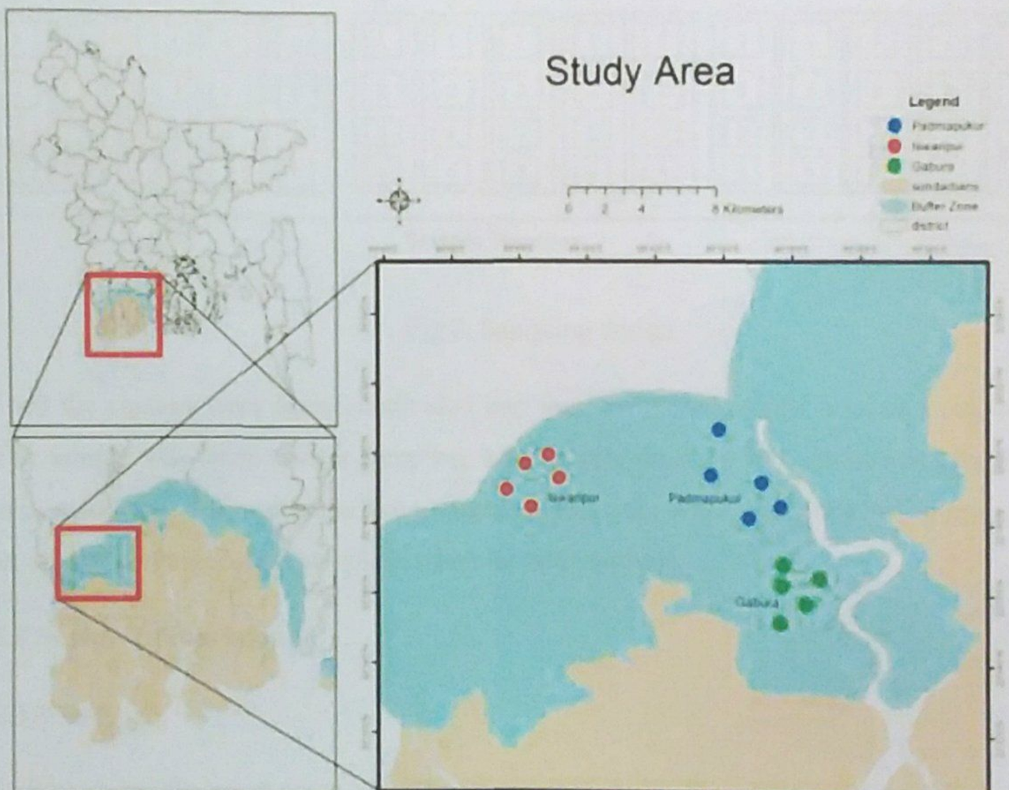


Fig 1: Study area

3.2 Sampling design

Five clusters were selected purposively from Shymnagar, shatkhira. Purposively because, I wanted to work in buffer zone of the Sundarbans. At first the total study area was classified into three regions. Then the region was subdivided into five clusters. The minimum distance between two clusters was 200 meter.

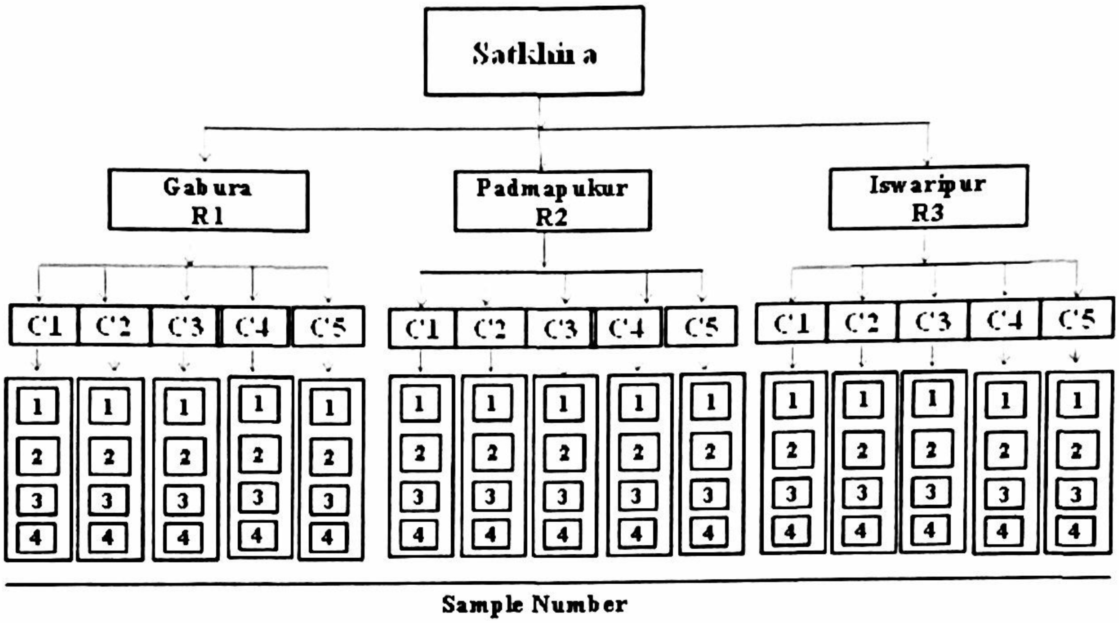


Fig 2: Sampling design

Then the clusters were again subdivided into four samples. The soil is taken from the dike. The sample was taken cluster sampling way. In that time the amount was not fixed but at minimum level. Soil was taken in a transparent poly bag. Water was collected in same way in an air tide container. This sample is taken for next analysis.

3.3 Sample preparation

3.3.1 Soil

Collected samples were taken to lab for the next analysis. The entire soil samples were taken from shatkhira to Khulna in a polybag. After that the soil is dried in air. Then the soil was grinded with blender. Then this soil is separated by sieve. Only the fine portion is used for analysis. And again the soil is kept in air tide container. Another portion is kept for further analysis if needed. The fine particle should be free from other particle like root, waste and other particles.

3.3.2 Water

Water in air tide container is kept safely in such a place if it is not fall down. The water is filtered with whatman filter paper-1 and 42 as it required for analysis. Water does not require any physical change to analyze it. Measurement is done on the same condition as it collect.

3.4 Sample analysis

3.4.1 Soil

To check the available nutrients soil is analyzed several nutrients and some other properties that is related to soil properties. The nutrients are measured named N, P, K and Na. Other properties are Soil pH, ORP (Oxidation Reduction Potential), salinity and carbon.

Soil Salinity (EC)

Soil Salinity (EC) was measured according to Mostara and Roy, 2008.

Soil pH

Soil pH was measured according to Miller and Kissel, 2010.

Total Organic Carbon

Loss of ignition (LOI) was measured according to Allen et al, 1974 at 450°C in Muffle furnace for four hours

The LOI or organic matter was converted to organic carbon according to Nelson and Sommers, 1996 by using a universal conversion factor 1.724 based on the assumption that organic matter contains 58% or ganic C (i.e., g organic matter/1 .724 = g organic C)

Soil Total Kjeldahl Nitrogen

Soil Total Kjeldahl Nitrogen was measured according to Baethgen and Alley, 1989

Soil Total Phosphorus

Soil Total Phosphorus was measured according to Digestion method of Olsen and Sommers, 1982.

To analyze N and P, UV spectrophotometer was used and for Na and K Flam photometer was used. By this way pH and ORP was measure in pH meter. For analyzing sample a standard solution was prepared and that was in ppm unit. For this reason the measured unit of N, P, K and Na is ppm. In the time of determination of N and P there was used an equation to get the result. Because the readings from UV spectrophotometer were only for 5/4 g of soil. The reading was given in ppm but after the calculation we get the result in our required unit.

3.4.2 Water

To check the soil nutrients water is analyzed as the soil. N, P, K and Na are measured and other properties pH, ORP, salinity, TDS and EC are measured by several instruments. The nutrients are measured named N, P, K and Na. Other properties are water pH, ORP (Oxidation Reduction Potential), salinity and TDS (total Dissolved Solids).

Water Salinity (EC)

Soil Salinity (EC) was measured according to Mostara and Roy, 2008.

Water pH

Soil pH was measured according to Miller and Kissel, 2010.

Water Total Kjeldahl Nitrogen

Soil Total Kjeldahl Nitrogen was measured according to Baethgen and Alley, 1989

Water Total Phosphorus

Soil Total Phosphorus was measured according to Digestion method of Olsen and Sommers, 1982.

To analyze N and P, UV spectrophotometer was used and for Na and K Flam photometer was used. By this way pH and ORP was measure in pH meter.

3.5 Data analysis

Different soil and water quality parameters were analyzed by one way Analysis of Varience (ANOVA). For different region using Microsoft excel 2010 data analysis add-ins. Significant difference was measured with 95% confidence level.

Chapter 4

Results and discussion

Results and discussion

4.1 Available Nutrients of soil and water

Soil nutrients (N, P, K and Na) was not significantly ($p>0.05$) varied among the three region. The average content was 60.14 μg/g, 19.73 μg/g, 4.06 μg/g and 2.54 μg/g for N, P, Na and K respectively.

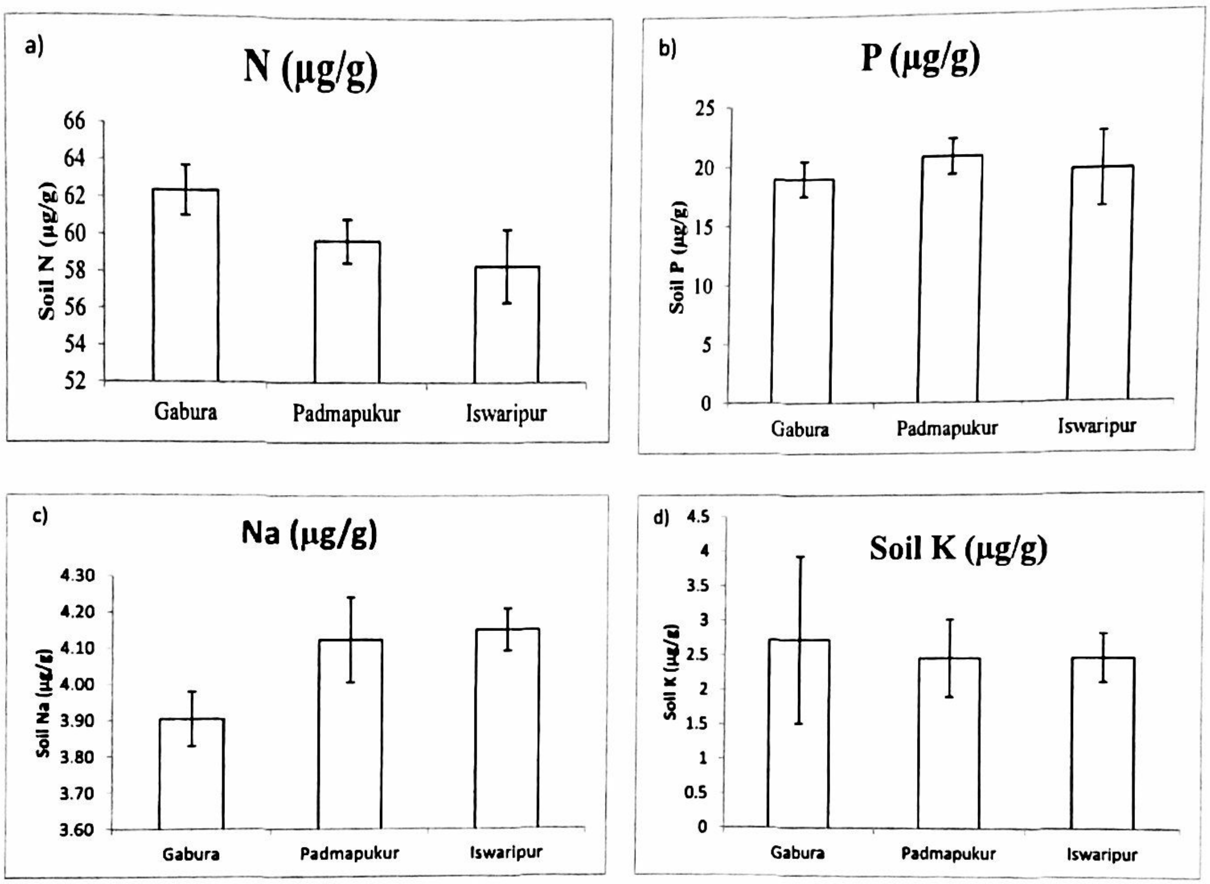


Figure 4: Available nutrients of Soil, a) Nitrogen concentration (μg/g), b) Phosphorus Concentration (μg/g), c) Sodium Concentration (mg/g) and d) Potassium concentration (mg/g)

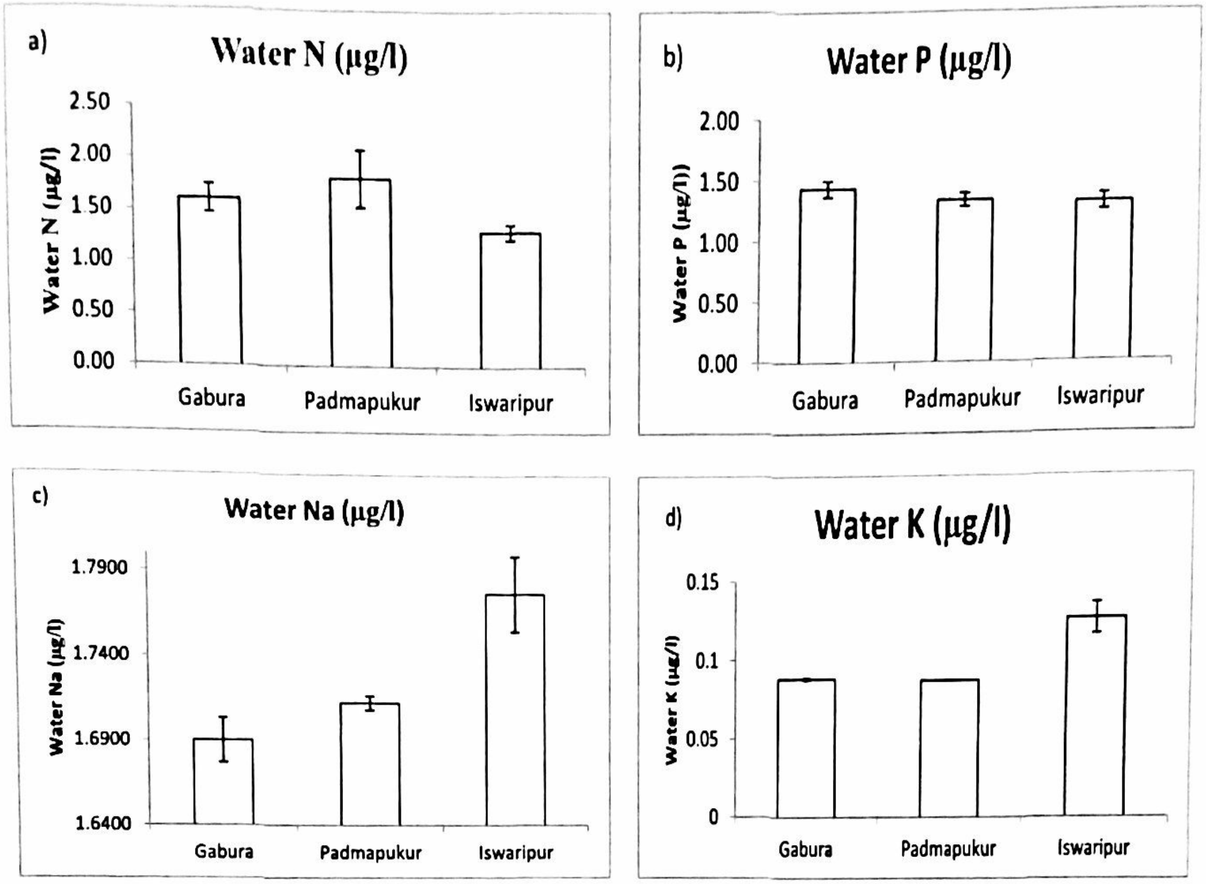


Figure 4: Available nutrients of water, a) Nitrogen concentration (mg/l), b) Phosphorus Concentration (mg/l), c) Sodium Concentration (g/l) and d) Potassium concentration (g/l)

In water there is a strongly significant difference ($p<0.01$) for K and Na in water) and for K and Na there is no significant difference in N and P concentration.

Table 1: ANOVA table sowing the significant difference of N, P, K and Na in soil and water.

	N	P	K	Na
Soil	**NS**	**NS**	**NS**	**NS**
Water	**NS**	**NS**	**	**

The table shows the significant differences among the three regions. NS indicates not significant, * indicates significant and ** indicates strongly significant.

4.2 Other properties of soil and water

In case of soil pH Padmapukur has high pH (8.01) indicates the soil is alkaline. Lower pH value in Gabura indicates the acidic soil. Gabura has a higher amount of salinity (6.59 ppt) and lower salinity found in Iswaripur (5.86 ppt). For soil Gabura has lower ORP and for water also Gabura. In water dissolved solids is higher in Gabura but lower in EC. Carbon percentage in soil is higher in Iswaripur.

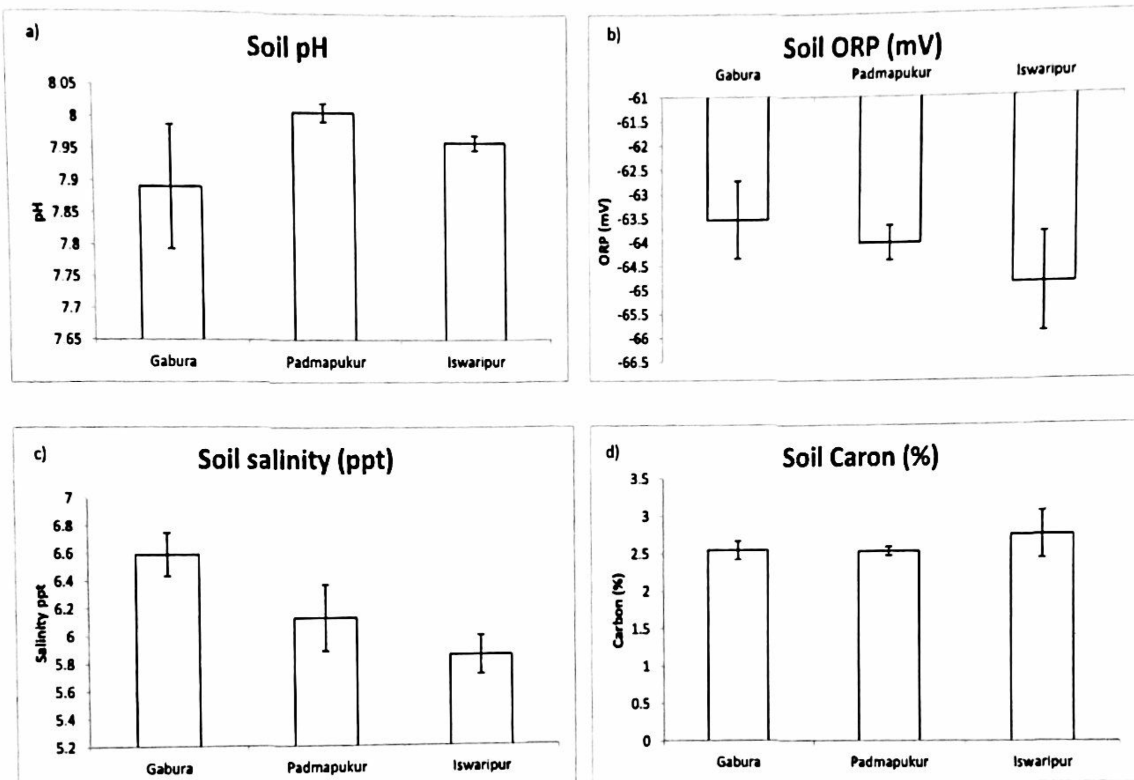
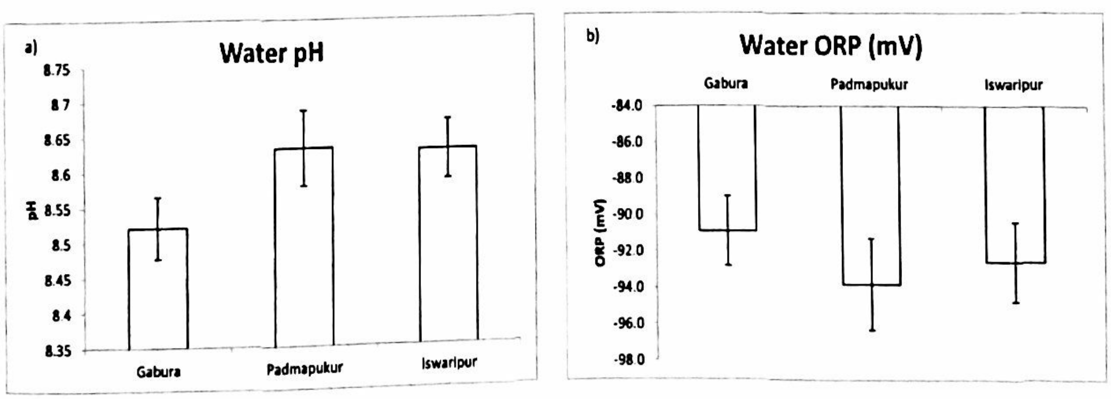


Figure 5: Other Properties of soil, a) Soil pH b) Soil ORP (mV) c) Soil salinity (ppt) and d) Soil Carbon Percentage (%)



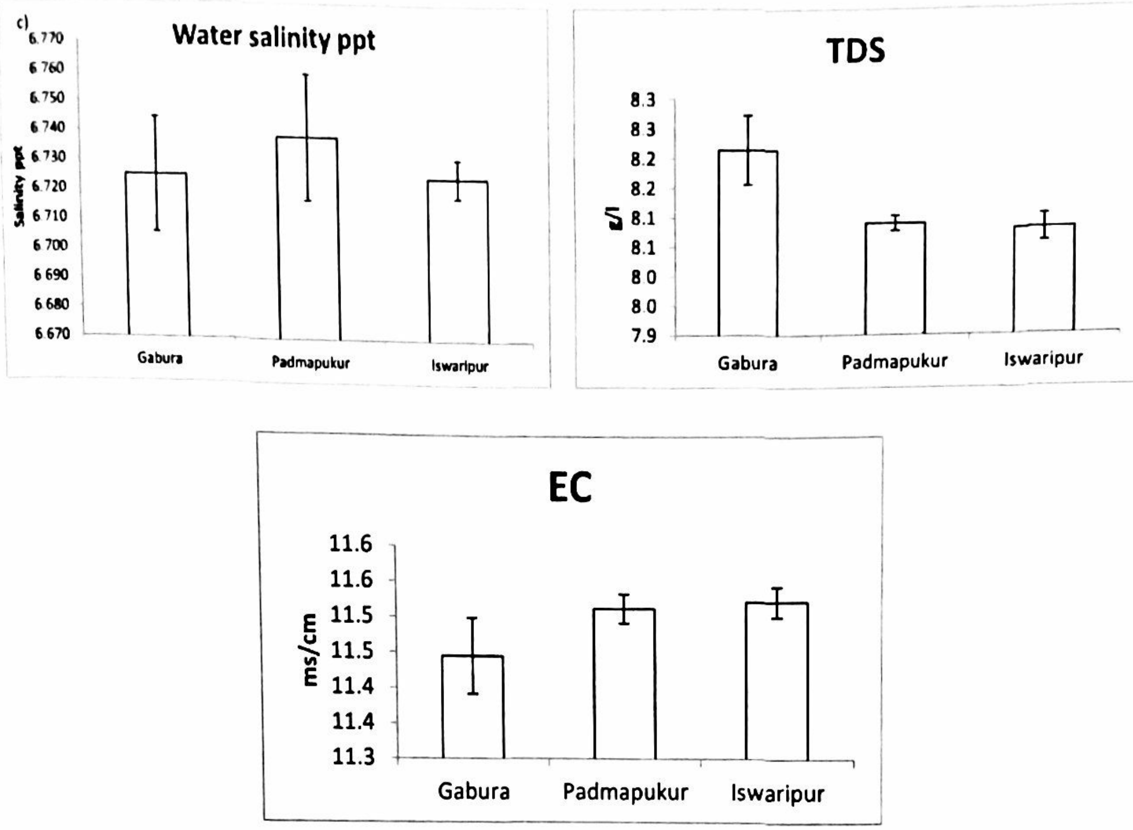


Figure 5: Other Properties of water, a) water pH b) Soil ORP (mV) c) Water salinity (ppt) d) Water TDS and e) Water EC

In water there is a significant difference ($p<0.05$) for soil salinity and water TDS and for pH, ORP and water EC there is no significant difference.

Table 2: ANOVA table sowing the significant difference of pH, ORP, salinity, soil carbon percentage, water TDS and water EC in soil and water.

	pH	ORP	Salinity	C	TDS	EC
Soil	NS	NS	*	NS		
Water	NS	NS	NS		*	NS

The table shows the significant differences among the three regions. NS indicates not significant, * indicates significant and ** indicates strongly significant.

Chapter 5
Conclusion

Conclusion

Freshwater prawn farming plays an important role in the economy of Bangladesh, earning valuable foreign exchange and contributing to increased food production, diversifying the economy and increased employment opportunities. In spite of several problems, the practice of prawn farming has offered an opportunity to increase incomes for farmers and associated groups. Salinity has a great impact on plantation in dyke. Due to this higher amount salt plant is not grow well there. Both soil and water is alkaline. But in cases of water it more alkaline. Overall condition of dyke is not so good. Alkaline soil on dyke, over salinity decreases the productivity of dyke. But there may be opportunity to plant salt tolerance species. The people have the opportunity to plant small plant on dyke to increase their income.

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Appendix

Appendix-1

Amount of available nutrients in
Soil and Water among the three regions.

		N (μg/g)	P (μg/g)	K (μg/g)	Na (μg/g)
Soil	Gabura	62.37 (1.34)	18.96 (1.47)	2.72 (1.21)	9.72 (3.64)
	Padmapukur	59.69 (1.18)	20.73 (1.48)	2.45 (0.56)	6.62 (2.47)
	Iswaripur	58.37 (1.99)	19.50 (3.11)	2.45 (0.35)	4.15 (0.06)
		N (μg/g)	**P (μg/g)**	**K (mg/g)**	**Na (mg/g)**
Water	Gabura	1.62 (0.13)	1.43 (0.07)	0.17 (0.00)	4.30 (0.03)
	Padmapukur	1.82 (0.28)	1.34 (0.06)	0.17 (0.00)	4.35 (0.01)
	Iswaripur	1.32 (0.08)	1.31 (0.07)	0.24 (0.02)	4.52 (0.06)

Appendix-2

Other properties of soil and water in the three regions

		pH	ORP (mV)	Salinity (ppt)	Carbon (%)	
Soil	Gabura	7.89 (0.10)	-63.53 (0.80)	6.59 (0.16)	2.55 (0.12)	
	Padmapukur	8.01 (0.01)	-64.02 (0.36)	6.13 (0.24)	2.53 (0.06)	
	Iswaripur	7.96 (0.01)	-64.86 (1.03)	5.86 (0.14)	2.74 (0.31)	
		pH	**ORP (mV)**	**Salinity (ppt)**	**TDS**	**EC**
Water	Gabura	8.52 (0.04)	-90.91 (1.91)	6.73 (0.02)	8.22 (0.06)	11.45 (0.05)
	Padmapukur	8.63 (0.05)	-93.79 (2.52)	6.74 (0.02)	8.09 (0.01)	11.51 (0.02)
	Iswaripur	8.63 (0.04)	-92.56 (2.19)	6.73 (0.01)	8.08 (0.02)	11.52 (0.02)

Appendix-4

ANOVA table for Soil pH

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.035373	2	0.017687	1.089696	0.367402	3.885294
Within Groups	0.19477	12	0.016231			
Total	0.230143	14				

Appendix-5

ANOVA table for Soil ORP

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	4.524333	2	2.262167	0.739713	0.497805	3.885294
Within Groups	36.698	12	3.058167			
Total	41.22233	14				

Appendix-6

ANOVA table for Soil Salinity

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.362333	2	0.681167	3.993161	0.046848	3.885294
Within Groups	2.047	12	0.170583			
Total	3.409333	14				

Appendix-7

ANOVA table for Soil Carbon

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.138694	2	0.069347	0.36163	0.703878	3.885294
Within Groups	2.30115	12	0.191763			
Total	2.439844	14				

Appendix-8

ANOVA table for Soil Nitrogen

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	41.64979	2	20.8249	1.742138	0.216642	3.885294
Within Groups	143.4437	12	11.95364			
Total	185.0935	14				

Appendix-9

ANOVA table for Soil Phosphorus

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.242563	2	4.121281	0.176415	0.84041	3.885293835
Within Groups	280.3358	12	23.36132			
Total	288.5784	14				

Appendix-10

ANOVA table for Soil Sodium

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7.8E-05	2	3.9E-05	1.206329	0.333137	3.885294
Within Groups	0.000388	12	3.23E-05			
Total	0.000466	14				

Appendix-11

ANOVA table for Soil Potassium

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	2.37E-07	2	1.18E-07	0.037379	0.963423	3.885294
Within Groups	3.8E-05	12	3.17E-06			
Total	3.83E-05	14				

Appendix-12

ANOVA table for Water pH

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.039281	2	0.01964	1.781747	0.210109	3.885294
Within Groups	0.132278	12	0.011023			
Total	0.171558	14				

Appendix-13

ANOVA table for Water Salinity

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.000593	2	0.000296	0.175824	0.840888	3.885294
Within Groups	0.020222	12	0.001685			
Total	0.020815	14				

Appendix-14

ANOVA table for Water TDS

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.056583	2	0.028292	4.140244	0.042916	3.885294
Within Groups	0.082	12	0.006833			
Total	0.138583	14				

Appendix-15

ANOVA table for Water EC

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.017867	2	0.008934	1.426215	0.278165	3.885294
Within Groups	0.075167	12	0.006264			
Total	0.093035	14				

Appendix-16

ANOVA table for Water Nitrogen

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.645371	2	0.322686	1.92753	0.187966	3.885294
Within Groups	2.008907	12	0.167409			
Total	2.654279	14				

Appendix-17

ANOVA table for Water Phosphorus

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.040291	2	0.020145	1.009183	0.393462	3.885294
Within Groups	0.239543	12	0.019962			
Total	0.279834	14				

Appendix-18

ANOVA table for Water Sodium

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.020365	2	0.010183	8.937313	0.0042	3.885294
Within Groups	0.013672	12	0.001139			
Total	0.034037	14				

Appendix-19

ANOVA table for Water Potassium

ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.00496	2	0.00248	14.97783	0.000547	3.885294
Within Groups	0.001987	12	0.000166			
Total	0.006947	14				