

Environmental assessment of shrimp farming in relation to livelihoods in the south-west coastal Bangladesh

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Abstract

The study was designed to assess the environmental impact of shrimp farming and implications on local livelihoods at the south-west coastal area of Bangladesh. All the stakeholders reported that shrimp farming negatively affected on the environment at the coastal area. The soil and water, fish habitation, agricultural cropland, grazing land, indigenous fish, household vegetations, trees and plants, land fertility and mangroves are affected negatively by the shrimp farming in the coastal area. About 44 percent stakeholders agreed that mangroves were destroyed by the extension of shrimp farming in the study area. In the case of positive impact of shrimp farming on environment about 16 percent stakeholders agreed that the household vegetations increased due to alternate rice and shrimp-prawn farming.

Key words: Shrimp farming, Environment, Mangrove

Introduction

Shrimp farming has been the subject of warm debate and scrutiny as a result of the negative environmental and social impacts that have been documented around the world (Rosenberry 2006, Lebel *et al.* 2002, Patil *et al.* 2002). Since shrimp cultivation occurs in a closed or semi-closed system, there is potential for waterlogging and increased salinity levels to alter drainage patterns and the quality of the soil (Bhattacharya 2005). Furthermore, the use of fine seine nets to sieve for shrimp larvae for cultivation has been associated with the decline of other fish species that were naturally occurring in the river deltas of south-west Bangladesh. Finally, the loss of vegetative cover has also been attributed to increased salinization and salt water intrusion. Shrimp farming is not only earnings foreign exchange but also losses the gross domestic product (GDP) of Bangladesh examined by Bhattacharya 1999. While much of the loss of mangrove forest in Bangladesh occurred over the previous 50 years, some areas have been deforested as a result of shrimp aquaculture (Guimarães 2002). In the above aspects, the present study was carried out to report on the perceived environmental impact of shrimp farming and its implications for local livelihoods in the south-west coastal Bangladesh.

Methodology

Study area and selection of the shrimp farming stakeholders

The study areas were selected from the south-west part of Bangladesh, mainly in Satkhira and Khulna districts where the majority shrimp farming activities are concentrated. According to their involvement in different activities of the shrimp industry, nine categories of stakeholders were selected for data collections (Table 1).

Table 1. Sampling design and distribution of shrimp farming stakeholders

Sl. No	Stakeholder	Sample size	Description
1	Shrimp farmers	30	Year round only shrimp farming
2	Alternate rice and shrimp-prawn farmers	30	After rice culture; shrimp-prawn culture together
3	Rice farmers (control)	30	Rice farming in shrimp growing area
4	Depot owners	10	Depot: Local shrimp processing factory
5	Depot workers	10	Worker in the shrimp processing factory
6	Shrimp farm laborers	20	The laborers are working either whole day and night or part time
7	Faria-Shrimp traders	10	Buying shrimp from shrimp farm and selling it to depot
8	Land lessors	10	Leasing their land to the rich shrimp farm
9	Shrimp seed collectors	10	They collect the Post Larvae (PL) from the river
Total stakeholders		160	

Simple random sampling techniques were applied for selecting the respondents of rice farmers, shrimp farmers, and alternate rice and shrimp-prawn farmers. For applying the technique, at first the list of rice farmers, shrimp farmers and also the alternate rice and shrimp-prawn farmers were collected from the Upazila Agricultural office and Upazila Fishery Office of the selected upazila and then random number table was used for selecting the sample units. The sample of shrimp farm laborers, depot owners, depot workers, shrimp seed collectors and land lessors were selected by purposive method.

Questionnaire design and survey of the study area

One draft questionnaire was designed to survey the environmental issues due to shrimp farming and implications on local livelihood. During August-December 2007 the data were collected by the pre-tested draft questionnaire from the two respondents

of each category. Then the questionnaire has been finalized for collecting the necessary data through interview method.

The survey method was followed through direct interview from the different stakeholders. For determining the environmental impact of shrimp farming “before and after” and also “with and without” methods were applied. The respondents were asked about what were the environmental situations were before and after the shrimp farming practice at the study areas. Data was collected through direct observation and transect walk (informal surveys and this participatory studies known as a walk over the transect of an area for the observation and documentation of the similarities and differences of environmental and bio-physical features described by PPM&E (2004).

The data were also collected by oral history method. Oral history is an interview method by which the researcher collects about the past events and ways of life. The beginning history of the shrimp farming, the mangroves were present at the shrimp farming area or not and also the agro-ecosystem gradually destroying or not were obtained from the very old aged people at the coastal areas by this oral history method. In this case the respondents were more than sixty years old. The selected respondents were different categories like shrimp farmers, shrimp seed collectors and shrimp farm laborers and land lessors of very near the mangroves region of the coastal area.

The effect of cyclone Sidr on the study area

In every year the coastal villagers are facing cyclones, storms and over flood. The cyclone *Sidr* struck at the South-west coastal part on November 15, 2007. It was the middle time of the author’s research data collection from the *Sidr* struck area. At that moment the respondents were not interested to provide the information. After the *Sidr* attack author had collected data from the stakeholders by giving them some money so that they could get food in exchange for the interview. The shrimp farming stakeholders were facing their uncertain future after the *Sidr*. Bangladesh government estimates that around 8.5 million coastal people were affected of which 3400 people had died described by Larson (2008). Around 10,000 shrimp farms and hatcheries were washed away from the Satkhira, Khulna, Bagerhat and Patuakhali districts and about 36 million US Dollars lost due to the devastating *Sidr* (Rosenberry 2008).

Data analysis

The data from the questionnaire were grouped and categorized according to the different stakeholders of the shrimp farming. The whole data were entered into the MS Excel program and in the tabular form in the computer. Mainly the tabular and graphical methods were used for analyzing the data.

Result and discussion

Perceived positive impact of shrimp farming on environment

The positive impacts of shrimp farming on environment have been estimated from the collected data. About 7-10 percent respondents have been reported that mangroves and trees and plants have increased and about 16 percent respondents have reported

that the household vegetations have increased due to shrimp farming because the farmers are cultivating different types vegetables on the bank (*Bheri*) of the shrimp ponds (Table 1). Some respondents have planted trees and plants surroundings their homestead areas, so they have reported that it has increased in the shrimp farming areas.

Table 1. Perceived positive impact of shrimp farming on environment in the study area

Different aspects of environmental issues/ Respondents	Shrimp farmers (n=30)	Alt. rice & shrimp prawn farmers (n=30)	Rice farmer (n=30)	Depot worker (n=10)	Shrimp farm laborer (n=20)	Faria (n=10)	Shrimp seed collectors (n=10)	Over all % n=160
Decreased soil and water salinization	0	0	0	0	0	0	0	0
Increase of mangrove	0	0	0	30	20	20	20	10
Increased mangrove goods and services	0	0	0	20	30	10	10	11.11
Increase of household vegetation	30	23.33	30	20	40	0	0	15.92
Increased Ag crop land (use for shrimp farm)	0	0	0	0	0	0	0	0
Increased land fertility	0	0	0	0	10	0	0	1.11
Increased grazing land	0	0	0	0	0	0	0	0
Increased trees and plants	0	0	0	0	30	20	20	7.77
Increased indigenous fish	0	0	0	0	0	0	0	0
Increased livestock production	0	0	0	0	0	0	0	0
Increased fish habitation	0	0	0	0	0	0	0	0
Increased Poultry production	86.66	90	93.33	100	100	100	100	96.66

About 97 percent respondents have been reported that the poultry production has increased due to shrimp farming at the coastal areas. The shrimp farmers and rice farmers are using the poultry excretion as manure of their shrimp and rice farms. On the other hand the poultry growth rate is very high and profitable so, the coastal peoples are encouraged to do the poultry farm. On the aspect of soil and water salinization, agricultural crop land, grazing land, indigenous fish and livestock production and in the case of fish habitation there have no positive impact due to shrimp farming at the coastal areas.

Perceived negative impact of shrimp farming on environment

About 89-93 percent stakeholders reported that agricultural crop lands and freshwater fish habitation has been decreased due to saline water in the study areas, because freshwater fishes and agricultural crops cannot grow well in saline water. The

agricultural crop lands are decreasing gradually because they are using their lands for shrimp farm.

More than 80 percent respondents have been reported that the livestock production especially cow, goat, buffalos and other domestic animals has decreased simultaneously with the decreasing of agricultural land and grazing land. The rest part of the paddy trees and the grass of the grazing lands have been used for the main feed of the livestock. Islam *et al.* (2002) have found that the main feed of livestock are paddy straw has the acute shortage due to convert the rice farming to shrimp farming and also the shortages of gazing lands the livestock have decreased from the coastal areas have reported by the 63 percent respondents. Only 3 percent stakeholders have reported that the poultry production have the negative impact due to shrimp farming which is ignorable. And more than 60 percent respondents has been reported that the mangroves goods and services, household vegetations, land fertility, trees and plants also have affected due to shrimp farming at the coastal area.

About 44 percent of the stakeholders have reported the mangroves are destroying due to shrimp farming, but 60 percent respondents have agreed that the mangroves are destroying with other causes such as cyclone, storms, cutting by thieves, fire wood and guard shed. For the causes of mangroves destroying the spawning grounds of fishes are going to extinct gradually. According to the research data about 66 percent respondents have reported that the household vegetations have decreased due to shrimp farming in these areas. The native plants, trees and mangroves forest have been destroyed due to the extension of shrimp farming in the coastal areas (Islam *et al.* 2002). They also have found that the shrimp farming also have damaged the household vegetation and social forestry, particularly in the Khulna and Satkhira region. The indigenous fish and freshwater fish habitation have not decreased significantly in the rice farming areas because it is salinity protected very small area, whereas all the shrimp farmers and other stakeholders have reported that it has decreased due to shrimp farming in their region.

Causes of mangroves destruction

The 'Sundarban' mangroves of Bangladesh are situated at the coastal areas which are gradually decreasing by the different causes. About 75 percent respondents have been reported that the nearer villagers are using mangroves as their fire wood, the guard shed of shrimp farms and about 69 percent stakeholders have agreed that the roof of the house of villagers are also using by the mangroves/*golpata* (Fig. 1). The coastal peoples are also using the mangroves as the timber, firewood and thatching material (Rahman 2007). Around 60 per cent stakeholders have told that thieves are cutting the mangroves, cyclones and storms are also destroying the mangroves have agreed by 50 percent respondents. About 44 percent stakeholders have reported that mangroves are destroying by the extension of shrimp farming; they also have told that mangroves could be grown if the shrimp farm were not present here. The respondents whose are not living near the mangroves some of them (25 percent) have been reported that they do not know about the mangroves are destroying or not.

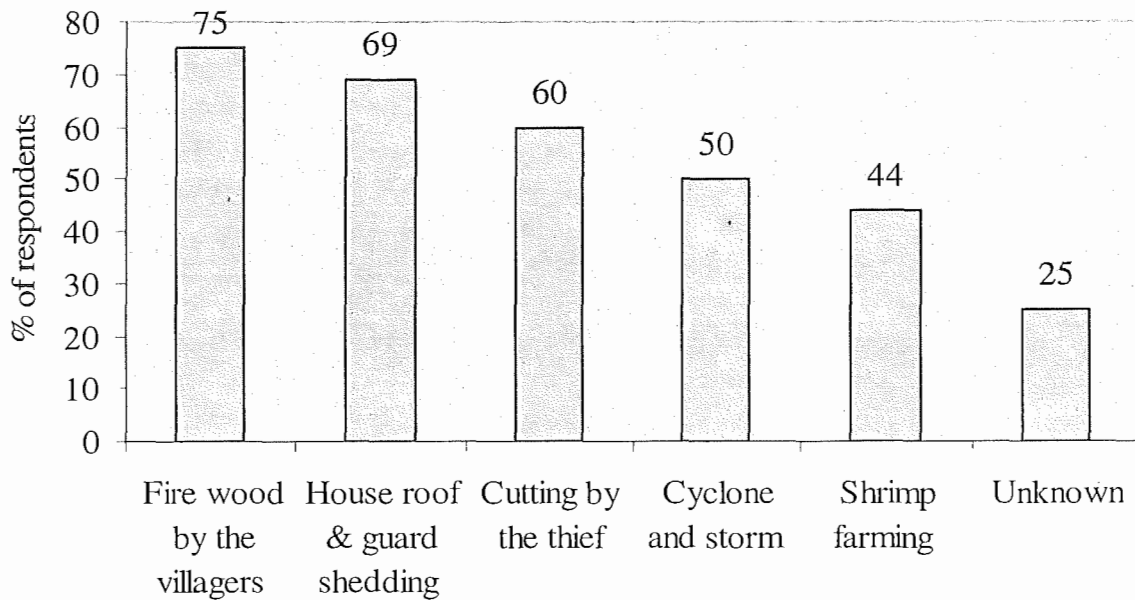


Fig 1. Causes of mangrove destructions at the south-west coastal area.

The shrimp fry collectors are also destroying the mangroves. When the shrimp seed collectors collect the post larvae by the net the young mangroves are rooted out from the clay. The coastal forest *Sundarban* mangrove has decreased from 12,328 acres in 1993-94 to 1996-97 about 44 per cent decline during this period (Islam *et al.* 2002). In the case of extensive shrimp farm sometimes a vast area of mangrove are cleared thus reducing the biodiversity. The total global mangrove losses of the past 2 decades, as much as 38% is attributed to shrimp farm development (EJF 2008). The illegal political leaders are grabbing the mangroves and using for shrimp farms in the South-east coastal areas of Bangladesh (Rosenberry 2006). Shrimp farming is not the major factor responsible for the destruction of mangroves; the traditional agricultural expansion including agricultural encroachment (81 percent), aquaculture (12 percent) and urban development (2 percent) causes the mangroves destruction in the Tsunami affected areas including Bangladesh (Rosenberry 2007).

Water pollution due to shrimp farming

All the shrimp farms at the southwest coastal area are discharging the waste water into the connected canal and occurs environmental degradation and finally destroying the ecological balance. These waste waters also contain a vast amount of antibiotics, pesticides and also chemical fertilizers which are the causes of environmental pollution. The farmers are using antibiotic drugs and chemicals to combat disease (Larson 2008) and Thai environmental governance is driving to change shrimp farming practices by reducing antibiotic use (Lebel *et al.* 2004). About 36 per cent stakeholders have been

reported that the shrimp farms are affecting and water pollution are causes by the toxic chemical pollution from the untreated industrial effluents.

Perception of causes of viral disease of shrimp

The shrimp farmers are losing a lot due to the viral disease in their farms. The viruses are attacking at least two times in a year and after attacking the virus within one week all the shrimps have died and it takes 45-60 days to become the previous situation again. Disease is the single most important factor limiting production in the shrimp industry (Lebel *et al.* 2002). The causes of viral disease have been estimated by asking to the shrimp farmers and the results have depicted in the Fig. 2 in percentage term. All the shrimp farmers have reported that the main causes of attacking the viral disease is contamination by water, crabs, birds, snakes and nets. The birds, crabs, snakes, frogs are contaminating the viral disease from one pond to others. The virus also contaminated by the nets and water. About 95 percent respondents have agreed that initially the viral contaminated Thai shrimp fry are the first causes of viral disease in Bangladesh. Recently some Bangladeshi hatchery owners are buying secretly the low quality and virus-infected post larvae (of West Bengal, India) from the smugglers and selling it to the unsuspecting farmers as locally produced fry at high prices (Rosenberry 2008).

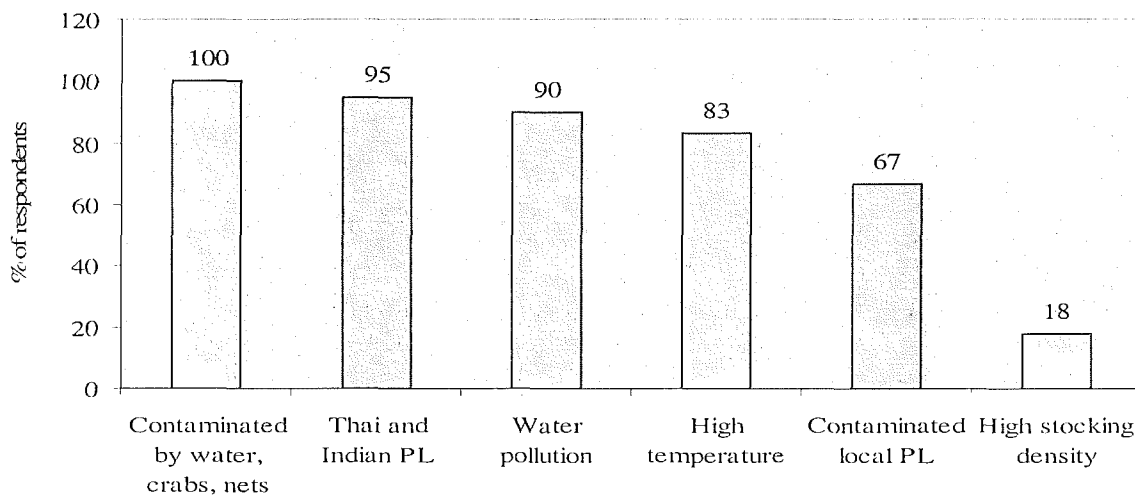


Fig 2. Causes of viral disease reported by the respondents.

Shakil (2006) has found the causes of viral disease of shrimps are adverse weather, heavy rain and flooding, contaminated water rolling down from the hills, unplanned and unscientific farming practices, imported seed stock infected with viruses and indiscriminate use of drugs and chemicals. About 90 percent farmers have reported that water pollution making the favorable conditions for viral disease. Water is polluted by the shrimp waste products, uneaten feed, dead algae and other faunas, and rich effluents. In summer when the temperature is very high and the depth of shrimp ponds

are low, the shrimp fry becoming weak and for this reason the virus is attacking; have reported by 83 percent shrimp farmers. And only 18 percent stakeholders have reported that the causes of viral disease are the high stocking density of shrimp fry in the pond.

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