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Review

# Effects of Floods on Rice Production in Bangladesh

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**The actual situation of the effect of flood is examined with a view to evaluate the rice production in Bangladesh. Ten villages by taking two villages from five sub districts of the Gazipur district of Bangladesh were selected for the study. Of the two villages, one village is located comparatively nearer to the sub district headquarter while the other one is located comparatively away from the sub district headquarter. Total 1000 farmers by taking 100 from each village were surveyed through pre structured questionnaire. The study is done through regression analyses. It is found that the coefficient of flood has significant and negative effects on rice production of all villages. Evidences show from the study that production of rice in the flood affected areas can rise by taking some steps.**

**Key words:** Flood, farmers, rice yield, villages, Bangladesh.

## INTRODUCTION

Food production of Bangladesh has been increased and prices of rice and vegetables were relatively stable for the entire 2014(Anonymous 2014). It was projected that overall production would rise because of increased acreage of hybrid varieties (Anwar 2017) though such expectation yet been achieved. For example, Boro, a well-known rice crop cultivated on 46.85 lakh hectares, the lowest since 2008-09. Another crop Aus was targeted to produce 24.75 lakh tons while it fell down 22.89 lakh tons during 2016 (Anonymous 2016).

The above dual picture of the rice production in Bangladesh shows a grim picture of rice production which is the chief food of the people of Bangladesh. There are many reasons for the inconsistency of rice production in Bangladesh. It is said that farmers fail to recover their costs of production due to many reasons and the one reason is flood (Doha 2017; Anonymous 2014).

Many studies have been done in order to identify the causes of flood and the way to reduce her damage (Abdul et al. 2015; Musyoki et al. 2016; Svetlana et al. 2015; Tanvir 2015). Like many other countries, the food prices of Bangladesh may double (Reuters 2016). Food prices should be decreased if it is possible to raise the food production. At the same time, it may possible to export food crops such as rice to rice deficit country by producing more rice. In this context, preventive measures should be taken against flood. Flood does not occur in every places. So it is necessary to identify the places where flood occurs. With this regard, the present study has been done.

## METHODOLOGY

### Sampling Design

The selection of the Gazipur district, upazilas (sub districts), villages and sample respondents were done purposively. There were some salient features in the selection procedure. First one, the selected district includes some important infrastructures, such as Bangladesh Agricultural Research Institute and Bangladesh Rice Research Institute, etc. Secondly, total

number of selected villages was ten by selecting two villages from five upazilas, namely: Sadar (central), Sreepur, Kapasia, Kaliakoir and Kaliganj. Of the two villages in each upazila, one village is selected comparatively nearer to the upazila headquarters and the other one is selected comparatively away from the upazila headquarters. The selected nearer villages were Samantapur (Sadar), Bagnahati (Sreepur), Dushya Narayanpur (Kapasia), Katalia (Kaliakoir), and Poinlanpur (Kaliganj). The selected villages which were comparatively away from the upazila headquarters, namely, Bara Bhabanipur (Sadar), Saitalia (Sreepur), Noyanagar (Kapasia), Poshim Chandpur (Kaliakoir), and Bhatgati (Kaliganj). Thirdly, the total households were more than one hundred in the selected villages. It was then decided to collect one hundred samples from each village. The total numbers of investigated farmers were one thousand (2 villages x 5 upazilas x 100 farmers). Primary data was collected by using survey method and personal interviews were conducted through pre-tested questionnaires with a view to collecting data. The survey was administered with the help of staff of BARI in 2002. Lastly, each upazila has some characteristics: Sadar upazila is completely urban type; Sreepur, Kapasia and Kaliganjand Kaliakoirupazilas are rural type and headquarters of these upazilas are the only urban areas (BBS 1993).

**Conceptual Framework**

Many of the previous researches used the productivity index representing the amount of production per unit of farm land, the value added of production, which is found by deducting production costs from gross income. By using that index, it is possible to convert the specific quantities of products into given amounts of money to add up; therefore, it represents a considerable analytical benefit. The method of settling the type of variables from which the index is determined, expected to be discussed (Begum 1998).

As is commonly used in analyzing production, chemical fertilizer, farm buildings, irrigation facilities, family and hired labours should be considered as important investment functions (ibid). Begum (1998) considered crop income per unit of land as dependent variable and chemical fertilizer cost per unit of land, irrigation cost per unit of land, experience of farmers, farm area, number of times extension contact as independent variables. Therefore, it summarized the model, Ln crop income=f (ln chemical fertilizer, ln irrigation, ln experience, ln farm area, ln labour, extension contact $dummy_1$, extension contact $dummy_2$). It is (ibid) interpreted rice yield as dependent variable, while age of the farm household head, number of family earners in the household, number of times extension contact, proportionate effect of flood to crop land, distance from farm land to market, actual size of cultivated land, per unit cost of chemical fertilizer, per unit land cost, per unit irrigation cost, village dummy was taken as independent variables. The production function was solving by applying the ordinary least squares.

**Empirical Model**

The model applied here is the input-output model. The heart of the input-output model is the concept of the production function [Y=f (Capital, Labour)] which helps us in understanding the role of important variables like capital and labour in determining the crop productivity. But only two factors have no reflection on the productivity of any crop. Therefore, based on related past studies and logical analysis, some important explanatory variables are considered in this study namely age of the farm household head (ag), years of schooling of the head of the household (ed), number of family members (Fm), number of family earners in the household (fea), 1-2 number of times extension contact received by the farmer for the sample crop season ($etdummy_1$),3 times and above number of times extension contact received by the farmers for the sample crop season($etdummy_2$), proportionate effect (%) of flood to crop land (fec), distance from farm land to market in miles (mr), actual size of cultivated land in acre (fs) , total money spent for irrigation (irr), total cost spent for chemical fertilizer(ch), total labour cost (lab), village dummy (vdummy) = 1 if near village; otherwise = 0. Dependent variable is the rice production per unit of farm land (Ric). Table 1 represents the summary statistics of variables.

Data have been analyzed through frequency, percentage, mean, standard deviation and regression analyses. The productivity expressed in terms of rice production per unit of farm land is as follows,

Ric=f(ag,ed,fm,fea,fec,mr,fs,lab,ch,irr,$etdummy_1$,$etdummy_2$,vdummy).

To understand the quantitative relationship individually between floods and some selected inputs namely distance between farmland to nearest market (MR), irrigation cost/fs (Irr/fs) and cost of chemical fertilizer (Ch/fs), labour cost/fs,data were fitted with a linear regression model of the form: Y= a+bx, where Y= selected variables e.g. distance between farmland to nearest market (MR), irrigation cost/acre (Irr/fs) and cost of chemical fertilizer(Ch/fs), labour cost/fs (Lab/fs), b=coefficient of the flood (fec) variable, x=relevant input i.e. flood and a=constant(ibid). Explanatory variables explanations can be found in relevant literatures (ibid).

**RESULTS AND DISCUSSION**

The results of regression are presented in Table 2. The results suggest that all the selected variables have positive

**Table 1 Summary Statistics of Variables**

| Variables | Mean | Standard Deviation |
|---|---|---|
| ricyield(maund/acre) | 69.992 | 40.366 |
| ag (age of the farm household head) | 42.52 | 11.83 |
| ed (schooling year of farm household head) | 5.77 | 2.11 |
| fm (number of family members in the farm household) | 5.34 | 2.11 |
| fea (number of family earners in the household) | 1.49 | 0.85 |
| et(number of times extension contact) | 0.24 | 0.61 |
| fs (actual size of cultivated land in acre) | 0.74 | 0.61 |
| fec (proportionate effect of flood to crop land) | 10.08 | 19.79 |
| mr (distance from farm land to nearest market in miles) | 1.03 | 1.39 |
| irr (total cost of irrigation/acre) | 6377.12 | 17415.85 |
| ch(cost of chemical fertilizer/acre) | 6719.25 | 17927.92 |
| lab(cost of labour/acre) | 7025.70 | 18513.73 |
| vdummy (1near village, otherwise 0) | 0.50 | 0.50 |

**Source**: Author's calculation from survey data.
1 US$= BDT82 (appro.); 1 acre=0.405 hectare; 1 maund= 38 kilogram (appro.)

**Table 2 Regression Results**

| Variables | Near villages | Far villages | All villages |
|---|---|---|---|
| Constant | *** | *** | *** |
| ag | -.034<br>*-.862* | -.026<br>*-.673* | -.033<br>*-1.210* |
| ed | -.052*<br>*-1.392* | .013<br>*.359* | -.013<br>*-.488* |
| fm | .040<br>*.913* | .034<br>*.749* | .025<br>*.795* |
| fea | .014<br>*.319* | .069*<br>*1.584* | .041*<br>*1.364* |
| fec | -.085**<br>*-2.200* | -.143***<br>*-3.572* | -.101***<br>*-3.676* |
| mr | -.067**<br>*-1.904* | .065**<br>*1.824* | -.020<br>*-.769* |
| fs | -.129***<br>*-3.007* | -.180***<br>*-4.097* | -.179***<br>*-5.935* |
| lab | -.118***<br>*-2.666* | -.163***<br>*-3.755* | -.118***<br>*-3.801* |
| ch | .501***<br>*11.756* | .239***<br>*5.510* | .372***<br>*12.263* |
| irr | .216***<br>*5.692* | .446***<br>*10.113* | .286***<br>*10.201* |
| $etdummy_1$ | .197***<br>*5.160* | -.006<br>*-.153* | .110***<br>*3.985* |
| $etdummy_2$ | .044<br>*1.252* | -.029<br>*-.828* | .023<br>*.918* |
| vdummy | - | - | -.152***<br>*-5.880* |
| $AR^2$ | .433*** | .393*** | .402*** |
| F | 30.938 | 27.495 | 50.844 |
| N | 471 | 492 | 964 |

Source: Author's calculation from survey data. ***, ** & * indicate 1%,5% and 10% level of significance.

effects on the yield of rice except few variables. It is seen that effects of flood is negative and significant for all villages though effects of flood is comparatively stronger in the villages away from sub district headquarter than in the nearer villages. It means floods mainly effect in the remote type rural areas which supports (Anwar 2017; Doha 2017).

It is evident from the analyses that remote type rural areas are mainly affected than in the comparatively non remote type rural areas. This is plausible. For example, it has been damaged BDT 5081crore worth of rice, fish, and fodder in 7 haor district in the north eastern region by the devastating flash flood in Bangladesh (Anonymous 2017). According to one bulletin (Anonymous 2017) the main affected crop is Boro rice while the damaged Boro rice cropland has been estimated 371,381 hectares (ibid).

Effects of some selected variables have been examined also. It is observed that floods hamper communication

**Table 3 Comparative Individual Effects of Some Variables**

| Effects | Best fit regression equation | Adjusted $R^2$ |
|---|---|---|
| Effects of floods on MR | MR=1.08-0.00511fec* | $AR^2$ 0.4%* |
| Effects of floods on IRR/fs | Irr/fs=1450+3.77fec*** | $AR^2$ 0.4%*** |
| Effects of floods on Ch/fs | Ch/fs = 1032-1.43fec | $AR^2$ 0.1 % |
| Effects of floods on Lab/fs | Lab/fs= 2237+13.140fec*** | $AR^2$ 3.15%*** |

***&* indicate 1%&10% level of significance.
**Source**: Author's calculation from survey data.

between cropland and nearest market since the regression coefficients of flood is negative and significant. Due to floods, market places are unable to conduct normal marketing function. Farmers carry their goods to the market places under river ways with the help of boats etc. which become costly.

Floods have no impact on chemical fertilizer. Crops are not possible to cultivate during the tenure of floods. Moreover, chemical fertilizers which are usually kept on the premises of farmers' house become unusable condition. Therefore, this impact is insignificant at the time of floods.

Floods have positive and significant effects on per unit of cost of irrigation. Usually irrigation is unnecessary when floods are occurred. Irrigation equipment is not available during the time of flood. Because irrigation may face mechanical problem and irrigation equipment like DTW are gone under water. Therefore, irrigation management becomes expensive during the time of floods. Therefore, flood increase, irrigation cost per unit of land also increases.

Labour cost of per unit of farm land is critical factor during the time of floods. Farm laborers become jobless and migrate to the big cities to look for job. Therefore, cost of farm labour raise due to shortage of farm labour supply.

## CONCLUSION

Results of the study are comparable to the previous studies though most of the studies are done descriptive or empirical studies. The present study has been done by following descriptive and empirical analyses. It is evident farm the study that floods have no positive role in order to raise rice production and agricultural inputs. Due to floods, every year it faces crop damages and needs to import food crops from the international market. The Government needs to arrange food subsidy for the flood effected people and also needs to ensure agricultural inputs subsidy for the farmers of the flood affected area (Reaz and Reazul 2017). It is cleared from the study that floods effect to the villages which comparatively away from the urban or semi urban type villages.

Causes of floods in Bangladesh are lack of depth of rivers, canals, sudden rise of water. The Bangladesh Government and donor agencies, WB, ADB and NGOs always take initiatives in order to prevent floods. Those initiatives become disappear or go slowly due to financial constraints or proper management for the building up the dam, barrage and embankments. Therefore, effects of floods are common socio economic problems for the remote rural people of Bangladesh.

The government of Bangladesh and other stakeholders of the country should create awareness for their flood protection plans, implementation and would consolidate in order to reduce the crop damage, jobless, homeless of rural peoples by concentrating the socio economic development of Bangladesh and other countries as well. Policymakers should take note of the outcomes of the experiment.

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