

## ENGINEERING & TECHNOLOGY

Khulna University Studies 1(1): 36-41

### LOW COVERAGE OF IRRIGATION BY PUMPS IN BANGALDESH: PROBLEMS AND PROSPECTS FOR IMPROVEMENT

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Accepted February 1994

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**Abstract:** Bangladesh is predominantly an agricultural country. About 7.5 million acres of land are irrigated which comprise about 20 per cent of the total cultivable land. The average productivity of rice at present is slightly above a half ton per acre. It is generally accepted that to increase the productivity of rice and other crops e.g. wheat and vegetables, irrigation facilities require to be extended with effective operational measures and management system. Irrigation through Deep tube well, Shallow tube well and Low-lift pumps constitute a major share (65 percent). In the past, capacity utilization of pumps and tube wells could not be achieved due to a number of problems, causing low coverage of irrigation. The aim of this paper is to evaluate the existing irrigation system and find out the factors responsible for low coverage by pumps. It is observed that the low coverage and poor performance of the irrigation projects are due to technological inefficiency, socio-economic constraints and lack of guidance by responsible authorities. A number of government and semi-government agencies are involved in the whole process but are not well coordinated among them. The government of Bangladesh has adopted a number of good policies to improve the irrigation method. These, however, have not been resulted any substantial improvement in the system due to a wide gap between national and local level administration. Corruptions at the field level associated with lack of monitoring facilities have been an obstacle to achieve the expected result. It is therefore assumed that coordination among the various government and semi-government agencies responsible for irrigation activities is necessary to establish an effective linkage between the national and local bodies.

**Keywords:** Low coverage; Irrigation; Pump; Improvement

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#### Introduction

Agriculture is the most vital sector of the economy in Bangladesh. It accounts a major share in the national economy and majority of the population depends on this sector. In 1991 census records that 84.8 per cent of the total population live in the rural areas. About 36.8 per cent of the gross domestic products come from agriculture (BBS, 1993). Crops account for approximately 28.9 per cent of GDP and about four-fifths of that share come from rice alone. Out of 34.6 million acres of cropped area, the net cultivated area is 20.17 million acres. The total crop area however is estimated to be about 171.70 per cent of the net crop area. The average productivity of rice at present is slightly half a ton per acre. This can very well be increased substantially by the application of modern imports viz. better seed, fertilizer, pesticides and irrigation water. Moreover, cultivation can also be made more intensive. According to Statistical Yearbook '93, at present in Bangladesh about 7.5 million acres of land are irrigated comprising about 20 percent of the total

DOI: <https://doi.org/10.53808/KUS.1999.1.1.39-44-se>

cultivable land. Earlier, Bangladesh had sufficient perennial water supply due to its location in the delta of the great rivers, the Ganges and the Brahmaputra. But now for various reasons, the supply of water has been considerably reduced in dry seasons, and cannot meet irrigation requirements. Therefore, it is necessary to exploit the ground water resources by Deep and Shallow tube well operation. Irrigation through Deep tube well, Shallow tube well and Low-lift pumps constitute a major share (65 %). Ideally, a two-cusec pump is able to irrigate about 120 acres of Boro rice. But, in practice, the actual command area, as has been reported, is much less than their ideal capacity (Biswas and Rahman, 1978). Similar situation is prevailing in case of deep tube well.

The broad objective of the study is to find out the present status of irrigation command areas by different pumps and tubes wells in different regions of Bangladesh. The specific objectives of the study are – i) to identify the factors responsible for low coverage of irrigation by pumps and tube wells; ii) to evaluate the major factors responsible for low coverage and; iii) to suggest possible measures for improvements.

### **Materials and Methods**

The study was conducted in the two different Thana namely: Sonargaon of Naryanganj District and Manikgonj of Manikgong District. Thakurgaon Deep tube well Irrigation project also included in this study to compare with the other two Thana irrigation projects. Three categories of irrigation equipment were considered in the study, such as, Deep Tube Well (DTW), Shallow Tube Well (STW) and Low Lift Pumps (LLP).

### **Results and Discussion**

The average command area of Deep tube wells, Shallow tube wells and Low-lift pumps in the study area were found at 48.29 acres, 6.64 acres and 40.36 acres respectively. Inter area variation of irrigation coverage was found more significant than intra area variation of irrigation coverage. The average irrigation coverage in Thakurgaon project was 70 acres whereas in Sonargaon Thana it was 26.66 acres (Figure 1). It seems that there are some local factors, which create such variations. In the study area, it was observed that there was little control over the inter-spacing of different irrigation schemes. The distance between two pumps or tube wells was not maintained as required. Though, a government had circulated that the installation of tube well should be maintained on a minimum distance of 3000 ft. between two tube wells (Ministry of Agriculture, 1974). But it was found that more than one-tube wells were installed within the zone of influence of one deep-tube well, which creates overlapping of command area as well as decreases the discharge capacity. The correlation between the variables of command area and radial distance of the next pumps was found highly significant. From the analysis, it was found that the irrigation coverage by pumps and tube wells decreased when those were installed in the congested areas. Inter areas variation of command area was found to be significant due to radial distance between the pumps and tube wells. In Thakurgaon project, the tube wells were installed nearly equal radial distance and consequently command area of such tube wells was found to be greater other than two areas of Sonargaon and Manikgonj Thanas (Table-1).

Location of site for installation of pumps is the important factor responsible for low coverage of irrigation. Out of 24 pumps in the study area in total 13 pumps and tube wells were installed at wrong locations (Table-2). Ten pumps were installed at wrong locations by the influence of power structure which irrigated lower acres than the pumps installed at right locations.

Disorder of pumps and tube wells is a common phenomenon of the irrigation projects. But, when the disorder continues for a long time it affects seriously, especially during the flowering stage of the crop. Non-availability of spare parts and insufficient of technicians and workshop facility are the important factors responsible for the pumps which remain out of order over a long period of time. The average days of disorder of DTWs, STWs and LLPs projects have been found 5 days, 6 days, and 5 days respectively in the month during peak demand of irrigation water (Table-3). The correlation between the variables of command areas and days of disorder of DTWs, STWs was found to be highly significant: All the engines require to be kept in rest after certain period of operation for preserving better operational condition. But there are some factors, which enforce to keep the engine inoperative for a longer period than the normal period. The average hours of inoperation of DTWs, and LLPs were found 7 hrs and 9 hrs respectively per day during peak demand of irrigation water (Karim , 1985). Irregularity of electric supply, scarcity of fuel, indecision of the committee, absence of pump drivers, non-availability of sources of water is the major factors causing inoperation of the pumps. The negative correlation between the variables of command areas and hours of inoperation of pumps and tube wells reveal that the irrigation coverage by the pumps will be decreased when inoperation hours of the pumps will be increased.

Table- 1. Relation between Irrigation coverage and radial distance of the next pump and tube well in feet.

Type of irrigation unit	Study area	Av. irrigation coverage for the individual study area (acre)	Av. radial distance of the next tube well for individual study area (feet)	Av. irrigation coverage (acre)	Value of correlation ("r")
Deep tubewell	Sonargaon Thana	26.66	1940	48.29	0.60
	Manikgonj Thana	46.20	2106		
	Thakurgaon Project	70.00	2380		
Shallow tubewell	Sonargaon Thana	6.13	566	6.64	0.82
	Manikgonj Thana	7.15	783		
Low-lift tubewell	Sonargaon Thana	41.40	Not applicable	40.36	
	Manikgonj Thana	35.47	do		
	Thakurgaon Project	44.23	do		

Source: Field survey, 1984.

Table- 2. Site selection of different pumps and tube wells.

Name of irrigation unit	No. of irrigation unit	Location		Right selection		Wrong selection		Av. command area (acre)	
		Right	Wrong	Power structure influence	Consensus opinion	Power str. influences	Consensus opinion	Right selection.	Wrong selection.
Deep tubewell	9	4	5	1	3	4	1	67.50	32.92
Shallow tubewell	6	2	4	2	0	3	1	10.40	04.76
Lowlift pump	9	5	4	2	3	3	-	43.28	34.50
Total	24	11	13	5	6	10	2	-	-

Source: Field Survey, 1984.

Table- 3. Relation between irrigation coverage and number of days of disorder during peak demand in a month.

Study area	Type of irrigation unit	Irrigation coverage	No. of days of disorder	Av. days disorder	Value of correlation (r)
Sonargaon	DTW	26.66	6.00		
Manikgonj	DTW	46.29	5.00	4.55	- 0.86
Thankurgaon	DTW	70.00	2.67		
Sonargaon	STW	6.13	4.00		
Manikgonj	STW	7.15	8.33	6.33	- 0.47
Sonargaon	LLP	41.40	4.00		
Manikgonj	LLP	35.47	7.00	4.66	- 0.83
Thankurgaon	LLP	44..23	3.00		

Source: Field Survey, 1984.

**Management system of irrigation water supply:** The system of water distribution has an implication on the over all directions and patterns of development within the project area. It is found that most of the conflicts among the users and the managers have arisen from the water distribution arrangement. In the study area it was found that the command area was divided into few blocks and the process of rotation of distributed water. But there was no guideline, as to when and what quantity of water will be applied or standing in the crop field. These largely depend on the desire of the farmers. Naturally, most of the farmers want to have delivered enough water to their fields that the amount actually required. As a result, a very significant amount of water is misused. If this misuse could be checked, more land area could be brought under irrigation.

In some cases, it was observed that the distribution of irrigation water depended on the whims of the manager or chowkider. The conflicts were arisen between the users and manager when the user was not satisfied with the supply of irrigation water. For this reason along with other factors, several farmers detached themselves from the scheme and an individual or a group of individuals opened a new scheme, which divides command area of a scheme into several command areas. Therefore, actual command area per pump or tube well is reduced.

In the absence of any organizational efforts for repairing and construction of drain, huge amount of water is lost through Kutcha drain, breach, rat holes and over spilling of water from the drain. Intra or inter area variation of irrigation command area has been found significant in pucca drain which covered larger areas than the Kutcha drain. However, the present study did not make any attempt to quantify the loss of water during conveyance. But it was reported in a case study of some selected areas by Hamid *et al.* (1978) that conveyance losses through the Kutcha drain/canal causes 15 to 40 per cent of the actual discharge. No fixed schedule or systems of equity distribution of water has been maintained. The allocation of the irrigation water has been subject to the whim of the managers, causing bad relation with the users which affects the development of irrigation command area.

**Involved power structure:** In all the sites of the study area, the person who had put in the initial effort to bring the pumps and tube wells to the villages are the chairman, members, influential person or rich farmers. They also hold the post of a manager or president of the scheme. The scheme manager is engaged in more than one job and spends a little time for the managerial activities. The whole managerial activities have been performed haphazardly by the member or the users of the scheme. The managerial activities of the manager increase during the time of collection of charge of irrigation water. The existing social structure in the study area is not conducive to the development of irrigation scheme in an appropriate manner. The study reveals that the present practices of selecting irrigation scheme and its management activities are not satisfactory to the

farmers. The major anomalies in the distribution of irrigation facilities arise from the discriminatory role played by the influential farmer, local elites and the manager of the scheme. The performance of the management authorities shows very unsatisfactory result and cannot bring any benefit to the poor farmers. The farmers, who have good relationship with the local influential persons and easy access to the Thana officers, obtain maximum benefit of the irrigation facilities. The poor farmers are usually deprived of the irrigation facilities. There are other problems, such as, lack of professional training of the personnel involved in the scheme management and input supply system.

**Charge of irrigation water:** High charge of water is one of the factors responsible for limiting the irrigation coverage. In absence of controlling guidelines over the charge of irrigation water, small and medium farmers are deprived of the use of irrigation water. The charge and fees for irrigation water are always not collected fairly. Besides, there is discrimination in the distribution of water. About 8 to 28 per cent of the users are defaulters (Table-4) while majority of the relatives and friends of the manager did not pay the charges for irrigation water. Thus the lord and influential persons in the society who have control over the irrigation scheme have usually no interest for increasing participation of the small and poor farmers in the scheme and hence the irrigation coverage by pumps is far below than its designed capacity. Table-5 shows the factors responsible for under utilization of irrigation water under different irrigation units.

Table- 4. Percentage of users responded regarding charges of irrigation water in the study area.

Name of Thana	Irrigation unit	Av. command area (acre)	Amount charge of water (Tk./acre)	Percentage of users			Total
				Unable to afford the cost	Charged in - curred high	Satisfied as reasonable charges	
Sonargaon	DTW	28.66	1200.00	27.78	55.56	16.66	100
	STW	6.13	1500.00	12.10	60.11	26.78	100
	LLP	41.40	1000.00	8.33	66.66	25.00	100
Manikgonj	DTW	46.20	1000.00	20.82	58.22	20.96	100
	STW	7.25	5/16th of the yield	9.27	63.90	26.83	100
	LLP	35.47	1/4th of the yield	10.12	70.00	19.88	100

Source: Field survey, 1984.

## Conclusion

In order to improve the irrigation scheme care should be taken to utilize the limited resources in an efficient manner ascertaining the actual problem before installation of the pumps and tube wells. To do so, the local knowledge and ideas require to be incorporated with the available technical skill in the government agency. By doing so, the issue of low coverage of irrigation by pumps and tube wells may be handled fairly and thus the situation may significantly improve.

Therefore, to bring a positive change in the existing situation, the mentality of the social elite class will have to be changed and preferential institutional support for irrigation facility should be emphasized for the small farmers who are found to be more productive. In order to bringing about subsistence, small farmers should have proportional representation in the selection of irrigation committee. The institutional support and assistance will be required for adopting such measures to

Table- 5. Factor responsible for under utilization of irrigation water in different irrigation units in the study area.

SL. No.	Factors responsible for under utilization of irrigation water	Percentage of users responding under use of irrigation water in different project		
		DTW	STW	LLP
1.	Conveyance and seepage loss	28.32	24.17	20.86
2.	Inappropriate slope and level of land	14.53	9.37	9.53
3.	In appropriate site selection	18.72	16.33	4.42
4.	Pump operated sub-optimally	9.50	10.75	4.32
5.	High charge of irrigation water	7.13	9.82	8.31
6.	Lack of understanding between managing committee and users	6.50	3.25	7.67
7.	Bias and bad water distribution system by the managing committee	6.37	3.07	4.50
8.	Wastage of water through the holes, cracks and over flow of the irrigation canal	4.12	6.11	12.19
9.	Main canal had not constructed in elevated land	2.89	4.57	10.38
10.	Absence of pump driver and manager	1.93	6.30	12.45
11.	Selected land did not include the scheme due to late harvesting of previous crops	2.04	2.19	1.95
12.	Length of the main canal is shorter than actually required.	2.95	4.07	3.21
Total:		100	100	100

Source: Field survey, 1984.

increase the irrigation area and to intensify the irrigation activities with the sincerity of the management authority and rationality in the approach of undertaking and implementing the scheme. It is therefore assumed that coordination among the various government and semi-government agencies responsible for irrigation activities is necessary to establish an effective linkage between the national and local bodies. Thana administrative bodies may perform the most vital role in improving the irrigation method and irrigation system within the Thana under the guidance of Thana Irrigation Committee (TIC) as suggested in this study. The Thana Irrigation Committee may seek necessary assistance from the District and National Irrigation Committees for any problems to be encountered for the development, or for the improvement of the irrigation project.

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