

## **FACTORS AFFECTING THE PERFORMANCE OF FLOOD CONTROL, DRAINAGE AND IRRIGATION PROJECTS IN BANGLADESH : A CASE STUDY**

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**ABSTRACT :** This paper presents the results of a study carried out to evaluate the performance of Karnafuli Irrigation Project. The data were collected through review of project documents, field inspection, interview with service providers and beneficiaries. The achievement of the project for irrigation was found to be quite satisfactory but the flood control and drainage benefits could not be realized as expected. This is partly because of some deficiencies in planning, design and implementation of the project. Major operation and maintenance problems include inadequate fund, shortage of manpower at the field level and lack of beneficiaries participation. The agricultural development constraints are : adverse land tenure, lack of agricultural credit and poor extension services. The performance of the project may be improved through effective participation of beneficiaries in operation and maintenance.

**KEY WORD :** Flood control, Drainage, Irrigation, O & M, Performance.

### **INTRODUCTION**

Agriculture is the dominant sector in the Bangladesh economy. This sector accounts for about 50 percent of Gross Domestic Products (GDP) and employs 85 percent of the rural labour force. But the productivity of agriculture is hampered by floods during the monsoon and drought from November to March. Therefore, water management for agriculture has been an important element of the development program of this country since the early 1960s.

As of June 1993, 482 projects of different sizes have been implemented by Bangladesh Water Development Board (BWDB) to provide flood control and drainage facilities to about 3.65 Mha and irrigation water supply to about 0.75 Mha of land (Hai, 1994). But the anticipated benefits from many of the projects could not be achieved due to several reasons; the principal one being inadequate operation and maintenance (IRWP, 1986; EIP, 1990). Improved operation and maintenance is therefore, critical to achieving benefits from these projects. With this purpose in view, a pilot study has been undertaken at Bangladesh University of Engineering and Technology (BUET). The phase I of the study dealt with the evaluation of the performance of six

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selected flood control, drainage and irrigation projects and it was concluded in May 1991. This paper presents the findings of this study on Karnafuli Irrigation Project.

### PROJECT DESCRIPTION

The Karnafuli Irrigation Project (KIP) is located in the south-eastern part of Bangladesh near the coast of the Bay of Bengal. The Project consists of two units : Halda and Ichamati; located on the north side of the Karnafuli River (Fig. 1). The Halda unit lies around the Halda tributary and the Ichamati unit lies in the lower valley of Ichamati tributary. The project area comprises parts of the Rauzan, Hathazari and Rangunia thanas of Chittagong district. The gross area within the project is 23484 ha of which 18625 ha is cultivable.

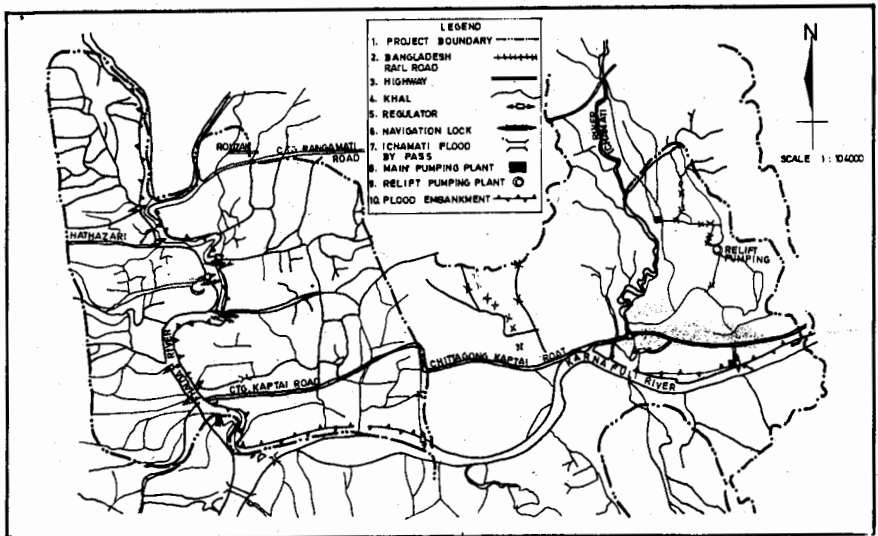


Fig. 1. Karnafuli Irrigation Project Area

The primary objective of Karnafull Irrigation Project is to supply water for irrigation to a net area of 15385 ha during the dry season. The aims of the project also include to provide flood control and drainage facilities to a gross area of 23484 ha. The physical facilities developed for this project include 18 regulators, 5 navigation locks, a main pumping plant (5 pumps, 30 cusec each), a relift pumps plant (2 pumps, 30 cusec each), 135 km of improved channel, 5.6 km of embankment and a flood bypass (5 vents).

The main pumping plant serves dual purposes i.e., irrigation during the dry season and drainage during the monsoon season. The relift pumps are operated to provide irrigation water to the higher areas within Ichamati unit. The regulators are provided with two flap gates-one at the country side and the other at the river side. These regulators can be operated to either admit tidal inflow or evacuate drainage water.

The farmers lift water from the khals to their fields by using low-lift pumps. To this end the project has a provision for 800 low-lift pumps. These pumps are leased out or sold to the farmers and BWDB continues to provide maintenance services free of cost for old pumps.

Three agencies namely, Bangladesh Water Development Board (BWDB), Department of Agricultural Extension (DAE) and Bangladesh Rural Development Board (BRDB) are involved in management of the project. BWDB is responsible for operation and maintenance of main pump, relift pump, regulators and other structures. This organization also looks after maintenance of channels and embankment as well as distribution and maintenance of LLPs. DAE is responsible for motivation and training of farmers, extension of HYV cultivation, demonstration and promotion of new technologies in the project area. BRDB is responsible for formation of farmers' cooperatives (KSS), training of cooperative staff and distribution of agricultural loan.

## **DATA COLLECTION**

Two board categories of data from both primary and secondary sources were collected for this study. These were : (a) technical data and (b) agricultural and socio-economic data. The technical data sources were available project documents, information available with various data collection agencies, physical inspections in the field and discussion with relevant officials. The agricultural and socio-economic data were collected from review of project reports, group discussions, household interviews, interviews with service providers and published information.

The available project documents such as feasibility reports (Justin-Courtney-Hohlweg-Watts, 1968; International Engineering Co., 1974) and operation and maintenance manual were reviewed in order to identify the general strengths and weaknesses of project management. A number of field visits were made during both summer and winter months

to observe the flood control, drainage and irrigation activities in the project area.

Two questionnaires - one for the O & M officials and one for the beneficiaries of the project were prepared for investigation. The questionnaire prepared for the officials mainly dealt with the engineering and management aspects. The questionnaire prepared for the beneficiaries concentrated on agricultural and socio-economic aspects. Farm water management issues such as water delivery at outlets, operation and maintenance of tertiary level structures, construction and maintenance of field channels were included in the household questionnaire survey.

A multistage stratified random sampling technique was used for household level data collection. In the first stage villages were grouped into three categories based on their locations (head, middle and tail end of main canals). In the second stage, stratified random sample farmers were selected based on their landholding status. This way 10 landless, 142 small, 44 medium and 10 large farmers were selected for the purpose of questionnaire survey.

#### **PROJECT PERFORMANCE**

The irrigated area of the project during the last few years are shown Table 1. It is seen from Table 1 that the achievement of the project in terms of irrigation coverage is quite satisfactory. But the flood control and drainage measures of the project have been partially effective. About 94 percent of the beneficiaries reported partial damages to their Aman and Boro crops due to flood and waterlogging.

**Table 1. Irrigation Development in Karnafuli Irrigation Project Area**

Year	Irrigated Area in ha	Percent of Design Irrigation Area
1982-83	10628	69
1983-84	12046	78
1984-85	13757	89
1985-86	11129	72
1986-87	13521	88
1987-88	12721	83
1988-89	11260	73

The availability of irrigation water has helped the cropping pattern of the area to undergo changes from Aus - Aman to T. Aman followed by HYV Boro. The cropping intensity has increased from 181 percent in 1981 to 200 percent in 1990. The changes in the agricultural practice have led to an increase in the yield of Aman and Boro rice.

It has been admitted by the local people that the project has benefitted them. But the benefits of the project have been differential across various socio-economic groups because of differences in the landownership. About 97 percent of the survey households have reported

that they have been positively benefitted from the project. The types of benefit obtained by different landholding groups and their distribution has been presented in Table 2.

**Table 2. Types of Benefits Obtained from the Project**

Description	Percentage of households benefitted*
1. Increase in cropping intensity	98.9
2. Increase in crop productivity	98.9
3. Transport improvement	5.3
4. Others	1.1

Table 2 shows that about 99 percent farmers have reported that the benefits of the project occurred due to an increase in cropping intensity and productivity of crops.

**Table 3. Degree of Benefits due to the Project (Qualitative judgement in percent of farmer's category)**

Farmers	DEGREE OF BENEFIT*		
	High	Medium	Low
Landless	40.0	60.0	-
Small	21.2	78.0	0.8
Medium	29.5	70.5	-
Large	77.8	22.2	-
All	26.3	73.2	0.5

\* Significant at 5% level

In Table 3 attempts have been made to distribute farmer groups by the degree of benefits that they have obtained from the project. It appears from the table that majority of the farmers have obtained medium degree of benefit and only 26 percent have received high degree of benefit from the project. By landholding groups it appears that a high degree of benefit of the project have been appropriated by the large farmers while the medium, small and landless farmers have reaped a medium degree of benefit from the project.

## **PROBLEMS AND CONSTRAINTS**

The problems and constraints as identified in this study can be categorized as engineering, institutional and socio-economic.

### **Engineering**

The following engineering problems were found to affect the performance of the project.

1. About 90 km of embankment was planned to be constructed to control flood in the project area. But the embankment could not be constructed as proposed mainly due to the problems of land

acquisition and opposition by local people. The project has been declared complete after construction of only 5.6 km of embankment in Ichamati unit. However, relatively low embankments have been constructed under the Food for Works program.

2. Drainage congestion occurs outside the project area and the local people cut the embankment almost every year. The flood water enters into the project area causing damages to crops and structures.
3. The capacities of some existing regulators are not adequate to drain the beel area in Halda unit. The capacity of the main pump is also not sufficient for effective drainage of the area in Ichamati unit.
4. The gate hoisting device of some regulators are not functional.
5. Farmers have dug few field channels within the command area of each low-lift pump. But in most cases the network is inadequate. Moreover, the condition of these channels is poor due to lack of maintenance.

### **Institutional**

The following institutional problems have been identified through discussion with project officials and beneficiaries as well as analysis of information collected through questionnaire survey.

1. Most of the regulator operators are not regular and permanent staff of BWDB. About 89 per cent of the beneficiaries interviewed reported that the operation of the regulator has not been done properly and timely mainly due to the negligence of the operators.
2. There is shortage of manpower of DAE at the field level to carry out extension work effectively in the project area.
3. There is lack of coordination among the different agencies in managing the project. Meetings at the project level are not held regularly.
4. The annual budget allocation is reported to be inadequate for proper operation and maintenance of the project. Irrigation charges are not being assessed and collected to meet the O & M expenses of the project.
5. The responsibility of water management at field level is vested to farmer's group. BRDB is responsible for organizing farmers into village-based institution known as Krishak Samabay Samity (KSS). In KIP about 380 KSSs have been formed but about 170 of them have been liquidated because these societies were controlled

by rich farmers most of whom became defaulters. Even where the KSSs are functioning, these are dominated by the large or well-to-do farmers. The poor and small farmers do not derive substantial benefits from the present KSS systems that exist in the project area.

### **Socio-economic**

The socio-economic problems impeding the agricultural development in the project area are discussed below :

1. There is predominance of marginal and small farmers in the project area. These minifundist farmers face various resource constraints in the form of land, capital, labour and draft animal. About 60% of the farmers in the project area grow crops as sharecropper. Five types of crop share arrangements exist in the project area of which 1 : 1 cropshare is dominant. This adverse land tenure system provides hindrance to agricultural development in the project area.
2. The household survey indicates that lack of capital is a major problem faced by the marginal and small farmers in the project area. Agricultural credit is not easily available and the farmers borrow money mostly from traditional sources (e.g. Mahajans) at a higher rate of interest.

### **CONCLUSIONS**

This paper has endeavoured to identify the main problems and constraints which affect the performance of a major flood control, drainage and irrigation (FCDI) project in Bangladesh. The various problems thus far identified may be lumped together to the issues of irrigation water management at the project and farm levels. Project level management problems thus appear to be inadequate operation and maintenance due to shortage of fund and manpower while the farm level management problems are associated with lack of effective beneficiary participation. Other exogenous factors which affect the performance of the project are adverse land tenure and lack of capital.

It, therefore, appears that the performance of the project may be improved if project and farm level management belonging to two parties are integrated through an institutional arrangement. The formation of a Water Users Association (WUA) as a federation of Low-lift Pump Groups would fill in the gap that presently exist between project and farm level management systems and would ensure beneficiary participation in both physical and financial terms.

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