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ENVIRONMENTAL IMPACTS OF SHRIMP AQUACULTURE: THE CASE OF CHANDIPUR VILLAGE AT DEBHATA UPAZILA OF SATKHIRA DISTRICT, BANGLADESH

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Abstract

The present study based on primary investigations (focus group discussion, field observation, household interviews etc.), laboratory analysis for soil and water quality (heavy metal test, pH, salinity, electricity conductivity, particle size analysis etc.) and secondary materials (remote sensing data, satellite images analysis etc.) reveals that due to poor drainage system and continuous shrimp farming at Chandipur Village under Debhata *Upazila* of Satkhira District, salinity level of both soil and water are increasing (1.6 ppt and 13.4 ppt respectively). In addition P^H, salinity, electrical conductivity of soil and water have been found in a very fragile condition. Different types of heavy and toxic metals such as Na, Fe, Cr, Zn, Ni and Pd have been detected in *ghers'* soil.

Key words: Environmental impacts, Soil and water quality, Shrimp farming, Satkhira, Bangladesh

Introduction

Shrimp farming in Bangladesh has been recognized as a part of the Blue Revolution. In parallel with its large contribution to local and national economy, it has already caused significant damages to the local ecosystems (Environmental Justice Foundation 2004). More than 15.6 million people of the country are directly and indirectly involved in this sector. During the last few decades shrimp aquaculture, particularly the black tiger shrimp *(Bagda)* has been a major component in the development of our national economy. Coastal aquaculture is mainly based on shrimp cultivation, while shrimp is the second largest source of earning foreign currency (Ahasan 2012). Among exported fishes only shrimp contributed 57 percent during 2010-2011. Bangladesh has a huge coastal tidal area which is considered favourable for shrimp farming and 0.276 million hectares of land are currently under brackish water shrimp cultivation. During 2010-2011 the country produced 182,471 metric tons of large (121,203 metric tons) and small shrimp (Fisheries Resources Survey System, 2010-2011 & 2012) and earned US$ 437.40 million from both frozen shrimp and fishes (Bangladesh Frozen Food Exporters Association 2012). South-western and south-eastern parts of the country are favourable for shrimp cultivation. Coastal shrimp culture however, is mainly concentrated in the districts of Khulna and Chittagong. Most of the lands of this region are now under shrimp cultivation. Since 1980s shrimp has been a major part of aquaculture in this region and is considered as the major driving force of economic development in this area. Two-thirds of the farms in Khulna region (southwestern part) rotate paddy with shrimp cultivation, while in highly saline condition of Chittagong region (southeastern part), salt is commonly rotated with shrimp (Alam 2002).

Apart from the overall contribution of shrimp cultivation to the national economy of Bangladesh, it has been causing severe threats to local ecological systems, such as-deterioration of soil and water quality, depletion of mangrove forest, decrease of local variety of rice and fish, saline water intrusion in ground water, local water pollution and change of local hydrology (Rahman *et al.* 1994 cited in Wahab 2003 Hoq 1999 Islam 2003 and Eva 2012). Recent extensive expansion of shrimp cultivation has severely caused depletion of forest cover of the Chokoria-Sundarbans and led to significant losses of biodiversity of fisheries and forest species (Alauddin and Tisdell 1998, Quader *et al.* 2010 and Shahid and Islam 2003). Salinization in ground water and saline water intrusion in surrounding areas have caused a serious ecological and socioeconomic damage in the coastal environment. Salinity is being thought to be a silent poison in the southwestern part of Bangladesh due to continuous shrimp cultivation. In this region, the practices of shrimp farming have caused massive loss of crop production, loss of fruit and other indigenous floral species, fresh water crisis for drinking and so on (Wahab 2003 and Karim 2003). The absence of national policy and strategy on sustainable shrimp aquaculture has been a fundamental problem of this sector (Environmental Justice Foundation 2004). Gradual increase of toxic elements in the soil of this region is contaminating lower level soil. Products of this soil also carry these toxic substances and have the potentiality to create health hazards. Primavera (1998) reported that with the steady rise of biomass and food inputs, water quality in high density ponds decreases over the cropping periods. In addition, outsiders control of the large shrimp farms is the primary cause of social imbalance and deteriorating law and order in the coastal areas in Bangladesh (Alauddin and Hamid 1996).

The present study was an attempt to identify various negative impacts of shrimp farming on the local environment particularly on water and soil quality, vegetation and land use change.

Materials and Methods

Household Questionnaire Survey: The present study has been accomplished mainly based on primary data. In addition, secondary level data have also been consulted. Primary data were collected in various ways (household questionnaire survey, focus group discussions and laboratory experiments of water and soil in the laboratories). First of all, the villages dominated with shrimp farming practices within Debhata *Upazila* have been identified and Chandipur, the present study village has been randomly selected out of these villages. A total of 108 households out of 290 from the study village were randomly selected for interviews with semi-structured questionnaire. For household level interviews, the household heads were mostly considered who had attained experiences of shrimp cultivation.

Focus Group Discussion: A significant number of people in the study has recently left shrimp cultivation as they do not make satisfactory profit out of shrimp production. Therefore, in order to find out difficulties of shrimp cultivation, their present occupational status, informal group discussions and focus group discussions were also conducted. In the study area, 2 focus group discussions were carried out with more than 10 people each who were earlier engaged in shrimp farming but have recently left these practices.

Laboratory Experiments: In order to assess the magnitude of declining soil and water quality in the study area, the present research has emphasized on laboratory experiments of soil and water collected from shrimp *ghers* in two different time periods (February and May in 2012). Salinity is assumed to be higher in the drier most months, and therefore water samples were collected in May. In addition, water samples were also collected from local freshwater ponds in order to compare with the quality of *gher* water. The characteristics of water in both *ghers* and freshwater ponds which have been considered for measurement are salinity, p^H, total dissolve solid (TDS), total suspended solid (TSS), total solid (TS) and electrical conductivity (EC). The first water samples were collected in 15 February, 2012 both from pond and *gher,* and later on 10 May 2012 the second sample collection was carried out for salinity, pH, total dissolve solid (TDS), total suspended solid (TSS), total solid (TS) and Electrical conductivity (EC). The characteristics of *gher* soil in three different layers that have been measured are soil salinity, p^H, heavy metal pollutants, particle size analysis, EC, percentage of organic carbon and organic matter. Soil samples were collected from three (3) different layers at 5 May 2012 (top soil- upto 15 cm from the surface, 15-30 cm depth and then at 30-45 cm depth). Water and soil samples were experimented in the environmental laboratories of the Department of Geography and Environment, University of Dhaka and Bangladesh Council for Scientific and Industrial Research (BCSIR), Dhaka.

Secondary Data: Secondary data have been collected in two steps. In first step, relevant literatures (e.g., peer-referred journals), documents, websites, books, local journals, etc. were consulted. In the second step: relevant local and national level institutions were consulted. Among them, Bangladesh Bureau of Statistics (BBS), Department of Fisheries, Ministry of Fisheries and Livestock, Community Report of Satkhira 2012, District Agricultural Office & District Fisheries Office of Satkhira, *Upazila* Statistics Office, *Upazila* Agricultural Office, *Upazila* Fisheries Office of Debhata & Satkhira. Information collected from these offices mainly include total area under cultivation, production of annual fish and other agricultural crops etc.

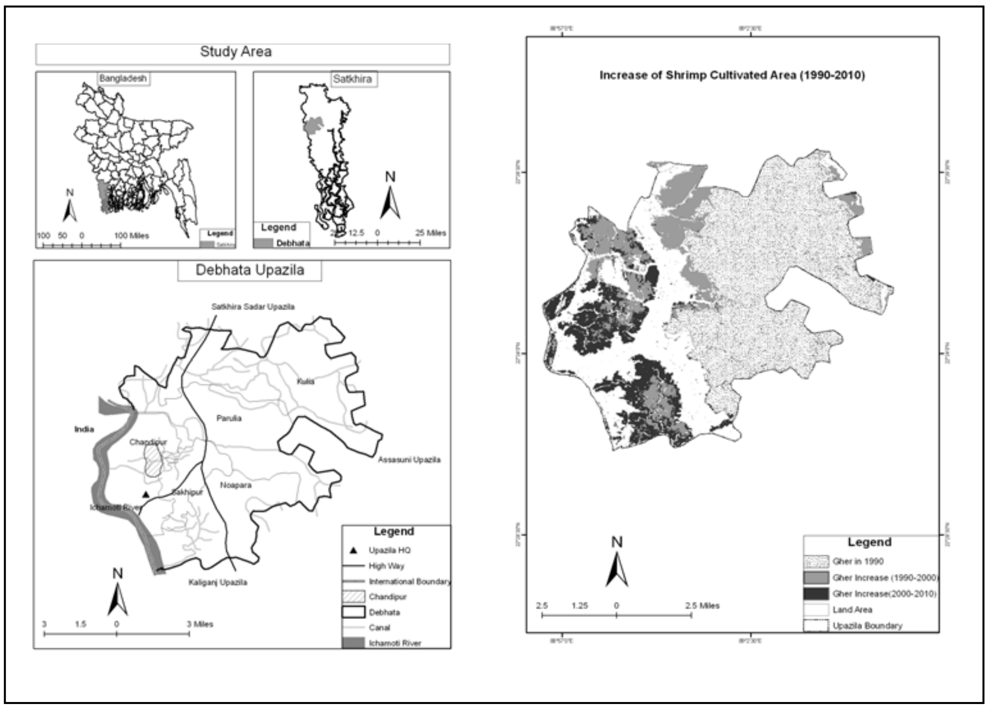
Map Processing: Maps have been prepared using ArcGIS 9.3. Temporal (1990-2010) change detection has been done through satellite images. Land Sat 1 & 2 images are used to show the shrimp cultivated area in1979, Land Sat 4 & 5 to show the increase of the area for shrimp in 1989, Land Sat image 7 is for the increase of shrimp farming area in 1999 and Land Sat 7 & 5 images are for present land use pattern of shrimp cultivation. Most of these images are captured in November (relatively dry season) and therefore some water bodies' are missing. All these images are over-laid to one another to identify the expansion of shrimp farms *(gher)* over time.

Results and Discussion

Environmental Impacts of Shrimp Cultivation: Only three districts of Bangladesh (Khulna, Bagerhat and Satkhira) accommodate around 80 percent of total shrimp production (Chowdhury and Muniruzzaman 2003 and Karim 2003). In the early 1980s, shrimp farming was introduced in Khulna region turning a vast amount of arable lands into shrimp ponds. The transformation of potential high yielding variety *aman* and *boro* rice fields into shrimp ponds declined the yield of both cultivations and simultaneously reduced the total production of rice in Bangladesh. The expansion of shrimp farming has drastically reduced the area under rice cultivation particularly in Satkhira. It has remarkably changed the soil properties over time causing fertility reduction that has reduced the rice yield. The farming pattern of shrimp is either extensive or semi-extensive and intensive. Extensive shrimp farming rapidly depletes soil organic matter content. Intensive and semi-intensive shrimp farming delivers high volume of organic matter, inorganic effluents and toxic chemicals to the ecosystem that result in hyper-nitrification and eutrophication and high soil toxicity. Prolonged saline water logging in shrimp ponds accelerates leaching base materials and increases soil acidity. Its adverse effects are also observed on aquatic environments (Ali 2006).

Impacts of Shrimp Cultivation on Local Environment: Like other areas, shrimp farming in the study area (Debhata *Upazila* of Satkhira) (Figs. 1 and 2) has also been recognized as lucrative. Almost every farmer/individual of this locality is directly or indirectly involved in this aquaculture practices, and is economically benefitted from shrimp farming. The local people of this area have been involved for almost two decades. But the present study reveals that shrimp cultivation at Debhata is no more of profit in the recent time. The prosecution of rice and vegetables has significantly dwindled. Shrimp cultivation is practiced continuously in Debhata *Upazila* since 1980s. Before practicing shrimp, people were mainly engaged in agricultural activities. Different varieties of rice, vegetables, and fresh water fishes were cultured in this area. Salinity intrusion due to shrimp cultivation is heavily affecting on the local environment. Soil and water qualities are degrading day by day. To explain overall scenario of land use changes satellite images are used and Bangladesh Water Development Board data are used to notice the tidal flow and change of EC. To measure the vegetation loss and environmental degradation, some soil and water parameters were taken as indicators.

Land Use Change: It has earlier been mentioned that land use of Debhata *Upazila* has been changed due to shrimp cultivation, because it is more profitable than paddy and other vegetable cultivation. In order to identify changes of landuse Landsat images have been used. In 1990, the total water surface of Debhata *Upazila* was 31.21 square mile and land surface was 34.67 square mile. These figures were changed over time as more and more lands were converted to shrimp farming. In 2000, land surface decreased while water surface increased to 40.4 square mile. Again in 2010, the total land area decreased to 20.14 square mile while water body enhanced to 46.01 square mile. Fig. 1 shows the expansion of shrimp cultivation from 1990 to 2010.



Figs. 1 and 2. Study Area with Shrimp Farming.

Local Vegetation: In the present study, it has been found that local vegetation is under severe threat and degradation. Most of the respondents blamed shrimp cultivation for the loss of vegetation. It is evident that before the introduction shrimp cultivation in the study area, the farmers used to produce various types of agricultural crops. Apart from paddy cultivation, the local farmers also used to cultivate different types of vegetables.

Their homestead lands were also used for vegetable production; such as bitter gourd (*korola*), beetroot, ash gourd (*chal kumra*), broad beans (*sheem*), pumpkin (*kumra*), string beans (*barboti*), pointed gourd (*potol*), bottle gourd (*lau*), carrot, yam, tomato, turnip (*olkopi*), turnip greens (*shalgam*), sweet potato, ceylon spinach (*pui shaakh*), drumstick (*sajner* data), snake gourd (*chichinga*), ridge gourd (*jhinga*), potato, radish, mustard, *brinjal* (begun), elephant foot yam (*ol*), cucumber, red amaranth (*lal shaakh*) etc. But after the initiation of shrimp cultivation, they could not grow any vegetables even in their homestead land also mostly due to salinity intrusion. Therefore, they have to buy these vegetables from local market, which they find reasonably expensive. Moreover, many of the local variety of trees like mango, guava, sapodilla (*sofeda*), palm, *shegun*, *mehguni*, berry, rose apple (*jamrul*), jujube (*kul/boroi*), *kadbel*, wood apple, coconut etc. have remarkably declined over time due to the same reason.

Soil Texture: Soil texture is important to identify soil characteristics, their saline holding capacity and also suitability for different crops. Depending on soil texture salinity holding capacity varies. Generally sandy soils tend to be less saline because sands particles are less coherence to each other and salts leach easily. Peat soils also help leaching saline easily because of their surface drainage network. But salts tend to attach to clay particles and clay soils tend to be more saline for longer. To identify soil texture of surveyed area, soil samples were taken from shrimp farm *(gher)* of different age and from different depths. Table 1 shows the soil composition of surveyed areas. The percentage of sand is on the rise with the increase of *ghers'* age. It was also found that the proportion of sand has increased at the lower depth of soil. From this table, it can be observed that the soil of the sampled area is mainly clay dominating. Every layer of soil was found the highest percentage of clay, then silt and a small amount of sand. Sedimentation is very common in those *ghers'*. Clay soils can hold salt for longer period because of its high water holding capacity, very slow drainage rate and poor aeration system (Brady and Weil 2004).

Table 1. Textural Analysis of Soil.

Lifespan of shrimp ponds	Depth (cm)	Sand (percent)	Silt (percent)	Clay (percent)
1 year	0-15	2.55	42.27	55.18
	16-30	2.55	52.79	44.66
	31-45	2.55	50.16	47.29
10 years	0-15	2.16	35.16	62.68
	16-30	2.16	37.79	60.05
	31-45	2.55	44.90	52.55
15 years	0-15	5.18	44.90	49.92
	16-30	2.55	29.07	68.34
	31-45	2.55	34.37	63.08
20 years	0-15	4.79	19.37	75.84
	16-30	2.16	40.42	57.42
	31-45	5.18	37.00	57.82
30 years	0-15	2.55	42.27	55.18
	16-30	5.18	44.90	49.92
	31-45	4.79	43.05	52.16

(Source: Laboratory Analysis 2012)

Organic Carbon and Organic Matter: Soil organic matter is complex and mixture of organic substances, including living organisms, carbonaceous remains of organisms that once occupied the soil. It provides much of cat-ion exchange capacity and water-holding capacity of soils. It comprises only 1-6 percent in soil (Brady and Weil 2004). The percentage of organic matter is depended on the decomposition capacity of soil. The shrimp cultivation pattern in Bangladesh is mainly extensive to semi-intensive. Generally extensive and semi-intensive shrimp farming systems are driven by inorganic nutrients and tend to be autotrophic, while intensive system is driven by inorganic nutrients and tend to be heterotrophic (Fast and Lester 1992 cited in Hoq 1999). Phillips *et al.* (1993 cited in Hoq 1999) reported that no significant load is expected to be accumulated for it.

Shrimp cultivation in Indonesia is totally an intensive system, and therefore for the betterment of their farm they need to remove organic matter, unwanted sediments from the pond bottom to avoid low dissolved oxygen in water of their farms (Yuvanatemiy *et al.* 2011). So if the stocking and feeding rate increase in the shrimp farms, aeration and water exchange can prevent low concentration of dissolved oxygen and excessive concentration of ammonia. Organic matter increases water holding capacity of soils and makes water available to plants. It is the major sources of Nitrogen, Sulfur and Phosphorus which is essential for plant growth (Brady and Weil 2004). Organic matter was calculated in different aged *ghers'* from different depth to observer their differentiation.

The applied feed of shrimp is partially dissolved in water and the rest residue accumulates at bottom of *gher.* The uneaten feeds and residues are mixed with soil and water and increase organic carbon, because different organic products such as; mustard cakes, cow dung and other phytoplankton are used as shrimp food. The organic matter of *ghers'* soil is ranges from 4.6 percent to 6.25 percent and organic carbon is 2.7 percent to 3.63 percent (Table 2). Comparatively highest organic matter was found in 1 year aged *gher's* soil. But in different depth the organic matter contents were more or less similar and this rate is decreased according to their depth. So soil is slowly losing its' organic matter because of continuous shrimp cultivation. Most of the farms do not maintain any regular feeding procedure. So deposition rate of uneaten food is lower in surveyed area compared to other countries.

Table 2. Existence of Organic Carbon and Organic Matter in the Sample Soil.

Lifespan of shrimp ponds	Depth (cm)	Organic Carbon (percent)	Organic Matter (percent)
1 year	0-15	3.625	6.25
	16-30	3.104	5.351
	31-45	3.229	5.567
10 years	0-15	2.73	4.707
	16-30	2.98	5.137
	31-45	3.431	5.915
15 years	0-15	2.808	4.841
	16-30	2.855	4.922
	31-45	2.761	4.76
20 years	0-15	2.668	4.599
	16-30	2.714	4.68
	31-45	2.855	4.922
30 years	0-15	3.237	5.581
	16-30	2.839	4.895
	31-45	2.792	4.814

(Source: Laboratory Analysis 2012)

• *Salinity Measurement:* Saline water is generally intruded in surveyed area because of regular shrimp farming since 1980s. This saline is entered in lower depth of soil. To measure soil quality we have to know about pH, salinity level and EC of soil.

• *pH:* To measure the degree of soil acidity and alkalinity, soil pH is a very important variable and it helps to know about soil properties chemical, biological and indirectly physical environment including both nutrients and toxins. The activity of micro-organisms, plant growth, biochemical breakdown, solubility and absorption of colloids etc. are known through soil pH (Bradey and Weil 2004). The pH of a solution is a measure of the molar concentration of hydrogen ions in the solution and as such is a measure of the acidity or basicity of the solution. The ideal range of pH in soil is 6.0 to 6.5 because most of the plants' nutrients are available in this stage (Vossen 2012). The pH values ranged from 7.11 to 8.23 in the collected sample (Table 3). Highest pH was found in 1 year aged *gher*, but that *gher* has been I use to supply water from canal more than 20 years ago. pH is decreasing slightly with the increase of *ghers'* age. The pH below 8.5 indicates saline soil (Brady and Weil 2004).

• *Electrical conductivity (EC):* The EC values of the surveyed *ghers* were in the range of 1.585 mS/cm to 3.14 mS/cm (Table 3). The EC is increased with the increase of *ghers'* age and upper soils' EC is higher than the soil of lower depth. From the observation it can be said that (Table 3), EC of the upper soils of relatively new *gher* are lower than the soil of lower depth of older *ghers*. So from EC determination, it can be said that EC is increasing with the increase in depth of soil due to continuous shrimp cultivation. On the basis on EC level, it can be mentioned that the soils can still have the potentiality to continue other agricultural works. In agricultural standards, soils with an EC greater than 4 mS/cm are considered saline. Salt-sensitive plants may be affected by conductivities less than 4 mS/cm and salt tolerant species may not be impacted by concentrations of up to twice this maximum agricultural tolerance limit (Munshower 1994).

Table 3. Salinity, pH and EC of *Gher* Soil.

1.5dS/m=1.5mS/cm=1500uS/*cm*

Lifespan of shrimp ponds	Depth (cm)	pH	EC (mS /cm)	Salinity (percent)
1 year	0-15	7.91	2.23 mS /cm	11
	16-30	8.26	1958 µS/cm	10
	31-45	8.23	1585 µS/cm	8
10 years	0-15	7.84	2.25 mS/cm	11
	16-30	7.61	2.17 mS/cm	11
	31-45	7.27	2.11 mS/cm	11
15 years	0-15	7.66	3.01 mS/cm	16
	16-30	7.34	2.32 mS/cm	12
	31-45	7.25	2.41 mS/cm	12
20 years	0-15	7.57	3.14 mS/cm	17
	16-30	7.26	2.54 mS/cm	13
	31-45	7.32	1812 µS/cm	9
30 years	0-15	7.51	2.86 mS/cm	16
	16-30	7.37	2.4 mS/cm	15
	31-45	7.11	2.33 mS/cm	12

(Source: Laboratory Analysis 2012)

An EC value less than 1 indicates that soils are highly suitable for cultivation, EC value of 1-3 is injurious to crop growth, EC values between 3 and 4 will definitely cause yield reduction and soils with EC value more than 4 are designated as saline soils and need reclamation to restore them for cultivation (Umamaheswari *et al.* 2005). So the result shows that, salinity of the soils are at injurious level for other agricultural activities and this situation will be worse in future.

• *Salinity:* Each soil contains some soluble salts, but when soluble salts' content exceeds rate exists the tolerance level of plants is known as soil salinity. The reason behind the increase of soil salinity is poor drainage system, poor irrigation system, less rainfall, dumping toxic substances and others (Blaylock 1994). From laboratory report (Table 3) it was found that, percentage of salinity was increased with the increase of *ghers'* age and also with the increase of soil depth. It is also evident that, 11 percent salinity was found in 0-15 cm of 1 year aged *ghers'* soil and 12 percent of salinity was found at 31-45 cm of 30 years aged *gher*.

• *Water Quality:* Water quality problems are increasing in shrimp farming areas because of excessive feeding, effluents and high stocking of foods. Poor water quality causes diseases, mortality, low production of shrimp and in some places it has become impossible to continue shrimp farming any more (Yuvanatemiya *et al.* 2011). So to gain profit from shrimp and also to save environment water quality has to be maintained. To measure water quality four different water samples are taken from two different places and at two (2) different times. pH, salinity, TDS, TSS, TS, EC experiments were carried out.

• *pH:* For aquaculture a slandered pH value is to be maintained in the range of 7.5-8.5 (Central Institute of Brackish Water Aquaculture 2001) and the optimum pH value for shrimp cultivation was also within this range and this value should not vary more than 0.5. But in February (Table 4) the pH value in *gher* was less than the optimum value and in July it was near about double than the optimum value so under both conditions water was not favorable for shrimp cultivation. It may be a vital reason for loss of shrimp production. But the condition of pond water is moderate in every season and no remarkable change was found in the area.

Table 4. pH, Salinity, TDS, TSS, and EC of Water.

1000 mg=1 gm

Period	Type	pH	Salinity (ppt)	TDS	TSS	TS =TDS+TSS	EC
February (Spring)	*Gher*	6.83	12.3	10.31 g/L	0.355 g/L	10.665 g/L	20.6 mS/cm
	Pond	7.40	0.8	0.854 g/L	0.252 g/L	1.106 g/L	1708 uS/cm
July (Wetter)	*Gher*	7.24	13.4	11.11 g/L	0.684 g/L	11.794 g/L	22.2 mS/cm
	Pond	7.90	0.7	0.772 mg/L	0.021 g/L	0.793 g/L	1543 uS/cm

(Source: Laboratory Report, 2012)

• *Salinity:* For shrimp cultivation the minimum level of salinity in water is 5 ppt (Alam 2007). To get optimum production, salinity level should be 15-25 ppt (Central Institute of Brackish Water Aquaculture 2001). In *ghers'* soil the salinity level was very close to optimum level and can be said as favorable condition for shrimp cultivation. But the salinity level of pond water was negligible. From the observation it may be said that, *ghers'* water did not influence the inland water bodies.

• *Total Dissolved Solid (TDS):* It is the simplest way to determine the total amount of dissolved salt in water sample. Normally TDS ranges from 5 to 1000 mg/L (Brady and Weil, 2004). The average concentration of TDS was 18,539 mg/L in coastal pond, while averages for inland ponds ranged from 3,888 to 8,739 mg/L (Boyd *et al.* 2002). The TDS value ranged from 10,310 to 11,110 mg/L in the *gher* and in pond this range was within

854 to 772 mg/L (Table 4). The TDS value of *gher* was close to coastal ponds and it can easily be said, this water is saline in nature and pond is not affected by saline water. TSS values in *gher* were found higher than that of the pond. Comparatively higher amounts of substances (those are not dissolved) were mixed in this *ghers'* water.

• *Electrical Conductivity):* The EC values of water were 10 times higher than that of soil. *Ghers'* water retained much salt because of shrimp cultivation and mainly brackish water shrimp is cultivated here. EC of spring is less than July in *gher* water. But it is expected to increase of EC value in winter and early Summer time because of its' dry condition. Rainfall was not enough in wet season, so the EC value was remained higher. High value of EC is harmful for other fish culture in *gher* and also for shrimp cultivation. The EC value of pond water was mot at the level of risk for other fish cultivation (Table 4). The water supply of shrimp cultivation in Debhata *Upazila* is mainly dependent on Ichamoti River. From Figure 1, it can be observed that the value of EC varied in different times. In 1982 the EC suddenly increased and in 2002 to 2004 this range was within 4,000µm/cm. After 2005 the EC value increased once again. One of the major reasons may lie with the reduction of water flow in the down streams of Bangladesh as India has constructed barrages in many of the rivers in the upstream flows. Ichamoti River being connected to the Bay of Bengal through the Sundarbans is a source of saline water to the shrimp farming areas in the southwestern part.

However, the widespread practices of shrimp cultivation in the south-eastern and south-western parts of the country have slowly brought severe damages to local ecosystems. The study area is one of sites where local environment has been heavily damaged due to shrimp production. Saline water intrusion in the study area has caused colossal negative effects to the local vegetation and particularly to production of rice and vegetables. Due to continuous shrimp farming the level of EC has remarkably increased in lower depth of *gher* soil affecting soil productivity. Insoluble materials from food inputs in the shrimp ponds have been prevalent to a large magnitude causing high level of water contamination. Saline water in the *gher* being stagnant for a long time allows toxic substances to settle in the *gher* soil. The local people are ultimately under severe health risks as a result of extensive shrimp farming. The present research reveals that an immediate step is essential to stop the further degradation of local environment. Saline water being destructive to local freshwater sources, the level of salinity has to be maintained in *gher* water for better production and environmental sustainability. Proper drainage system needs to be introduced to maintain water quality and discharge effluents from *ghers*. Saline tolerant rice and other crops may be introduced in shrimp cultivated area. Sustainable shrimp cultivation should be maintained to ensure social, economic and ecological stability. Above all, more research initiatives have to be conducted in order to identify better solutions of environmental issues induced by shrimp cultivation.

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