



Effects of 2017 Early Flash Flooding on Agriculture in Haor Areas of Sunamganj

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Abstract

The Sunamganj district is covered by major Haor systems in the north-eastern region of Bangladesh. Flash flood is the most commonly occurring water related disaster in the Haor areas. During the flash flood it is very common that people lost their primary agricultural productions which are the only source of their livelihood. The present study focuses on the effects of 2017 early flash flooding on rice and fish production of Sunamganj Haor areas. The flood caused enormous damage to agriculture such as rice especially Boro rice and fish production on which the Haor dwellers rely upon for their livelihood. The total affected land of Boro rice cultivation in Haors of Sunamganj was 149,224 hectare and the total amount of damaged rice was 393,855 metric ton (MT). The total number of affected farmers was 315,084. The early flash flood also affects the quality of Haor water which caused the death of fishes. The total amount of damaged fish was 49.75 MT and the loss was 158.70 lakh taka. The total number of affected fishermen was 44,445. This findings could be very useful for the environmental scientists to predict the probable future effects on agricultural production due to early flash flood events in Sunamganj Haors areas.

Key words: Agriculture, Flash flood, Haors, Sunamganj

Introduction

Bangladesh is extremely vulnerable to flood because of 80% of the country comprises the combined delta of three international rivers namely the Ganges, the Brahmaputra and the Meghna with a total catchment of 1.8 million km² (Islam, 2011) having 700 tributaries. Flooding is a recurrent phenomenon and one of the major natural hazards that the people of this country must confront regularly. Untimely flooding also occurs periodically, which is locally called *bonna* in the local term. However, flooding is not always considered to be a hazard. Normal flooding is considered as *borsha*, a blessing as it replenishes the floodplain soil by providing the necessary nutrients (Haque, 1993). There are three types of abnormal floods or *bonna* such as monsoon or river floods, rainwater floods and flash floods. Another type of flooding is called coastal or storm-surge flooding associated with tropical cyclones in the Bay of Bengal. Monsoon or river flooding caused by monsoon rainfall (particularly in the Himalayas) and major rivers affects the north-western parts of Bangladesh. Rainwater flooding caused by heavy rainfall and drainage congestions is more prevalent in the north-western and the south-western parts of the country. Flash flooding caused by overflowing of hilly rivers rises and falls rapidly, typically within a few hours or days, and most prevalent in the north-eastern and the south-eastern parts (NPDM, 2010; Brammer, 1990). The year 2017 is hazardous with flash flood, hailstorm, tornado, lightening, embankment collapse, riverbank erosion occurring throughout the country. Heavy rainfalls as well as onrush of water from the upstream Meghalaya hills in India have led to the inundation of a vast croplands of Haor areas and low-lying areas of the northeast. Flood started on 28th March affecting north-

eastern Haor regions consisting of six districts namely Sylhet, Moulvibazar, Sunamganj, Habiganj, Netrokona and Kishoreganj. Rising water overflow and breached embankment in many places and inundated vast areas of croplands. It destroyed nearly ready for harvesting Boro rice in about 219,840 hectares areas. The flood has severely affected 518 unions of the total 541 unions in the 62 upazilas under the 6 districts (NIRAPAD, 2017). About one third of the total households of these districts has suffered due to loss of Boro crop, fisheries and domestic animals. Moreover, some households have lost their houses fully or partially.

On the other hand, the total number of Haor is 414 with sizes varies between 730 and 24,292 hectares. Boro rice is the principal crop in this region. But pre-monsoon flash flood from the very steep uplands adjacent to the region in Asam and Meghalaya Hills range in India cause immense damage to the standing Boro crops before harvesting. In Haor areas flash flood damages were greater also in 2000, 2002, 2004, and 2010 because of maximum duration (Salaudhin, 2010). The Sunamganj district is located in the north-eastern part of the country, has a unique physiography as it contains 95 Haors. Communities living in Sunamganj Haors rely upon a single crop in a year but contribute significantly to the national production of rice. But abnormal flash floods and early floods often cause significant volume of Boro crop loss in this region. It is found that the percentage of damage is higher in March (75%) and April (70%-90%) when there is an early flooding compared to May (15%-40%). The Sunamganj district has been affected most extensively due to early flash flooding in 2017. About 102,436 hectares agricultural land has been fully damaged while about 91,690 hectares of standing crop in Boro

fields has been damaged. Estimated total loss of potential rice crop was 354,840 metric tons (MT) and in monetary terms estimated loss amounted to BDT 10,645.2 million. About 23 water bodies have been affected and 49.75 metric ton (MT) fishes have been damaged. Moreover, about 2600 houses have been fully damaged and about 15,000 houses have been partially damaged due to this catastrophic early flash flood (NIRAPAD, 2017). The wetland-community is not only vulnerable to early flooding but is also vulnerable to extreme monsoon and post-monsoon flash floods. Unlike early floods, monsoon and post-monsoon floods damage homestead property, water infrastructure and sanitation facilities that facilitate water borne diseases during post-disaster period. Abnormal monsoon and post-monsoon floods are also serious threats to people and their resources living in wetland areas. However, communities have learned to live with extreme flood events and have adjusted their livelihood accordingly. But in recent times, their historical adaptation process with floods have been challenged due to the unpredictable and unexpected nature of extreme flood events. Therefore, the objectives of this study were to find out the effects of 2017 early flash flooding on rice and fish production of Sunamganj Haor areas.

Materials and Methods

The study was carried out at Haor areas under Sunamganj district.

Geographic area and location

Sunamganj district is located in the north-eastern borderline of Bangladesh. It stands on the Surma river bank and full of Haors and Baors. It lies between 24°34' and 25°12' North latitudes and between 90°56' and 91°49' East longitudes. The total area of the district is 3747.18 km² of which 71.28 km² are under forest. The district is bordered by Khasia and Jaintia hilly area of Meghalaya (Indian State) to the north, Habiganj district to the south, Sylhet district to the east, Netrokona district to the west. The total population is 2,013,738; male 1,036,678 and female 977,060. Average literacy rate is 34.4%; male 38.1%, female 30.5%. There are 11 upazilas in Sunamganj district containing 87 unions, 1535 mauzas and 2887 villages.

Haors of Sunamganj district

Haors are bowl-shaped depression of considerable aerial extent lying between the natural levees of rivers or high lands of the northeast region. In most cases, Haors have formed as a result of peripheral faulting leading to the depression of Haor areas. There are 95 Haors in Sunamganj district. Among 11 upazilas, Bishwambarpur does not have any Haors.

Site selection

Eleven (11) upazilas of Sunamganj district were selected for the study. The upazilas are Sunamganj Sadar, Dakshin Sunamganj, Dowara Bazar, Bishwamvarpur, Jagannathpur, Jamalganj, Tahirpur, Dharmapasha, Chhatak, Derai, and Sullah.

Data collection

The study data were collected through field visit in the flash flood affected area from 15-21 June 2017. The Data were also collected from the Department of Agricultural Extension (DAE), Upazila Agriculture Office (UAO) and District Fisheries Office (DFO) of Sunamganj.

Rice production

Rice especially Boro rice cultivation on Haor areas of Sunamganj district was severely affected due to devastating flood event. Data of cultivated and affected land area of Boro rice, amount of damaged rice, affected land area of hybrid, local and ufshi varieties were collected from the Department of Agricultural Extension, Khamarbari and Upazila Agriculture Office, Sunamganj.

Affected farmers

As the early flood destroyed rice production most of the farmers were affected severely. Data of affected farmers were collected from Department of Agricultural Extension, Khamarbari and Upazila Agriculture Office, Sunamganj. Landless, marginal, small, medium and large farmers were taken under investigation.

Fish production

Due to early flash flood lot of fishes were damaged in Sunamganj Haors. The data of damaged fishes amount and their prices were collected from the District Fisheries Office, Sunamganj.

Affected fishermen

As the early flood destroyed fish production huge number of fishermen were affected severely. The data of affected fishermen were collected from the District Fisheries Office, Sunamganj.

Water quality parameters

The data of water quality parameters such as pH, Dissolved Oxygen (DO), Total Dissolved Solid (TDS), and Ammonia (NH₃), were collected from the District Fisheries Office, Sunamganj. Due to harsh environmental and socio-economic condition, and unavailability of reliable data, only 4 days data were collected.

Results and Discussion

Historical floods in Bangladesh

Many parts of Bangladesh during pre-monsoon frequently suffer from severe floods. Some parts experience floods almost every year with considerable damage. Affected area and percent of total area of Bangladesh affected by the flood are available since 1954 (Figure 1). The floods of 1954, 1955, 1974, 1987, 1988, 1998, 2004 and 2007 caused enormous damages to properties and considerable loss of life (BBS, 2011; Brouwer *et al.*, 2007; Elahi, 1992).

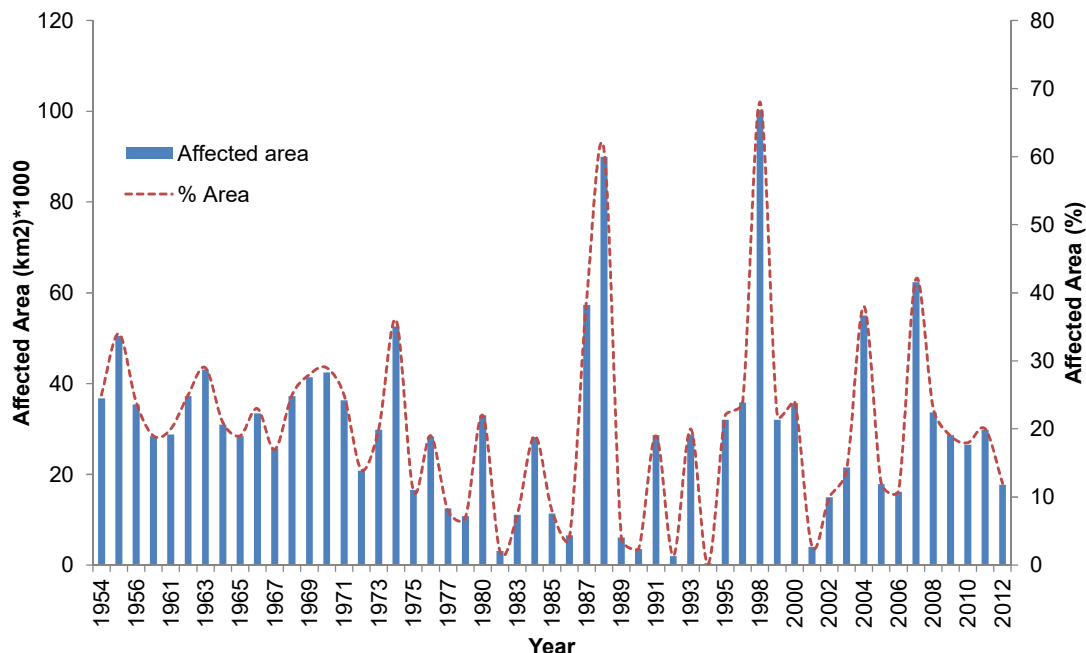


Fig. 1. Year-wise flood affected area in Bangladesh (1954-2017)

The figure 1 represents that the floods of 1987, 1988, 1998, 2004 and 2007 were most devastating and caused heavy economic losses. During the monsoon 2014, the flood was an average one and stayed for short duration in south-eastern Hill Basin-flash flood and short to medium in other three basins, the Brahmaputra, the Ganges, and the Meghna. It is observed that the floods of 1988 and 1998 affected higher percentage of the total area of Bangladesh. Flood number was higher before 1980's. From 1980's

to 1990's number of floods were relatively smaller but the extent of flood was severe. In present decade (2002-2017), flood is happening almost every year.

Effects of Flood

Effects on boro rice production

From the figure 2 it is observed that, whole Boro rice cultivated land was affected by early flash flood in Dharmapasha, Sullah, Tahirpur, Dowara Bazar and Chhatak upazilas.

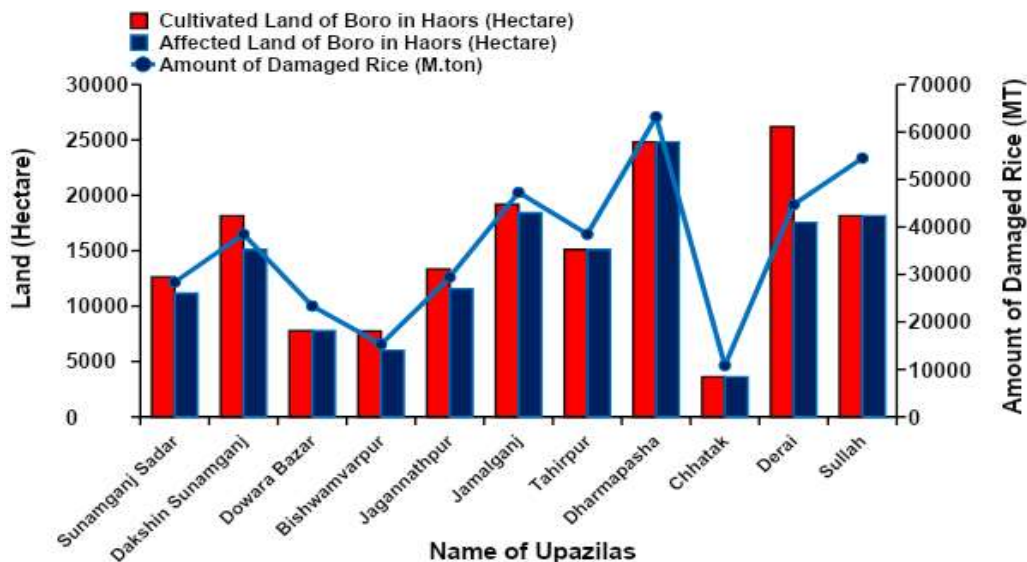


Fig. 2. Cultivated and affected land of Boro rice and amount of damaged rice among different Haors

Among investigated eleven (11) upazilas, Dharmapasha (24,800 ha), Jamalganj (18,414 ha),

Sullah (18,160 ha), Derai (17,550 ha), Dakshin Sunamganj (15,100 ha) and Tahirpur (15,100 ha) were

affected most. Amount of damaged rice was also higher in these upazilas especially in Dharmapasha, Sullah, Jamalgang, and Derai which were 63,189, 54,480, 47,271 and 44,712 metric ton (MT), respectively. In Derai upazila a large amount of cultivated land was not affected because there are some high land areas in this upazila where flood water was not reached. The total affected land of Boro rice in Haors of Sunamganj district was 149,224 hectare and total amount of damaged rice was 393,855 MT. In

Haor areas Boro rice is damaged by early flash flood mainly due to unavailability of controlling measures (Khan *et al.*, 2012).

Effects on hybrid rice production

The figure 3 represents the higher amount of damaged land in Patharia (250 ha), Paschim Birgaon (190 ha), Shimulbak (175 ha) and Jaykalas (150 ha) unions as there amount of cultivated land was greater which amounted 375, 250, 295 and 235 hectare, respectively.

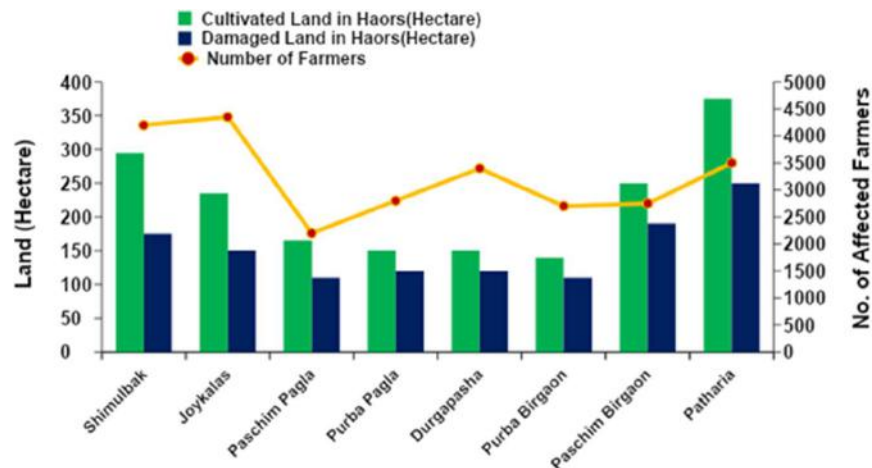


Fig. 3. Cultivated and damaged land of hybrid rice and number of affected farmers among different Haors in Dakshin Sunamganj upazila

Farmers were highly affected in Jaykalas, Shimulbak, Patharia and Durgapasha unions. Some lands were saved in Shimulbak, Joykalas, and Patharia unions because probably those areas were located in high land and a portion of crops was harvested before entering flood water. In Dakshin Sunamganj upazila the total damaged land of hybrid rice production was 1225 hectare. CEGIS (2012) reported that about 1.02 million hectare of rice had been completely damaged by floods and 2.44 million tons of rice could not be harvested because of floods during 1993 to 2010.

Effects on local rice production

Figure 4 shows the largest (102 hectare) amount of land was cultivated in Patharia union and smallest (39 hectare) amount of land was cultivated in Paschim Birgaon union. In Purba Birgaon and Paschim Birgaon unions almost all of the cultivated land was damaged because the severity of flood was extreme in those two unions.

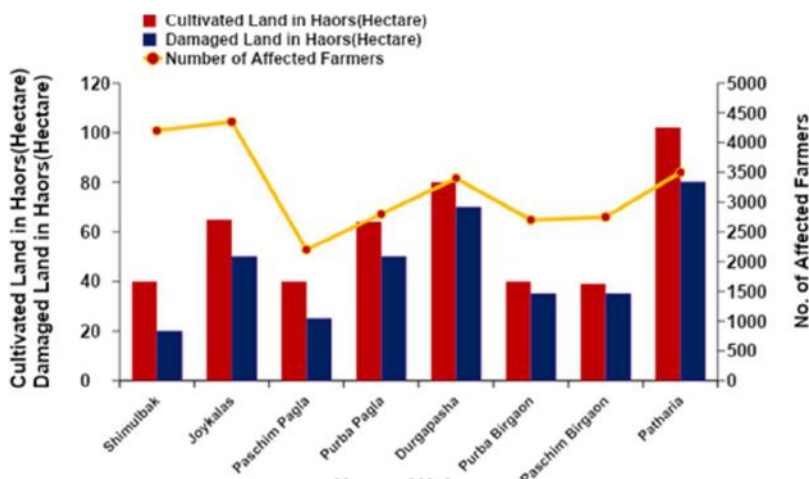


Fig. 4. Cultivated and damaged land of local rice and number of affected farmers among different Haors in Dakshin Sunamganj upazila

It is also observed that, in Patharia (80 ha), Durgapasha (70 ha), Jaykalas (50 ha), and Purba Pagla (50 ha) unions the amount of damaged land was higher as there amount of cultivated land was greater which amounted 102, 80, 65, and 64 hectare, respectively. Farmers were highly affected in Jaykalas, Shimulbak, Patharia and Durgapasha unions. The total damaged land of local rice production in Dakshin Sunamganj upazila was 365 hectare.

Effects on ufshi rice production

From the figure 5 it is observed that the largest (2890 hectare) amount of land was cultivated in Shimulbak union and smallest (1400 hectare) one was in Paschim Pagla union. In Purba Birgaon and Durgapasha unions almost all of the cultivated land was damaged because most of the crops were not harvested before early flash flooding. It is also observed that, in Jaykalas (1810 ha), Durgapasha (1680 ha), and Shimulbak (1665 ha) unions the amount of damaged land was higher and farmers were highly affected.

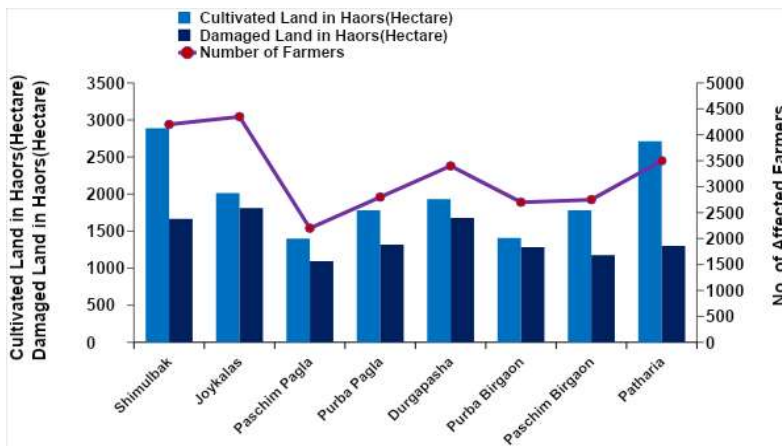


Fig. 5. Cultivated and damaged land of ufshi rice and number of affected farmers among different Haors in Dakshin Sunamganj upazila

In Shimulbak and Patharia unions a large amount of cultivated land was not damaged because probably those areas were located in high land and a portion of crops was harvested before entering flood water. The total damaged land of ufshi rice production in Dakshin Sunamganj upazila was 11,230 hectare.

affected because of their lower amount of cultivated land which was totally damaged by flood. On the other hand large farmers were least affected because their amount of damaged land out of total cultivated land was lower and probably they have other sources of income. The total number of affected farmers was highest (53,026) in Dharmapasha upazila because all of the Boro rice cultivated land (24,800 ha) was affected by flood and the amount of damaged rice was highest (63,189 MT).

Effects on farmers

Figure 6 represents the order of flood affected farmers (small > marginal > landless > large) according to their number. Small farmers were mostly

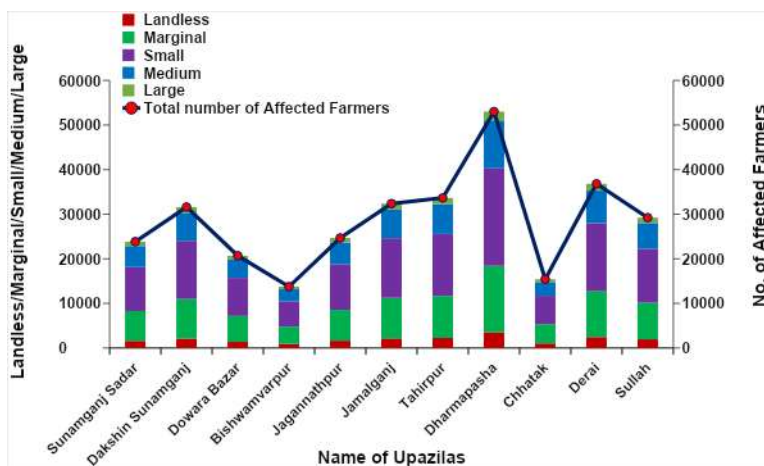


Fig. 6. Early flash flood affected farmers in the study areas

Again, the total number of affected farmers was lowest (13,765) in Bishwamvarpur upazila because small amount (6123 ha) of Boro cultivated land was affected by flood and the lowest amount of damaged rice was found (63, 270 MT) here. The total number of affected farmers in all upazilas of Sunamganj district was 315,084. Samarakoon (2004) also observed that the damages caused by the floods have affected most the lower-income sectors of the population mostly small farmers, fishermen and unskilled laborers.

Effects on fish production

The local fish production was damaged severely due to early flash flooding (Figure 7). Higher amount of fish was damaged in Dharmapasha (10 MT) and Jamalganj (9.50 MT) upazilas and the loss was 31.70 and 31 lakh taka, respectively. On the other hand in Chhatak (0.6 MT) and Dowara Bazar (1.00 MT) upazilas amount of damaged fish was minor and the loss was 1.97 and 3.28 lakh taka, respectively. The total amount of damaged fish was 49.75 metric ton in in all upazilas of Sunamganj district and the total loss was 158.70 lakh taka.

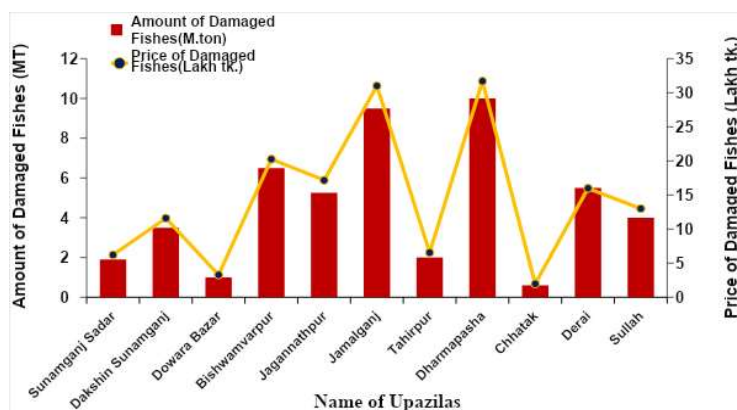


Fig. 7. Amount of damaged fishes with their approximate prices among different Haors in the study areas

The fish might have died for various reasons, including water pollution and falling oxygen level in water due to the formation of ammonia gas after green paddy got rotten following the flashflood water level. Primarily presence of ammonia gas in the water was one of the possible reasons behind the death of fish.

Effects on fishermen

From the figure 8 it is observed that, fishermen became victim of the early flash flood in Sunamganj district. The total number of fishermen was highest (17,000) in Dharmapasha upazila and was lowest (3008) in

Bishwamvarpur upazila. The number of affected fishermen was highest (11,900) in Dharmapasha upazila because largest amount of fishes (10 metric ton) were damaged and the loss was 31.70 lakh taka. On the other hand the number of affected fishermen was lowest (355) in Chhatak upazila because smallest amount of fishes (0.6 metric ton) were damaged and the loss was 1.97 lakh taka. The number of affected fishermen was also higher in Derai (9209) and Sullah (9140) upazilas. The total number of affected fishermen was 44,445 in all upazilas.

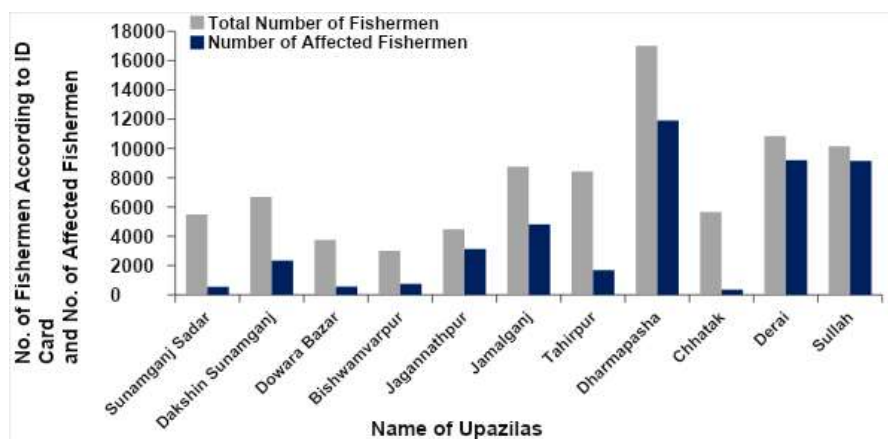


Fig. 8. Number of affected fisherman among different Haors in the study areas

Effects on water quality

Short term pH status

The pH of 11 different water bodies of Sunamganj Sadar, Dakshin Sunamganj, Dowara Bazar, Bishwamvarpur, Jagannathpur, Jamalganj, Tahirpur, Dharmapasha, Chhatak, Derai, and Sullah upazilas) on 4 successive days in April varies from 5.2 to 7.5 (fish blood has a pH of 7.4) while the ideal pH level for fish is 7-8 (Figure 9). In most of the water bodies the value of pH slightly changed every day but in case of Halir

Haor (6.5) the pH value remained unchanged. In Matian Haor water was so acidic probably due the decomposition of green paddy and other terrestrial vegetation in excess amount. Most of the Haors have lower pH value than 7 resulting huge destruction on fish and other aquatic living bodies. The lower pH value was probably due to the stirring effect of the flood resulting in the mixing of the poorly alkaline or acidic bottom waters with alkaline surface waters.

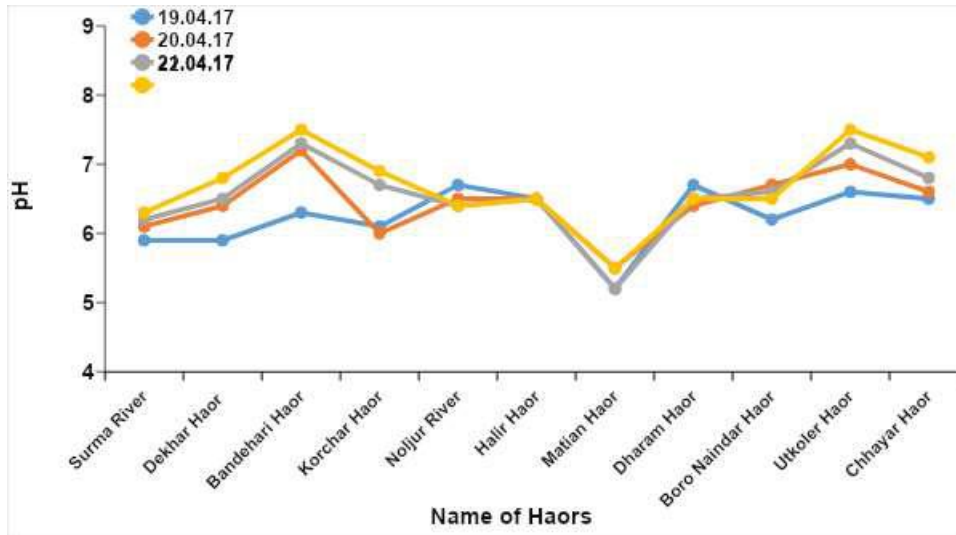


Fig. 9. pH status among different Haors in the study areas

Also the decrease in pH was due to decomposition of green paddy and other inundated terrestrial vegetation. It is possible for dissolved ions present in flood water

to affect the pH of the body of water, which in turn may influence the overall health of many aquatic species.

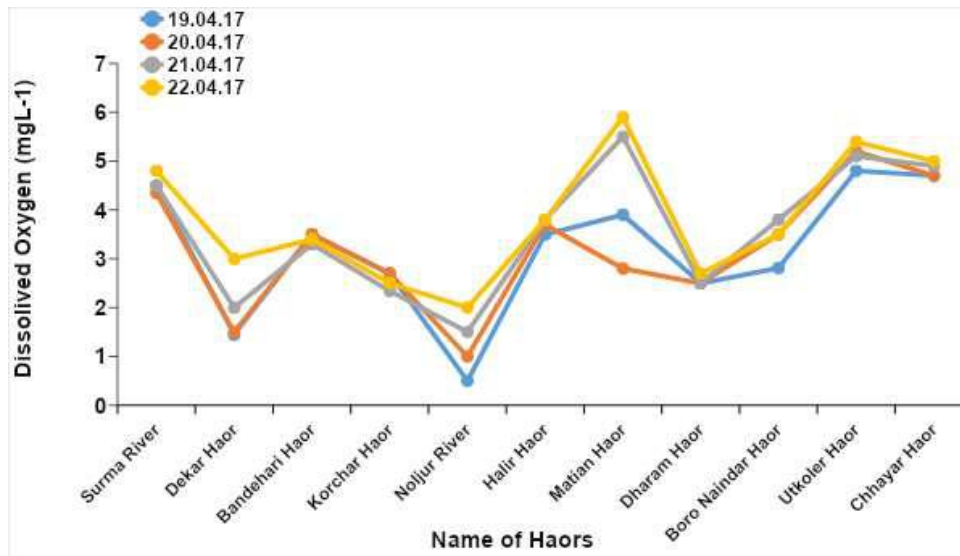


Fig. 10. Dissolved oxygen (DO) status among different Haors in the study areas

Short term DO status

Dissolved Oxygen (DO) level of Surma River, Utkoler Haor and Chhayar Haor was near 5.0 mgL^{-1} but in case of other Haors, the dissolved oxygen level was below 5.0 mgL^{-1} which caused a drastic effect on aquatic lives (Figure 10). The decrease in DO was caused due to the decomposition of green paddy and other inundated terrestrial vegetation. Decomposition reduced the amount of oxygen, while increasing the amount of carbon dioxide in the affected environment. Also oxygen level in the water fell due to the formation of ammonia gas. The DO level was

increased gradually in most of the Haors as rain continues for the next few days.

Short term TDS status

Total Dissolved Solids (TDS) of 11 different water bodies of study area on 4 successive days in April varies from 30 to 90 mgL^{-1} (Figure 11). The values of TDS were increased day by day in most of the Haors in where a constant level of TDS in the water is necessary for aquatic life. Presence of wastes and minerals in flood water may be the reason behind the rise of TDS in Haor water.

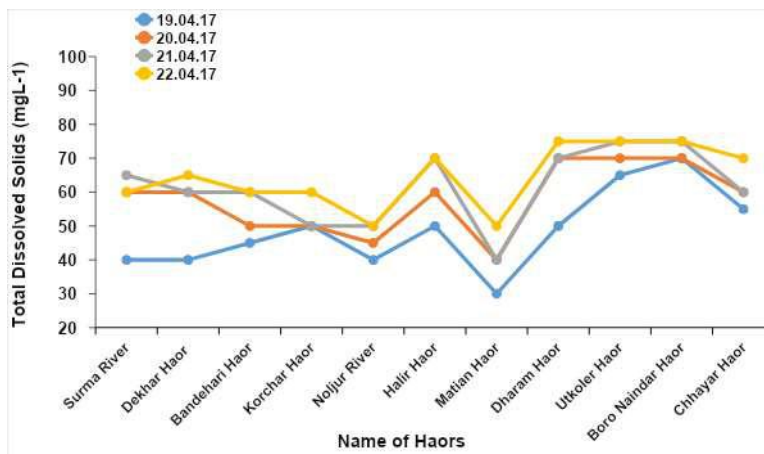


Fig. 11. TDS status among different Haors in the study area

Short term NH₃ status

The NH₃ of 11 different water bodies (Haors) of study areas on 4 successive days in April varies from 0.25 to 1.00 mgL^{-1} (Figure 12). Water quality in the Haors was

not normal as NH₃ gas formed there that killed huge fishes. This NH₃ (ammonia) gas was formed in Haor water due to rotten green paddy amid flash flood.

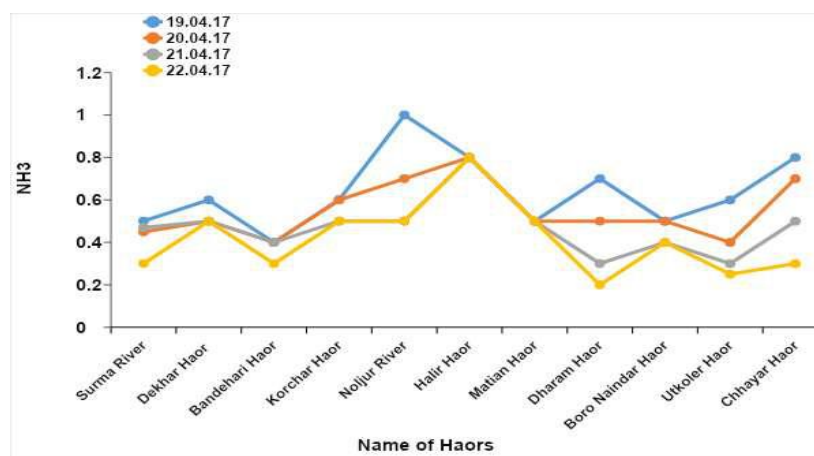


Fig. 12. NH₃ status among different Haors in the study area

From the figure it is observed that, in most of the water bodies the values of NH₃ decreased day by day most probably due to the flow of flood water. But in case of Halir Haor (0.8 mgL^{-1}) and Matian Haor (0.5 mgL^{-1}) the values remained unchanged probably due to the presence of excess rotten green paddy.

Conclusions

The flash flood of 2017 in the north-east region, triggered by heavy rainfall has breached parts of embankments and resulted in huge loss of assets and income of Haor dwellers. The flood caused enormous

destruction to agriculture especially on Boro rice and fish production on which the Haor dwellers rely upon for their livelihood. This early flash flood affects agricultural production, livelihood including food security, water and economy. Among investigated eleven (11) upazilas of Sunamganj district, Boro rice production was damaged more in Dharmapasha, Jamalganj, Sullah, Dakshin Sunamgonj, Derai due to more affected land in those areas. The total affected land of Boro rice cultivation in Haors of Sunamganj district was 149,224 hectare and the total amount of damaged rice was 393,855 MT. Due to the enormous damage in rice production farmers in those areas have become the victim of early flash flood. The total number of affected farmers was 315,084. Small farmers were mostly affected by flood where large farmers were least affected. The flood caused severe effects the quality of water on Haor such as on pH, DO, TDS, NH₃ which caused the death of fish. The total amount of damaged fish was 49.75 MT and the loss was 158.70 lakh taka. Fishermen were brutally affected due to this massive loss in fish production. The total number of affected fishermen was 44,445. So, the 2017 early flash flooding was a curse for the people of Haor areas of Sunamganj district, Bangladesh.

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