An Alternative Irrigation Approach of BMDA Over Farmer Managed Irrigation Systems

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Abstract: This paper describes the development process of modern irrigation management technology in respect to water saving and management of water resource in Barind Area. Our growing demand of food entails intensifying land productivity and developing modern agricultural technology. Unfortunately, our country is lagging behind in comparison to other developed countries regarding technological innovation and development. However, in recent few years, impressive success has been made in the agriculture sector as agricultural productivity that brings self-sufficiency in food. Presently, only farmer managed and dependent farmer managed (government associated) irrigation systems are in operation in Barind land as well as in Bangladesh. But BMDA has an effective role in increasing crop production and attaining the self-sufficiency in food. Better management of irrigation water, water distribution system and appropriate water charging in BMDA will enhance efficiency in water use. BMDA already has launched e-agriculture in its jurisdiction. It is found that the operation performance of the existing irrigation systems in Barind area is better in terms of water use efficiency. Improved management of surface and ground water irrigation and appropriate pricing strategies are also suggested for achieving physical and economic efficiency in water use.

Key Words: BMDA Irrigation, Barind Area, Efficient Water Utilization,Farmer managed irrigation

Introduction

Farmer Managed Irrigation Systems are situated all over Bangladesh where most of the fertile agricultural land is either low-lying flood plains under deltaic influence or flood-free upland beyond the scope of gravity-flow water supplies. There are a few primitive devices for lifting water for limited irrigation. Modern lift irrigation, either from surface sources by low lift pumps or from ground water aquifers through deep or shallow tube wells, has taken the key role in both agricultural and rural development programs in Bangladesh for the purpose of increasing farm outputs against recurring food deficits and growing rural unemployment. Minor irrigation systems cover and continue to cover about 95% of the country's irrigated area mostly managed by farmers. On-farm distribution and management of irrigation water would be done by the farmers and public agency intervention would be in planning, implementation, operation and maintenance of the main system. In the very past, development of both surface and ground water resources for irrigation has been done entirely by the government agencies.

Now the most of groundwater irrigation systems like Deep Tube wells (DTWs), Shallow Tube wells (STWs) and other Manually Operated pumps for irrigation have been privatized.

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Low Lift Pumps (LLPs) are also operated and managed by farmers. Only installation, operation and maintenance of the large surface irrigation systems are carried out by the government agencies. Major portion of irrigation systems are managed by either farmers or farmer-cum-agencies. The role of minor irrigation in increasing food production and employment is already well-documented (Hamid 1977; Hanratty 1983;Palmer-Jones 1985)

After, 38 years of independence (1971), cultivable land has declined about 35 percent while the population and demand of food has doubled. However, agriculture sector has performed relatively well in the last decade due to increase productivity, incipient diversification into value- added products, such as fruits, vegetables, flower, pulses, spices, poultry, dairy and fish and almost self-sufficiency in food grain production (Ahmed, 2007). In contrast, we have failed to make the best use of natural resources due to our ignorance of advanced technologies. The developed world has been enjoying the benefits of modern innovation of the agricultural sciences (Zaman, 2006). But Bangladesh is still lagging behind, needs to exploit the benefits of science more than anything.

Bangladesh agriculture is still rice based and rice is the staple food of 90 percent population. This component provides 96 percent of the countries' food requirement and employees about 60 per cent of labor force (Alam,2008). Most of the technological advancement are attained concerning to increase food grain production. Rightly, country achieved at marginal self-sufficiency on food grain production with the cost of indiscriminate use of natural resources particularly water resources. Thus, this is the best time to pay attention on sustainable water management with the help of modern technology (Rahman and Jianchao,2014).Water availability during the year in Bangladesh is highly skewed since the country is subject to alternating annual periods of extreme excesses and deficits in rainfall, recurring floods and cyclonic storms(Ghani and Rana,1992).

The most water consuming crop, rice (Boro) is usually irrigated through flood irrigation, which losses about 60-70% of the water. The source is mainly underground water, which causes water depletion resulting intrusion of salinity, arsenic and other metals harmful for health. Considering the issue, Government has formulated Irrigation Water Use Policy, which enhance the preservation and use of rain and surface water, construction of rubber dam, canal digging, use of buried pipes, solar power operated Pat Kua (Dug Well), Alternate Wetting and Drying (AWD) method, Drip Irrigation System, Fita Pipes (Water Pipes) and sprinkler irrigation system. Motivation programs are continuing among the farmers to replace more water consuming rice (Boro) by less water consuming rice (Aman and Aus) varieties to enhance water efficiency (MoA, 2017).

Both surface and groundwater are used as a source of irrigation in Bangladesh. But the country does not have much control over surface water since most of the flow comes during June to September from the catchment area outside of Bangladesh. Specially in Barind Tract, most of the streams remain dry or nearly dry during November to May and cannot be used as a dependable source of irrigation unless conservation and augmentation facilities are created. A more Dependable source of irrigation is ground water extraction. Very recent, the Government has taken initiative to recover the scarcity of irrigation water through harvesting of rain water in khal/khari, beel, pond, lowland, reservoir etc. through re-excavating these water bodies. BMDA has already taken some projects to re-excavate the water bodies for harvesting and conservation of rain water.

In this paper, an attempt is made to compare BMDA's irrigation management system over farmer managed irrigation systems to strengthen overall water use efficiency and to pay attention on sustainable water management with the help of modern technology as well as to increase food grain production.

Study Area

Bangladesh is an agricultural country divided into 8 hydrological regions. Northwest region encompasses the Rajshahi and Rangpur Administrative Division of 16 districts and is bounded by the Brahmaputra and Ganges rivers. The total area of this two division is 31,54,860 ha of which net cultivable area of 26,41,216 ha(Minor Irrigation Survey Report 2017-18, BADC). Apart from Rajshahi, Rangpur, Dinajpur, Bogra and Pabna are the main urban centers. Average rainfall is about 1700 mm but its south western part in the Barind zone is one of the driest in Bangladesh with average rainfall below 1400 mm. The Barind Tract is the driest part of the region where surface water supply is very limited. The tract extends over Rajshahi, Dinajpur, Rangpur and Bogra districts of Bangladesh and Maldah district of West Bengal, India. The temperature varies between 6 to 44 degree Celsius. Apart from the monsoon from mid-June to mid-October the climate is very dry. The high Barind is the only elevated land.

The Barind Tract is distinguished by hard red soils and older alluvial deposits which are different from other parts of Bangladesh. The main clay minerals are kaolinite, chlorite, smectite, and mica-smectite interlayered phases. The Barind clay contains an average total organic carbon content of 0.05%. The agro climatic conditions of the Barind region are highly favorable for irrigation but it requires an enormous government support before this potential could be realized. The area map of the study area is given bellow in figure 1.

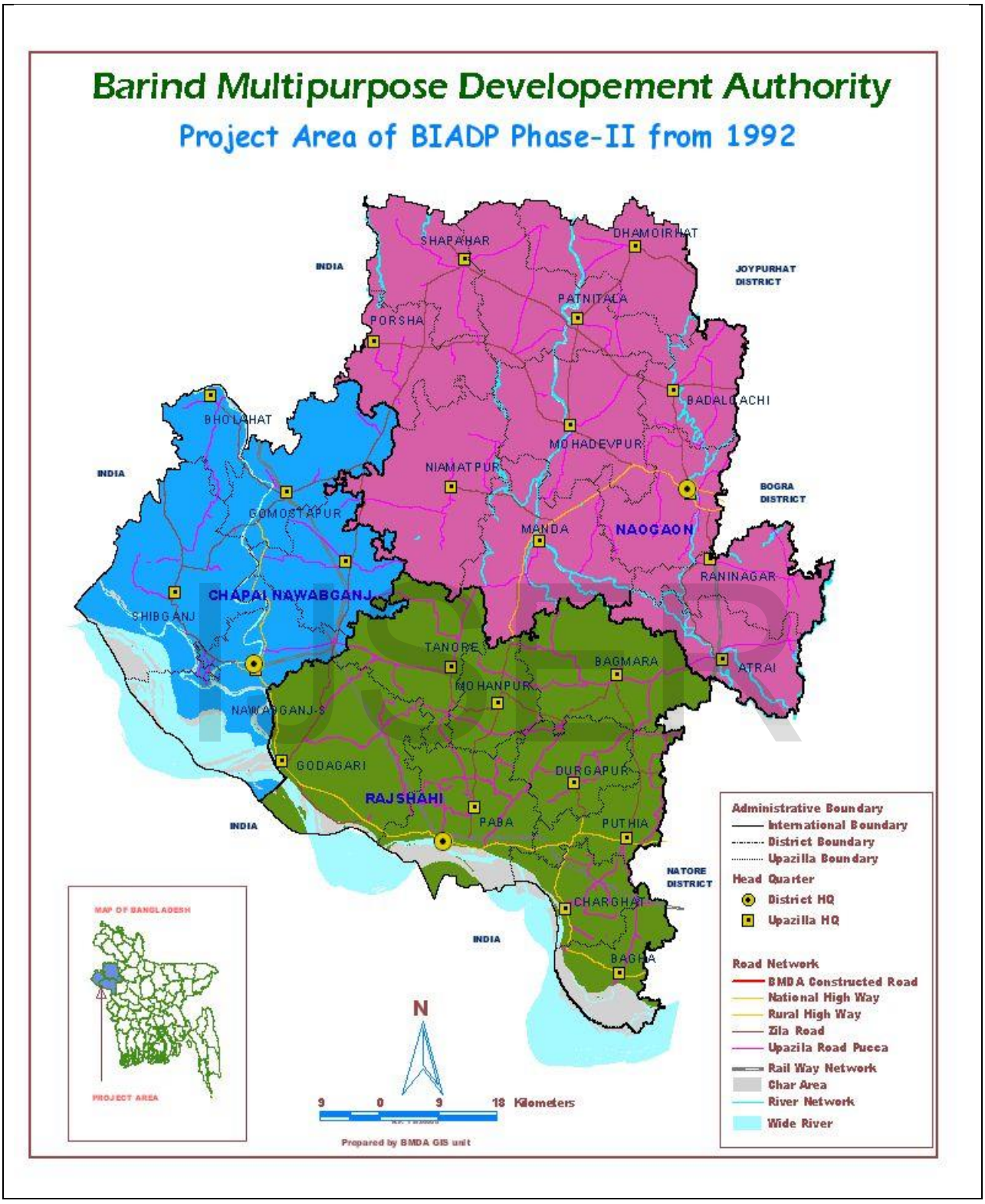

Figure 1: Area map of the study area

Irrigation Status in BMDA Jurisdiction

At the preliminary stage, BMDA has installed deep tube well with diesel engine as prime mover. But due to hazards of repair/maintenance and higher irrigation cost, BMDA started electrification of deep tube wells through Rural Electrification Board (REB). This was done by developing electrical networks and sub-station. Vertical turbine pumps and vertical motor were used for pumping. Now a days more modernized submersible pumps are being used.

Earlier deep tube wells were designed in the suitable aquifer placing the strainer below depth of upper well casing. But for the critical characteristics of Barind aquifer in some cases, the strainer was placed inverted way to the upper well casing keeping the depth of tube well as of depth of upper well casing. Such special type of deep tube well is named as inverted deep tube well.

For surface water use, though it is scarce in Rajshahi Barind, BMDA has some special approaches. In Rajshahi Barind area there are so many natural drainage canals. Due to time bar these canals are silted up and derelict. During rainy seasons the rain water of this catchment area goes to the nearest rivers way to Bay of Bengal. Keeping this condition in mind, BMDA takes steps to conserve this rain water through re-excavating the canal, Khal/khari, beels etc. and providing submerged weir (locally called cross-dam). Hence surface water reserve is ensured for supplementary irrigation and also helping for groundwater recharge. There are some solar powered LLP at the re-excavated canal/khal-khari sites.

BMDA is re-excavating derelict ponds and digging low land, beels, dighis etc. for irrigation water reservoir and for restoration of rain water for irrigation as well as fish culture. BMDA has also introduced irrigation facility from river by placing LLP and constructing rubber dam with water distribution networks in small river.

Dug well technology is the new invention of BMDA in irrigation sector. These are mainly constructed in high Barind areas where no DTW is possible and used only for vegetables or less water consuming crops and also used for drinking purpose.

An irrigation status of BMDA(Rajshahi and Rangpur Division) and other Agencies is shown below:

Sl,No.	Organization/ Agency	Operated irrigation equipments			Area irrigated by					Irrigation coverage in %
		DTW	STW	LLP	DTW	STW	LLP	Others /manual	Total	
1	BMDA	15517	0	417	495580	0	10855		506435	22.94
2	BADC	2923	42	251	88864	558	5896		95318	4.32
3	Private	5738	671023	11491	125634	1409983	56726		1592343	72.13
								13403	13403	0.61
Rajshahi+Rangpur Total		24178	671065	12159	710078	1410541	73477	13403	2207499	100

Source: Minor Irrigation Survey Report 2017-18, BADC.

Table 1: Status of Irrigation in Rajshahi and Rangpur Divission in 2017-18.

The result reveals that total 707407 nos. of irrigation equipment are used and 2207499 hectares of land were irrigated in Boro season in the year 2017-18 where BMDA's contribution of irrigation was about 23% and the major part was irrigated through private owner's irrigation equipment. The number of farmers involved in irrigation is 83.41 lakh of which BMDA's farmer is about 9.56 lakh.

The above figure shows that the net area coverage by irrigation is 83.58 % of the net cultivable land in which BMDA's contribution is 19.17 %. The area coverage per DTW,STW and LLP are 28.57 ha,2.19 ha and 6.72 ha respectively(BADC,2019). Minor Irrigation System has covered 95.16% of the country's irrigated area in which 76 52% managed by farmers only.

Chronology of Irrigation Charging Systems

To overcome the farmers' problem regarding payment of irrigation cost BMDA tried to have a farmer's friendly solution. It has long history since 1985. Initially BMDA started with irrigation in Public sector with Diesel operated Deep tube wells. Earlier irrigation charge was fixed for a deep tube well amounting Tk. 13500 annually for command area of 60 acre. Among this charge 1/3 (one third) amount was allowed for repair-maintenance of the deep tube wells. In this system farmers group was supposed to pay repair charges beyond amount in 1/3 of irrigation charges. When the repair charges were going beyond the capacity of the group, the pumps

were uncertain for operation due to repair problem. Other disadvantages of this system were- farmer are willing to have more water for their plots without knowing the adverse effect of excess flooding which hampers optimum tillering of plants causing decrease of yield. From the experience of success in irrigation charge fixing and realization and some problems faced by diesel operated deep tube wells, BMDA decided to electrify all the deep tube wells and construct lined irrigation water distribution systems and tried to make the system of irrigation charge more effective and introduced coupon system. In the coupon system the irrigation charge is fixed on hourly use basis of deep tube well. The rate varies (TK 100 to 110) with the capacity of the pump delivering water to the irrigation canal.

It is a time-based method of irrigation charge realization in the form of coupon and optimal use of limited water. In this system the farmers have to buy the coupon from the respective BMDA upazila office or nearby coupon dealer selected by the BMDA. The farmers can get irrigation water for any crop as per requirement by giving their coupon to the operator of respective water distribution units (DTW or LLP schemes).

Prepaid Metering System for Digitalized Irrigation

There are many organizations/agencies/bodies like BWDB,BADC etc. in Bangladesh which are introduced prepaid meter in their systems. But BMDA is the only organization that starts prepaid meter system in irrigation first. Automation in irrigation (prepaid meter system) is a new water charging system in BMDA. In this system each pump (deep tube wells) is connected with a pre-paid meter. Each farmer has to be provided pre-paid card (user card). The pre-paid card is charged by any amount of Taka (Bangladeshi currency) as per requirement of the farmer from the mobile vending unit (MVU) machine provided by the authority to the vendor or dealer.

A farmer whenever he requires irrigation water for his crop field, he takes his pre-paid card to the deep tube well operator. The operator gets this pre-paid card inserted into the pre-paid meter then the deep tube well is started and water is supplied. When this card is taken off from

the meter, the deep tube well stops automatically. So, no one can get irrigation water without inserting the card into the pre-paid meter or without giving irrigation charge.

BMDA farmers are now using smart phone and getting the advantages of e-agriculture service. DTW operators are getting their operating salary through DBBL mobile account.

Conclusion

Farmers in Bangladesh do not pay for use of per unit of irrigation water. When surface water was abundant farmers solely depended on rivers, canals and ponds to irrigate their fields with traditional local methods where the maintenance cost of the apparatus and labor charges were the costs of irrigation. The farmers in poverty stricken north-western area had no other alternative other than agriculture for their livelihood. When they found deep tube well irrigation cost effective and as a means of job and livelihood, they took it as a source of income generation. They participated with BMDA's deep tube wells activities and BMDA's irrigation system. BMDA, with coupon and pre-paid card systems, has provided the requirement of irrigation round the year through installed deep tube wells and has rendered facility to utilize irrigation water efficiently, as and when needed at farmers' crop fields at a reasonable and accepted rate. Through coupon and pre-paid card, optimum utilization of irrigation water has been ensured resulting cost saving in crop production.

Thus BMDA is maintaining ensured irrigation facilities keeping the equipment ready round the year and being assured of irrigation water the farmers are willing to pay irrigation charge in the form of coupon or prepaid metering system. By this cohesive and efficient irrigation management system, BMDA has proved the irrigation sector sustainable.

Suggestions for the Future Actions

The following suggestions are made for the future action which needs to be taken under consideration:

1. Agricultural development in the field is not possible without modernization of agriculture. So all phases' agricultural production must be mechanized through appropriate technology and these technologies should be made locally available.

2. Heavy rainfall and local flood water submerge huge crop lands and damage crops. On many occasions these lands remain water logged for several months and delays or eliminated the next cropping season. Also often reduce the productivity of terrace soil due to removal of fertile top soil. It is necessary to find ways and means to get rid of the problems.

3. Every year a large quantity of produced crops is damage due to poor processing, drying, preservation and storage system. This situation demands improvisation of these systems.

4. Improvement of on-farm irrigation management practices and irrigation water distribution are now crucial need for increasing agricultural production. Much attention should be given for improving the performance of existing irrigation water distribution system.

5. So far drought adaption options and ground water stress concern, artificial recharge of ground water and rain water harvesting should be promoted in the area with a positive effect.

6. In order to prevent water logging re-excavation of dighi, bils, ponds, canals, small rivers or digging of new canals should be undertaken.

7. Planned construction of water control structures (embankment, small cross dams, sluice gates etc.) should be undertaken to make reservoirs for preservation of irrigation water.

8. Appropriate technologies such as serial pumping, fog trapping, drip irrigation, use of solar energy may be implemented.

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