

The 1998 Flood: Losses and Damages of Agricultural Production in Bangladesh

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Abstract: A survey was conducted to assess the extent of damage and to evaluate the impact of the 1988 flood on agricultural production specially crops. The results revealed that 52 out of 64 districts were affected by flood to various degrees of severity. The flood of 1998 continued for almost 74 days as a whole and the intensity of flood was really high as indicated the maximum water depth (5.23 m). Flood damaged crops, trees, and destroyed majority of valuable resources and T.aman was the main crop normally affected by the flood of 1998 in different districts. Over 0.9 million ha Aman rice area was damaged through which almost 1.4 million metric tons of rice could be produced. Total production loss was 3.35 million metric tons and it was Tk. 66840 million in terms of economic loss. The special distress situation raised out of the flood'98 was that nearly 55% people had to stay out of their house for almost one month. The study suggested that Agricultural Rehabilitation Plans are needed at national level, so that funds and materials can be allocated promptly to provide appropriate assistance immediately after the flood.

Key words: Flood, losses, damages, agricultural production

Introduction

Flood is a natural calamity and an annual affair in Bangladesh. Bangladesh suffers from flood every year and is normally associated with the yearly monsoon rains that pour into the entire Ganges-Brahmaputra-Meghna basin. About 60% land of Bangladesh is flood-prone while 25% areas in Bangladesh are inundated by monsoon floodwater between June and October every year (Siddique, 2000). Many problems arise out of flood. Flood makes life miserable and causes a big loss of life, property and crops. The peasants also loss their stocks of food grain, seed and agricultural implements. Many people have to leave their houses and take shelter on high road or ground where they have to depend on charity. Flood also often leads to the disruption of the transport and communication system. In short, the effects of flood are manifold and immeasurable. However, the recent flood, 1998 affected many districts of Bangladesh and had broken all previous records of losses. Available statistics revealed that about 60% of the area of Bangladesh was flooded this year. Similarly, in 1988 about 60% of Bangladesh was flooded, but the

duration of the flood in 1988 was about 15/20 days whereas the 1998 flood lasted for more than two months. The flood in 1998 started in around 12th July and continued up to the middle of September and in some areas the whole of September (Choudhury, 2000). Evidence indicated that 52 out of 64 districts were affected to various degrees of severity. The severe flooding was occurred in 120 thanas, moderate flooding in 125 thanas and normal flooding was in 65 thanas of Bangladesh. Bhattacharjee (2000) found that about 68 percent of the total area of the country was affected and almost 31 million people suffered due to the severity of floods.

In order to assess the extent of damages and to evaluate the impact of flood on agricultural production specially crops, a survey was conducted in the flood-affected districts of Bangladesh. Therefore, the present study was undertaken with the following specific objectives:

- To know the nature and level of crop damages particularly rice caused by the devastating flood of 1998;
- To delineate the level of crop damaged with the intensity of flood damage;
- To delineate the farmers' perceptions on minimizing the sufferings from flood; and
- To derive policy implications from the above.

Materials and Methods

Sources of data

The study was based on both surveyed (primary data) and secondary data. Primary data were generated through farm household survey following multi-stage stratified random sampling procedure.

Survey area

Basically, the affected districts were classified into three groups namely; (i) severe flood affected (ii) moderate flood affected and (ii) normal flood affected region. At first, the following nine districts of Bangladesh were selected on the basis of the intensity of flood damage.

Flood intensity

Severely affected

Moderately affected

Normal flood affected area

Selected districts

Chapai Nawabgonj, Rajshahi and Narshingdi

Sirajganj, Gazipur and Chandpur

Tangail, Comilla and Kishoreganj

From the above listed districts, the most flood-affected upazila were selected and after then four villages from each upazila were chosen for the survey area. Ten households in every village were randomly selected. A pre-designed questionnaire was used to collect the necessary data. The collected data was analysed using descriptive statistics and other relevant techniques. The survey was conducted during January to April, 1999.

Review of previous floods in Bangladesh

Every year flood inundates land and causes damage in Bangladesh. The floods that caused most damage over this period occurred in 1974, 1988 and 1998. The flood in 1984 was not as bad, but still among the worst so far experienced. In the years, 1972, 1975, 1977-79, 1981-83, the incidence of flooding was rather mild and in 1960, 1961, 1965 and 1967 flood affects were moderate. They were more severe in the rest of the years. The 1974 flood affected more than 60% of the total area of Bangladesh; in 1984 the affected areas was about 35%. It was no more than 15% in the years of mild floods and less than 20% when floods were moderate (Hossain *et al.*, 1987). The regions hit by the floods almost every year are Sylhet, Chittagong, Comilla, Rangpur, Faridpur, Pabna and Mymensingh. The others areas which are also visited by floods quite often are Tangail, Bogra, Noakhali and Dhaka. In addition, there are some pockets areas like Narail, Jessore and Rajshahi region where flood have been very frequent in the recent past. The other regions also are not absolutely flood free. There has been at least one flood since 1960 in Khustia, Khulna, Barisal, Chittagong Hill Tracts and Dinajpur.

Causalities in lives, however, are not all recorded, yet apart from in 1974 and 1984, loss of lives appears to have been quite high in 1968, 1970, 1971, 1972 and 1976. In 1968 at least 126 human lives and more than 12 thousand cattle heads were lost due to floods. The loss in 1970 is reported to have been 87 human beings and about 7000 livestock. The corresponding figures are at least 120 and nearly 2500, respectively. In 1972, 77 human lives and about another 2500 cattle heads were lost due to floods and in 1976, the number of human deaths was no less than 54 (Hossain *et al.*, 1987). The records indicate that the houses completely damaged were nearly 100 thousand or above in 1968, 1969 and 1971 and more than 200 thousand in 1970. The houses partially damaged were about 650 thousand in 1969 and 365 thousand in 1970. They were around 100 thousand in 1971 and 1972. It appears that the loss of lives and the destruction of houses are not very correlated, even though severe floods caused damages to both.

Floods also caused extensive damage to crops. However, it is not possible to estimate accurately the extent of such damages. According to available information they go up to 100% in some flood hit areas and are frequently found to be in the range of 30 to 60%. Standing crops mostly rice, jute and sugarcane are usually destroyed. Table 1 shows the amounts of crop losses due to floods in some years in the recent past. Nearly 50 thousand cattle head and over 600 thousand poultry lives were lost in 1974 flood. It damaged standing crops of nearly 1.5 million tons paddy, 1.5 lakh tons of sugarcane, 354 thousand bales of jute (Table 1).

The 1984 flood inundated vast areas in the districts of Sylhet, Maulavibazar, Habiganj, Comilla, Chittagong, Cox's Bazar and Noakhali. In June, the central part of Bangladesh had rainfall 38 to 51 cm above normal. This caused extensive floods in the Ganges and Brahmaputra basins in the first fortnight of June. The crop damage was extensive in the Sylhet and Comilla regions. It damaged specially Boro crop during the period of harvesting. In 1983-84, total rice production

Table 1: Loss of major crops due to floods in different years of Bangladesh

| Years | Paddy (000'tons) | Jute (000'tons) | Sugarcane (000'tons) |
|---------|------------------|-----------------|----------------------|
| 1964 | 321.20 | 317.70 | NA |
| 1970 | 1298.40 | 606.30 | NA |
| 1974 | 1500.00 | 354.00 | 150.00 |
| 1980 | 283.00 | 37.00 | 172.00 |
| 1988** | 2110.33 | 26.24 | 375.17 |
| 1998*** | 3040.91 | NA | NA |

** Agriculture Statistics Wing, 1989 *** DAE, Ministry of Agriculture NA = Not Applicable

Table 2: Yearly rice crop losses due to flood and drought

| Years | Rice production (million metric tons) | Flood drought loss (million metric tons) | Losses as a % of total potential production |
|-----------|---------------------------------------|--|---|
| 1972-73 | 9.90 | 0.25 | 2.50 |
| 1974-75 | 11.10 | 0.72 | 6.10 |
| 1978-79 | 12.70 | 0.10 | 0.80 |
| 1980-81 | 13.70 | 0.44 | 3.10 |
| 1983-84 | 14.30 | 0.59 | 4.00 |
| 1987-88* | 15.41 | 2.11 | 13.70 |
| 1997-98** | 18.86 | 2.01 | 10.60 |

Source: Statistical Year Book 1984-85 *Statistical Year Book, 1989 ** DAE, Ministry of Agriculture

Table 3: Damage of major crops due to severe flood during August and September, 1988

| Name of crops | Fully damaged area ('000 ha) | Partially damaged area ('000 ha) | Total damaged area ('000 ha) | Total loss of production ('000 MT) |
|---------------|------------------------------|----------------------------------|------------------------------|------------------------------------|
| Aus | 37.00 | 24.22 | 61.22 | 50.50 |
| Aman | 1162.52 | 751.91 | 1914.43 | 2059.82 |
| Sugarcane | 6.17 | 24.00 | 30.17 | 375.17 |
| Jute | 12.55 | 16.63 | 29.18 | 26.24 |
| Vegetables | 6.78 | 1.33 | 8.11 | 71.06 |

Source: Agriculture Statistics Wing, 1989

Table 4: Coverage of inundation, production and economic loss due to flood, 1954-98

| Years | Flood area (Sq. k.m) | Percent of total area | Production loss (million ton) | Economic loss (million Tk) |
|-------|----------------------|-----------------------|-------------------------------|----------------------------|
| 1954 | 36920 | 25 | - | 1500 |
| 1968 | 37.00 | 25 | - | 1200 |
| 1974 | 52720 | 35 | - | 20000 |
| 1980 | - | - | 0.282 | 4000 |
| 1988 | 77700 | 52 | 2.505 | 4000 |
| 1998 | 10000 | 68 | 3.347 | 66840 |

Source: *DAE, Ministry of Agriculture, 1999 Islam (2000)

was 14.30 MMT and flood drought loss was 0.59 MMT (Table 2). Flood also damaged roads, highways, bridges, culverts etc. Almost 372 km. of roadway, 117 bridges and numerous culverts in 10 out of 15 administrative divisions of Bangladesh were badly damaged. Population affected 28.1 million and crops damaged 21850 sq. km (Hossain *et al.*, 1987).

Due to severe flood during August and September (1988), the fully damaged areas of Aus, Aman, Sugarcane, Jute and Vegetables were 37.00, 1162.52, 6.17, 12.55 and 6.78 thousand ha, respectively and the total loss of production for the respective crops were 50.50, 2059.82, 375.17, 26.24 and 71.06 thousand metric tons (Table 3). According to BBS (1989), the total loss of paddy production was about 2.11 million metric tons. On the other hand, total production and economic losses were about 2.505 million metric tons and Tk 4000 million, respectively (Table 4). But the flood of 1998 has exceeded all previous records of devastation. Prolonged duration of flood, 1998 has increased suffering of the people beyond measure.

Results and Discussion

The 1998 flood statistics

The rural people had experienced the worst flood of the century in 1998. The flood of 1998 hit the country in three phases. The first one hit in the beginning of July, the second in mid-August and the third in early September. Altogether, the deluge prolonged for two and a half months. The statistics on the damage due to the 1998 flood are given in Table 5. Almost one thousand people dead due to the devastating flood of 1998. Above fifteen lakh ha crop and five and half lakh houses were damaged due to flood. Moreover, a significant number of bridges and culverts, Highway and roads, educational institutions and also industrial units were disrupted for the 1998 flood.

Flood duration and inundation level

Although the severe flood of 1998 continued for almost 74 days as a whole but the initiation of flood varied from area to area. Farmers' expressed that the flood in Chapai Nawabgonj started on 29th July and remained upto 24th October of the same year. Virtually Chapai Nawabgonj experienced the maximum duration (87 days) of the historic flood of 1998 (Table 6). Similarly, in Chandpur, the flood started on 24th June and continued upto 15th September indicating the second highest duration of 1998. On the other hand, the most short duration flood was existed in Kishoreganj (51 days).

The data on floodwater depth as obtained from the field survey at different study locations are presented in Table 6. In Chapai Nawabgonj, the intensity of flood was really high as indicated by the maximum water depth (6.4 m). As the duration of flood was lower in Kishoreganj, the inundation level/depth of water was substantially lower in Kishoreganj (4.2 m).

Level of crop damaged due to flood

Due to severe flood, 1998, total crop production loss was 3.35 million metric tons and it was 66840 million Tk. in terms of economic loss (Table 4). In 1997-98 total rice production was 18.86 million metric tons of which 2.01 million metric tons rice was lost due flood (Table 2). According to DAE and MOA, amount of economic loss was Tk.6683.96 million for the devastating flood among this, total rice production loss was Tk.30098.8 million (Table 7).

Table 5: The 1998 flood statistics at a glance

| Items | Quantity (unit) |
|--|-----------------|
| Districts affected (no.) | 52 |
| Thana affected (no.) | 314 |
| Deaths (no.) | 1050 |
| Highways and roads damaged (km) | 15000 |
| Embankments damaged (km) | 2000 |
| Crops damaged (ha) | 1565390 |
| Houses damaged (no.) | 550000 |
| Educational institutions damaged (no.) | 24000 |
| Industrials units damaged (no.) | 11000 |
| Bridges and culverts damaged (no.) | 20500 |
| Tubewells damaged (no.) | 300000 |

Source: Siddique, 2000

Table 6: Extent of flood in different flood affected districts in Bangladesh

| Districts | Date of initiation | Date of receding | Duration (days) | Water depth (meter) |
|------------------|--------------------|------------------|-----------------|---------------------|
| Chapai Nawabgonj | 29th July | 24th October | 87 | 6.4 |
| Rajshahi | 21th July | 5th October | 75 | 6.1 |
| Narshingdi | 28th June | 21th September | 79 | 6.2 |
| Sirajganj | 1st July | 12th September | 72 | 4.9 |
| Gazipur | 9th July | 25th September | 78 | 4.7 |
| Chandpur | 24th June | 15th September | 84 | 5.2 |
| Cornilla | 14th July | 20th September | 66 | 4.5 |
| Tangail | 14th July | 24th September | 71 | 4.9 |
| Kishoreganj | 20th July | 10 September | 51 | 4.2 |

Source: Field survey, 1999

Table 7: Loss of Rice and jute, vegetables & trees due to flood, 1998

| Name of crops | Damaged area (million ha) | Loss of Production (million metric tons) | Amount of loss (Crore Tk) |
|--------------------------------|---------------------------|--|---------------------------|
| Aus | 0.198 | 0.218 | 327.50 |
| B. Aman | 0.324 | 0.324 | 485.60 |
| T. Aman | 0.587 | 1.057 | 1584.78 |
| Deficit in T. Aman cultivation | 0.340 | 0.408 | 612.00 |
| Total T. Aman | 0.927 | 1.465 | 2196.78 |
| T. Aman seedbed | 0.054 | - | 77.75 |
| Total Rice | 1.505 | 2.007 | 3009.88 |
| Jute, vegetables, trees etc. | 0.234 | 1.340 | 3674.08 |
| Grand Total | 1.739 | 3.347 | 6683.96 |

Source: DAE, MOA.

T. Aman is considered as the most important crop in Bangladesh. The standing T.Aman crop of 1998 was damaged totally in the severe flood affected areas under Chapai Nawabgonj. Moderate yield of MV T.Aman was obtained both in Narshingdi and Chandpur districts. But in Narshingdi and Gazipur, the yield of MV T.Aman was quite low. The production loss was 1.57 million metric tons for T. Aman (Table 7). On the other hand, the production loss of jute,

Table 8: Replanting of different crops after receding of flood

| Name of the districts | Area of replanting T.Aman (%) | Grown other Crop* (%) | Kept fallow (%) |
|-----------------------|-------------------------------|-----------------------|-----------------|
| Chapai Nawabgonj | 5 | 81 | 14 |
| Rajshahi | 8 | 71 | 21 |
| Narshingdi | 15 | 40 | 45 |
| Sirajganj | 21 | 40 | 39 |
| Gazipur | 36 | 19 | 45 |
| Chandpur | 12 | 46 | 42 |
| Tangail | 23 | 52 | 22 |
| Comilla | 24 | 51 | 25 |
| Kishoreganj | 29 | 40 | 29 |

Source: Field survey, 1999. * Other crops = Mugbean, Lentil, Blackgram, Mustard etc.

Table 9: Information on food stock in flood, 1998

| Name of the districts | Food stock per household | | Continuing with this stock (months) | Food deficit for this year | |
|-----------------------|--------------------------|-------------|-------------------------------------|----------------------------|-------------|
| | mounds | metric tons | | Mounds | metric tons |
| Chapai Nawabgonj | 4.2 | 0.157 | 1.5 | 22 | 0.821 |
| Rajshahi | 3.9 | 0.145 | 1.2 | 15 | 0.560 |
| Narshingdi | 2.5 | 0.093 | 1.0 | 16 | 0.597 |
| Sirajganj | 2.0 | 0.074 | 1.0 | 20 | 0.746 |
| Gazipur | 3.0 | 0.112 | 1.7 | 13 | 0.485 |
| Chandpur | 3.3 | 0.123 | 1.5 | 21 | 0.784 |
| Tangail | 1.9 | 0.071 | 1.4 | 24 | 0.896 |
| Comilla | 3.4 | 0.127 | 2.1 | 21 | 0.784 |
| Kishoreganj | 2.5 | 0.093 | 2.0 | 26 | 0.970 |

Source: Field survey, 1999

Table 10: Flood'98 experience of the flood affected people

| Comments | %of farmers response of different districts |
|---|---|
| Never seen | 85 |
| Stay outside of the house for one month | 49 |
| Damaged crops | 84 |
| Destroyed trees | 61 |
| Affected livestock | 39 |
| Destroyed fish | 17 |
| Damaged valuable materials | 89 |

Source: Field survey, 1999

Table 11: Suggestions of the flood affected people for reducing suffering from flood

| Comments | %of farmers response of different districts |
|---|---|
| Necessary food should be supplied on time | 68 |
| Cash money should be provided in time | 45 |
| Agricultural inputs should be supplied in time | 76 |
| During flood, shelter for man and livestock should be arranged properly | 34 |
| Necessary relief releasers should be taken | 29 |

Source : Field survey, 1999

vegetables, trees, etc. was 1.34 million metric tons. DAE and MOA also reported that total damaged area was almost 1.74 million hectare among this total damaged area of rice was 1.50 million ha.

Replanting of different crops after receding of flood water

After receding of floodwater, most of the farmers failed to replant T.Aman. About 36% of the T.Aman area of Gazipur district was replanted which was the highest area among the four surveyed districts. Most of the farmers of Chapai Nawabgonj district could not replant T.Aman. Only 5% of the Aman cropped land were replanted as T.Aman and 81% of the lands were devoted to other crops (Table 8). In Gazipur and Narshingdi about 45% of the cropped land were kept fallow due to lack of seed and required funds. It is disappointing that the Government Banks provided quite inadequate amount of cash money to the farm households as agricultural credit especially for the purpose of T.Aman replanting.

Availability of food stock during flood

Attempt was also taken to assess the farm households' existing food stock during the food period. The sample farms under Chapai Nawabgonj district reported that they had only 0.157 MT of food per farm household and with this food stock, a farm household could maintain the livelihood for 1.5 months (Table 9). On an average, food deficit per household of Chapai Nawabgonj district for that year was 0.821.MT. Similarly, food deficit per household of Rajshahi, Narshingdi, Sirajgonj, Chandpur, Gazipur, Tangail, Comilla and Kishoreganj districts were 0.56, 0.60, 0.75, 0.48, 0.78, 0.90, 0.78 and 0.97 metric tons, respectively.

Experience from the 1998 flood

Eighty five percent farmers reported that they had no experience of such flood before as that of 1998. They also mentioned that flood damaged their crops, trees, and destroyed majority of their valuable resources. T.Aman was the main crop affected by the flood of 1998 in different districts. In Chapai Nawabgonj, the flood of 1998 also affected sugarcane, blackgram and a large number of mango trees. The devastating flood of 1998 inundated many ponds under Chandpur and Narshingdi districts. The special distress situation raised out of the flood'98 was that 49% people had to stay outside the house for one month (Table 10). Even some flood affected people had to stay on the roof of the house for a 15 days.

Farmers' perceptions on minimizing the suffering from flood

About 45% farmers from different districts opined that government relief as cash money should be provided to the flood victims in time so that they could overcome the adverse situation after receding of the flood (Table 11). Another 68% farmers under the flood affected areas expressed that the required food should be supplied free of cost. Agricultural inputs like seed, fertilizer,

pesticides and irrigation facilities should be ensured in due time for crop production. Almost 29-34% of the farm households desired necessary relief and shelter for people and livestock as well during the flood period (Table 11).

Though flood is a common and regular disaster in Bangladesh the flood of 1998 is of particular importance for its devastation and long duration. It damaged not only established crops like T.Aman either totally or partially, it also destroyed trees, homesteads, buildings, roads, bridges, embankments etc. Human lives, livestock and other animals were lost due to flood. A remarkable amount of production lost by the devastating flood, 98. Therefore, precautionary measures should be undertaken to avoid or reduce the damages of flood.

The geographical location of Bangladesh is such that she has no control on the huge monsoon runoff of her three major river systems. Due to the flat topography and hydrological conditions, it may not be possible in every case to eliminate flood inundation completely. Despite extensive flood control measures, intensive rainfall and drainage problem during monsoon may cause flooding. Therefore, to control flood the following strategies may be recommended:

After crops have been destroyed by flood, farmers should use different cultivation practices from normal in order to replant or resow rehabilitation crops as soon as possible.

Where crops have been lost due to flooding, efforts must be made to increase production of substitute crops and/or of crops grown in the following season.

Farmers whose crops have been destroyed may need to have their loans (including agricultural loans) rescheduled for payment after they have harvested their next crop or over a longer period.

Increase the incentives of the farmers of the normally flooded areas to undertake cultivation of HYV and increase land productivity during the flood-free seasons. Farmers may be appraised about the right time of planting of crops to compensate the loss from frequent flood occurrences. Widen the opportunities of employment for the flood-affected people.

Flood control projects should be speedily executed. At least one-third of the flood vulnerable area should be protected by the end of the next two-decade. The emphasis must be on small-scale projects, which can be implemented within a short time.

Appropriate Agricultural Rehabilitation Plans are needed at national level so that the essential agricultural inputs such as seed/seedlings, fertilizers, pesticides etc. and credits can be supplied to the victim farmers immediately after the flood.

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