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Potential Rainwater Harvesting For Irrigation In Godagari Upazilla, Rajshahi

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Abstract
Water is an essential input for modern agriculture and more use of irrigation water has contributed to manifold increases in crop productivity in Bangladesh. Godagari Upazilla is located in High Barind tract situated in the northwest portion of Bangladesh. A typical dry climate with comparatively high temperature prevails in this Barind area. The Barind tract is an area of low and erratic rainfall with limited irrigation potential. Farmers there largely rely on rain fed cropping. But rainwater has been the supplementary irrigation resource and thus dependency on groundwater has been increased. A gradual fall in the groundwater level due to excessive withdrawal of water for irrigation has been contributing to a water crisis and affecting agricultural production and environmental degradation in the region. Rainwater harvesting might be potential alternative way of extensive irrigation. The study was undertaken with a view to determine consumptive use for the Aman, Aus and Boro crops and availability of rain water. The maximum water requirement in the study area in Boro season and excess rainfall occurs in Aman and Aus season and irrigation requirement is less in this season. The excess rainwater that can be stored in the existing ponds and dependency on groundwater can be reduced.
Keywords- *Barind Area; Consumptive Use; Godagari Upazilla; Irrigation; Rainfall; Water Requirement*

I. INTRODUCTION

Bangladesh, one of the most densely populated countries in the world, has been suffering from the problem of food shortage. The country has a population of about 16 crore in its 14.4 million hectares of land. The demand of food is increasing day by day in Bangladesh due to the increasing of population. As a result agricultural land area is cultivated more than two times in a year and requirement of irrigation water is more than the past time which is supplied by deep tubewell. The study area is situated in the Barind tract where three crops (Aman, Aus and Boro) are produced in a year. About 36.36% people are involved with agricultural activity in study area. Agricultural activity is dependent on irrigation during dry seasons of eight months from mid-October to mid-June when rainfall is minimum. Groundwater supplies about 75% of dry season irrigation. With the increasing use of groundwater for irrigation the annual extraction of groundwater are far in excess of net average recharge from natural sources. About 700 deep tubes well were installed in Godagari thana for the dry season irrigation. To reduce this problem the excess rainwater which flown away as surface run off can be harvested in pond and other reservoir and might be used for dry season irrigation. In Aman and Aus season, crops are irrigated by rainwater. But Boro season, irrigated water are totally supplied by deep tube well. If the excess rainwater in Aman and Aus seasons is stored in reservoir, this water can be used for Boro season irrigation. The aim of this study is to investigate the potentiality of rain water harvesting during the monsoon and use the harvested rainwater for irrigation during the dry season. The scope of the study is to analysis rainfall data and meteorological data to calculate the available rainwater and irrigation requirement for every month of a year by Blaney–Criddle method. A study is also conducted on existing pond to determine the present storage capacity.

II. LITERATURE REVIEW

Rain Water Harvesting is an age-old system of collection of rainwater for future use. But systematic collection and recharging of ground water, is a recent development and is gaining importance as one of the most feasible and easy to implement remedy to restore the hydrological imbalance (groundwater) and prevent the crisis. In scientific terms, water harvesting refers to collection and storage of rainwater and also other activities aimed at harvesting surface and groundwater, prevention of losses through evaporation and seepage and all other hydrological studies and engineering inventions, aimed at conservation and efficient utilization of the limited water endowment of physiographic unit such as a watershed. Directly collected rainwater can be stored for direct use or can be recharged into the groundwater. All the secondary sources of water like rivers, lakes and groundwater are entirely dependent on rain as a primary source. The term water harvesting is understood to encompass a wide range of concerns, including rainwater collection with both rooftop and

surface runoff catchment, rainwater storage in small tanks and large-scale artificial reservoirs(like pond), groundwater recharge and also protection of water sources against pollution.

III. STUDY AREA

The name of study area is Godagari. It consists of nine unions and 389 mouja. It is located in Barind tract situated in the Northern portion of Bangladesh. Godagari is a part of greater Rajshahi district and the Padma River passing through the side. The hard red soil of this area is varying significant in comparison with respect to the other part of the country. The Rajshahi Barind tract is located in between 24 degree 23 minute to 25 degree 15 minute north latitude and 88 degree 2 minute to 88 degree 57 minute east longitude. Its total population 217811; consists of male 50.88%, female 49.12%, Muslim 86.55%, Hindu 8.05%, Christian 1.93% and others 3.47%. Main occupations in the study area are agriculture. In Godagari about 36.36% peoples are depends on agriculture. In the study area total cultivable land are 35750.71 hectares and fallow land 218.74 hectares.

Fig. 1 Map of study area

A. *Climate Condition in Study Area*

There are two main season, separated by transition season. The monsoon season lasts from May/June until September and shows the typical monsoon characteristic of heavy rain and high humidity. The dry season from November to February is sunny and relatively cool, with only occasional scattered. The climate of the project area is more and less the average for the country as a whole characterized by the two distinct seasons- the wet season from June to September and the dry season during rest of the year.

B. *Temperature Condition in Study Area*

The average temperature of the study area varies between 8 to 44° C January and February are the coolest month, when temperature falls below 8° C. Summer starts abruptly in March and is characterized by a hot north westerly wind a rapid increase in mean daily relative humidity from 60 to 85%. Temperature is high as 43°C is experienced for some time during summer season.

C. *Rainfall Condition in Study Area*

The monthly distribution of rainfall in the project follows the usual pattern of monsoon with heavy rains starting in May and ending in September and very little of no rainfall during the rest of the year. Rainfall in the area varies from about 1500 to 2000 mm. Minimum evaporation occurs in the months from November through February when monthly evaporation varies from 55.88 to 60.96 mm. Maximum rate of evaporation is observed in months of March to May when monthly evaporation varies from 140 to 162 mm only.

IV. RESULTS AND DISCUSSION

In the study area has number of ponds which is excavated by Barind multipurpose development project. These ponds are mainly uses for rainwater harvesting and irrigation purposes in three seasons. Water reservoir capacity of these ponds is shown in Table I.

TABLE I EXISTING POND NUMBER AND WATER RESERVOIR CAPACITY

Sl. No.	Name of Mouja	No. of Pond	Pond Capacity (m^3)
01	Belasi	14	3049
02	Shahapur	14	2849
03	Mohonpur	12	5626
04	Rajarampur	12	5032
05	Pakri	14	6542
06	Reshikul	12	4376
07	Bangdara	14	7945
08	Kanaitkunda	9	5943
09	Itahary	14	2479
10	Joikrisnopur	27	21088
11	Shakalipara	12	5671
12	Mohadebpur	18	16417
13	Gogram	8	5932
14	Sakura	17	5487
15	Kumodpur	11	1058
16	Gowripur	15	3180
17	Balygram	14	4240
18	Goshira	15	8100

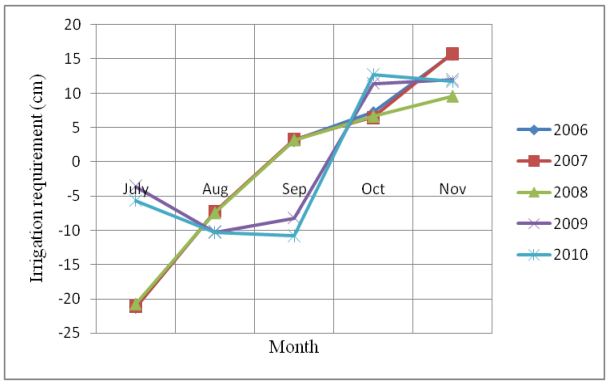

Fig. 2 Variation of irrigation requirement for Aman season

The Figure 2 indicates that in Aman season irrigation water is required in October and November. But irrigation is not required in July and August due to excess rainfall and excess rainfall water can be stored in the existing ponds.

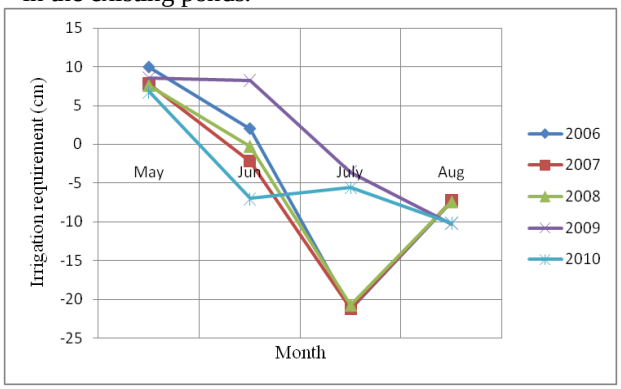

Fig. 3 Variation of irrigation requirement for Aus season

In Aus season, land is cultivated fewer amounts in the study area. The Figure 3 indicates that in Aus season irrigation water is required in May and June. But irrigation is not required in July and August due to excess rainfall and excess rainfall water can be stored in the existing ponds.

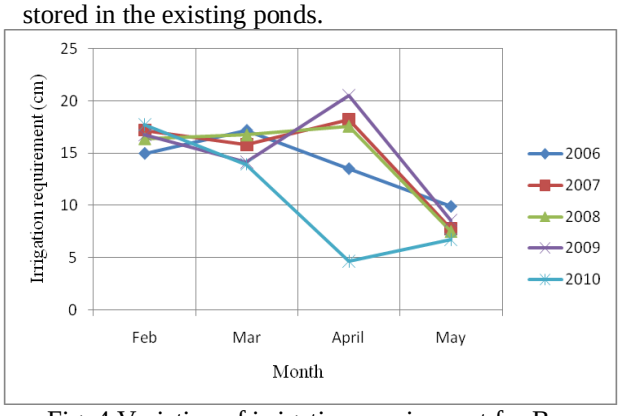

Fig. 4 Variation of irrigation requirement for Boro season

The Figure 4 indicates that in the study area, Boro crops season is totally depends on supply irrigation water. Rainfall in Boro season is fewer amounts.

V. CONCLUSIONS

It has been seen that the consumptive use and consumptive irrigation requirement are mainly depends on monthly average temperature, sunshine hour and monthly rainfall of the study area. For the Aman crops, the peak water requirement arises in October to November. In the month July to September irrigation requirement is decreases and excess rainfall can be stored in the existing ponds. In Aus crops water requirement is peak in May and other month excess rainfall can be stored in the existing ponds. But for Boro season water requirement is much and whole irrigation is done by artificial methods like deep tube well. If the excess rainwater in Aman and Aus season can be stored, it will be supplied in Boro season irrigation. It will become more economical for irrigation and safe the groundwater from withdrawn as well as the environment and ecological imbalance.

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