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## **SALT IS KILLING US: SALINITY AND LIVELIHOOD IN A BANGLADESH VILLAGE**

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## **ABSTRACT**

This thesis is the result of a minor field work in a coastal Bangladesh village where peoples are struggling to adapt with salt water intrusion. It describes how people in one community under climatic change or variability adapt to an acute problem, and how their perceptions of that environment, their Ethnoecology influence this response. To make sense my primary and secondary data I have used adaptation theories of anthropology more specifically how people respond to changing environment regard to livelihood. The perceptions on salinity, livelihood adaptation strategies, politics of adaptation and how their culture and nature are shaped by each other are developed in the body of this dissertation. The study encompasses theoretically in a broad sense Ecological Anthropology and specifically cultural ecology and practically addresses adaptation to climate change impacts, a growing field in Anthropology known as ‘Anthropology of Climate change’.

**Keywords:** Bangladesh, Salinity, Climate change, Livelihood adaptation, Ethnoecology.

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## FOREWORD

This thesis is the result of a minor fieldwork conducted in Harinagar, a coastal village under Shamnagar upazilla<sup>1</sup> in Satkhira district of Bangladesh. The fieldwork was done on February and March 2009. I wish to thank Sushilon and Caritas, the two leading NGO working in the region and their staffs for accepting me as their guest and helped me to access both areas and persons crucial to the study. A special thank to Sannat Ali who kindly provided his transport facility to me and made my access easy to my informants. I'd like to thank Bangladesh Centre for Advance Studies and International Institute for Environment and Development for inviting me to the 3<sup>rd</sup> International Conference on Community Based Adaptation to Climate Change in Dhaka which provided me such an interesting topic of investigation. I need to thank my informants without whom I would never have been able to produce this dissertation. I am also grateful to my supervisor, Steven Sampson for interesting discussions, valuable insight and for all the great advice.

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<sup>1</sup> Local government unit smaller than district but bigger than union

## **ABBREVIATIONS**

BBC	British Broadcasting Corporation
BCAS	Bangladesh Centre for Advance Studies
BIRRI	Bangladesh International Rice Research Institute
BWDB	Bangladesh Water Development Board
CIDA	Canadian International Development Agency
GDP	Gross Domestic Product
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
LDC	Least Development Countries
NAPA	National Adaptation Program of Action
NGO	Non Governmental Organization
PSF	Pond Sand Filter
UNESCO	United Nations Educational Scientific and Cultural Organization

## CHAPTER 1

### INTRODUCTION

#### 1.1 Statement of the dissertation

Writing for *The Los Angeles Times* on February 21st 2007, Henry Chu visiting the coastal zone in Bangladesh wrote:

“Global Warming has a taste in this village. It is the taste of salt. Only a few years ago, water from the local pond was fresh and sweet on Samit Biswas’s tongue. It quenched his family’s thirst and cleansed their bodies. But drinking a cupful now leaves a briny flavor in his mouth. Tiny white crystals sprout on Biswas skin after he bathes and in his clothes after his wife washes them”<sup>2</sup>

This story highlights the issue of increasing penetration of saltwater through the groundwater and along rivers inland from the coast. How peoples are responding to adapt their livelihood to this environmental transformation has been discussed in the body of this thesis. Salinity touches every walk of their lives and affects basic needs like food, clothing, shelter, health and education of the Harinagar village community. So the central thesis of this dissertation is how people respond to salt water intrusion caused by tidal upsurge and direct inundation by saline or brackish water in the context of a coastal village in Bangladesh. It describes how people in one community under climatic change or variability adapt to an acute problem and how their perceptions of that environment, their Ethnoecology influence this response. I was interested to know their perception because

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<sup>2</sup> <http://articles.latimes.com/2007/feb/21/world/fg-warming21> accessed at 10.20 on January 25, 2010



“societies do not interact directly with their environment but with their perceptions of that environment” (Crate and Nuttall 2009: 20) and adaptation to environmental change is something that primarily takes place at the local level (ibid: 13). I wanted to understand their Ethnoecology<sup>3</sup> because it explores how nature is viewed by human groups (Toledo 2002: 514 cited by WinklerPrins and Barrera-Bassols 2005: 7). In order to do this, the thesis describes how the inhabitants of Harinagar village, a rural and coastal farming community in Bangladesh adapt their livelihood with the salt water intrusion. Salt water intrusion into coastal region of Bangladesh is apparently a physical problem but adaptation to salinity occurs through cultural practices since “the primary mechanism by which humans adapt to their environment is culture, probably the most potent method of adaptation available to humans (Dobzhansky 1972:422; Cohen 1974; Kirch 1980 mentioned by Sutton and Anderson 2004: 1991) and in this dissertation I wanted to reveal the cultural/ human dimension of salt water intrusion in Bangladesh. To make sense my primary and secondary data I have used adaptation theories of anthropology more specifically how people response using environmental knowledge regarding their subsistence pattern to the changing environment. The perceptions on salinity, livelihood adaptation strategies, societal impact of those livelihood skills, women’s sufferings, politics of adaptation, and how their culture and nature are shaped by each other are developed in the body of this dissertation. The study encompasses theoretically in a broad sense Ecological Anthropology and specifically cultural ecology and practically addresses adaptation to ‘climate change’ impacts, a growing field in Anthropology known as ‘Anthropology of Climate change’<sup>4</sup> (Nuttall 2009). So this dissertation can be considered as an attempt to show the role of anthropology is and can be in understanding local response to salt water intrusion, an obvious

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<sup>3</sup> For details on Ethnoecology and its relevance to this study please see chapter two (2.4)

<sup>4</sup> This term comes as result of email contact with the author, Mark Nuttall

consequence of sea level rise. I am not claiming that the salt water intrusion in Harinagar is happening or happened due to sea level rise or climate change but salinity is an inevitable impact of sea level rise (Pender 2008: 39, Prdi 6: 1<sup>5</sup>) and need to be addressed from a social science perspective because most of the climate change related research is done and have been doing by natural scientists but they are in lack of human dimension. In the words of Finan (2009: 175),

“Natural scientists have adequate tools at their disposal to describe the anticipated physical impacts of warming with some precision, and have done so in the series of IPCC reports and elsewhere. These reports, however, do not address the impacts on human systems. They are restricted to so many hectares of agricultural land lost, temperature increases and desiccation in this or that region, disappearing water supplies, vegetation change, decreases in biodiversity, loss of fish stocks, and so on. This is climate change without a human face”.

This study attempted to provide human face to an obvious impact of climate change and sea level rise and that was salt water<sup>6</sup> intrusion into coastal area of Bangladesh.

## **1.2 Cause and nature of the problem**

Bangladesh is one of the world's most densely populated and impoverished countries. More than half of its estimated population of 149 million lives on less than 1 US dollar a day and its total annual per capita income is less than 400 US dollar (Finan 2009: 178). Because of its fertile agricultural land and fishing opportunity the coastal zone about 36000 square kilometer is inhabited more densely though susceptible to natural disaster like flood, cyclone, tidal storm etc. The main crop grown in fresh water is paddy and earthen dam made by the

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<sup>5</sup> [http://www.preventionweb.net/files/8199\\_Salinity.pdf](http://www.preventionweb.net/files/8199_Salinity.pdf) visited at 10.18 pm on 22 January 2010.

<sup>6</sup> Salt water and salinity are used in the same meaning which denotes both ground and water salinity.

government keeps the salt water of The Bay of Bengal and rivers adjacent the mouth of the delta out of the paddy fields. From the 1980's the patterns of land use has begun to alter and now cultivating paddy is replaced by other livelihood practices. This development happened in two ways and firstly;

“Bangladesh discovered the tremendous economic potential of the shrimp export markets to Europe, Japan and the US and well-heeled Bangladeshi capitalists (with political backing) acquired many of the coastal areas behind the polders for shrimp aquaculture, forcing out the farmers and replacing the paddy fields with the saline water enclosures (Finan 2009: 179).

This process continues for last two decades in full swing and some traditional farmers after being deprived was trying to return to their paddy growing profession recently. Secondly; in 2007 and 2009 two very catastrophic cyclones named ‘*Sidor*’ and ‘*Aila*’ hit the coastal region including the study area with water upsurge resulting huge salt water intrusion by breaking earthen dyke and almost all the cultivable land is inundated by salt water. A very recent study shows that 175 square kilometers of coastal land is inundated by salt water due to sea level rise<sup>7</sup> and the study wanted to show salinity as an impact of climate change and sea level rise. Haque (2006: 1360) identified “the factors which contribute significantly to the development of salinity are, tidal flooding during wet season (June-October), direct inundation by saline or brackish water and upward or lateral movement of saline ground water during dry season (November-May)”. Over 30 per cent of the net available cultivable lands of Bangladesh are located in the coastal areas. But this land is not being utilized for crop production, mostly due to soil salinity. Soil salinity is now considered a major constraint to food production in coastal areas<sup>8</sup>. Salinity decreases food production causing shortage of food, decreases buying capacity of clothes. Due to salt water inundation people

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<sup>7</sup> [www.bbc.co.uk/bengali/news](http://www.bbc.co.uk/bengali/news) on 13 December at 10 pm Bangladesh time

<sup>8</sup> <http://www.newagebd.com/2007/mar/22/oped.html> visited at 12.25 AM on January 23, 2010

lost their housing and traditional sources of drinking water resulting risk of more diseases like cholera. In addition to that salt water caused destruction of infrastructure including educational institution and compelled children to leave schools in search of work to support their family (Sarwar 2005). A team from WaterAid in Bangladesh conducted a sample study in 2007 to form a general idea of the problem and, in particular, to explore the situation for women. The main objective of the study was to investigate the social and physical consequences of using saline water in daily life for a long period on the human body, especially among women and found that

“Women and adolescent girls are usually required to collect drinking water from distant sources. This may take three to four hours a day. As a result, they do not have enough time or energy to carry out other household duties like cooking, bathing, washing clothes, taking care of elders, etc. when they go out to collect water; women and adolescent girls are sometimes harassed by boys and men. The women and girls therefore feel uneasy and threatened while collecting water from distant sources. The skin of adolescent girls becomes rough and unattractive due to the use of saline water. Men from outside the area do not show their interest in marrying these young girls. Even within the area, girls from poor families are neglected by the rich families. In addition to that, when a poor family cannot afford to collect water due to sickness or because it does not have any member in the family to do the job, they have to buy water from water vendors at Taka 10 per pitcher. It is very difficult for them to spend Taka 300 per month for drinking purposes as their monthly income is typically Taka 500 - Taka 1500. Therefore, sometimes they have no choice but to use saline water for drinking purposes. Furthermore, females are the prime consumers of saline water within their family.”<sup>9</sup>

This is the social and economic affect of the problem but impact of salinity on body especially on women and adolescent is found more painful and miserable, and in the words of the report;

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<sup>9</sup> <http://www.wateraid.org/bangladesh/news/5465.asp> visited at 12.39 am on January 23, 2010

“Every person in the study was found to be suffering from one or more saline water-related disease. Women and adolescent girls are affected by gynecological problems by using saline water during menstruation. Women, explaining their bitter experiences about menstrual hygiene management, reported that saline water creates pain during menstruation. The used clothes become hard after drying (due to the water salinity), which creates discomfort when next used. Further use of the same hard clothes can create genital injury, including bleeding, infection and other complications”.

According to Finan (2009: 182-183) this biophysical problem, salinity has three dimensions to explore by social scientists particularly anthropologists and namely distributive, institutional and empowering. Distributive dimension includes resource access and resource use, livelihood analysis and responses and institutional dimension focuses on the set of resources and interventions that are beyond the capacity of the community itself to mobilize, including infrastructure works, availability of and access to new technologies, sources of information, and networks. The empowering dimension includes existing organizational analysis to reorganize for empowering of local management. How this salt water intrusion is perceived and responded in terms of livelihood practices by the Harinagar community<sup>10</sup> was the central issue of my investigation which addresses an important aspect of distributive dimension. In addition to this I wanted to see how their Ethnoecology influences their responses in terms of livelihood. Details objectives of this study are as follows-

### **1.3 Objectives of the study**

**Broad objective:** The overall objective of the study was to know the perception and livelihood adaptive strategies in response to salt water intrusion in the Harinagar, a coastal village in Bangladesh.

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<sup>10</sup> See 2.3 for operational definition of the concept

**Specific objectives:** To address the main research question following specific questions were addressed-

- a. What is the perception of the community towards salinity problem/ how do they perceive salinity?
- b. How do they especially women adapt with the salinity intrusion regard to drinking water?
- c. What is their livelihood response to salt water intrusion and impact of the responses?
- d. How does Ethnoecology influence their livelihood responses to the salinity problem?
- e. What is the nature of politics of adaptation regard to salt water intrusion?
- f. Who shapes whom between nature and culture and how?

#### **1.4 General point of research in this dissertation**

All peoples and cultures are faced with a number of major environmental issues, problems that can be addressed by cultural ecology<sup>11</sup>. Today the humanity is facing a crucial environmental problem and that is climate change (IPCC 2007). One of the major manifestations of climate change is sea level rise and salt water intrusion is an inevitable impact of this sea level rise. When salt water intrusion occurred in a coastal region it not only carries salinity but also thousands of miseries for the respective community and among them disturbance of livelihood is most important. People respond to this problem by using their culture more specifically their knowledge about environment. So the general point of research

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<sup>11</sup> The concept discussed briefly later on this chapter

of this dissertation was how peoples respond to environmental change regarding livelihood and why. In a word, how and why cultures adapt in one way and not another (Sutton and Anderson 2004:85) and my issue of investigation was how a certain community responds to salt water intrusion and why. This dissertation is neither on salinity nor on Bangladesh. It is about human response to an acute environmental problem where I used Bangladesh as a case study.

### **1.5 Why Bangladesh is interesting and important as a case study?**

Bangladesh is one of those countries responsible less but victim most of global warming or climate change. Study shows that the sea level has been raised 28 centimeter by the last two decades in the Bay of Bengal, adjacent to Bangladesh, and the present rate is 14 mm per year and if this rate continues sea level rise will reach in 1 meter by 2081. Such amount of sea level rise will pose a serious threat to lives and livelihood of Bangladeshi population. The consequences are clearer in the words of Pender;

“In terms of the impact of climate change, few places in the world will experience the range of effects and the severity of changes that will occur in Bangladesh. These global warming induced changes will almost all have negative impacts on the population of Bangladesh; a country that already has around half of its citizens living below the poverty line. It is the world’s third most vulnerable country to sea-level rise in terms of the number of people and in the top ten in terms of percentage of population living in low-lying coastal zones. Currently, almost 40 million people live in the coastal areas of Bangladesh. Loss of coastal land to the sea in this vulnerable zone – currently predicted to reach up to 3% by the 2030s, 6% in the 2050s and 13% by 2080 – is likely to generate a steady flow of displaced people “ (Pender: 2008:37-38).

In this condition, Bangladesh government with the help of international community especially monetary support from the international adaptation fund has been trying to build resilience of the local population to adapt with the

adverse effect of sea-level rise more specifically to the salinity problem. But we are in lack of sufficient understanding related to local/cultural response to salt water intrusion that is already happened in the coastal region which is significant for future plan and actions because climate and culture are inextricably linked (Crate and Nuttall:2009:30).

Salt water intrusion can be happened in many ways other than sea level rise as I have mentioned in the causes and nature of the problem just few lines ago but it is a prime feature of sea level rise, no doubt. I mean if sea level rise occur as per the projected score more and more area will be inundated by salt water. It can be mentioned here that I am dealing sea level rise and climate change just to show the importance of this kind of study for future not to prove the studied problem due to climate change or sea level rise and my point of departure is our deeper appreciation about nature of response to salt water intrusion and their social aspects is immensely needed for policy implications and disciplinary understandings.

## **1.6 The perspective of this thesis**

The perspective of this thesis is that of cultural ecology and Steward defined cultural ecology in his 1955 book *The Theory of Culture Change* as "the study of the processes by which a society adapts to its environment"<sup>12</sup>. Here I wanted to know how and why local people do what they do to solve their livelihood problems, how groups of people understand their environment and how they share their knowledge of the environment (Sutton and Anderson 2004:3) to adapt with the change, salt water intrusion. This dissertation deals with the ways in which culture is used by people to adapt to their environment particularly the livelihood

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<sup>12</sup> <http://archaeology.about.com/od/cterms/g/culturalecology.htm> visited at 10.40 on January 22, 2010.



adaptation to salinity intrusion of a certain community. How do they perceive salinity problem, why and how they formulate strategies to adapt with the changing environment. In short, what they do to solve their subsistence problem which is very much matches and highly relevant to cultural ecology as Julian Steward combined four approaches in studying the interaction between culture and environment where understanding of the relationship between culture and environment was mentioned as a process not just a correlation (Sutton and Anderson 2004). In this study adaptations are found short lived and constantly adjusting to changing environment I mean from fresh water to salt water and paddy growing to shrimp farming and gathering of mollusk, Clam and oysters.

Salt water was seen as a problem posed by environment and livelihood was seriously hampered due to salinity. The informants had to give up their age old rice farming and compelled to shift their focus elsewhere rather than traditional livelihood pattern. Here salinity, a problem posed by environment is solved through the mechanism of culture, the most potent method of adaptation (Dobzhansky 1972: 422; also see Cohen 1974; Kirch 1980 cited by Sutton and Anderson 2004:91). I mean livelihood responses are part of their culture. At this point I feel to frame the problem from development perspective as a student of development studies.

### **1.7 In the framework of development challenge**

As a member of so called LDC Bangladesh is burdened of foreign loan and struggling to get rid off that net but 'natural disaster' likes flood, cyclone, and tidal upsurge pose threat every year more frequently and intensely. As impact of those hazards death toll and loss of resources has been increasing day by day and making the gap from Bangladesh to sustainability wider. Among multidimensional climate change impacts Sea level rise has various significant

impacts on economy, environment and security of Bangladesh and if these impacts are not integrated in the development plans, it will fail to attain sustainability (Sarwar 2005:5).

If Bangladesh fails walk in the right way of development the problem will spread to neighboring countries. Further more in the age of globalization world community can not skip the problem. More over if the sea level rise occurs as projected by scientists millions of people will be severely affected by either inundation or through incursion of salt water as McGregor (2002: 283) states-

“Coastal deltaic areas, such as the southern part of Bangladesh, present particular risk, since these are potentially at risk of flooding from both land and sea. The densely populated delta land of Bangladesh presents a critical problem for the nation and world’s aid agencies”.

So salinity is a crucial development challenge for coastal region in the world particularly for Bangladesh. The nature of the salinity problem is almost same all over the world but poor nations like Bangladesh is more vulnerable than developed nations. As for example in the context of Australia Dovers (2009: 1) states

“In the long run, in major agricultural areas of Australia, serious attempts to manage water and salt in an *ecologically sustainable* manner would require major transformations in patterns of production and consumption, and in our approach to settlement and land use. Towns would fade away, the diets of urban dwellers would change, property rights would be radically revised and much bigger compensation and buyouts than ever before envisaged would be needed. Whether that would be *socially or economically* sustainable, or politically possible, is another matter”.

In the case of Bangladesh this problem could be worse than Australia due to lack of resources and technology. In this context we need to address the problem from

a holistic perspective but still we are in lack of socio-cultural information which is very important for policy implications because

“The problem of salinity has to be translated into a series of policy problems at a number of levels of resolutions, in terms of jurisdiction, statutory tractability, available policy instruments capable of delivering trustworthy technical innovations, institutional settings to implement these, distributional impacts, and so on” (Dovers 2009:2).

From this short discussion it can be said that salinity problem in the coastal region in Bangladesh is certainly a crucial development challenge and we need deeper understanding of people’s perception and socio-cultural responses both for enriching our disciplinary knowledge and policy implications. More over, findings of this study can be useful to address similar challenges to all over the world since “the study of any human group is relevant to understanding all human groups” (Hill and Hurtado 1996; Gragson 1993 quoted in Gragson and Blount 1999: xvi). Again I want to return to Dover to conclude this point (2009:6) where he directly terms salinity as a sustainability challenge and said

“Salinity is a classic sustainability problem. Salinity cuts across jurisdictions and portfolios of policy responsibility, is long term, considerable uncertainty attaches to the magnitude of impacts, it is unable to be neatly addressed by familiar policy instruments, is highly connected to other policy sectors such as agriculture, water and infrastructure, and the causes are deeply embedded in established production and settlement systems. It is to be expected that our traditional structures of knowledge and policy would struggle with such a problem”.

In the case of Bangladesh “Sea level rise affects agriculture in three ways, i.e. by salinity intrusion, by flooding and by increasing cyclone frequency and its depth of damage. Combined effects of these three factors decrease agriculture production in the coastal zone. Decreased agriculture will cause decreased GDP. If agricultural production is decreased, food and cash crop production will be

decreased too. Decreased food production will cause food shortage leading to health hazards or even famine. The ultimate result of reduced agricultural production is high poverty that will force Bangladesh to seek aid from other countries' (Sarwar 2005:20). So salinity should be considered as a very important and frontline development challenge for Bangladesh.

### **1.8 Limitation of the study**

I did a minor field work that was only four weeks long but to grasp the native's point of view on environmental change like salt water intrusion such a limited time is not enough. I think duration of field work was a limitation of my study and it was not possible due to time and financial constraints. It could be better if I was able to spend more time in the field to gather data. Harinagar villagers respond to salt water intrusion by practicing some livelihood skills like shrimp cultivation, crab fattening, oyster, clam and mollusk gathering and saline tolerant rice farming. In addition to that I wanted to know how their perception and Ethnoecology influence their livelihood response and politics regarding adaptation. Considering all of these, my issues of investigation were very broad and it would be better if I could further narrow down my research topic for instance only crab fattening or influence of Ethnoecology or a small section of population like marginalized women or landless laborers in response to environmental change.

### **1.9 What is stated in the rest of the chapters?**

In this study I wanted to reveal how a particular community in Bangladesh copes with an acute environmental problem and in order to do this the **second chapter** deals with theoretical and analytical frame work where I discussed reasons for choosing anthropological approach and concepts like adaptation, livelihood, Ethnoecology, and community as basis of analysis. **Third chapter** discusses the

tools used to collecting primary data from entering into the field up to data analysis process. In this chapter I discussed formulation of the Ethnoecological interview guide as a technique for gathering information. **Fourth chapter** contains local people's perception to salinity, livelihood responses and social aspects of those livelihood skills and in the **fifth chapter** a general discussion on impact of those responses, local politics, ethnoecological influences and how nature and culture are shaped by each other was discussed and finally I have drawn conclusion and recommendations for further research in the **sixth** and last chapter of this dissertation.

## CHAPTER 2

# THEORETICAL FRAMEWORK AND LITERATURE REVIEW

### 2.1 Anthropology and climate change

I am neither claiming nor ignoring that salt water intrusion in to the coastal region of Bangladesh is happening due to sea level rise or climate change. I am not interested to research this aspect since I think natural scientists could do it better than me. It can be mentioned here that there is a controversy regarding the nature, causes and consequences of climate change. The controversy includes whether global warming trend is unprecedented or within normal variations and measurements is authentic or not. Climate skeptics term it as a hoax on the other hand climate change believers including IPCC considers it as an inconvenient truth. To them “climate change is not something that may happen in the near future or far future but is an immediate, lived reality that they struggle to apprehend, negotiate, and respond to “(Crate and Nuttall 2009:9). Further more, they opined that “causes and effects of climate change to be about people and power, ethics and morals, environmental costs and justice, and cultural and spiritual survival” (*ibid*: 11) and climate change is environmental colonialism at its fullest development. Any way, I do agree that salt water intrusion can be happened due to sea level rise which is caused by global warming or climate change. My point is that if sea level rise occurs as per the projected rate a large portion of the coastal region including Bangladesh will suffer similar salinity problem which is studied now and here I’d like to discuss why I have chosen an anthropological approach. More specifically, why an anthropological tool kit is appropriate to add new knowledge and help policy makers to grasp the human dimension salt water intrusion? To reach the point what I want to make here I’d

like to shed light on history of the interaction between Anthropology and climate change at this stage.

If we turn our eyes to past we can see that climate has a long history in the social sciences that goes back to environmental determinism and touch the works of Hippocrates where he theorized how climate shapes society, assessing how climate differs, extremes and how this variability affected human activity (Harris1968:41-42). Among the early Greek philosophers Ibn Khaldun, Montesquieu and Comte considered climate as an important factor for health, physical and personality characteristics and sociopolitical organization. Nineteenth century anthropologists readily explained cultural or physiological differences based on climate variation: why did one group have darker skin, longer noses, low population density, co-sleeping, or matrilocality while other groups didn't? Average temperatures, seasonal variation and other climate related variables were used as explanatory factors for both physical and cultural variation (Brookfield 1964; Whiting 1964 quoted by Peterson and Broad, 2009:72). Later on cultural ecologists like Leslie A. White and Julian Steward focused on how societies adapted to their environment with available technologies. Other research critiqued and built on this work, providing the foundation for ecological or environmental anthropology (Moran 1982).

Studying human behavior linked to climate change today poses challenges that differ from earlier studies of weather or seasonal climate. If we think the distinctiveness of anthropology and its implication to climate change research then we can find the most prospective role of anthropology to climate change research. We know culture frames the way people perceive, understand, experience and respond to key elements of the world which they live in. And the distinctiveness of anthropological field works, gaining insights in to the relationship between climate and culture. Roncoli *et al* (2009: 88) focus on

“Four overlapping axioms that elucidate the different ways cultures engage their world through the prism of climate change: how people perceive climate change through their cultural lenses; how people comprehend what they see based on their mental models and social locations; how they give value to what they know in terms of shared meanings and values”.

At the same time anthropological techniques have been playing historical role to understand indigenous and marginalized people since politics and policy of climate change matters to lives of those people. Further more Anthropology’s emphasis on field work and participant observation can play a pivotal role to grasp the cultural meanings and practices of response to climate change and variability because ‘being there’ is important to know them. That’s why Hallie Eakin (2006: 213 quoted in Roncoli *et al.* 2009) might acknowledged that

“Some of my greatest insights into the livelihoods of farmers in the Puebla-Tlaxcala Valley came from simply being there: helping with the harvest, chatting with mothers outside the primary school, attending a wedding celebration or school graduation. Particularly ethnographic interview and participant observation provide entry points into ways which reveal the phenomena that people use as evidence that climate is changing.

‘Anthropological eye and ear’ is important to understand the local manifestations of global climate change due to lack of a proper human face in other approaches as I mentioned in the introduction. In this study I wanted to see how changes in the natural system, salt water intrusion revise current terms of engagement in terms of livelihood practice at the level of communities. To understand this dynamic is the gauntlet at the feet of anthropology (Finan 2009) which is illustrated by this case study.

## **2.2 Literatures Specific to human dimension of salinity**

Research Literatures that deals with only the salt water intrusion problem in Bangladesh is rare. Even I couldn’t find any but there are some literatures that



address the salinity problem along with other environmental problems of Bangladesh. Most of the literatures contain discussion on predicted impacts of climate change and sea level rise on Bangladesh especially on coastal population. While addressing different sea level rise related impacts and adaptation strategy scholars spoken of salt water intrusion as an example where most of them are in lack of cultural dimension. Finan (2009) opined that due to sea level rise related impact particularly salt water intrusion can destroy all kinds of livelihood of the coastal population where 100 million people could be affected; 10 percent of the fertile agricultural land could be destroyed, farming and fishing livelihoods could be completely compromised; and the Sundarban mangrove forest, declared as part of world heritage could be disappeared. Citing example from Arizona he suggests that long-term process of adaptation requires two major inputs-technology and social reorganization. In addition to that he advocates a three dimensional anthropological contribution to climate change and variability in this coastal region and those are distributive dimension, institutional dimension and empowering dimension<sup>13</sup>. Further more he states “an anthropological approach can localize the adaptation process and seek to understand how local communities can adjust to and reorganize for increased environmental uncertainty”. This study addresses the latter point I mean local response to salinity, an acute environmental uncertainty which addresses distributive dimension as I mentioned earlier.

Dovers (2009: 5) identified salinity as a serious sustainability problem and opined that we have been emphasizing more on technical aspects of salinity than societal aspects. He gave emphasize on translating the problem from its biophysical entity to policy problem and states “If one does not engage in this kind of translation of biophysical observation to policy problem, then one cannot

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<sup>13</sup> This three dimension is discussed in the introduction more details

complain about a lack of societal response. It is easy to fall into the popular Australian malady of “Ortism” – that the government, or someone else, “orta” do something about it, but not to engage in the hard yards of trading off and allocating values, interests and scarce resources” (2009: 2). After discussing history of salinity in Australia he felt urgency to mainstreaming salinity in the landscape of policy and institution and viewed “scientific or even community knowledge on salinity is insufficient to ensure action, and that the complicated world of policy, politics and institutions is where the real challenge lies. I have not suggested how that messy reality can be avoided, but a strategy for engaging with it. Those concerned with salinity might even teach those concerned with climate change that adapting to a changing environment may not be as hard as they think, up to a point” (ibid:8). Here lays my main point of researching human dimension of salinity and use of Ethnoecology while responding to it.

Reduction of fresh water availability due to salinity caused by tidal flooding is seen as a threat to livelihood of coastal region in Bangladesh especially agriculture by Rashid and Islam (2007). They advocated for crop diversification and integrated rice and shrimp farming as prospective response to secure livelihood in the coastal Bangladesh in their research. After two years of their study both responses were found by me in the research area. Different studies identified wider salinity in the surface, ground and soil in the coastal zone as a major threat to the traditional livelihood particularly to crop production. Analyzing existing socioeconomic condition studies suggested some strategies to cope with the salinity problem including coastal aforestation with community focus, providing drinking water to coastal communities, promotion of research on saline tolerant varieties of crops and salt tolerant fish (See NAPA 2005, CIDA 2002-2005, World Bank 2000, Ahmed *et al.* 1999). Among these suggested

adaptation strategies saline tolerant paddy is under implementation on an experiment basis.

### **2.3 How the same problem responded in other places**

Salinity problem is persists not only in Bangladesh but also many parts of the world though the causes are varies country to country even within a country. Unlike causes responses are also different based on nature of salinity, available technology and resources. Most of the literatures on responses to salinity address highly technical aspects of the problem like measurement of salinity, plant tolerance capacity, desalinization process etc and only a few literatures shed light on social and livelihood aspects of this environmental problem. Robertson et al. (2007: 2) discussing dry land salinity problem in Western Australia found that “salinity was a second order issue for many landholders, particularly those higher in the catchments. Salinity was mentioned as a pressing threat mostly by landholders in the valley floor .....and is not expected to greatly worsen in the catchments, so many landholders see little merit in investing in salinity prevention when the benefits are typically small” and it was perceived to be a problem that only gradually would impact on farm profitability. They identified lack of knowledge on salinity management as a great constraint of the farmers. In particular, knowing what to do where was crucial due to the localized nature of salinity. Citing example from Murray Darling Basin Symes and Maher (2007) emphasized on effective and coordinated government initiated project on natural resource management based on past study findings and they identified ‘caring for our country’ a project directed by Australian government as successful where community skills, knowledge and engagement played pivotal role to adapt with salinity intrusion by sustainable farm practices. Shams et al. (Eds) argue in favor of multidimensional approach to increase crop production in the face salinity. In

their edited volume they showed nature and solution of salinity different parts of the world including China, Pakistan, India, Near East and Australia and advised to develop plants tolerant of elevated level of salinity as well as traditional soil and landscape manipulation techniques to improve and sustain the productivity of agricultural soils. Shannon *et al.* (1998) suggested saline tolerant rice farming to adapt with the salinity in California, USA. In this way different communities are responding to salinity problem differently according to their understandings, needs, technology etc.

## **2.4 Conceptual and analytical framework**

The analytical framework was based on some concepts including livelihood, adaptation, salinity and community. Livelihood of the studied Harinagar villagers was adapted to salt water intrusion where adaptive responses were modified by environmental change and responses takes place at a community level through culture. I will not deal with the scientific and technical details of salinity as this was not my topic of interest and investigation. As a student of Development Studies who's major is Social Anthropology I'd like to deal with only the people's perception and responses to salinity and their societal impacts. We know sea water is saline or salty and generally people can not drink it even cultivation is difficult where salinity<sup>14</sup> is present in the soil or water. Apparently it is a biological problem which has physical or material effects but since culture frames the way people perceive, understand, experience, relate to, and respond to the social and physical worlds around them (Nuttall: 2009: 297) it is a cultural problem too and my focus is on the adaptation of Harinagar village community with salinity,

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<sup>14</sup> Interested readers can see appendix 1 for details

Adaptation is widely used in the biological sciences to refer a successful coping strategy. In social sciences and especially in Anthropology the term has long been used to describe successful or functional interactions of human cultures in localized environment (Finan 2009: 176). Some times it is used as synonymous to adjustment, cope with and other similar words. But one thing is common to all discipline and that is adaptation is related to habitat. In the words of Cohen (1974) “A population’s adaptation is its relationship to its habitat”. He further opined the concept of adaptation is historical: when we say a population is adapting we mean that it is altering its relationship to its habitat to make that habitat a more fit place in which to live or to make itself more fit to live in that milieu and adaptation is achieved by means of culture. Cohen states hunting gathering was a technique of extracting a livelihood from the habitat and cultivation was the second strategy of adaptation. In this dissertation I use the term as a response that improves the outcome, i.e. to increase the level of ones livelihood, which can take place autonomously (without conscious planning) or non-autonomously (planned) (Reilly and Schimmelpfennig 2000). In this context what do the people of Harinagar village to cope with salt water intrusion regarding their subsistence pattern. Adaptation is seen as the reduction of vulnerability and the enhancement of resilience in terms of livelihood in the rest of the paper (Finan 2009) where by livelihood I meant subsistence pattern or strategies by which human being satisfy their basic needs. In the words of Ingold “the ways in which human beings relate to components of their environment in the activities of subsistence procurement .....and elucidate the patterns of several such constructions” (2006:9) is livelihood. It can be mentioned here that the central processes of making a livelihood are culturally modeled and it is culturally constructed in diverse ways (Gudeman, 1986:28). In the rest of the discussion I use livelihood to refer the satisfaction of basic needs through direct or indirect production of material goods. My aim was to examine the response of

the community to salt water intrusion satisfy their basic needs though to some scholars' livelihood is some thing more than basic needs. I use the term in it's narrow meaning here because I think the people like Harinagar village community those who live hand to mouth have no scope to think some thing more than their basic needs. Community is a feeling that denotes social togetherness and belonging, often in connection with rituals. In *communitas* (Turner's term), people stand together "outside" society, and society is strengthened by this.<sup>15</sup> In this study I have use the concept as social togetherness where Harinagar villagers think themselves under the same umbrella when negotiate with others than their village. Community is used here as an identity that allowed anthropologists to think about the systematic nature of relations in communities and between communities and local environments (Dove and Carpenter 2008: 39).

## **2.5 What are Ethnoecology and its relevance to this study?**

'Ethno' refers to human culture and 'ecology' refers to interactions between organisms and the physical environment. Ethnoecology is the cross-cultural study of how people perceive and manipulate their environments. It has traditionally focused on linguistic analyses of terms for plants, animals, habitats, and other ecological phenomena in attempts to reveal underlying structures of the human mind that influence human behavior (Casagrande 2009). It allows us to appreciate the amazing variety of ways that humans find solutions to environmental challenges. It is a way of looking how people use their culture to adapt with environmental transformations. Hence, conceptually and methodologically, Ethnoecology offers great promise for linking anthropology meaningfully with other fields of investigation and discourse (Nazarea 1999: vii). Much of the

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<sup>15</sup> <http://www.anthrobase.com/Dic/eng/>

original ethnoecological research thus centers on the interaction between human and nature. This study investigates how humans perceive salt water intrusion, a physical phenomena in the natural world. It also seeks to describe cultural responses to salt water intrusion into the village and culture is viewed here as a system of knowledge or what must know to act effectively in one's environment (Townsend 1999: 20). This research attempts to incorporate traditional elements of ethnoecological research into an applied approach by showing how the culture of the villagers can be influenced by changing environment and how do their culture respond to the environmental change. Therefore, this is an attempt to explore how ethnoecological anthropology can best facilitate the development of relationships among local people and policymakers, resource managers, and scientists. The most important methodological foundation of this research is the application of ethnoecological interview guide to collect data of how rural peoples perceive, cognitively organize, and interact with ecological elements in the environment. If you ask me why I am using Ethnoecology here since I placed my dissertation under the theoretical umbrella of environmental anthropology or cultural ecology in the beginning? My answer is simply due to its focus on knowledge by which they respond to salt water intrusion because "Ethnoecology seeks to provide an understanding of the system of knowledge that local people have" (Gragson and Blount 1999: ix) where as cultural or human ecology deals with generally the relationship between human and environment. In fact it is, from environmental anthropology to Ethnoecology, not a theoretical or methodological shift rather narrowing down my focus. I showed here that in the face of salt water intrusion Harinagar villager's alternative livelihood is not learnt from books, rather from experience, direct interaction, and purposeful, utilitarian activities within the new environment.

The main ways of gathering ethnoecological data is to talk with people, to watch what they do and to participate in their activities. Native language should be used,

and in general questions should not be complicated and ambiguous<sup>16</sup> (Gerique 2006). Among various techniques participant observation, artifact interview, checklist interview, group interview, informal, structured, unstructured and semi structured interviews are widely practiced. I used semi structured interview technique in this study which is discussed in the methodology part.

## **2.6 Contribution to the discipline and policy implication**

This dissertation can be placed under an attempt to show the role of anthropology is and can be in understanding local response to global climate change impacts like salt water intrusion, an obvious consequence of sea level rise. Most of the climate change related research is done and have been doing by natural scientists but they are in lack of human dimension as I mentioned before. Salt water intrusion into coastal region of Bangladesh is apparently a bio-physical problem but adaptation to salinity occurs through cultural practices and in this dissertation I wanted to reveal the cultural/ human dimension of salt water intrusion. Now the question arises are anthropologists engaged in a good number in researching human dimension of environmental transformations like salt water intrusion? Gragson and Blount (1999: xii) responded this question in the following way-

“All four root causes, regardless of how interpreted, lie within the traditional domain of anthropological investigation. What we find surprising is the small number of

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<sup>16</sup> Gerique, Andrés (2006) An introduction to Ethnoecology and ethnobotany:

Theory and Methods,

<http://www.utpl.edu.ec/summerschool/images/stories/presentaciones/ethnoecology.pdf> visited on 25 March, 2009 at 12.22 AM.



anthropologists (e.g. Stonich 1993; Moran 1993; Painter and Durham 1995) concerned with understanding the causality of environmental transformation”.

So findings of this study, to my view, will add something new to local response to a global problem that can be considered as an extra feather to ‘Anthropology of climate change’. From a practical point of view policy makers are in lack of such kind of cultural data to take appropriate decision for addressing salinity problem sustainably. Since “Decision making is a cognitive process that involves schemas, models, and contingencies in linking the thought and behavior of local populations” (Gragson and Blount 1999: xv). Findings of this study can be valuable to policy makers to avoid formulating culturally conflicting strategies which will help proper use of resources and time.

## **2.7 Summary of chapter contents**

Most of the research done on climate change and its associate consequences is dominated by natural scientists but those are in lack of cultural understanding. Anthropological approach due to its uniqueness, among other social sciences can portray human dimension of climate change related impacts like salt water intrusion successfully. Salt water intrusion in to the Harinagar village is a bio-physical problem but solution lies on both technological and cultural aspects of this environmental uncertainty. This study deals with theoretically adaptation to climate variability and change which is not new in anthropology but takes a momentum because of frequency and intensity of climate variability or environmental uncertainty. Thus analytical frame work of this dissertation is deeply rooted on some related concepts like livelihood, adaptation, salinity, Ethnoecology, community etc. Study findings can enrich anthropology of climate change and bear importance to policy makers.

## CHAPTER 3

### METHODOLOGIES

This thesis is based on four weeks field work in the Harinagar village of Munshigonj union under Shamnagar upazilla of Satkhira district in Bangladesh. I conducted field work in two phases. In the first phase 1<sup>st</sup> March to 14 March and in the second phase 18 March to 2<sup>nd</sup> April 2009. My introduction to the community was facilitated by Sushilon<sup>17</sup>, a local NGO which was implementing a number of projects like natural resource management, livelihood diversification, empowering landless women, crop diversifications etc. The organization is mostly funded by foreign donation from European countries. It is the most visible nongovernmental organization in the Munshigong union that includes Harinagar village in terms of activities and infrastructure as I observed. Sushilon works in collaboration with union parishad administration to make Munshiganj a model union regarding good governance and development. My primary contact to the informants was with Caritas, an international NGO provides assistance to the most vulnerable on behalf of Catholics around the world. According to Caritas<sup>18</sup> their members believe they can achieve more in emergencies, sustainable development and peace by working collectively as part of an international Caritas network and they are committed to combating dehumanizing poverty, which robs people of their dignity and humanity. Caritas has many faces but one heart. Caritas provides assistance to the most vulnerable regardless of race or religion, on behalf of Catholics around the world. In the study area Caritas is implementing several projects including natural resource management. Caritas has been providing safe drinking water through its project. Most of the staffs are Christian

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<sup>17</sup> A Bengali name signifying endeavor for a better future

<sup>18</sup> <http://www.caritas.org/about/index.html> accessed at 9.38 on January 24, 2010

and some people alleged that Caritas has hidden agenda and it is converting poor Hindus in to Christian. But I think people's perception on these two organizations had no impact on my field work though my entrance in to the field was initiated by them. Now I am going to discuss data gathering techniques and first of all ethnoecological interview which I used as a cornerstone of my research.

### **3.1 Ethnoecological interview guide**

In order to develop an ethnoecological interview protocol, I first wrote an outline of topics and questions that need to be covered. Originally the interview guide was prepared in English and I did it intentionally because I did hope it will help me to copy the guide directly to the dissertation while I write the essay. This guide (see appendix B for details) later translated in to Bengali and was further refined and structured after consulting with my key informant to make questions easily understandable where I replaced some key terms with commonly used words in the community and then used to administer the interviews. It can be mentioned here that this list was just a guide and it allowed me to act with flexibility. In the semi-structured guide I specifically encouraged respondents to produced elaborated and detailed answers, by questions and body languages (Rapley 2004).

### **3.2 Sampling**

The sample for the ethnoecological interviews was drawn from the list of a project on natural resource management administered by Caritas. The project manager generously shared the list with me for this purpose. Total 11 interviews were taken where 7 were male and 4 were female respondent. Among 11 respondents 6 was Hindus and 5 was Muslim. By this I wanted to know was there any difference in response regard to belief system. I used stratified sampling to

make a list of 14 respondents but failed to reach 3 of them due to their busyness and my time constraints.

### **3.3 Entering in to the field**

Before going to Munshiganj I contacted director of Sushilon administering different projects in that area to alleviate poverty. I came to know from him that there is no hotel in the area to reside and the only accommodation which I can get was in a guest house directed by his organization. Most of the visitors and government officials who visit this area stay in their rest house. I decided to avail that accommodation and confirmed him over phone. Harinagar village, my field was about two kilometer far from the rest house where I stayed. After arriving at the guest house while taking dinner I talked to the cook of the guest house and asked him how to get in to Harinagar village. He informed me that the field is about two kilometer far from guest house and I need to hire a motorbike to travel to and from guest house. He also managed his brother who drives motorbike commercially to carry people near distance. Most of the time during field work he accompanied me and he was my key informant though he didn't know his role and importance to me.

Since he lives on the income of this motorbike and spent time for me with the bike I paid him in an hourly basis. Every day he helped me to travel to my informants by his motorbike. He was known to most of the informants and it was he who introduced me with most of my informants. After first three days he stays away from me and the informants while conducting interviews. In a word I entered in to the field via him. The local Branch manager of Caritas also helped me by introducing with the informants.

### **3.4 Performing interviews**

As I mentioned before I used the guide while conducting interviews in the field. Every interview was 1-2 hours long and most of the interviews were taken in the

afternoon because relatively it was their free time. Some interviews were conducted in the evening at the informant's home. Among the 11 interviews three was conducted in the field where they were working in their shrimp farm. Those interviews were longer than 2 hours as there were several breaks because informants talked to me while taking rest after working some time. But if I count the real time of the interview it was no longer than 2 hours. Informants of those interviews conducted in the field showed me boundary of their paddy field where they could no longer cultivate rice due to salt water intrusion. Most of the interview with male was between me and the informant but not with the female. During interviews with female informants other women always present there and they interfered in the interview process. In that case I had to discuss their topic of interest like what should be done by the government in this crisis. Why are they ignorant by national and international NGO's etc? But I did not feel that it was a drawback since I was able to manage to discuss all of my required issues in the same sitting. Most of the informants were very concern about Royal Bengal Tiger's attack in their village. Almost in the every interview informants mentioned Royal Bengal Tiger as a prime problem. It came in response to the question what is their main problem regard to livelihood? Initially I would have preferred meet them individually but it was not possible since this was unusual to them to meet a women by an outsider individually. In fact without very close keen it is not permitted to see a woman individually by a man.

### **3.5 Keeping record**

I didn't use any tape recorder to record interviews because to my mind informants don't feel comfort to talk for recording and it encourage people to tell the ideal thing or what should be done instead of reality and practice but I wrote down details of every interview in the respective night I mean after returning from the field and it was in English. I noted down some indigenous terms during the

interview since it would be impossible to remember because those terms were totally new to me like *gher*, *hari* etc.

### **3.6 Analyzing data**

Interview data can be used ‘as resource’ and ‘as topic’. In the first case the interview data is seen as (more or less) reflecting the interviewee’s reality outside the interview and in the latter the interview data collected is seen as (more or less) reflecting a reality jointly constructed by the interviewee and interviewer (Rapley 2004). In this study I used the interview data as resources. I didn’t want to problematize the issue here regarding constructionist traditions. The data which I treated here as resources was analyzed thematically (Flick 2006). During analysis I gave importance to their body languages as informants expressed their past actions and future plan by this. As for example informant 9 told me in response to a question ‘look at the river’ by pointing his finger. Informant 4 expressed his irritation to local politics by making his voice louder and changing his face.

### **3.7 Summary of chapter contents**

For a better appreciation of how people perceive and manipulate their environment to adjust with salt water intrusion, the environmental change an ethnoecological interview guide was used to collect data. Data sources include interview, observation and relevant publication. During the four weeks field work 11 informant were interviewed based on but not limited to the interview guide and the guide allowed me to remain in the track with flexibility. It can be mentioned here that each interview was 1-2 hour long and conducted in way of conversation. Data recorded by keeping field notes written in the same day and analyzed based on theme. In a word, ‘anthropological eye and ear’ were used to collect data and thematic analysis was done to present the findings.

## CHAPTER 4

# LOCAL DISCOURSE, LIVELIHOOD RESPONSES AND CONSEQUENCES

Major findings of this study, answers the specific questions mentioned in the introduction and those are perception and local responses to salinity, politics of adaptation, water, women and salinity etc. My line of argument will be supported mainly by informants' statements. In the beginning I'd like to discuss their perception on salinity as people do not interact directly with their environment but with their perceptions of that environment (Rosen: 2007).

### 4.1 Local discourses about salinity

For most of the population of Harinagar village livelihood security is closely connected to salinity. So their perception is built upon how and to what extent livelihood is impacted by salt water intrusion. Salinity is '*Nona Pani*' or 'salty water' which is undrinkable regardless of topic, gender and belief system to them. Salinity meant to them undrinkable water first. In a word, young to old, male to female and Hindu to Muslim salinity is the another name of undrinkable water . After this, it is synonymous with hunger, joblessness and associated consequences. Salinity means lack of food and can be deadly, whereas fresh water means life to Harinagar village community as 6<sup>th</sup> informant viewed-

“Only a decade ago we produced plenty of rice, we had pond full of fishes, we never thought twice what kind of water we were drinking. But today we lost our land; we lost our paddy field and our pond where to farm fishes. We have neither present nor future and it was salinity that ruined us. We can live only if you change salt water with fresh water in Harinagar”.

Usually women are responsible to manage drinking water for their family members regardless of number of the members of her family. Her first thinking concerned to drinking water. All the women informants were very conscious for collecting drinking water and to them salinity is lack of drinking water that might be the cause why 8<sup>th</sup> informant opined-

“Another name for water is life but salt water is death to me. How can you collect water from 2 miles far from every day? Where do you keep your children then? Who will take care of my children during that time? We born to suffer and salinity doubles our suffering. You are a man you can not realize our misery, no man, no man”.

Most common perception on salinity is enemy and Harinagar villagers are used to compare salinity with Royal Bengal Tiger of adjacent Sundarban<sup>19</sup> because they are dependent on Sundarban and cultivable land in the village for their livelihood. Those who had land cultivate paddy and those who are landless depend upon forest for their livelihood. It can be mentioned here that more than one thousand peoples have been killed by Royal Bengal tiger in the last decade. Though most of them killed in the forest before but now a days tigers began to enter in to the village and kill people in their home. That's why they consider tiger and salinity as their two common and deadly enemies which can be clearer in the words of 4<sup>th</sup> informant-

“If we go to forest tiger will kill us and if not salinity. What will we do? Do we starve to death? We are not bird so that we can fly somewhere else”.

As I noted in the introduction that shrimp farming became as a golden opportunity for some people to make money and most of them are absentee owner of means of production. Most of them are physically invisible in the village but every one can

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<sup>19</sup> A mangrove forest declared as part of world heritage by UNESCO



realize their presence. To them salinity is not something harmful for villagers. It can be harmful only in lack of proper management and vision. To them we can be richer if we use our resources in a planned way to produce more shrimp. One informant who belongs to a very few of his kind in terms of owner of the means of production in the village states-

“Shrimp is like white gold. If you don’t have salt water how do you grow shrimp? How do you earn foreign money? Without salinity many peoples will loose their job here and even in the capital. So salinity is a gift of God, we just need to properly use this gift. Bangladesh can be rich if we able to just produce more shrimp and can ensure virus free production.

Salinity is a revenge of nature to some people in the community. To them we used nature according to our needs but ignored the necessity of nature. We didn’t think about our future but only immediate needs. The informant was very angry when I asked him what the causes behind salinity were. After a brief discussion on misuse and over use of land and Sundarban, the adjacent forest, he commented

“God always forgive, human sometimes forgives but nature never forgives”.

I observed in this study that perception of salinity varies regarding age, sex and class as “Rich people view the world differently from poor people, white people view the world differently from people of color, old people view the world differently from young people, and men view the world differently from women (Bart *et al* 1991 in Fonow and Cook: 1991). Not only this perception is highly related to nature of engagement with the environment and thus, salinity is used as a symbol or metaphor for insecure livelihood in general (Kruger and Grotzke 2008) which is echoed in the word of (Ingold 2006: 15) where he states-

“The anthropological claim of perceptual relativism – that people from different cultural backgrounds perceives reality in different ways since they process the same data of experience in terms of alternative frameworks of belief or representational schemata”.

In this study we observed that though they are living with the same consequences of an environmental change their perception on salinity is shaped by individuals' background and nature and degree of engagement with the environment. It can be noted here that I didn't find any difference based on belief system I mean between Muslim and Hindus. Only one thing and that was Hindus used to live adjacent to the river and Muslims on the other way around. The same reality, salt water intrusion is perceived in different ways by different gender and class.

#### **4.2 Livelihood response to salinity intrusion**

Here I'll be discussing their livelihood response to salinity more specifically what is done by Harinagar villagers as response to salt water intrusion into their area which includes saline tolerant rice practice, shrimp cultivation, crab fattening, and gathering of mussel, clam and oyster. I'll be rather emphasizing on their indigenous techniques, which in some cases seem to ignore by scientific community. More over emphasis will be given how did they learnt those techniques which justify my methodological tool use I mean ethnoecological interview. As I mentioned before salinity is not an age old problem for them. They started to face this environmental transformation from early 1980's and before then they used to cultivate paddy generation after generation. Farming paddy was their one and only means of livelihood. In the early 1980's salt water intrusion occurred and villagers were compelled to initiate alternative livelihood. As a first response to salinity traditional farmers started to cultivate shrimp but how and how did they learn the technique and conflict of interest centering shrimp farming is discussed below based on secondary sources and my

observation. It should be emphasized here that while shrimp cultivation is a very broad topic, I will be focusing on know how and societal aspects only.

#### **4.3 Shrimp aquaculture livelihood and conflict of interest**

Shrimp was introduced by an enterprising individual who wondered if shrimp could be raised in a small pond like water body locally known as *gher* (See appendix D3) as it was in the saline water in the river. The shrimp spends their post-larvae stage in brackish water, and then migrate up rivers to grow to adulthood before returning to the sea. This innovative farmer obtained a sample of post larvae and grew them out in a small pond near his home (Finan 2009). This farmer is identified as Nuruzzaman (Rowshonara *et al.* 2004) and he introduced this technique in early 80's. After that other people did the same by raising earthen walls called *ghers*, trapezoidal in shape and about one meter high and a half meter across the top. These allow them to control the water level favorable to cultivate shrimp and if needed more water they can manage by opening the dike temporarily. "During the dry season, *boro*<sup>20</sup> paddy land is cultivated as was always done; after the monsoon season starts, farmers put post larvae in a small flooded trench along the inside of the *gher*. As the rain fill up the trench, the post larvae spill out into the open field where they grow to adulthood" (Finan 2009: 180). This technique provided an alternative livelihood both for land owners and landless since landless laborers can work in shrimp *gher* and "from a livelihood perspective, the *gher* technology has diversified income, intensified the productivity of scarce resources (land) and tapped greater quantities of abundant labor resources" (ibid). Gradually shrimp farming became an export oriented business for Bangladesh and accounted for 4.1 per cent of global production of commercial shrimp in the mid- 1990s (global production at the time was 721

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<sup>20</sup> Bengali name of paddy cultivate in winter usually by irrigation

thousand tones). The total area of shrimp culture (a major component of coastal aquaculture) in Bangladesh covers about 130 thousand hectares, which is 12.7 per cent of total global area under shrimp culture. The area under shrimp culture registered a three-fold increase over the last decade. The 750 km coastline provides an ideal natural environment for commercial shrimp culture in Bangladesh but “the economic benefit from shrimp farming has mostly bypassed the common people. Instead it has brought about misery and health hazard for them and complicates any exercise to remove the expanding water logging and salinity problem (Hossain 2003). Moreover, absentee and politically backed rich farmers took the control over this process and compelled small farmers to hand over their lands for cultivating shrimp. As a result, the number of landless peoples increased rapidly.

As this kind of shrimp farming seemed profitable more and more land became under salt water which later proved serious harmful for environment and “the concern raised regarding export-oriented shrimp culture in Bangladesh encompasses political, socio-economic and environmental issues. Some of these are: (a) non-resident entrepreneurs having no motivation to practice sustainable shrimp farming; (b) increased salinity leading to drastic decreases in soil fertility; (c) irreparable damage to traditional economic activities such as cattle grazing, poultry keeping; (d) damage to household vegetation and communal forests; (e) loss of common property rights; (f) increased income erosion and growing income inequality; (g) irreversible damage to the (Sundarban) mangroves and coastal vegetation; (h) irreparable damage to flora and fauna and bio-diversity”.<sup>21</sup> An engineer who closely worked for more than a decade with water development board discussing the process said-

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<sup>21</sup> <http://www.unep.ch/etu/etp/acts/capbld/rdone/bangladesh.pdf> accessed at 8.01 pm on 26 January 2010

“While the paddy production lay in ruin, the trapped saline water in the polders provided an ideal opportunity for commercial cultivation of shrimps. With the rapid spread of shrimp farming, vast new areas came under saline inundation, thus further worsening the environment and ecology (Hossain 2003).

This shrimp aquaculture is hundred percent exports oriented and Bangladesh earns foreign currency by exporting shrimp but “various social costs are associated with shrimp cultivation which cannot be measured in monetary terms. Most of the shrimp farms are cultivated by entrepreneurs who are not residents of the area and thus have no social obligations to the area. Area residents who protest against shrimp cultivation are often subject to torture and violence, and even killing. Small and marginal farmers are not allowed to work in the shrimp fields, as the entrepreneurs are afraid of theft of shrimp. Consequently, they have to look for employment somewhere else, often outside the village leaving the family and resulting in family dislocations. As output from this industry is consumed primarily in export markets, the degradation of the Bangladesh environment in affected regions remains a local externality whose costs go unaccounted for in consumption markets. As a vulnerable group of the society, women are the most affected victims of environmental degradation. Not only are they engaged in the collection of shrimp fries and the processing of shrimp, but they also have to perform household activities in a degraded environment which poses serious threats to their health. They are also harassed and tortured by the owners of the shrimp farms. Children, on the other hand, miss their classes during the season when shrimp fries are collected”.<sup>22</sup>

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<sup>22</sup> <http://www.unep.ch/etu/etp/acts/capbld/rdone/bangladesh.pdf> accessed at 7.50 pm on 26 January 2010

That's why local peoples are not any more interested to rent their land for shrimp cultivation. On the other hand Bangladesh government, entrepreneurs and consumers mostly from Europe, United States and Japan are in favor of continuing shrimp farming. In this regard a study by J. Martinez-Alier et al. comments that "Television reports of flooding and loss of life in Bangladesh are not uncommon in Northern homes, but the connection to destroyed mangroves, abandoned shrimp farms, and decreased coastal defense against cyclones is not often made. Deforestation has left the area highly vulnerable to sea water intrusion when cyclones strike. Thus, the lack of food security because of the enclosure of the mangroves in order to produce a luxury export product such as shrimps is compounded by environmental insecurity."<sup>23</sup> Exactly this thing happened in 2007 and 2009 when Bangladesh was hit by two devastating cyclones namely *Sidor* and *Aila* with tidal upsurge and most of the shrimp gher inundated under sea water and collapsed the whole gher system.

It can be mentioned here that The World Bank has announced the approval of a US\$28 million equivalent credit and a US\$5 million Global Environment Facility 1grant for the Bangladesh Fourth Fisheries Project to increase environment-friendly and sustainable fish and shrimp production and "the objective of the project was to support environmentally-friendly and sustainable fish and shrimp production for domestic consumption and exports and to help fight poverty in Bangladesh by improving the livelihoods of people who depend on fishing. At full operation, the project will account for about 22,000 metric tons in incremental fish production and an additional 2,500 metric tons of shrimp each year. The

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<sup>23</sup> <http://www.wrm.org.uy/bulletin/144/Bangladesh.html> visited at 6.20 pm on January 26, 2010

project will also provide about 440,000 additional jobs in the fishing industry, especially for the poor and women,"<sup>24</sup> Though the project outcome is not yet assessed but significant improvement is not seen and felt by local people.

In this condition, local people want their land back from absentee entrepreneurs but they are not in a position to fight to get back their land as their counter part is well equipped with money, muscle and administrative support. This conflict of interest leads most of the time to fierce clash and some times leaving lives though local people want to get rid off shrimp farming at any cost. Their desire gets momentum after introducing saline tolerant rice farming which echoes in the words of 1<sup>st</sup> informant,

“In the beginning per bigha rent was 300-500 taka which is 3000-3500 taka now for shrimp gher but it is neither profitable for gher owners nor for land owners. Even few days ago people could sell their labor and live hand to mouth but now there is no work to earn a single penny. So we don't want gold we want our land back from salinity so that we can return our fathers and grand father's profession.”

Due to increase the numbers of landless people those who have no capital to invest and no work to do they find another way of livelihood and that is crab fattening. This livelihood strategy is not become after shrimp rather it was practiced simultaneously in a limited way. But after the disruption of shrimp farming it has been practicing widely, and number of people engaged with crab fattening has been increasing day by day. How, then, did they learn crab fattening skill as a livelihood? How did they learn it, from whom, what kinds of social arrangements are organized to do this are discussed.

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<sup>24</sup> [http://www.edie.net/news/news\\_story.asp?id=1481](http://www.edie.net/news/news_story.asp?id=1481) visited at 8.29 pm on January 26, 2010

#### **4.4 Crab fattening and its consequences**

Crab is the short tailed decapods or ten legged crustacean and commonly known as shell fish. Crabs are widely distributed in mangrove area of the Indo-Pacific, including inshore water of the Bay of Bengal and since Harinagar village is situated by Sundarban mangrove forest, many villagers depend on crab for their livelihood. Crab is seen as the most important hidden resource of Bangladesh (Zafar and Siddiqui 2000: 105). Four species of fresh water and more than 16 species of marine crabs recorded from Bangladesh and the annual production is estimated to be more than 10000 tons. Bangladesh earns more than 6 million USD by exporting crabs (Zafar 2006: 3). Crab is not only collected from the river but also cultivated in a special process which display the way Harinagar village community employ their ecological knowledge and experience with environmental change, salt water intrusion<sup>25</sup>. The mud crab and swimming crab are consumed in Bangladesh as well as exported to Europe, USA and some Asian countries. (Zafar and Siddiqui 2000: 105) but the demand is higher than production. As a result more and more peoples are engaging with crab fattening in the coastal area. Only big crabs that are over 200 grams are exported but most of the crabs are found smaller than this size in the river. So after collecting from river they take some days to make them as fat as market demand. The whole process can be divided in to two phases and those are collection and cultivation. Both processes is discussed below briefly-

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<sup>25</sup> Casagrande, Dr. David (2009) home page <http://faculty.wiu.edu/DG-Casagrande/ethnoecol.html> visited on 21.11.09 at 10.55 pm.



**Collection of crab:** The crab collector groups comprised of children, youth, and women but dominated by male. They don't know what type of crabs they catch but able to identify the male and female by using their ecological knowledge. Small boats, known as *Dhingi* were exclusively used by the collectors during harvesting crab from the mangrove forest, Sundarban.

According to the informants crab might be found all the year round but the peak season is June to August while winter is the off-peak season when the price of crab increases. The crab collectors comprised of the most marginal segment of the coastal population and as such had little or no education. About 58 percent were found to be educated at the level of class one to two, 10 percent at the level of class five to nine where as the rest were completely illiterate. (Zafar and Ahsan 2006:37). When I observed both the crabs selected for fattening and selling were almost same in size asked what makes difference to them. 2<sup>nd</sup> informant takes his torch light and two crabs same in size in a dark place. He threw light on both crabs' and showed me that one has little flesh under its shell and other had more though both seemed almost same in size. By this way they distinguish what should be done to which kind of crab and separate crabs for further cultivation I mean fattening. Different system of crab fattening were observed in Harinagar village and those were cage culture, pond culture, and Pen culture.

**Crab fattening:** Traditional method with no scientific input of crab fattening in earthen pond started since 1993. Technologies of upgrading traditional method of earthen pond culture (see appendix D2) and cage culture of mud crab have been developed during the year 2003-2004. Presently they practice their traditional as well as recently developed methods and sometimes mixture of both of them but in all cases crab fattening is based on wild seed until now. In this method crabs become sellable in size by 15 to 20 days. Usually more than 180 gram is considered as exportable what is called 'grade' crab by crab cultivators.

In another way crab is cultivated in a bamboo cage beside or near the river. Small crabs feed for 15 to 20 days and after that sold to the buyers. During this period farmers use different types of food including poultry feed. Pen and pot culture are modified forms of cultivation by scientific community but used very seldom.

Research finding shows that growth rate of male crabs are higher than the female crabs in cages and ponds. Average growth rate was found 0.66 g/indiv./day for male and 0.36 g/indiv./day for female (Zafar 2005). Mud crabs has various uses, such as human dietary items to fulfill nutritional deficiency of poor coastal people and as export commodity fetching good amount foreign currency (*Ibid*). Mud crab fattening in bamboo cages has created a new avenue for the coastal people making livelihood approach easier for them. Crab fattening requires capital though the amount is relatively small but there are many people those who have no capital to invest and those people lead their lives by gathering oyster, clam and mussel.

### **Social aspects of crab fattening livelihood skill**

Crab fattening as a livelihood skill developed in the beginning of 1993 in the study area (Zafar 2004:6) and this is called traditional technique of crab cultivation. Learning of this technique is deeply rooted in the relationship between them and the adjacent river. Landless people depend upon the Sundarban and the adjacent river mostly for their livelihood. They gather various resources from the forest including leaves, honey and wood and catch fish from the river and crab fattening developed from the latter. When fishermen catch fish some other species are also caught by net like oyster, crab, mollusk etc and they used to separate fishes from other things. Most of the times fishermen throw others than fish in the river but some times crabs, mollusk and oyster are collected as food for their duck. In this process crabs are preserved home for some days and kept in water to

remain alive. After some days they observed that if crab is allowed to live in the salt water as it was in the river it grows and become fat. In the mean time market demand is grown for crab and local people found it profitable. In this way crab fattening developed but who introduced crab fattening first is not known until today. Informants opined that it might be developed by women first as they take care their domestic ducks and they are responsible to do such kind of domestic works. Whoever introduced it, now –a- days most of the works related to crab fattening is done by male and traditionally techniques are learnt from adult by young like from father to son. More over, recently scientific intervention is increased in this field as part of government and nongovernment organizations involvement in the name of livelihood diversification and livelihood security. According to scientific community in addition to their indigenous techniques scientific intervention increases production and hence profit. Informants did agree with this argument too. Crab cultivators don't want their son to see as them in the same profession and opined that they are doing crab fattening as there was no other alternative. They did hope to see their children as educated and doing some official works or desk jobs.

Crab farmers don't have any organization but they keep contact with each other and exchange views on farming techniques and selling rates. They often consult with each other to set prices just before selling their crabs to traders or middlemen. Some times they exchange views on how to dig pond, what will be the favorable deepness, how can they keep salinity within a perfect range for ensuring highest production. In the beginning they cultivated male and female in the same pond but now they do it separately and found very profitable. Even a minor boy of a farmer can easily recognize male and female crabs and it is learnt by their every day experience.

Other than crab fattening Mussel, clam and oyster gathering has been an alternative livelihood for Harinagar villagers particularly for women. More especially it is practiced by widow who lost their husband to Royal Bengal Tiger. Most of them are head of their household.

#### **4.5 Mussel, clam and oyster gathering**

To gather mussel, clam and oyster they prepare clutch by using locally available selected materials such as plastic sheet, pottery, *kortal* (window pane shell, *placuna placenta*) and bamboo pole. Prepared clutch frames install at different depths for spat collection. Bamboos of various sizes are used for raft construction. A plastic drum of 200 liter, one on each corner, is used as floats to keep the raft afloat. Iron anchor is attached to the raft. Clutch, rope and tray are hung from the raft for culture in both the sites. Floating raft is placed into the water in such a way that it can move with tidal fluctuations. Among them window pane shell is the most suitable for the coastal poor communities in respect of spat density, and economic analysis. The highest peak settlement season for oyster and mussel larvae are from September to November, second peak from March to April. The function of the harvester is to procure supplies and display them in forms and at times convenient for consumers and businessmen. Study found that external clutch materials deployed at coastal canals are economically and environmentally viable for spat collection. Hossain (2005) finds it a promising alternative livelihood comparison to destructive shrimp fry collection. Mollusk's culture in the coastal water is not capital intensive and can involve poor communities. Countries like Thailand, Vietnam and China have an increased demand for molluscs and the gap between supply and demand is so high. The shell of molluscs is used to make lime. These alternative livelihoods are practiced after

being ruined their traditional and age old livelihood paddy cultivation and dominated by female particularly marginalized and widows.

**Who does what, who gets what, how are catch's organized and controlled?**

Oyster, clam and molluscs gathering activities are done mainly by women and children and they are from very impoverished section of the society. They don't have capital to invest into other kind of business even no land or water body in their possession to cultivate shrimp or crab. A section of the women of these gatherers are widow who lost their husband to Royal Bengal Tiger. They just live hand to mouth by gathering oyster, clam and mollusk and it is very difficult to maintain their family by such a small amount of earnings. In the course of collection woman mainly does the work and her children just help her in different ways like pushing the net, separating wastages and weeds etc. Sometimes, more than two women form a group for a day and collect together. After gathering they divide equally among them and sell individually. In this case some time they gather and sell jointly and distribute the money equally among them. Though they don't belong to any formal organization they felt each other and so kind to their fellow or neighbor and used to extend helping hand in need. In the morning some one, most cases comparatively older person calls others to get ready and go for gathering or fishing to the adjacent river and in Sundarban. During fishing they share their joy and sorrow with each other.

Very recently Sushilon, an NGO has taken initiative to organize those women so that they can improve their lives. The NGO employed a person to help those buying nets, selling fishes, oyster, clam and mollusks in a good price. Recently they established a cooperative society where every one pay a certain amount of money as saving for future and they hope it might help them in their economic hardship.

After more than two decades local people are very eager to return to paddy cultivation as no other livelihood is as secure as paddy production. Now they are crying to return to their forefather's profession by which they could produce food directly for their children but it is not as easy as wish. By the help of scientific community saline tolerant rice farming is very recently introduced but not in a full swing as it is in testing period until now.

#### **4.6 Saline tolerant rice farming and its impact**

The studied coastal region of Bangladesh, Harinagar village and the adjacent area suffer from salinity problems due to three reasons and upon them livelihood varied and impacted differently. Those three reasons are firstly; tidal flooding and direct inundation by saline or brackish water during the wet season (June to October) secondly; intrusion of saline waters into the estuarine surface water system during the period of Low River flows in the months of December through April and thirdly; upward or lateral movement of saline ground water. The main concern is with the intrusion of saline waters in the surface water systems (BCAS 1994) which made land useless for paddy cultivation. According to scientists of Bangladesh Water Development Board (BWDB) land with 500-1000 c.c.m salinity is cultivable but in Sundarban area it is 25-35 thousand c.c.m, in which normal rice cultivation is impossible (see appendix A for details) but only 30 years ago it was 1500-4000 (The Dainik Proborthona July 15, 2004) where people could produce rice. Bashar *et al.* (2004) identified six kinds (see appendix A) of saline tolerant rice variety in the southwest Bangladesh and those are *Bamonkhir*, *Beki Balam*, *Chini Kanai*, *Horkoch*, *Jamai nadu* and *Morich sal* but these are not submerge tolerant which happened after Sidor and Aila. There are submerge tolerant rice but those are not saline tolerant. Most of the informants (7) opined

they need both saline and submerge tolerant rice to continue their traditional livelihood by which they can directly produce food. Very recently Bangladesh Rice Research Institute (BIRRI) developed such kind of rice named BR47 (see appendix D6) which is at its experimental period now. The farmers who cultivate BR47 are happy with its saline tolerance capacity. As 1<sup>st</sup> informant was showing his field with BR47 and said-

“Look at my field which is full of well grown paddy plant and look at the field beside my one which is almost dead. There is no magic in my land but only BR47. I advised my neighbor to follow me but he didn’t. I hope people will follow me from next year and we will get rid of devastating shrimp cultivation”.

Another strategy for livelihood adaptation is combined cultivation of rice and shrimp in the same land. In this process farmers cultivate paddy in May –July to November in the wet season and at the same time they open shrimp fry in the land. In the month of July they get out the saline water and irrigate fresh water. At the end of November and December they catch other fishes except Shrimp and harvest paddy. After few months later they fish shrimp and make their land ready for another term. In this way they can produce rice as well as fish and gain profit (Tutu 2004).

### **Impact of Saline tolerant rice introduction**

Introduction of saline tolerant rice is seen as a revolution by the local people but they are skeptic about its degree of tolerance against salinity. Some farmers were wondering whether it will be tolerant to full merge to salt water or not as it is tested in submerge salt water. Above all most of the farmers are hopeful to return to their traditional paddy farming but absentee shrimp farmers with capital and political patronage are not willing to allow farmers to shift from shrimp to paddy farming as they have been making money and profit goes to their pocket solely.

Presently farmers want to cultivate paddy and *gher* owners don't and it leads to confrontation which become sometimes fierce. General farmers try to keep salt water out of their paddy field to cultivate rice and gher owners try to penetrate salt water to make the land contaminated so that respective farmer find no other alternative to rent his land to the *gher* owners. In this competition and confrontation traditional farmers are not organized enough to resist *gher* owners who can be termed absentee land lord and farmers are not getting administrative supports as *gher* owners have political linkages both from local and national elites. 1<sup>st</sup> informant introduced this kind of rice in his land first and happy with its performance which inspired other farmers to follow him. To his mind, they will be able to return to their paddy farming only if they get administrative support as well as seeds of saline tolerant rice in time and according to their needs.

#### **4.7 Water, women and salinity**

“Six-year-old Chapala doesn't know the meaning of the terms, 'salinity'. But she does know she will have to wake up before dawn and walk five kilometers with her mother, braving the morning chill, just to fetch drinking water. She also knows that if she doesn't, her father will scold her because the whole family will have to drink salty water from a nearby shrimp-cultivating gher. Chapala's family and her neighbors have no alternative but to walk such distances because their local groundwater, already contaminated, has now been polluted with salinity.”<sup>26</sup>

This statement portrays the condition of women and their sufferings posed by salinity and it has a gender dimension I mean salinity doesn't impact on male and female equally.

Before the salinity intrusion local people used to collect drinking water from pond and tube well but salt water damaged their traditional sources of water. Even very

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<sup>26</sup> [http://www.sos-arsenic.net/english/groundwater/as\\_saline.html](http://www.sos-arsenic.net/english/groundwater/as_saline.html) accessed at 1.52 am on January 27, 2010



deep tube well can not provide fresh water as ground water is contaminated with salinity. Scarcity of fresh water made difficult their cooking and drinking jeopardizing traditional sources of fresh water. Primary responsibility goes to women to collect water for drinking and cooking. In addition to that the increasing salt water intrusion decreased the productivity of the land, pushing communities but more so women, because of either limited work opportunity and restricted mobility, further into poverty and “Consequently, women’s livelihood are being put in risk in the various ways, 1) women are displaced from their productive role, 2) over dependence on cash crop and loss of traditional safety nets, 3) lack of the national and community support during the transition phase. Consequently all this is exacerbating the marginalization of women. Moreover as women are involved in the shrimp fry catching in the nearby rivers they are also contributing towards reducing the future stock of shrimp. With the loss of subsidiary work (as no agricultural work takes place in the area) and increase of female headed households (as more and more men migrate outside the area looking for employment) it has put women with extra burden of taking care of the children alone”.<sup>27</sup> And very recently three children drowned in shrimp gher and lost their lives.

The crisis is even transforming old local customs and creating new cultural barriers. Marriageable girls now find their dream of marriage a far cry, since their parents, fearing that there will be no one to fetch them drinking water, do not want to marry them away.

So women are very much concerned and sufferer of this problem hence response begins with them first. To manage fresh water for drinking and cooking they apply their experience and environmental knowledge to adapt adverse effect of

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<sup>27</sup> <http://www.unnayan.org/env.unit/paper5.pdf> accessed at 12.36 on January 27, 2010

salinity in various ways such as rain water harvesting system, pond sand filter system, and pot filter system etc. Rain water is considered as fresh and pure. So it is drinkable and useable in cooking. But rain doesn't occur every day not even all season. As part of managing drinking water they collect rain water from top of their roof. To do this local people use *polithin*, banana leaves etc and preserve in big containers. This reserved water meets their demand during the rainy season. They also practice pond sand filter and jar filter system to get fresh water from salt water (please see appendix D1, 7 and 8)

Other than these three system women collect drinking water from very deep tube well by walking more than two kilometers from their home. Describing her misery 10<sup>th</sup> informant said-

“I have river one side and shrimp gher other side and both contain only salt water. There is no other alternatives to walk two miles and twice in every day. Not only this, I had to carry my children on my shoulders for their safety”.

I further asked her don't you feel bad to do this every day? She replied

“Bad feelings (misery) belong to rich people. We should not have such kind of feelings as we are poor and women”.

Women blame both salinity and patriarchal system for their sufferings since they are primarily responsible for domestic works including taking care of their children.

#### **4.8 Summary of chapter contents**

Salinity is perceived differently by the different sections of people in the community and perceptions are shaped by their engagement with environment and it is perceived as serious hindrance to livelihood and synonymous with

hunger, joblessness, diseases, lack of drinking water etc. To respond the environmental uncertainty they have altered their livelihood practice adopting shrimp cultivation, crab fattening and oyster, clam and molluscs gathering instead of paddy farming. Very recently with the scientific community intervention saline tolerant rice farming has been introduced but it is in experimental phase. Women use their traditional knowledge to manage fresh water and they practice pond sand and jar filter system to separate salt from water. They also preserve rain water to drink and to use for household work. All of these responses are based on their traditional knowledge except saline tolerant paddy farming.

Social impacts of these livelihood responses are varied and variations are due to degree and nature of their engagement. Oyster, clam and molluscs gatherers live hand to mouth by doing this. It helps them just to sustain or protect them from starvation. Crab fattening provides an alternative but not to landless farmers and crab cultivators are not happy with their existing condition. This livelihood skill not yet provided them a safe and certain income though it is growing with the scientific intervention. Shrimp cultivation earns money even foreign currency and very profitable but not ecologically sustainable. Further more profits bypass mass people and create a new class of absentee land lord. It creates confrontation between marginal farmers and politically backed *gher* owners. Considering all of these responses saline tolerant rice introduction appears as light at the end of the tunnel and encourages people to return their traditional livelihood of cultivation but *gher* owners with muscle and money are not interested to allow them to do this which resulted in fierce clash some times. And lastly, women are more sufferer than men due to salt water intrusion.

## CHAPTER 5

### **ETHNOECOLOGY, LIVELIHOOD, LOCAL POLITICS AND 'LIVING WITH SALINITY'**

#### **5.1 These responses lead to what?**

Shrimp farming, crab fattening and oyster, mollusk and clam gathering developed as response to salt water intrusion in the Harinagar village and those responses impacted differently to different segments of people in the society. Shrimp farming gives them money and earns foreign currency for Bangladesh but profit goes to the owners of the means of production and it creates a new class in the society that can be seen as absentee land lord known as gher owners. This class make money just investing capital on the other hand land owners compelled to hand over their land for using as *gher* against their will most of the times. If some one tries to keep his land to his own adjacent *gher* owner penetrate salt water in to the land and make the land corrupt so that he has to rent his land for shrimp cultivation against his will. Sometimes gher owners use their musclemen to capture adjacent land which leads to fierce clash and loosing lives. In this way shrimp farming earns money even foreign currency for the country but it worsen the lives of thousands of traditional farmers and a large section of the farmers lost their land and become day laborers who hardly living their lives now. As I mentioned earlier shrimp cultivation is no more as profitable as it was in the 80's or 90's and two devastating cyclone with water upsurge made everything upside down in this coastal region. Crab fattening is still practiced but the scope is not as wider as shrimp cultivation was. In addition to that crab fattening due to lack of proper and enough scientific intervention and administrative support has failed to

emerge as a potential alternative livelihood to paddy farming. Gap between the demand and supply, production cost and selling rate, intervention of middlemen and lack of capital still found as major hindrance to this livelihood skill. But most of the informants did agree that it helped them to overcome such a crisis and allowed them easier access to resources and political system. This livelihood helped them to avoid migrate from their area. Oyster, clam and mollusks gathering is relatively new and not yet flourished fully as an alternative livelihood but informants view it as 'something is better than nothing'. This skill is just better than begging to other people's door. Women engaged this livelihood is not earning enough money to live but it helps them to keep going their struggle for existence. The person employed to take care and establish this women's organization said that without this gathering skill they might become beggar and even a prostitute.

No doubt, salt water intrusion posed a serious threat to the society and local people responded in different ways but landless populations and women are the most vulnerable sections among them. Those who have land could rent for gher, owners of water body could practice crab fattening and women and children engaged themselves in gathering and fishing in a small scale. Since landless peoples used to work as day laborers to paddy field they become jobless and it becomes impossible for them to maintain their family. As a result a good number of them migrated to cities of the country including capital city, Dhaka and some of them, those who have relatives have migrated to India just crossing the river.

## **5.2 Local Politics of adaptation to salt water intrusion**

Salinity is seen as disruption of livelihood more specifically lack of food production in general. Since it is directly related to livelihood and livelihood is the

centre of both local and national politics; adaptation to salinity is always given importance in politics. There are more than two dozens of NGO working in the area and both local and national NGO's work to foster adaptation to salinity. Most of the NGO use words like capacity development, build resilience, reduce vulnerability to salt water intrusion as their project goal. Local leaders of national political parties help people by the name of 'adaptation to salinity' program. In the last local government and national elections adaptation to salinity was the prime concern both parties, voter and vote seekers. In the words of 6<sup>th</sup> informant-

“Salinity is not always a prime issue to politicians as to us. What is misfortune to us is fortune to them. Tidal upsurge not only carry salinity but also vote and financial benefit for local politicians”.

This way salinity sometimes became synonymous to 'vote' in local politics (Kruger and Grotzke (2008) because it provides scope for politicians to address and approach for votes in favor of their respective party. NGOs working in the village ideologically attached to national political party and they try to influence voters decision during national election and in the last election held on December 2008 such kind of influence was quite visible. In this regard 5<sup>th</sup> informant who was my key informant opined 'salinity is all about vote'.

Most of the NGOs provide microcredit to adapt with the adverse impact of salt water intrusion but loans are termed as high rate of interest by local peoples. If some one fails to pay installment once it become difficult to get rid off the net of loan. Many people flee away from the village and took shelter to their kin's in India. 1<sup>st</sup> informant was describing such an incident-

“My uncle was a farmer who used to cultivate his land and produce enough rice for his family for the whole year. After salt water intrusion in his land he lost his crops two years consequently and compelled to take loan from NGO. He paid loan of ASA taking loan

from SUSHILON and paid Sushilon's loan by taking loan from Grameen Bank. When loan reached more than 100000 tk. he sold his only land and left the country".

1<sup>st</sup> informant was presented as an example of successful adaptation to salinity in Harinagar village before the international delegates and urged more international aid to foster such kind of adaptation project. But he reported me that he was burdened with loan and found his life difficult to adapt to the adverse effect of salinity. He blamed educated people for selling them to the international community and viewed him as a defeated soldier against salinity.

Salt water carries hunger, joblessness and misery for most of the people and fortune for a very small segment of the society and the latter segment controls the politics in the village those who get shelter from political parties. Shrimp cultivation provides economic benefit but it skipped mass people. In the words of Hossain (2003)

"The lucrative cash crop has attracted powerful interest groups to shrimp farming who now wield a mafia-style grip on the local community and successfully manipulate, and at times have physically thwarted, attempts to drain the affected areas. The economic benefit from shrimp farming has mostly bypassed the common people. Instead, it has brought about misery and health hazard for them and complicates any exercise to remove the expanding water logging and salinity problem".

Competition on scarce resources leads to confrontation and some time fierce collision and all of this is centered on 'exercise to remove the expanding salt water logging'. So the local politics in Harinagar village is shaped by salinity and it widens the gap between have and have not. In this condition one group is well equipped with resources and administrative support and another group is disorganized with no money and muscles.

### **5.3 Ethnoecology and livelihood response to salinity**

In response to my question how did you learn shrimp farming after collapsing paddy cultivation 9<sup>th</sup> informant said-

“It is our fire in the belly [i.e., hunger] that taught us to do something. Our surroundings made us bound to discover an alternative livelihood to age old paddy growing because we can not leave our forefathers’ land, their home and their graveyard”.

The livelihood responses discussed above is deeply rooted in the Ethnoecology of Harinagar community, *i. e.*, and their knowledge about the environment and the ways they use it (Hirani 2005). The interaction between them and their surroundings based on their knowing shapes their responses to salt water intrusion. As for example, we observed that oyster ladies, can read the time and tide of the adjacent river and they fix their schedule according to their understandings. Not only that they are well equipped with knowledge how to classify and separate shell from flesh of oyster so that any damage can be avoided. In addition to that those ladies learnt how to make and push a net to gather maximum amount of oyster, clam and molluscs. They are not limited to one technique rather use different techniques according to the deepness and nature of mangroves.

Crab fatteners use their skills to alter the relationship between them and their environment in the face of salt water intrusion. They classify crabs, separate male from female and cultivate in different ponds to maximize production. This way of cultivation is recognized profitable by the scientific community<sup>28</sup> and informants said they came to know this technique without any intervention by scientific community. Crab cultivators classify crabs based on amount of flesh inside the shell and identify which is matured which is not what they called ‘grade’. Though all the crabs are almost same in size they can recognize which has more flesh inside the shell. ‘Grade fail’ crabs is not supplied for selling and kept more days in the pond to become mature or growing amount of flesh inside the shell. Shrimp

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<sup>28</sup> See discussion on crab fattening in 4.4.3



cultivators even capable to identify what kind of virus attacked the shrimp and they said most of the times shrimp is attacked by a virus called 'China viruses.

The point I wanted to make here by these example is that any further intervention to overcome the existing salinity problem needs to consider natives understandings and nature of interaction with the environment because solutions to ecological problems can not just be oriented towards the standardized application of certain technologies, but that these require an understanding and optimal use of the cultural diversity (Hirani 2005) I mean we need to consider existing cultural practices by different groups of people. Livelihood responses of Harinagar community revealed to us how nature is viewed by them through a screen of beliefs and knowledge, and how they use their images to acquire and manage natural resources (Toledo, 2005: 514 in WinklerPrins and Borrera-Bassols, 2005: 7).

#### **5.4 Who shapes whom nature versus culture?**

Between nature and culture, 'who shapes who' is an age old debate in Anthropology (Bennet 1976, Ingold 2000, Casimir 2008, Sutton and Anderson 2004, Dove and Carpenter 2008 etc). Before contextualize to Harinagar village and salinity problem I want to shed light upon definition of this two concepts. There are two kinds of versions of nature: 'really natural' nature (Rappaport 1968: 237-42, Ellen 1982, Ingold 1992a: 47-8 quoted by Sutton and Anderson 2004) and culturally perceived nature (Ingold 2000). On the other hand culture is the way how humans use nature. So Harinagar village community does not directly interact with salinity and do so by their perception of salinity (Rosen 2007). Here it is the nature which is culturally perceived by them where nature has been extended beyond the physical in to the socio-cultural (Bennet 1976:1) because the world can only be really 'nature' for a being that does not inhabit it (Ingold 2000).

Harinagar village community has been living in the same landscape generation after generation. In the face of salt water intrusion they used their ecological knowledge or culture to make their life secure by exploiting the resources of nature. In other words, their ethnoecological knowledge shaped nature for adapting livelihood to salt water intrusion (Ford 1999). They were able to transform undrinkable salt water to drinkable, cultivated shrimp and crab as alternative to rice, introduced molluscs, clam and oyster gathering to secure their livelihood. White truly said,

“The purpose and function of culture are to make life secure and enduring for the human species.....Tools are employed to exploit the resources of nature.....the purpose of culture is to serve the needs of man....In short, culture gives man the illusion of importance, omnipotence, and omniscience” ( Quoted by Bennet 1976:9).

This was one side of the coin. On the other side Harinagar villagers was practicing traditional farming system, paddy cultivation for long time but their knowledge was influenced by the environmental change and they adapted to the change by shaping their knowledge where culture was modified by nature or environmental change. They never thought of shrimp cultivation, crab fattening, molluscs gathering as livelihood but changed environmental condition made them bound to do that. Here they used what they wanted in nature, and that use modified the direction of their culture (Bennet 1976, Hawkes *et al.* 2008). So culture not only shapes ‘nature’ but also nature shapes culture.

## **5.5 Summary of chapter contents**

Local politics is shaped by salinity and some times salinity become synonymous to vote. Peoples are given microcredit to adapt with the adverse effect of salinity but they seldom get rid off debt and some times leave the village to avoid payment of credit. Response choices are made based on their knowledge on

surroundings and livelihood skills greatly influenced by their Ethnoecology. It can be noted here that most of the responses didn't change their social class or position upward rather kept them in the track to struggle for existence which means to them failure to adapt with salinity. Salinity touches every walk of the Harinagar and findings show that culture and nature are both shaped by each other.

## CHAPTER 6

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **6.1 Summary of methodology and findings**

In this study my original intent was to know the perceptions and livelihood responses to salinity in general where I used Bangladesh as a case study. To do this, ethnoecological interview, observation and visual technique were used to collect empirical data and secondary data source includes books, journal articles and World Wide Web. By these methods of investigation I wanted to get answers of six specific questions mentioned in the study objectives in the introduction. I believe these answers will help to direct actions to achieve successful and sustainable livelihood adaptation to salinity in coastal region. In short, those findings are firstly; salinity is perceived differently by different sections of people in Harinagar village according to their engagement with the changing environmental condition but generally it is treated as a deadly enemy that kills their lives and livelihoods and considered equally dangerous as The Royal Bengal Tiger in the adjacent forest. Secondly; they, especially women manage drinking water from different sources and use their traditional environmental knowledge to transform saline water to fresh water or drinkable. Thirdly; local people respond to salt water intrusion by practicing some livelihood skills including shrimp cultivation, crab fattening, saline tolerant paddy farming and oyster, clam and mollusks gathering. Fourthly; their Ethnoecology influences their response greatly and helped them to steer livelihood caravan in the track. Fifthly, salinity and their local politics impacted on each other and sixthly; nature not only shapes culture but culture also shapes nature *i, e.*, salinity and cultural responses are shaped by each other. Interesting point was that these responses could not make them

capable to remain in the same class or adapt with the adverse impact of climate change.

In a word, environmental transformations are perceived differently by different sections of people even living in the same reality due to their cultural understandings and responses are influenced by their perception and Ethnoecology and choices made based on nature and degree of interaction with that environment.

## **6.2 Conclusion**

By this study I have learnt that environmental change alters the relationship between human and their surroundings and people try to adapt with the transformation by the optimal use of their environmental knowledge which they learnt from age old interaction with the nature, Their Ethnoecology is a product of living with reality or climate variability and change. Whatever the degree of a change people tend to adapt with the transformation instead of relocation. This message is just echoed in the words of 1<sup>st</sup> informant where he uttered that if he was a bird he would fly away because the rise in sea level was making the fresh water disappear. The rise in sea level, and resulting salinity, is ruining their livelihoods and permanently altering their way of life but there is no other alternative to these people other than adapt to the changing situation because they have no ability to fight this change but learning to live with it (Pender 2008: 45) what they are trying to do now. This 'learning to live with' salinity is meant by adaptation in this study and the context is livelihood. Within the sustainable livelihood framework, three broad clusters of livelihood strategies are identified. These are agricultural intensification, livelihood diversification and migration (Scoone 2008:9). Due to high density of population, migration is not a viable solution for these people (though some people already migrated to neighboring India) and they have the first two options for livelihood adaptation to salinity at

community level and are engaged with this two, agricultural intensification and livelihood diversification. For a successful agricultural intensification community needs to combine natural capital with economic capital. In this case they have natural capital like land and water and social capital but lack of economic capital such as technology and credit to adapt with increasing salt water intrusion. The key message is only natural and social capitals are not enough to adapt with environmental uncertainty and economic capital is needed to do that successfully. At this point the question comes what can be done by researchers particularly anthropologists in this regard? The following three dimensional approaches advocated by Finan (2009: 182-183) can play a pivotal role to dig the issue deeper.

### **6.3 Recommendations for further research**

This study was an attempt to provide human face to salinity where I localized the adaptation process and wanted to understand how a community responds to environmental uncertainty. Considering the three dimension<sup>29</sup> of the problem this study, livelihood response addresses an important aspect of distributive dimension of salinity problem. To get a holistic picture of the problem further research can be done-

**Firstly**; on the set of resources and interventions that are beyond the capacity of the community itself to mobilize, including infrastructure works, availability of and access to new technologies, sources of information, and networks (Finan 2009:182). In this case power relationships, dependency, impact of outside intervention and thus include BWDB, local and international NGOs working in

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<sup>29</sup> See 1.5 for details of the three dimension

the area, universities and research centers etc I mean institutional dimension of salinity.

**Secondly:** on livelihood assessment where their human, physical, social and economic capital will be explored on household basis to understand their resilience and vulnerability against sea level rise or salinity. It can be mentioned here that my study addressed the livelihood response not the resilience or vulnerability.

**Thirdly;** to reduce the vulnerability associated with sea level rise and to enhance community resilience, organizational adjustment will be necessary but we are in lack of organizational data. So further study on existing organizational aspects can fill up the gap and help to empowering local management.

To my mind, further research on these three aspects in addition to my study can provide us a holistic picture of the problem and findings can be used to understand similar problems in general.

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## APPENDICES

### Appendix A

#### Saline tolerant rice

Passport characteristics of salinity tolerant rice germplasms in southwest Bangladesh

Variety name	Environment	Land type	Season	Plant height (cms)	Maturity (days)	Rice color	Special feature	Special use
Bamonkhir	6	F1, F2	T. Aman	145	180	Brown	Saline tolerant	Pitha, Muri
Beki balam	1-7	----- -	Aman	102	180	White	Saline tolerant	Khoi, pitha, chira
Chini kanai	1, 2, 3, 6	F1, F2	T. Aman	132	159	White	Saline tolerant	Polao, pitha
Horkoch	1, 2, 4, 5, 6, 7	F1, F2	T. Aman	191	180	White	Saline tolerant	Khoi, Muri, Pitha, Polao
Jamai nadu	6	F1, F2	T. Aman	132	182	Dull white	Saline tolerant	Muri, Pitha
Morich sal	3	F2	Aman	127	210	Light red	Saline tolerant	Not mentioned

**Environment** 1 Sweet water, 2 Shrimp (Gholda), 3 Water logged (partial), 4 Shrimp (Baghda), 5 Saline and Baghda 6 Semi saline 7 Saline

**Land type** F0 Highland (30 cm flooding), F1 medium highland (30-90 cm flooding), F2 medium low land (90-180 cm flooding) F3 low land (180-300 cm flooding) F4 very low land 300 cm flooding

**Source:** Evaluation report on Rice diversity and production in the southwest of Bangladesh (SP 2201) cited by Bashar et al. (2004).



## **Appendix B**

### **Ethnoecological interview guide and schedule**

Interviews were conducted based on but not limited to the following interview guide. Livelihood skills related questions were asked individual basis i, e., a crab fattener was asked detailed on crab fattening and shrimp cultivator on shrimp farming.

1. Background information (name, gender, religion, age, profession)
2. What do you mean by salinity? How does it affect your life?
3. What is your principal responsibility in the family and how it is impacted by salinity?
4. Have you changed your livelihood? If yes why?
5. What is your main livelihood practice now?
6. How did you learn this skill? (this question was livelihood specific)
7. Are you satisfied with this livelihood? If not why?
8. What can be done by GO and NGO to over come this problem?
9. What is the nature of local politics concerning salinity?
10. How do you manage your drinking water?

### **Schedule of interviews**

<b>Informants</b>	<b>interviewed</b>
1 <sup>st</sup> informant (male, 37) .....	March 3, 2009
2 <sup>nd</sup> informant (male, 62) .....	March 4, 2009
3 <sup>rd</sup> informant (male, 62) .....	March 4, 2009
4 <sup>th</sup> informant (male, 45) .....	March 5, 2009
5 <sup>th</sup> informant (male, 30).....	March 6, 2009
6 <sup>th</sup> informant (male, 38) .....	March 6, 2009
7 <sup>th</sup> informant (female, 55) .....	March 8, 2009
8 <sup>th</sup> informant (female, 32).....	March 10, 2009
9 <sup>th</sup> informant (male, 57) .....	March 22, 2009
10 <sup>th</sup> informant (female, 35).....	March 25, 2009
11 <sup>th</sup> informant (female, 85).....	March 27, 2009

## **Appendix C**

### **A short note on pains and pleasures of field work**

As I mentioned in the methodology part in chapter three that my dissertation is based on a minor field work which was only four weeks long but I enjoyed the stay in the field. It was very interesting, important and fun to me. The field session was dominated by pleasure rather than pain. At this stage I'd like to present a few sketch from my interesting moment. Firstly; in the beginning I was misunderstood by my informant. Some people identified me as an NGO worker or government employee who will prepare a list for giving relief and some thought me member of detective branch. I might investigate corruption of forest department. My informants were asking me number of questions on my identity but I could eradicate their misconception any way. Secondly; I stayed in the guest house which belongs to Sushilon and every day electricity supplies disrupted for 4-6 hours. At night it was common and disgusting as mosquito can bite easily in absence of light in the room. During my stay guest house authority ran their generator for few days but not in other days and later I came to know that there was some high officials in the guest house who can mobilize their fund to implement project and that's why load shedding<sup>30</sup> was covered by generator. By this incident I discovered my helplessness in that situation and realized how class system works in the society. Thirdly; I never eat crab and it is considered as *haram*<sup>31</sup> in my community but during the field work I ate and it was very tasty to me.

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<sup>30</sup> Due to power shortage electricity authority stop power supply in an area for the time being to manage load which is called load shedding

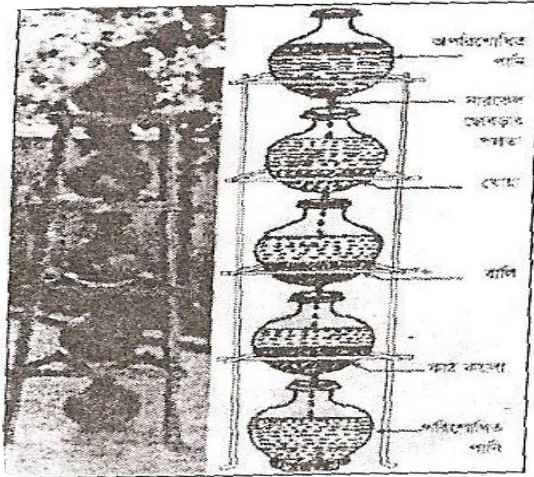
<sup>31</sup> Forbidden to eat by belief system

Most of the informants identified salinity and Royal Bengal Tiger as their common and deadly enemy. I was very shocked and become emotional when some widowed were describing how they lost their husband to tiger. An old lady was describing how her husband was killed by Royal Bengal Tiger at home and shedding tears. I couldn't continue the interview in that session due to the sad environment. Those narratives were very painful to me and then I couldn't distinguish between them and us in another word between 'self' and other. I might influenced by the narratives and qouted though it was not my topic of investigation.

## Appendix D

### Selected Photographs

1



Jar Filter System (Adopted from Tutu 2004)



Pond Sand Filter System

2



Crab Fattening pond (Adopted from Zafar 2004)



3



Shrimp Cultivation in Earthen Pond

4



Gathered Mollusk and oyster



5



**Oyster Ladies**

6



**Saline tolerant and normal rice side by side**



7



Pond sand filter system

8



Notice board for reserve pond to supply water into the PSFS