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PROSPECT OF RAIN WATER HARVEST IN FARM PONDS FOR IRRIGATION IN THE COASTAL SALINE AREAS OF BANGLADESH

Salma Begum^{a*} and Mainul Ahsan^b

^a Environmental Science Discipline, Khulna University, Khulna 9208, Bangladesh

^b Soil Resource Development Institute, District office, Khulna 9100, Bangladesh

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Abstract: A simple *water* balance analysis shows that about 532 mm rainfall remain excess during monsoon season. This excess can be stored in the farm pond/tank or canal/*khal* and it may be utilized for irrigation in second crop during *rabi* season. Storage structure will be excavated in an average depth of 2.25 meters in 1/5th of the mini/micro watershed area. This will ensure better drainage facility and multiple cropping in the area on a sustainable basis and will also encourage crop diversification in the cropping system.

Key words: Rain water; Pond; Irrigation; Coastal area

Introduction

Despite many efforts the impact of development in agriculture sector has not penetrated in the southern part of the country, particularly in the coastal saline area. This area is known to be one of the most agriculturally and socio-economically backward regions of the country. In this area the yield of almost all the traditional crops is poor.

Most of the areas are almost flat, low lying and the soils being heavy textured. The drainage condition of the land is poor which results in deepwater stagnation in *kharif* season. These limitations restrict the cultivation of high yielding rice varieties in *kharif* season and delay *kharif* crops sowing time due to late draining condition of the land after *kharif* rice (RSS report of Khulna and Bagerhat Subdivision, SRDI, 1973).

In this region intensification of agriculture largely depends on the extent of irrigation facility during post monsoon season, which can bring one area under multiple cropping. Very few canal irrigation systems exist in this region due to high river/creek water salinity during dry season. Lack of good quality irrigation water is one of the major constraints in growing a second crop in coastal saline area in dry season. Fresh water groundwater aquifer for irrigation is found at depths that range from 300- 400 meters and its

* Corresponding author: Tel.: 88-041-721791, 720171-3/279; Fax: 88-041-731244; E-mail: <ku@bdonline.com>
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exploitation extremely expensive and technically difficult. On the other hand, ground water at shallow depth ranging from 1.0 to 5.5 meters or more is also saline and therefore unsuitable for irrigation. The possible alternative is to store the excess water during monsoon in the farm ponds/tanks or creeks/*khal* with or without suitable control structure in order to drain excess water than the capacity of the pond, tank etc (Khandalwal *et al*, 1990).

Out of 1.65 million hectares of salt affected soils in south and southwestern part of the coastal saline areas of Bangladesh, only 0.34 millions hectares of land is affected by very slight-to-slight salinity. This area may be the most suitable saline area for rainwater harvest in farm ponds for irrigation in dry season.

Excess Rainwater Harvest

The climate of coastal saline area is humid subtropical. The average total rainfall ranges from 1682 mm to 2823 mm, of which about 90% occur during May to October. Excess rain water in the monsoon season causes severe water logging all over the area due to lack of adequate drainage facilities. On the other hand, there is acute shortage of good quality water for irrigation in winter and summer months. The excess rainwater if stored in places like dug out farm ponds; main drainage channels and closed small tidal canals/creeks can meet the irrigation requirements of a considerably larger area (Sen *et al*, 1998).

Table 1. Water balance of *Batiaghata Thana* in Khulna District.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Mean Rainfall (mm)	14	27	41	96	188	362	388	305	245	148	22	6
75% Probability	10	20	31	72	141	272	291	229	184	111	17	5
EV (mm)	82	92	110	119	121	118	114	116	116	113	99	84
Water Balance	-72	-72	-79	-47	20	154	177	113	68	-2	-82	-79
Excess Rain water from May to September (mm)								532				

Source: SRDI, 1989.

A simple water balance analysis involving rainfall and potential evapotranspiration for a location in coastal saline area indicates the amount of excess water that should be removed from most of the places. Probable monthly water balance of Batiaghata, Khulna was roughly estimated taking rainfall at 75% probability level and evapotranspiration in order to accommodate nearest lower values of rainfall, which is shown in Table-1. It shows that excess rainwater occurs mainly during the month of May to September. In May, a good amount of rainfall occurs but it is considered a dry month since crop water demand is quite high. In October, the amount of rainfall is nearly equal to that of May, but the water demand is much less. As a result, the amount of excess rainfall is almost nil but it is considered a wet month. From November to April the amount of rainfall is insignificant. Without considering deep percolation and seepage loss, it is roughly estimated that about 532 mm rainfall is excess during monsoon and it may be utilized for irrigation in second crop during *rabi* season, (*Thana Nirdeshika* report, Batiaghata, Khulna, 1989).

Farm Pond Technology

Technology at a Glance: The technology essentially involves land development in terms of land shaping, land grading for smooth removal of excess water toward the storage structures on mini watershed basis for community irrigation system or micro watershed basis in the farm ponds as per the suitability of the site. This will include following activities:

Leveling of the land to help draining out excess water and uniform leaching of salts for providing better water and nutrient control (Sen *et al.*, 1996). Construction of field *bunds* around the plots would regulate outflow of water from the field. The excess rainwater would be stored in the proposed storage structures during monsoon season for subsequent utilization in *kharif* and summer crop cultivation. Cultivation of horticultural crops on the embankment of the ponds and field *bunds* would be enhanced. Cultivation of *kharif* and summer crops on the surrounding of the ponds and introduction of high yielding varieties during *kharif* season would be possible. Pisciculture in the excavated pond would be carried out throughout the year.

Construction Methodology: Storage structure will be excavated of an average depth of 2.25m in 1/5th of the area of the mini/micro watershed. Required size of the farm pond for a standard farm holding size of 1.0 hectare is shown in Table 2 (Anon, 1987).

Bunds of about 1m height and 1.5 m width on the periphery of the storage structure may be constructed with the excavated earth so as to attain effective depth of water storage up to about 3.0 m (any modification may be accepted). The excavated soil may be spread on the remaining 4/5th of the area to raise it by about up to 0.50 m. It will reduce the drainage congestion during *kharif* and will help timely sowing of *rabi* crops normally delayed due to excess soil moisture after *kharif* rice harvest. Field *bunds* may be made in order to regulate the smooth and efficient removal of excess water towards the structure so as to maintain the optimum depth of water submergence in the field (ICAR Bull. no.13). The surface soil of the excavated area may be used as top dressing on the remaining plots. It is advisable to avoid spreading of any poor quality subsoils (acid sulfate/peat layer) on the surface of the land. Further, depending on soil characteristics, liming material may be used at places to ameliorate soil/water in crop field/fish ponds.

Table 2. Specification of the farm pond for a standard farm holding of 1 ha. land.

Size of holding (ha.)	1
Size of the pond at surface (sq. m)	1790 (42.3x42.3m)
Pond depth (m)	3
Pond slope	1:1-1:1.5
Water depth for irrigation (m)	1.5
Water depth for fish culture (m)	1
Water loss by evaporation and seepage (cm/day)	0.5
Water for kitchen gardening (cm)	15
Irrigation area (m ²)	8,000
Volume of earth work (m ³)	4,700
Left-over land (m)	0.4-0.5

Source: CSSRI, 1987.

Utilization: The *bunds* around the pond and around each plot may be utilized for

plantation of horticultural crops like coconut, banana, papaya, etc. Rain water reserve in the excavated storage structure may be utilized for i) growing crops in *kharif* or summer crops, ii) fresh water aquaculture, iii) supplemental irrigation in *kharif* during dry spell (Anon, 1987). It is estimated that about 3.0 m depth of water will remain in the storage structure at the end of *kharif* season. Out of this, about 0.5 m will be lost due to evaporation and deep percolation/seepage over a period of 7 months and about 1.5 m will be utilized to irrigate the crop in *kharif*/summer season. Remaining 1.0 m water may be used for growing fish (Sen, 1996). It is estimated that about 1/3rd of the land may be utilized for growing a third crop.

Capital Source for Excavation: In some of the SAARC countries excavation cost of about 80% farm pond is provided by commercial private Banks and NGOs with minimum interest rate. Farmers are providing only 15% of such cost (Anono, 1995-96). In our country commercial Bank/NGO may provide credit among the small farmers. Recommendation from soil experts of Soil Resource Development Institute/Salinity management and Research Center about soil condition of the specific area may be necessary during excavation of the farm pond.

Benefit of the Technology

A good quality water source is created to meet the irrigation need of *kharif* crops. By diversion of some of the excess rainwater from the adjoining cultivated area to the pond, the drainage needs are considerably reduced. Raising the level of the adjoining cultivated area by using the soil of the pond diminishes the water logging problem, which facilitates cultivation of the high yielding rice varieties with improved management practices. This will ensure multi-cropping in the area on a sustained basis and will encourage crop diversification in the cropping system. Additional income can be generated by the farmers with the introduction of pisciculture in the dugout farm pond.

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