A CRITICAL REVIEW OF THE METHODS TO EVALUATE THE PERFORMANCE OF IRRIGATION PROJECT

Submitted by

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CERTIFICATE

This is to certify that this project work has been done by me and neither this project nor any part thereof has been submitted else where for the award of any degree or diploma.

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ABSTRACT

The major objectives of the study were to critically review the different methodologies developed and proposed for performance evaluation of irrigation projects and to provide an insight into the present monitoring and data collection status of the projects in Bangladesh through studying seven representative projects. In the face of increasing cost of irrigation and limiting available resources in our country, the proper performance evaluation of the existing projects is a must in order to take necessary measures to attain maximum possible benefits and to learn lessons for future project planning and development.

The several approaches and methodologies for irrigation project performance evaluation are discussed. They should be developed and adapted depending not only on the objectives of the evaluation, but also on the resources and time allocation for the purpose, the scope and limitation of data and information generation, the diverse local settings, project type and cost effectiveness. However for rapid evaluation RRA technique and for long term and full evaluation PIE methodology can be used effectively.

The findings of the study was that the present monitoring and data collected by the concerned authorities are not quite sufficient for evaluation of the project performance and it is recommended that the monitoring and evaluation should be an integral part of the irrigation project management and emphasis should be given on intensive data collection by the project authority through regular monitoring for the completed projects.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BARC	Bangladesh Agricultural Research Council
BCR	Benefit Cost Ratio
BETS	Bangladesh Engineering and Technical Services
BIDS	Bangladesh Institute of Development Studies
BNC	Bangladesh National Consultants
BRDB	Bangladesh Rural Development Board
BUP	Bangladesh Unnayan Parishad
BWDB	Bangladesh Water Development Board
DAE	Directorate of Agricultural Extension
DFC	Drainage and Flood Control
DTW	Deep Tube Well
EEC	European Economic Community
EIP	Early Implementation Project
EIRR	Economic Internal Rate of Return
FAO	Food and Agricultural Organization
FAP	Flood Action Plan
FCD	Flood Control and Drainage
FCD/I	Flood Control and Drainage With or Without Irrigation
FPCO	Flood Plan Co-ordination Organization
FY	Financial Year
HTS	Hunting Technical Services Ltd.
HYV	High Yielding Variety
IIMI	International Irrigation Management Institute
IRR	Internal Rate of Return

IRRI	International Rice Research Institute
LLP	Low Lift Pump
MDIP	Meghna-Dhonogoda Irrigation Project
MPO	Master Planning Organization
NA	Not Available
NPV	Net Present Value
O&M	Operation & Maintenance
PIE	Project Impact Evaluation
PP	Project Proforma
RRA	Rapid Rural Appraisal
STW	Shallow Tube Well
WARPO	Water Resource Planning Organization

CHAPTER-1

INTRODUCTION

Irrigation is of major importance in many countries. It is important in terms of agricultural production and food supply, income of rural people and public investment. In the past three decades a large number of irrigation projects have been implemented in Bangladesh with main objective to boost up production in agricultural sector. Some of them are large, many of medium size and rest are small scale and early implementation schemes. But there exists a considerable gap between the actual and expectation in relation to the performance of irrigation projects. In the face of increasing cost of irrigation and limited resources proper evaluation of performance and identification of constraints is essential in order to take necessary measures to reduce that gap.

The performance of a system is represented by its measured levels of achievement in terms of one, or several parameters which are chosen as indicators of the system's goal. It is the measure of effectiveness, the means and services provided and the measures undertaken in the project with respect to the achievement of the desired objectives of the project. Evaluation aims to determine whether the project objectives set in terms of expected outputs, effect and impact were met. This leads to an assessment of the results achieved, necessary measures to be taken and the lessons to be learned for future improvement in later phase or in a similar project elsewhere. The performance of irrigation projects depends on several factors like engineering, agricultural, socio-economic and institutional. The nature and extend of their influence on project performance are subject to variation from project to project. In the recent years, there have been a lot of discussions in several regional workshops on methodology, data generation and analysis for the performance evaluation of irrigation projects. Several evaluation methodologies have also been developed, and proposed by different researchers and investigators (Bhuiyan, 1982; Garces, 1983; Jones, 1985; Sagardoy, 1985; Mao Zhi, 1989; etc.). Although few in number, evaluation of some projects in our country have been performed by different organization and they used different techniques. The earliest FCD/I evaluation was carried out in 1973, to review the Dhaka-Narayanganj-Demra flood control irrigation project. The EIP programme has been evaluated in four occasions (1977, 1981, 1983 and 1988). In 1990 Master Planning Organization (MPO) carried out an evaluation of historical water resource development, to identify the implications for the national water plan. In 1991 Flood Plan Co-ordination Organization (FPCO) commissioned Hunting technical Services Limited and others to carry out a comprehensive review of 17 completed FCD and FCD/I projects under FAP-12 agricultural study. But so far no attempt has been made to compare the different methodologies used to evaluate the performance of irrigation projects. Therefore the present study has been taken up with following objectives:

i. to critically review the methodologies developed and proposed for performance evaluation of irrigation projects.

ii. to check whether the present monitoring and data collected by the concerned authorities are adequate for performance evaluation.

CHAPTER-2

METHODOLOGIES TO EVALUATE THE PERFORMANCE OF IRRIGATION PROJECT

The evaluation of irrigation project is a complicated process. Different approaches are being adopted and some techniques have been developed and proposed depending on objectives of evaluation, resources and time allocation for the purpose, scope and limitations for data and information generation, the diverse local settings, project types etc. However to make a critical review and analysis of the different approaches and methodologies, the following criteria were considered:

i. Comprehensiveness i.e. whether the evaluation methodology contains engineering; agricultural; economical; social; environmental and institutional aspects.

ii. Data requirements and,

iii. Time allocation.

2.1 The Approaches

The approaches that are in practice to evaluate the performance of an irrigation project can be classified mainly in two classes,

i. Rapid evaluation, and

ii. Long term and full evaluation.

2.1.1 Rapid evaluation

Rapid evaluation is a simple and quick technique of evaluation rather than an intensive data collection with full sample survey. It is based on the following data sources (i) various project documents, (ii) questionnaires completed by executing agencies and farmers organization, (iii) interviews with farmers and field staffs of the agencies involved in the project, and (iv) visual inspection of the project site and operating system.

Rapid evaluation cannot give the accurate and quantitative estimate of the project performance but by involving experienced professionals in evaluation team, this evaluation can give a useful and ready overall assessment of how successful a project performance is. This is specially useful for interim evaluation carried out before a project is fully operational.

A number of techniques of this category have been developed which are discussed below.

a. Rapid Rural Appraisal (RRA) technique is a type of rapid evaluation started in the late 1970s. This technique of project assessment intended to produce results more quickly than formal interview studies, while avoiding biases in data collection. RRA consists of selective direct observation and interviews with informed respondents from representative areas of project by a small team of well qualified and experienced specialists who can reach informed judgement quickly in the field. The major strength of RRA is that it can provide a cost effective means of assessing project impact quickly without too great a sacrifice in terms of data quality and comprehensiveness. RRAs are effective means of collecting qualitative information and of making multi-disciplinary investigations. They are able to detect major change in qualitative impacts (substantial change in cropping patterns for example) but have usually been regarded as weaker when change in yields, cropping intensities or other agricultural parameters are involved. In Bangladesh RRA technique have already been used to evaluate completed water management projects including FCD project by MPO (MPO, 1985b, 1990), BUP (BUP, 1988), sazzad zohir (zohir 1991) and FPCO (FAP-12 1991). The Agricultural Economics and Rural Sociology (AERS) Division, BARC also organized a training course for the researchers and scientists of the National Agricultural Research System (NARS) to be trained in RRA techniques (Ali Mohammad 1990).

b. Bhuiyan (1982), has developed a methodology or index system for rapid evaluation and identification of causes of poor performance of many existing irrigation systems in Asian rice growing regions. He has selected seven performance indicators for studying the impact of irrigation system management. These are, corp yield, cropped area, water use efficiency, irrigation efficiency, relative water supply, water adequacy and, water distribution equity. To evaluate the impact of the project he has propose the use of comparative measures i.e. the "before" and "after" comparison and the "with" and "without" comparison. However some limitations in the definition of the indicators can be pointed out as follows:

For yield, to be a meaningful indicator for evaluating irrigation performance, information is needed about the factors that are likely to affect yield. But it is not considered in the definition of crop yield. For crop area no specific definition is given.

The water use efficiency (**WUE**) is defined as

$$WUE(\%) = \frac{(ET+S+P)}{IR+RF} \times 100$$

where, **ET** is the evapotranspirational requirement **S+P** is the seepage and percolation requirement, **IR** is the irrigation water supply, and **RF** is the rainfall amount.

The equation provides a simple way of examining water use related to total water supply from irrigation and rainfall sources. It serves as a useful indicator of the system performance when the rainfall is negligible. A problem arises when there is a substantial rainfall. Because rainfall is unpredictable and because rainwater, beyond a certain amount is not controllable at field level, the excess rainfall drains from the command area of an irrigation system.

Irrigation efficiency (**IE**) is defined as

$$IE(\%) = \frac{(ET+S+P)-RF_e}{IR} * 100$$

where, $\mathbf{RF_e}$ is the effective rainfall.

The difficulty of measuring effective rainfall in the field is a practical limitation of the use of **IE** as a performance indicator. Effective rainfall is difficult to measure because it is dependent not only on intensity, duration and distribution of rainfall but also on farmers field level water management practices.

The term relative water supply (**RWS**) is defined as the ratio of total water supply from rainfall and irrigation sources to total evapotranspiration need and seepage & percolation losses

$$RWS = \frac{IR+RF}{ET+S+P}$$

Thus **RWS** = $\frac{1}{WUE}$ as **WUE** = $\frac{ET+S+P}{IR+RF}$ The limitation of the use of **RWS** is the same as **WUE** as discussed earlier.

To estimate the water adequacy, weakly or every-10-day **RWS** values are used. But use for longer periods is difficult because if substantial rainfall occurs during a short time span, most of it will leave the project area but **RWS** value will give an erroneous impression of high water adequacy for the whole period.

The term water distribution equity may be complicated by water right question, in which equity may not mean equality. In this methodology "net returns" from all the farmers used as the equity criteria for areas of crop zoning and this is not clearly understood. However, Bhuiyan judged it by flow measurement data and water adequacy data.

When a comprehensive multisectoral evaluation is needed for a project then this methodology can not be used because it does not include social and environmental aspects. But for rapid evaluation of small scale irrigation project it is quite suitable.

c. Garces (1983), has developed a methodology for evaluation the performance of Philippine rice irrigation systems that is also adaptable for use in other countries. The model can estimate the irrigation system overall performance index (ISOPI) for a crop season and is termed as ISOPI model. The index is a three-tier structure, the highest level is the subsystems; the intermediate level, the indicators and the lowest level, the descriptors (Fig. 2.1). Evaluation moves from lower to higher levels so that final subsystem evaluation can take place only after the descriptors and indicators have been evaluated.

Each of the subsystems, indicators and descriptors were weighted (Fig. 2.1) to establish scores for quantitative estimation. The total score in the ISOPI estimate is for a season. The program allows the user of the model to shift it from most rigorous research level analysis using all cells or adding even more necessary parameters in the model, to a less intensive agency level analysis which uses only data usually collected by the irrigation agency.

The model can increase the understanding of factors affecting the project performance and analyses its strong and weak points. The models flexibility and simplicity can make it as a useful tool for evaluating and comparing the performance of irrigation projects. However to adapt this model in our country to evaluate the performance of irrigation project, some necessary parameters should be included and each of the subsystems, indicators and descriptors should be reweighted because the model was developed for Philippine and their socio-economic conditions are not same as ours.

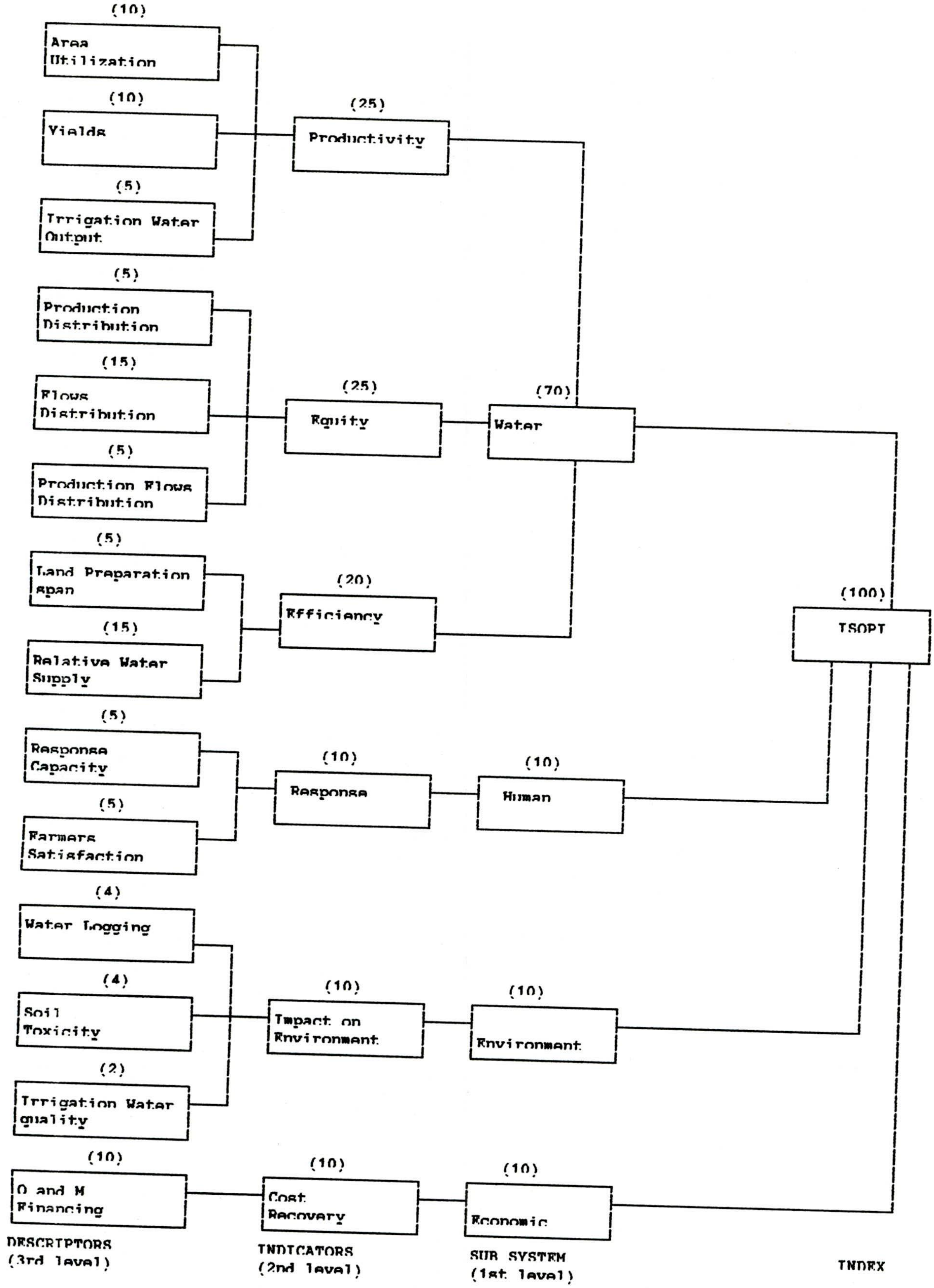

Fig. 2.1: Irrigation System Overall Performance Index (TSOPT) (After, Garces 1983)

d. Sagardoy (1985) proposed a methodology for rapid evaluation of the performance of small scale irrigation projects. He has selected 11 performance indicators to be used in evaluating the project. These are, irrigation efficiency, water supply for population, cattle water supply, aquaculture use, state of irrigation works, intensity of irrigation water use, use of land, agricultural production, benefit per hectare, water user's association involvement and, marketing and storage facilities. For each of these indicators a scoring grade system has been devised.

According to the grading system of evaluation the total score of a given project could be a maximum of 87 points. The project attaining from 0 to 30 points are considered as having serious problems and government assistant to improve them is recommended. Projects with 30 to 60 points would need help in some specific aspects. When the score is above 60, the community can probably handle its own problem. It is also recommended that if the score is below 30, a more indepth study should be carried out to ascertain whether or not it is worthwhile for improving the project.

For rapid and simple evaluation, the proposed methodology is quite suitable and it is also suitable to evaluate the multipurpose project. But the selected performance indicators did not covered all of the aspects for overall project performance evaluation and in relation to grading the indicators many of the terms and conditions are not clearly explained. However, to get a rough idea about the project performance through a quick and simple technique, the proposed evaluation methodology can be quite useful.

e. The research team of Food and Agricultural Organization (FAO) of the United Nations (FAO, 1986) has developed a methodology for monitoring and evaluation of small scale water resources projects. For evaluating the performance of post project activities, four criteria has been selected, these are: (i) water utilization, (ii) establishment of water user's group, (iii) project maintenance and (iv) technical support from government officials. These criteria are used for the design of questionnaires as a measure for evaluating post project activities. A score system together with a computer program has been developed for monitoring and evaluation of the system. The proposed methodology to asses the performance of projects is based on assigning scores for each response to questions. The score of each activities are assigned as follows.

Water utilization 0-60 scores

Water user's group 0-25 scores

Project maintenance 0-10 scores

Support of officials 0-5 scores.

This proposed methodology was tested with 30 selected projects from four regions of Thailand and the results obtained from the projects show that the computed scores are closely related to the real condition.

It seems that the emphasis of the proposed evaluation system is on the impact of the project rather than usual economic consideration. However, the results obtained from the proposed methodology can be asses as baseline information for monitoring and evaluation of the performance of small scale water resources projects.

(f) Mizutani (1987, after Hoque, 1990) proposed a methodology for evaluating the performance of water management in large irrigation project of Asian countries. The quantitative theory one (QT1) has been used for analysis of the data collected through questionnaire survey. In the proposed methodology Mizutani has chosen only irrigated area ratio (IAR = actual irrigated area/planned irrigated area) and the unit yield (yield per unit area) as performance indicators for evaluating the performance of water management in irrigation projects. Though this approach is a dynamic one it should include the most important indicators with respect to various disciplines concerned. This methodology has a firm mathematical base and the approach is modern but is seems to be too complicated.

(g) Mao zhi (1989), has used an index system for evaluating the performance of a large size irrigation scheme (zhanghe irrigation scheme) in south China. He has selected 12 techno-economical indices of evaluation of the irrigation and drainage scheme. The performance of the project in engineering, economical and social terms are quantified by these indices. Most indices give the percentage of actual performance interms of planned performance. The indices for analyzing the projects are organised into three groups. These are discussed below.

Group 1 - Indices of irrigation water utilization:

i. Efficiency of utilizing irrigation water, **S(%)**

$$S = \frac{Wp}{Wd} \times 100$$

where **Wd** and **Wp** are the design and actual annual quantity of irrigation water diverted from the water source in the same year (m^3/ year).

ii. Gross annual irrigation water quota, **M**

$$M = \frac{W}{A}$$

where **W** is the actual gross annual quantity of irrigation water (m^3/ year) and **A** is the actual irrigation area (ha).

iii. Irrigation application efficiency, **E**

$$E = \frac{Wt}{Wh}$$

where **Wt** is the total volume of water delivered in the field by irrigation canal system (m^3) and **Wh** is the total volume of water diverted from the head works for irrigation (m^3).

Group 2 - Indices of irrigation area and engineering aspects of system.

i. Efficiency of irrigated areas, **F (%)**

$$F = \frac{A}{Ad} \times 100$$

where **A** is the actual irrigated area (ha) and **Ad** is the design irrigated area (ha);

ii. Percentage of the area provided with field irrigation and drainage system **D (%)**

$$D = \frac{Af.a}{Af.d} \times 100$$

where **Af.d** and **Af.a** are the design and actual area provided with the field irrigation and drainage system (ha); and

iii. Percentage of facilities in good condition **G (%)**

$$G = \frac{Ng}{N} \times 100$$

where **N** is total number of facilities for irrigation and drainage in a particular category; **Ng** is the number of the facilities in good condition (safe, integrated, functioning normally and attaining the design standard).

Group 3: Indices of economic benefit.

i. Yield per unit area, **y** (ton/ha/year),

$$y = \frac{Y}{A}$$

where **Y** is the total annual yield (ton/year) of crops in area **A**, (ha)

ii. Yield per unit quantity of irrigation water, $\mathbf{Y_w}$ (ton/m^3)

$$Y_w = \frac{Y}{W}$$

where **Y** is total annual yield (ton/year) and **W** is the gross annual quantity of irrigation water (m^3/year)

iii. Income from irrigation water charges per unit area I (Yuan/ha/year)

$$I = \frac{IW}{Ad}$$

where **Iw** is the total annual income from irrigation water charge (yuan/year).

Note:- Yuan is the Chinese unit of currency

iv. Irrigation benefit per unit area, **b** (Yuan/ha/year)

$$b = (y-y_0)c + (y^1 - y^1_0)c^1 - h$$

where **y** and y_0 are the annual yields of crops per unit area (ton/ha/year) with and without irrigation respectively, y^1 and y^{10} are the annual quantities of by products per unit area with and without irrigation (ton/ha/year); c and c^1 are the costs of agricultural product and by product (yuan/ton); **h** is the annual expenditure per unit area for irrigation (yuan/ha/year).

v. Irrigation benefit per unit quantity of irrigation water **bw** (yuan/m^3)

$$b_w = \frac{b}{M}$$

vi. Percentage of financial self sufficiency J (%)

$$J = \frac{I}{H} \times 100$$

where H is the total annual expenditures which includes salaries, administrative expenses and current expenditures (yuan/year); I is the total annual income from water charges and other revenue sources (yuan/year).

In this methodology, except social and environmental aspects all other important aspects like, engineering, agricultural and economic are considered and for rapid and simple evaluation this methodology is quite suitable but in relation to defining the different indices many of the terms mentioned are not clearly explained.

2.1.2 Long term and full evaluation

Long term and full evaluation involves intensive field data collection with sample surveying. It is a field oriented direct measurement approach and generally carried out when project is fully operational in order to make a full assessment of the project performance. In this method both quantitative and quantitative data and information are collected both from the functionaries and beneficiaries. This is a comprehensive evaluation methodology and usually expensive and takes longer time.

A number of techniques of this category have also been developed which are discussed below.

a. Project Impact Evaluation (PIE) methodology is the earliest method of evaluation usually involves: a comprehensive review of the engineering structure; a review of the impact of these on flooding, drainage and irrigation inside and out side the project area; an analysis of hydrological data allowing calculation of flood hazard parameters; a random sample survey of households inside the project area, adjacent to it and in a control area (a comparable area outside the project to serve as a basis for comparison) to permit an analysis of with or without project condition, and an understanding of possible project impacts on those immediately outside the project area; and a detailed data collection on a wide range of topic related to project impact including agriculture, live stock, fisheries, communications, environment, nutrition, social, institutions etc. In general the methods of data collections are conventional. Team members from each discipline are responsible for data collection and analysis within their own areas of responsibility.

The advantage of the PIEs is that it can provide a more comprehensive and reliable information on project impact. The more detailed engineering investigations allow a confident evaluation of the projects engineering performance and the quantitative assessment of with and without project flood hazard. The socio-economic investigations permit a statistically reliable analysis of project impact by comparing with and without project conditions, and an evaluation of project impact on those living adjacent to, but outside the project area. The major disadvantage of PIEs is be their increased cost and the increase in time required to evaluate project impact. In Bangladesh this methodology was first used by BWDB in 1979 to evaluate Chandpur Irrigation Project (CIP). Also Bangladesh Unnayan Parishad (BUP, 1982) and P.M. Thompson (Thompson 1989) was used this method for CIP evaluation. This technique was also used by Bangladesh National Consultant (BNC, 1986), and FPCO (FAP-12, 1991) for evaluating different water resources projects. World Bank has also recommended this methodology to evaluate the performance of irrigation projects and between 1987 and 1990 they used this methodology to evaluate the different irrigation projects in six countries namely Mexico, Morocco, Sudan, Colombia, Philippines and Thailand (Plusquelle, 1990).

b. Biswas (1985), proposed a methodology for monitoring and evaluation of irrigated agricultural development projects. For monitoring and evaluation he suggested that irrigation project can be examined at four levels. The first level involves monitoring and evaluation of planning, design, and construction of physical facilities. He suggested that monitoring and evaluation at this level could examine employment creation and participation of farmers and local authorities in the project planning. The second level for monitoring and evaluation reviews operation and maintenance of water control facilities. The third level focuses on agricultural production. Evaluation at this level needs to take consideration of the availability of other essential inputs such as seeds, fertilizer, pesticide, machinery, extension, credit and marketing facilities. The fourth level for monitoring and evaluation involves the socio-economic impacts of irrigation project. Employment enhancement and income distribution are of particular importance, equally important is the impact of changes in income on quality of life (literacy rate, availability of health services, provision of clean water, sanitation, etc.). Biswas suggested that socio-economic monitoring does not need to be carried out as frequently as monitoring of the O & M or agricultural production levels; key variables can be noted annually, while others can be surveyed every two to five years.

However, in this methodology except environmental all other aspects are considered and for internal evaluation (evaluation by the agency responsible for the project or system) this is an ideal one.

c. Bellekens (1985), has developed a methodology to evaluate the impact of some surface irrigation systems in philippines. The performance criteria utilized in evaluations are, area coverage, cropping intensity, yield, and various measures of water management which includes infield water stress, timing for meeting agronomic requirements, irrigation efficiency, and saturation lead time. System saturation lead time measures the time it takes for soaking with water all rice field within a system at the onset of a crop season. Irrigation efficiency is defined as the percentage of the total water flow supplied to a system which is effectively used to grow a crop.

However, in this methodology only agricultural and engineering aspects are considered ignoring social, economical, environmental and institutional aspects. So, when comprehensive and multisectoral evaluation needed then it can not be used.

d. Jones (1985), proposed a project evaluation process which is shown diagrammically in Fig. 2.2. It comprises four parts; (i) a socio-economic survey to provide data needed to asses the economic and social impact of the project (ii) a cost study to provide information on investment and operation & maintenance (O & M) cost of the projects (iii) a management and engineering study to assess any organizational and engineering problems (design, construction, implementation, operation and maintenance stage) and to provide recommendations to overcome them as feed back to future projects and (iv) an economic evaluation to determine benefit cost ratio (BCR), net present value (NPV), internal rate of return (IRR) etc.

It seems that the evaluation process concentrates mainly on socio-economic factors ignoring important parameters like engineering, agriculture, environments etc. For socio-economic study and to compare the data only the "with" and "with out" approach is not enough because it is very difficult to find a similar area without project. Therefore, the combination of "before" and "after" project approach with the "with" and "without" project approach can be ideal to overcome the problem in this method.

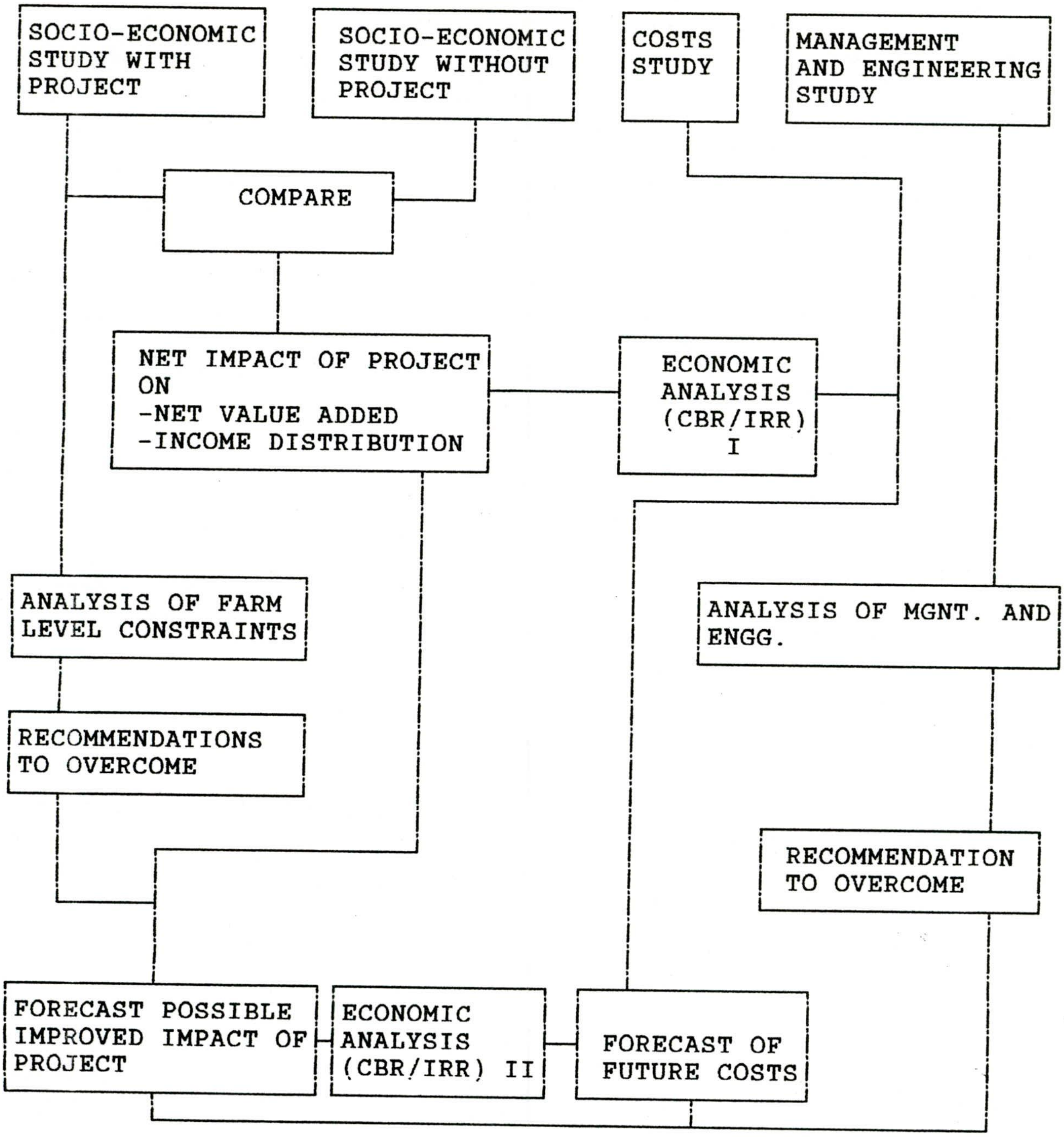

FIG. 2.2 The Project Evaluation Process: (After, Jones 1985)

e. Sevendsen et al. (1990), have developed a conceptual frame work for understanding irrigation performance. For irrigation system performance, they classified the performance indicators into three broad classes. These are (i) objective indicators, (ii) normative indicators, and (iii) composite indicators. According to them the objective indicators are largely free of values relating to acceptability correctness and goodness and they serve as the raw material for normative indicators, which are created when the objectives indicators are transformed in various ways. When the objective and normative indicators are combined with supporting economic, agronomic, and political information, composite indicators results and depending on the kinds of information to be added, this indicators may be either measures of irrigation out comes or broader measures of irrigation effects.

Sevendsen at el described the objective performance indicators are those that are derived directly from raw data on the three dimensions of irrigation performance. They categorised the objective indicators in two basic categories: depth and composition of water applied. For normative indicators they considered, adequacy, technical efficiency, manageability, reliability, flexibility, equity and water quality as performance indicators. Finally for composite indicators, they considered agricultural production, net income, allocative efficiency, return on investment, employment generation, and broader measures of economic and social development. They also identified some performance standards namely internal standards, external standards and relative standards to compare the performance measure.

The proposed framework covers almost all of the aspects for overall irrigation system performance but with respect to indicators different terms are not clearly defined, but only conceptualized. Moreover, in the above frame work, importance are given on the use of some performance standards to compare the performance but no standard values are given for different indicators.

2.2 Summary of Data Used in Different Methods

The data used in the different methodologies either rapid or full evaluation are summarised in Table 2.1. In this table the common data of the different methods are also shown. The table also provide a relative analysis of the data used by the different methodologies and make a comparison among the different methods.

Table 2.1 Summary of Data Used in Different Methods

Disci-pline	SL No	Data used in the different methods	Data required by the different methods proposed by different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagar doy	FAO	Mizu tani	Mao zhi	PIE	Biswas	Beile kens	Jones	Sevend sen
Engin-eering	1	Designed Irrigable area (ha)	+	+	+	+	-	+	+	+	+	+	+	+
	2	Actual irrigated area (ha)	+	+	+	+	-	+	+	+	+	+	+	+
	3	Total volume of water diverted from the head works for irr. (m^3)	+	+	+	+	+	-	+	+	-	+	-	+
	4	Total volume of water delivered to the field (m^3)	+	+	+	+	+	-	+	+	-	+	-	+
	5	Irrigation efficiency (%)	+	+	+	+	+	-	+	+	-	+	-	+
	6	Relative water supply (%)	+	+	+	-	-	-	+	+	-	+	-	+

Table 2.1 (Contd.)

Discipline	SL No	Data used in the different methods	Data required by the different methods proposed by the different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagar doy	FAO	Mizu tani	Mao zhi	PIE	Biswas	Belle kens	Jones	Sevend sen
Engineering Contd.	7	Adequacy of water supply (%)	+	+	-	-	+	-	+	+	+	+	-	+
	8	Equity in water distribution (%)	+	+	+	-	+	-	-	+	+	+	-	+
	9	No of facilities of different categories for irrigation & drainage (Nos)	+	-	-	+	+	-	+	+	+	-	+	-
	10	No of facilities of those categories in good conditions (Nos)	+	-	-	+	-	-	-	+	+	-	-	-
	11	Marketing and storage facilities	+	-	-	+	-	-	-	+	+	-	-	-

Table 2.1 (Contd.)

Discipline	SL No	Data used in the different methods	Data required by the different methods proposed by the different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagar doy	FAO	Mizu tani	Mao zhi	PIE	Biswas	Belle kens	Jones	Sevend sen
Agricultural	1	Yields of major crops annually (kg)	+	+	+	+	-	+	+	+	+	+	+	+
	2	Cropping pattern (% of area)	+	-	-	-	+	-	+	+	+	-	-	-
	3	Cropping intensities (% of areas)	+	-	-	+	-	-	+	+	+	+	-	-
Economic	1	Project investment cost (Tk)	+	-	-	-	-	-	+	+	+	-	+	+
	2	Annual expenditure for operation and maintenance of the project (Tk)	+	-	+	-	+	-	+	+	+	-	+	+
	3	Annual expenditure per unit area (Tk/ha)	+	-	-	-	-	-	+	+	+	-	+	+
	4	Annual income from charges and other revenue sources (Tk)	+	-	-	-	-	-	+	+	+	-	+	+

Table 2.1 (Contd.)

Disci-pline	SL No	Data used in the different methods	Data required by the different methods proposed by the different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagar doy	FAO	Mizu tani	Mao zhi	PIE	Biswas	Belle kens	Jones	Sevend sen
Social	1	Repayment capacity of the project beneficiaries	+	-	+	-	-	-	-	+	-	-	+	-
	2	Employment & wages	+	-	-	-	-	-	-	+	+	-	+	+
	3	Different class of farmers participation in water management group	+	-	-	-	-	-	-	+	+	-	-	-
	4	Migration to or from the area (Nos)	+	-	-	-	-	-	-	+	-	-	-	-
	5	Literacy rate %	+	-	-	-	-	-	-	+	+	-	-	-

Table 2.1 (Contd.)

Disci-pline	SL No	Data used in the different methods	Data required by the different methods proposed by the different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagar doy	FAO	Mizu tani	Mao zhi	PIE	Biswas	Belle kens	Jones	Sevend sen
Environmental & Ecological	1	Water logging area (ha)	+	-	+	-	-	-	-	+	-	-	-	-
	2	Project impact on land elevation land erosion	+	-	-	-	-	-	-	+	-	-	-	-
	3	Impact on soil characteristics	+	-	+	-	-	-	-	+	-	-	-	-
	4	Irrigation on water quality	+	-	+	-	-	-	-	+	+	-	-	+
	5	Drainage problem & associate health issue	+	-	-	-	-	-	-	+	+	-	-	-

Table 2.1 (Contd.)

Discipline	SL No	Data used in the different methods	Data required by the different methods proposed by the different researchers or used by different organization											
			RRA	Bhuiyan	Garces	Sagardoy	FAO	Mizutani	Maozhi	PIE	Biswas	Bellekens	Jones	Sevendsen
Institutional	1	Formation of efficient water users group	+	-	-	+	+	-	-	+	-	-	-	+
	2	Cooperation and coordination among various institution involved	+	-	-	+	+	_	-	+	_	-	-	+
	3	Direct or indirect communication between the water users group and support agencies	+	-	-	+	+	_	-	+	-	-	-	-
	4	Accountability of the concerned institutions	+	-	-	+	+	-	-	+	-	-	-	-
	5	Skills and level of performance of support staff	+	-	-	+	+	-	-	+	-	-	-	+

+ Data required by the method

CHAPTER-3

METHODOLOGY

It has been mentioned in the previous chapter that the evaluation of the irrigation project performance is a complicated process, specially in large irrigation project where multidisciplinary activities are involved. However, a methodology for carrying out the present study was worked out as follows: First of all available documents regarding the different methodologies to evaluate the performance of irrigation projects were collected, critically reviewed and identified their strengths and weaknesses. Then the data of the different methodologies either rapid or full evaluation were classified in to a number of categories i.e. engineering, agricultural, social, economic, environmental and institutional and a summary of the data as required by the different methodologies were prepared. Finally, with the help of this and adding some other important data relating to irrigation project performance, a common checklist of the data was prepared, and availability of these data from secondary sources for the selected projects was examined to check whether the present monitoring and data collected by the concerned authorities are adequate for evaluating the project performance.

3.1 Selection of Projects

In order to check whether the present monitoring and data collected by the concerned authorities are adequate for evaluating the project performance, seven FCDI projects were selected on random basis. These are

1. Bhola Irrigation Project, Phase-I
2. Meghna-Dhonagoda Irrigation Project
3. Baramanikdi Sub Project
4. North Kalkini Sub Project
5. Keranigong Irrigation Project
6. Aglar Chak Irrigation Project
7. Dublakuri Khal-Kata Khal Project

The projects are ranges from large to medium scale. The location of the projects are shown in Fig. 3.1 and the key features of these projects are shown in Table 3.1.

3.2 Sources of Data

The data related to project description, present monitoring and data collection status of the selected projects were gathered by (i) reviewing the project proforma (pp), Feasibility study report, Appraisal report, project completion report, and Monthly and annual reports of the projects and (ii) discussion with the concerned project personnel (BWDB, DAE, BRDB, Thana and District level officials).

Table 3.1 Key Features of the Selected Projects

Sl No	Project Name	District	Gross Area (ha)	Cultivable Area(ha)	Completion year
1	Bhola Irrigation Project, Phase-I	Bhola	65,000	53,000	1991
2	Meghna-Dhonagoda Irrigation Project	Chandpur	17584	14367	1987
3	Baramanikdi Sub Project	Faridpur	3076	2590	1986
4	North Kalkini Sub Project	Madaripur	3846	3077	1989
5	Keranigong Irrigation Project	Dhaka	10931	6886	1990
6	Aglar Chak Irrigation Project	Dhaka	7900	4450	1989
7	Dublakuri Khal-Kata Khal Project	Mymensingh	4921	4209	1984

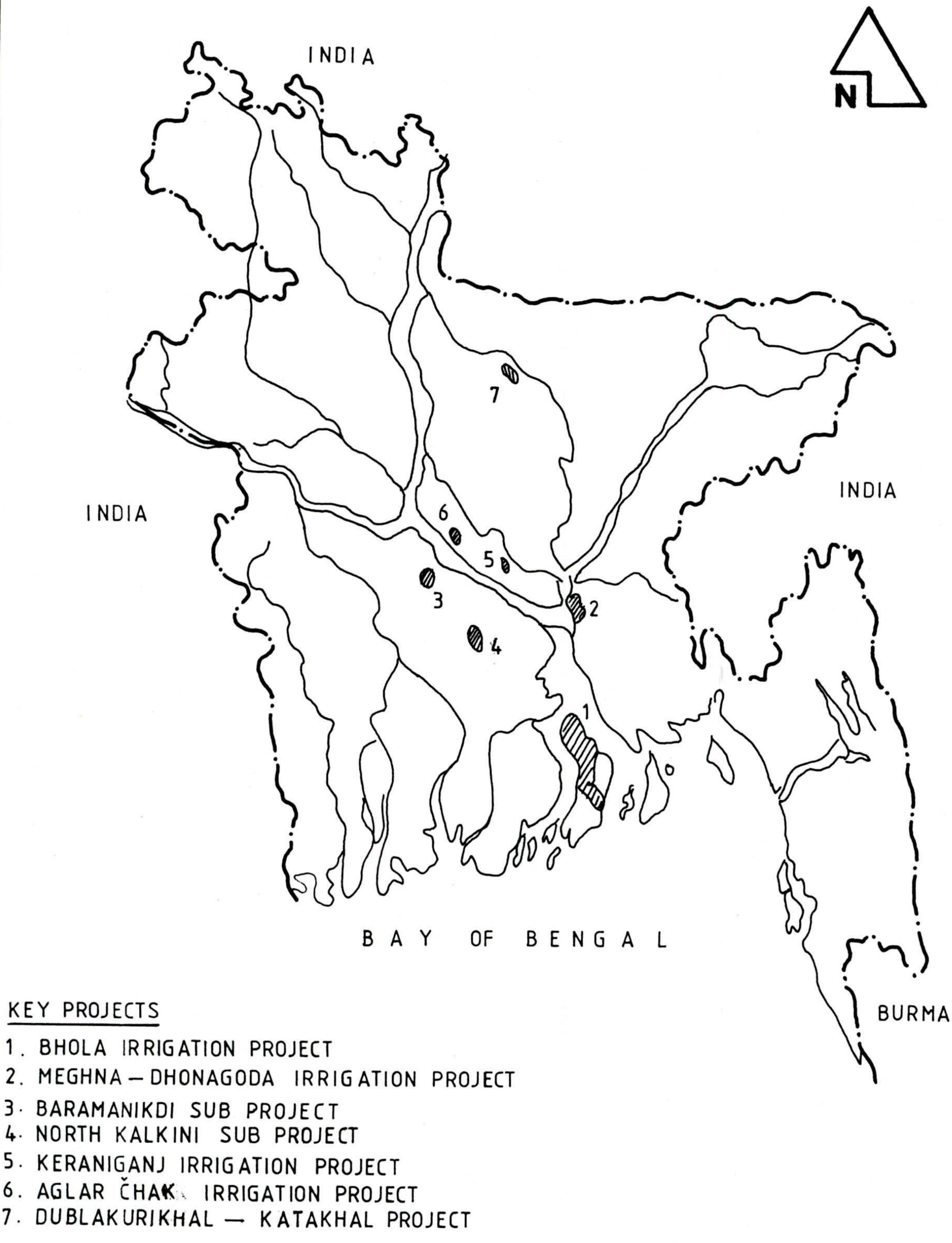

Fig. 3·1: Location of the selected projects

CHAPTER 4

CASE STUDIES

4.1 Salient Features of the Projects

4.1.1 Bhola Irrigation Project

General Information of the Project

Name of the Project	:	Bhola Irrigation Project, Phase-I
Location of the Project	:	Parts of Bhola, Borhan uddin & Lalmohan Thana,
District Bhola		
Gross Project Area	:	65,000 ha
Net Cultivable Area	:	53,000 ha
Irrigable Area	:	38850 ha
Area Under Irrigation	:	25334 ha
Funding Agency	:	ADB & EEC
Implementing Agency	:	BWDB
Scheduled Completion	:	FY 1990/91
Actual Completion	:	FY 1990/91
Original Cost Estimate	:	6307.97 Lakh Taka
Final Cost Estimate	:	8286.34 Lakh Taka

Infrastructure:

(a) Canal excavation & re-excavation	:	600 km
(b) Alternal embankment	:	36.50 km
(c) Sluice re-construction	:	2 No.
(d) Bridge construction	:	28 No.
(e) Road construction	:	43 km
(f) Repair of Flood embankment	:	22 km
(g) LLP irrigation canal	:	2051 Nos.

Background of the Project:

The Bhola Irrigation Project constitutes a part of proposed greater Barisal-Patuakhali Agricultural project which was assigned high priority by the Government. The project area falls under the Bhola District which is an Island located in the Meghna Delta in Bangladesh and lies between latitudes 22^0-11' North and longitudes 90^0-38' East (Fig. 4.1). The objective of the project is to increases agricultural production employment opportunities and farm income through the provision of Low Lift pumps for irrigation and improvement of supporting facilities to cover an area of 38850 ha of land. Principal benefits are come from grain production. Annual incremental paddy and wheat production at full development stage was expected to be 145,580 metric tons.

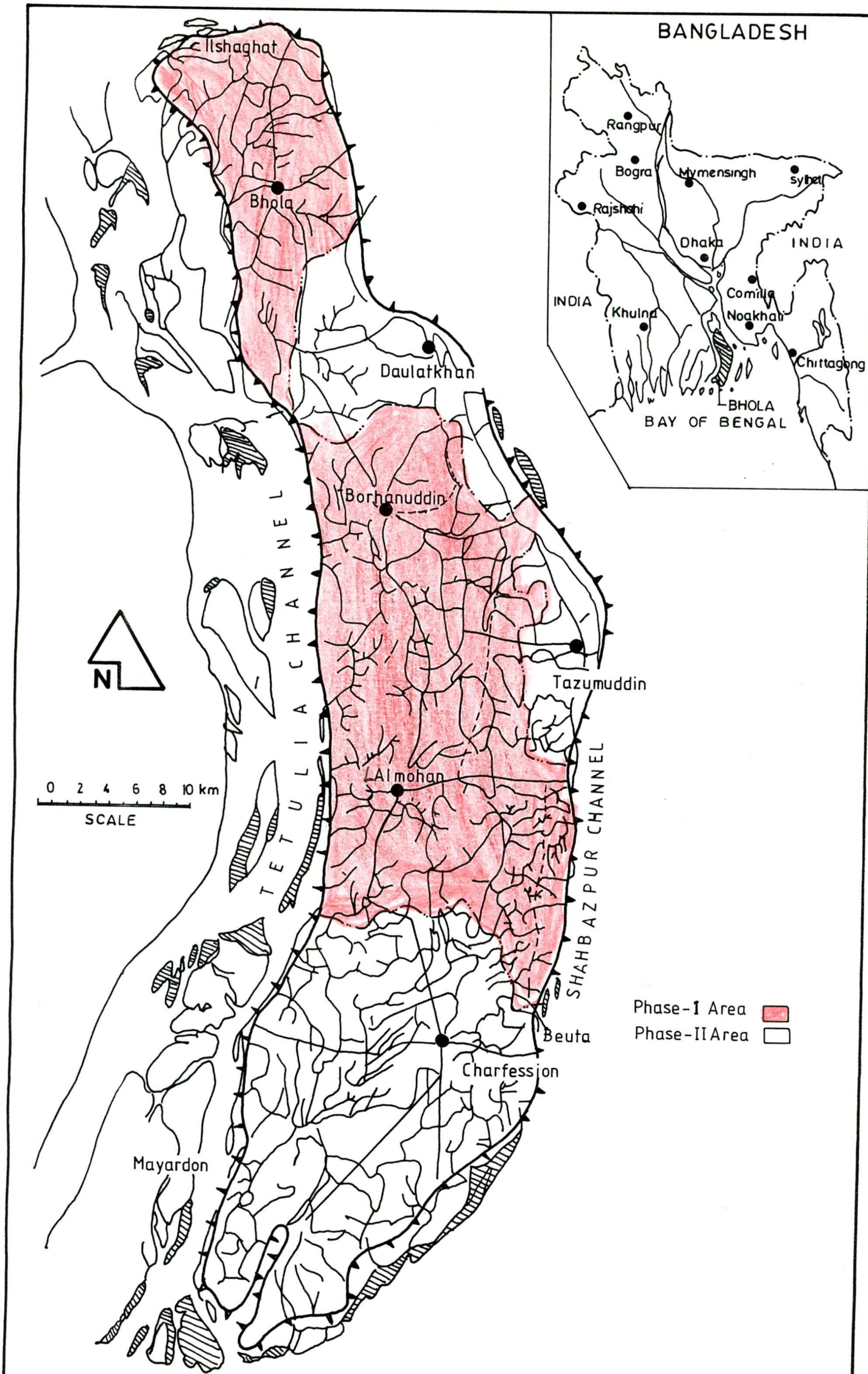

Fig. 4.1: Bhola irrigation project

4.1.2 Meghna-Dhonagoda Irrigation Project

General Information

Name of the Project	: Meghna-Dhonagoda Irrigation Project
Location of the Project	: Parts of Matlab Thana, District: Chandpur
Objectives of the Project	: Flood Control, Drainage and Irrigation
Gross project Area	: 17584 ha
Net Cultivable/irrigable area	: 14367 ha
Funding Agency	: ADB
Implementing Agency	: BWDB
Schedule Completion	: FY 1983/84
Actual Completion	: FY 1987/88
Original Cost Estimate	: N.A.
Final Cost Estimate	: Tk. 2418.8 million (1991 price)

Main Project Features

Item	No./Length (km)	
	As planed	Implemented
Embankment	65 km	60 km
Irrigation Canal		
i. Main & Secondary		97.5 km
ii. Tertiary		120.5 km
Total:	75 km	218 km
Irrigation Structure		
i. Regulator	69 Nos	69 Nos
ii. Irrigation Conduit	14 Nos	14 Nos
iii. Check gate	42 Nos	42 Nos
iv. Turnout	387 Nos	387 Nos
v. Escape	17 Nos	17 Nos
vi. Aqueduct	3 Nos	3 Nos
Drainage Canal	160 km	125.5 km
Drainage Structures		
i. Conduit	39 Nos	39 Nos
ii. Combined Structures	14 Nos	14 Nos
iii. Water Control Structure	9 Nos	9 Nos
Bridges	72 Nos	72 Nos
Roads	70 km	Nil
Navigation Locks	2 Nos	Nil

Background of the Project:

Meghna-Dhonagoda Irrigation Project (MDIP) is situated in Matlab Thana of Chandpur District in the south-east of Bangladesh (Fig. 4.2). The project has a gross area of 17584 ha and occupies the major portion of 14 out of 22 Union in Matlab Thana. MDIP is a combined Flood Control Drainage and Irrigation Project. The main design features are a ring embankment around the perimeter for flood protection and internal net works for irrigation canals to provide water during the dry season and drainage channel to remove excess water from rainfall in the monsoon. Evacuation of drainage water is by two pump stations, one at kalipur at the northern and Uddhamdi at southern end of the project. These are also lift water from Meghna and Dhonagoda rivers into the canals for dry season irrigation. Water distribution within the project is mainly by gravity flow, but there are two internal booster pump stations, at Dubgi and Eklaspur, to provide water to higher areas. The canal system commands a total of 14,367 ha, the balance of the gross area being excluded because it is two high to be commended economically.

The objectives of the project is to protect the interior of the island from river flooding and drainage congestion, in order to encourage agriculture and specially cultivation of HYV Aman, during the monsoon, to increase the security to the population, crops and livestock during the monsoon, and to promote rabi cropping and especially HYV Boro by proving an irrigation system.

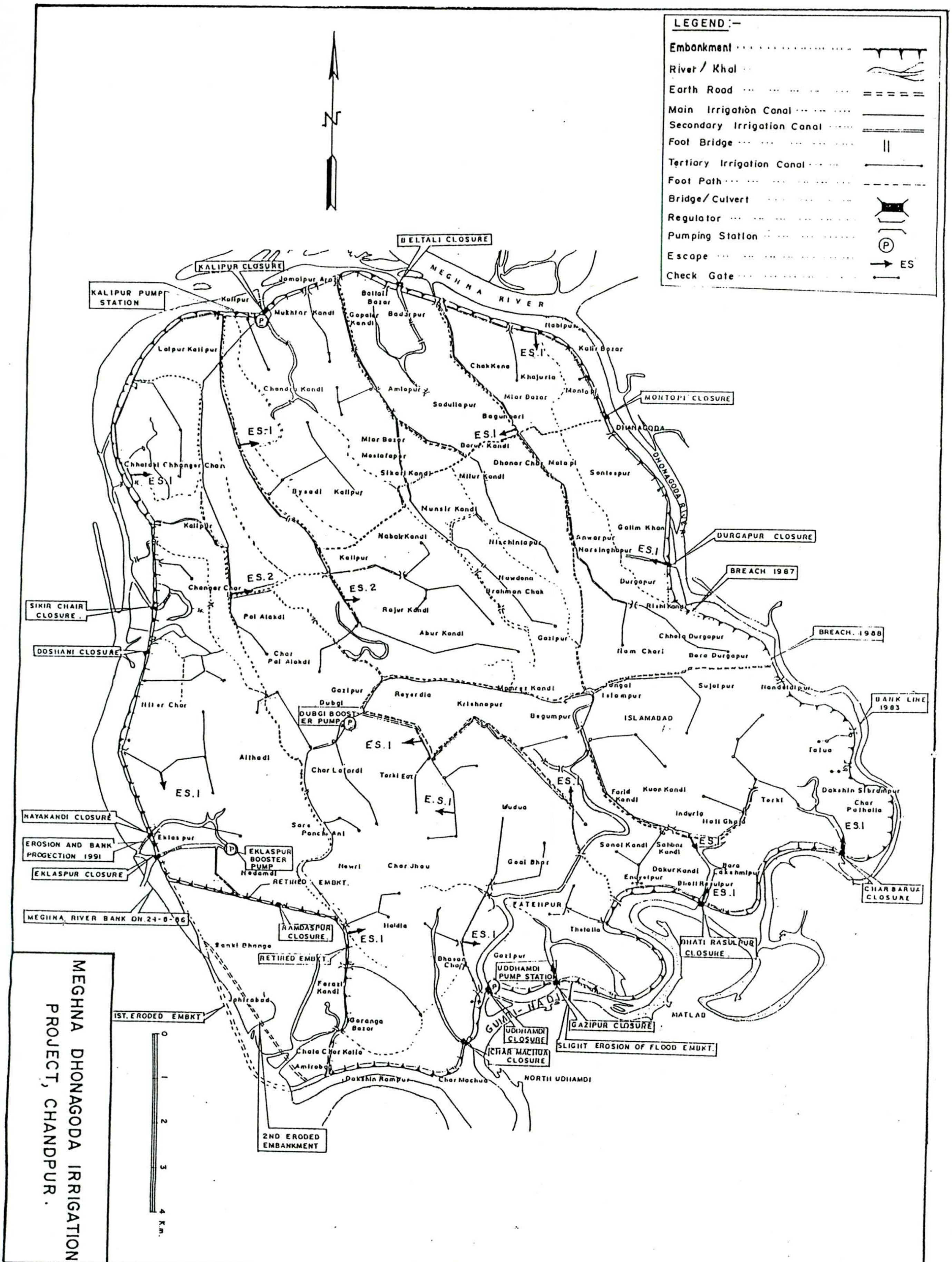

Figure 4.2 Meghna Dhonagoda Irrigation Project

4.1.3 Baramanikdi Sub Project

General Information

Name of the Project	: Baramanikdi Sub Project
Location of the Project	: The Sub-project is located in Faridpur district, about 50 miles West of Dhaka and about 5 miles South-east of Faridpur Town
Objectives of the Project	: To increase the agricultural production, farm income and employment opportunities with Flood Control, Drainage and irrigation improvement
Gross project Area	: 3076 ha
Net Cultivable Area	: 2590 ha
Funding Agency	: IFAD (International Fund for Agricultural Development)
Implementing Agency	: BWDB
Schedule Completion	: FY 1985/86
Actual Completion	: FY 1985/86
Original Cost Estimate	: TK. 156.88 lakh
Final Cost Estimate	: N.A.

Infrastructure of the Project

Flood Embankment	: 17.24 mile
Irrigation Canal re-excavation	: 23 mile
Regulator	: 2 Nos
Flushing Gate	: 2 Nos
Check Structure	: 2 Nos
Small Drainage Channel	: 7 Nos
Irrigation Inlet Structure	: 14 Nos

Background of the Project:

The Baramanikdi is one of the sub-projects under EIP-Type Minor Schemes-IFAD financed located in part of kotwali and Nogarkanda Thana of Faridpur district (Fig. 4.3) prepared with the objective of Second Five Year Plan to achieve self sufficiency in food over the shortest possible time; to increase farm income and to generate employment opportunity.

Before implementing the project, area were suffered from flood inundation at the early monsoon period from camber river at west and Bhubanswari river the east damaging standing young Aus plants every year. With implementing the project, flood embankment is provided to stop the flood intrusion from both river. Regulatory structure are provided to stop of flood water and efficient outflow of drainage water and this also help for retention of water in storage basin of khal from the late monsoon drainage for irrigation of the area. In addition some flushing gate, check structure, small drainage outlets and irrigation inlets for LLPs are also provided to help in both irrigation and drainage of the area.

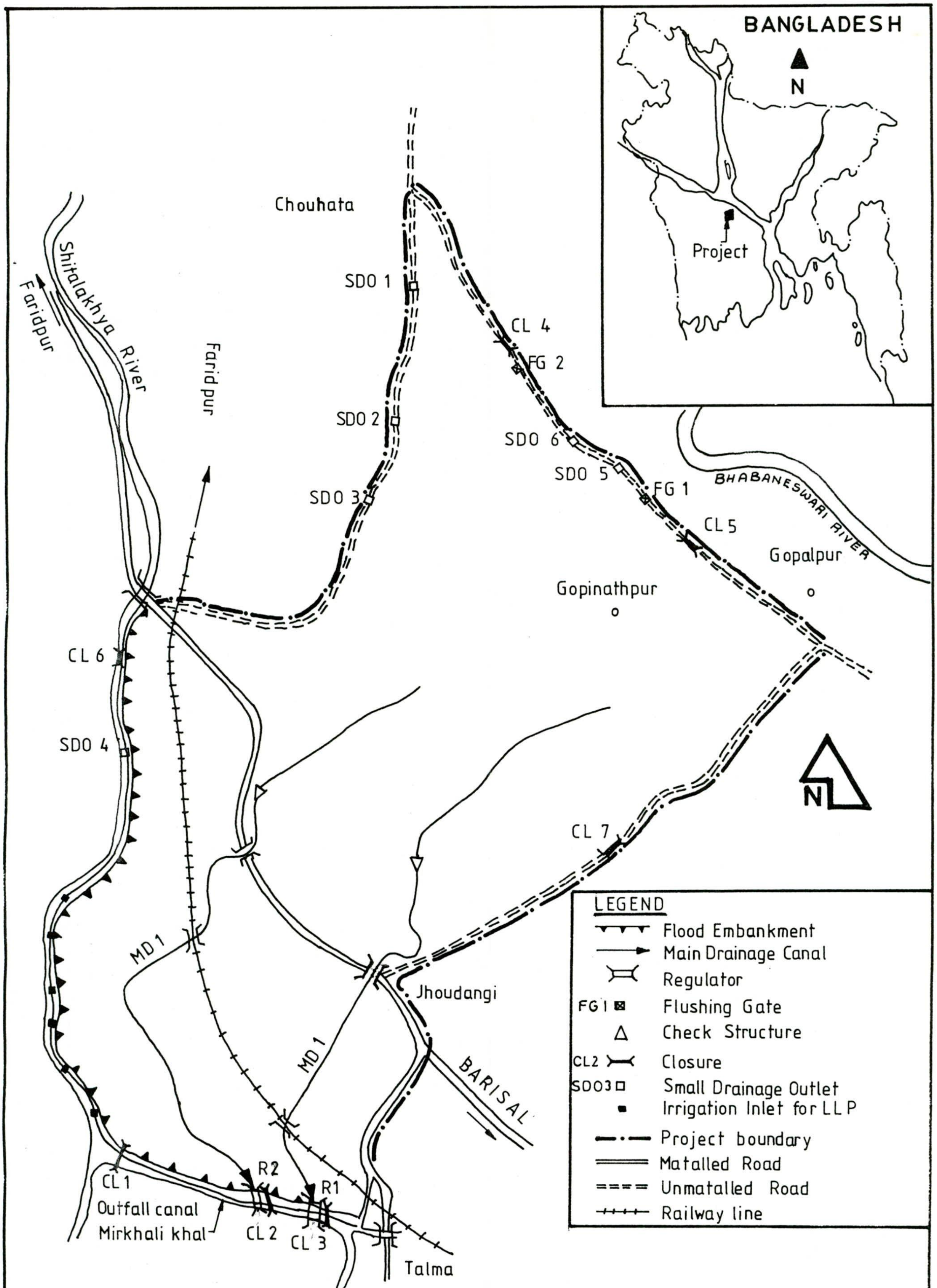

Fig. 4.3 : Key features of Baramanikdi sub project

4.1.4 North Kalkini Sub Project

General Information

Name of the Project	: North Kalkini
Type of the Project	: Small Scale Flood Control Drainage & Irrigation Project
Location of the Project	: Parts of Kalkini Thana District: Madaripur
Objectives of the Project	: To increase the agricultural production, farm income and employment opportunities with Flood Control, Drainage and Irrigation Improvement.
Gross project Area	: 3846 ha
Net Cultivable Area	: 3077 ha
Funding Agency	: International Fund for Agricultural Development (IFAD)
Implementing Agency	: BWDB
Schedule Completion	: N.A.
Actual Completion	: FY 1988/89
Original Cost Estimate	: N.A.
Actual Cost Estimate	: Tk. 360.05 lakh (upto June 1989)
Final Cost Estimate	: N.A.

Infrastructure of the Project

Total Flood Embankment	: 31.00 km
Main Drainage Canal	: 2 Nos
Regulator	: 2 Nos
Flushing Gate (Sluice)	: 5 Nos
Check Structure	: 4 Nos
Small Drainage Outlet	: 9 Nos

Background of the Project:

The North Kalkini Sub Project is located at kalkini Thana, Under Madaripur District, about 2 km east of kalkini Thana (Fig. 4.4) The project is under EIP-Type Minor Schemes and Financed by IFAD. The objective of the project is to increase the food production by providing Flood Control Drainage and irrigation improvement. The project covers a gross area of 3846 hectares and the net cultivable area is 3077 hectares. After implementation of the project the major agricultural changes is to a shift from broad cast (deep water) to transplanted (shallow-water) rice cultivation, and substitution of traditional low yielding rice variety by high yielding fertilizer responsive improved varieties.

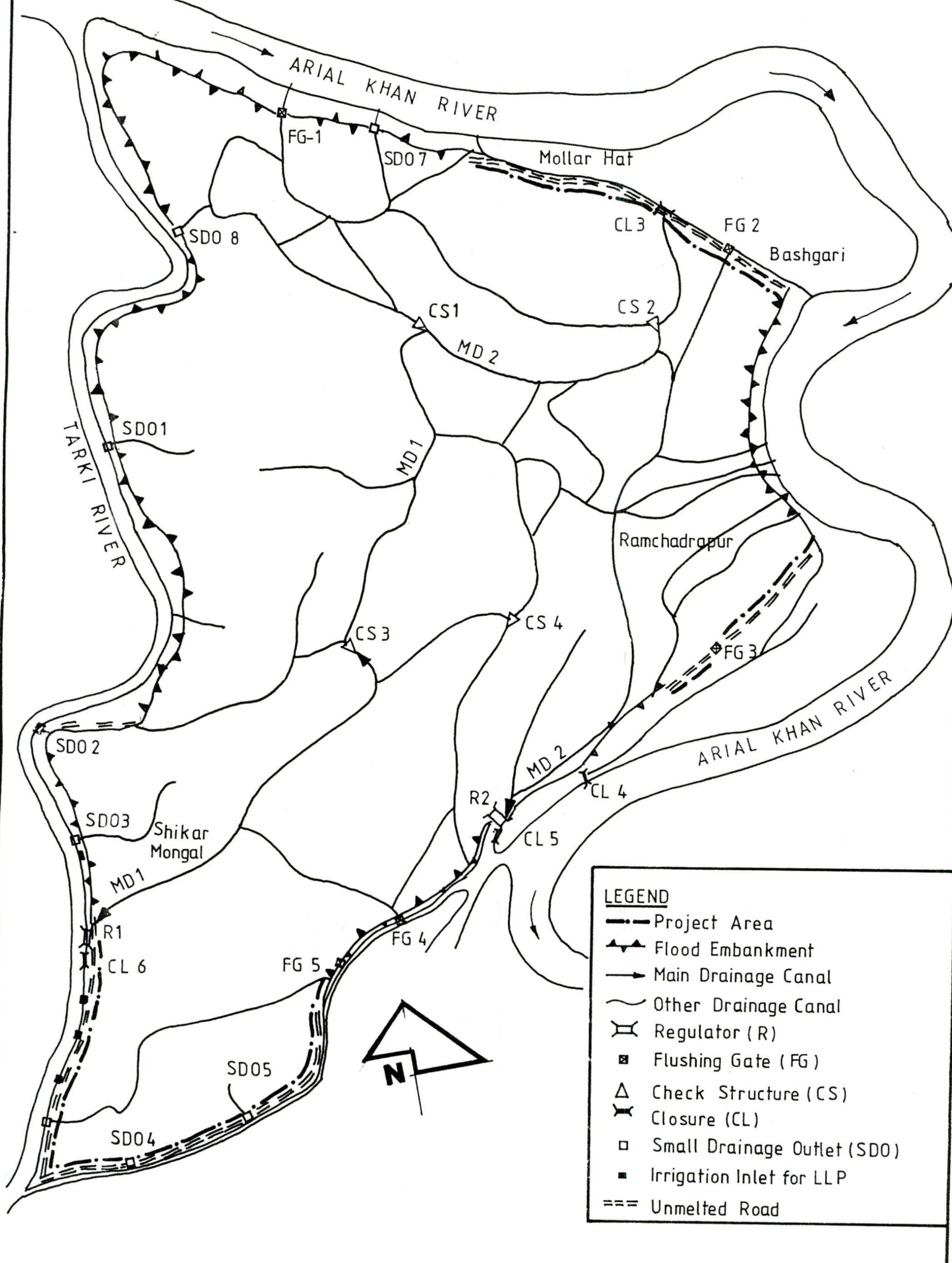

Fig. 4.4: Key features of North Kalkini sub project

4.1.5 Keranigong Irrigation Project

General Information

Name of the Project	: Keranigong Irrigation Project
Location of the Project	: Thana-Keranigong, District: Dhaka
Objectives of the Project	: To provide irrigation facilities to Boro HYV and to provide protection from early flood
Gross project Area	: 10,931 ha
Net Cultivable Area	: 6886 ha
Funding Agency	: ADB
Implementing Agency	: BWDB
Schedule Completion	: FY 1987/88
Actual Completion	: FY 1989/90
Original Cost Estimate	: TK. 967.54 lakh
Final Cost Estimate	: N.A.

Infrastructure of the Project

Flood Embankment	: 3.38 km
Khal excavation/ re-excavation	: 80.50 km
Regulator	: 10 Nos
Auxiliary Structures (like Box culvert, pipe culvert etc)	: 57.50 lakh
Boat pass on Regulators	: 6 Nos

Background of the Project:

Keranigong Irrigation Project is located at about 13 km south-west of Dhaka city in Thana-Keranigong of Dhaka District (Fig.4.5). It covers a gross area of 10931 ha and the net cultivable area is 6886 ha. Before the project a large areas were suffered from early flash flood due to over rain & river flow. For such early and flash flood the boro/irri crop of the areas were damaged at the period of harvest. The objective of the project is to proved-a) irrigation and drainage facilities to HYV Boro crops mainly by deepening khals and supplying irrigation equipments (LLP's and STW's) and b) Early flood protection by constructing submersible embankment. The major benefit accrue from substantial acreage expansion and slight yield increased/per acre of HYV Boro.

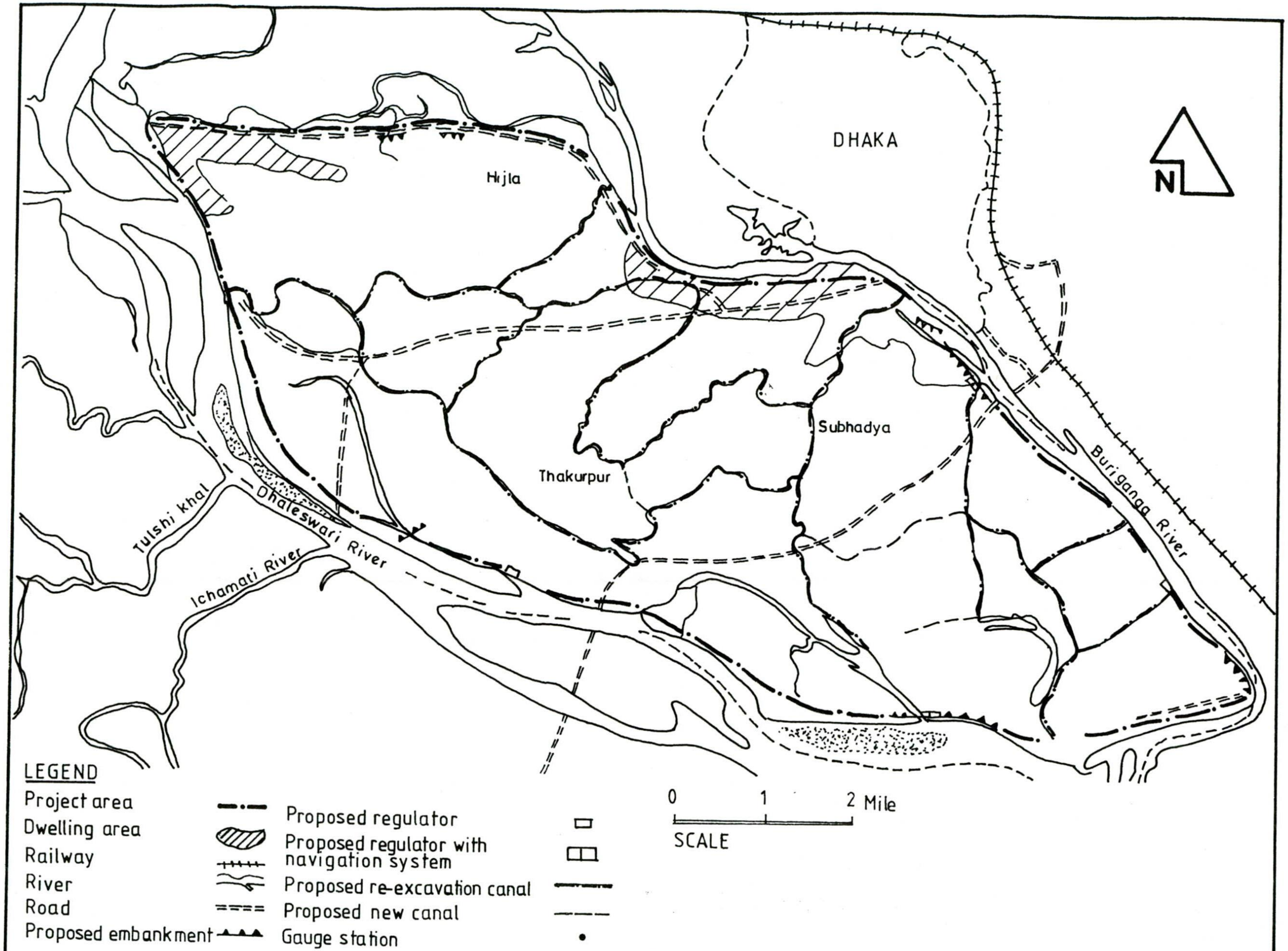

Fig. 4.5: Keranigonj irrigation project

4.1.6 Aglar Chak Irrigation Project

General Information

Name of the Project	:	Aglar Chak Irrigation Project
Type of the Project	:	Partial Flood Protection, Irrigation & Drainage
Location of the Project	:	Nawabgang Thana, District: Dhaka, 20 miles west of Dhaka City
Objectives of the Project	:	To maximise HYV boro production by i. providing irrigation by khals deepening & supply of pumps ii. providing protection from early flood
Gross project Area	:	7900 ha
Net Cultivable Area	:	4450 ha
Implementing Agency	:	ADB & EEC
Schedule Completion	:	FY 1987/88
Actual Completion	:	FY 1988/89
Original Cost Estimate	:	TK. 730.60 lakh (capital cost 1985)
Final Cost Estimate	:	N.A.

Infrastructure of the Project

Embankment	:	12 miles
Khal Improvement	:	29 miles
Regulator	:	15 Nos
Irrigation equipment	:	175 LLPs & 100 STWs
Box culvert	:	4 Nos
Pipe culverts	:	6 Nos

Background of the Project:

The project area is located about 20 miles west of Dhaka city (Fig. 4.6) and is 7900 hectares gross area. The area lies wholly within the Thana of Nowabgang. The eastern boundary of the project area is the Dhaleswari river which is a minor branch of the Jamuna river. On the north is the Kaliganga river which in turn is a minor branch of the Dhaleswari river. The objective of the project is to increase the production of food grains by proving irrigation facility and drainage improvement and flood protection. By implementation of the project it was expected that an incremental output of paddy of 7650 Tons per year will be achieved.

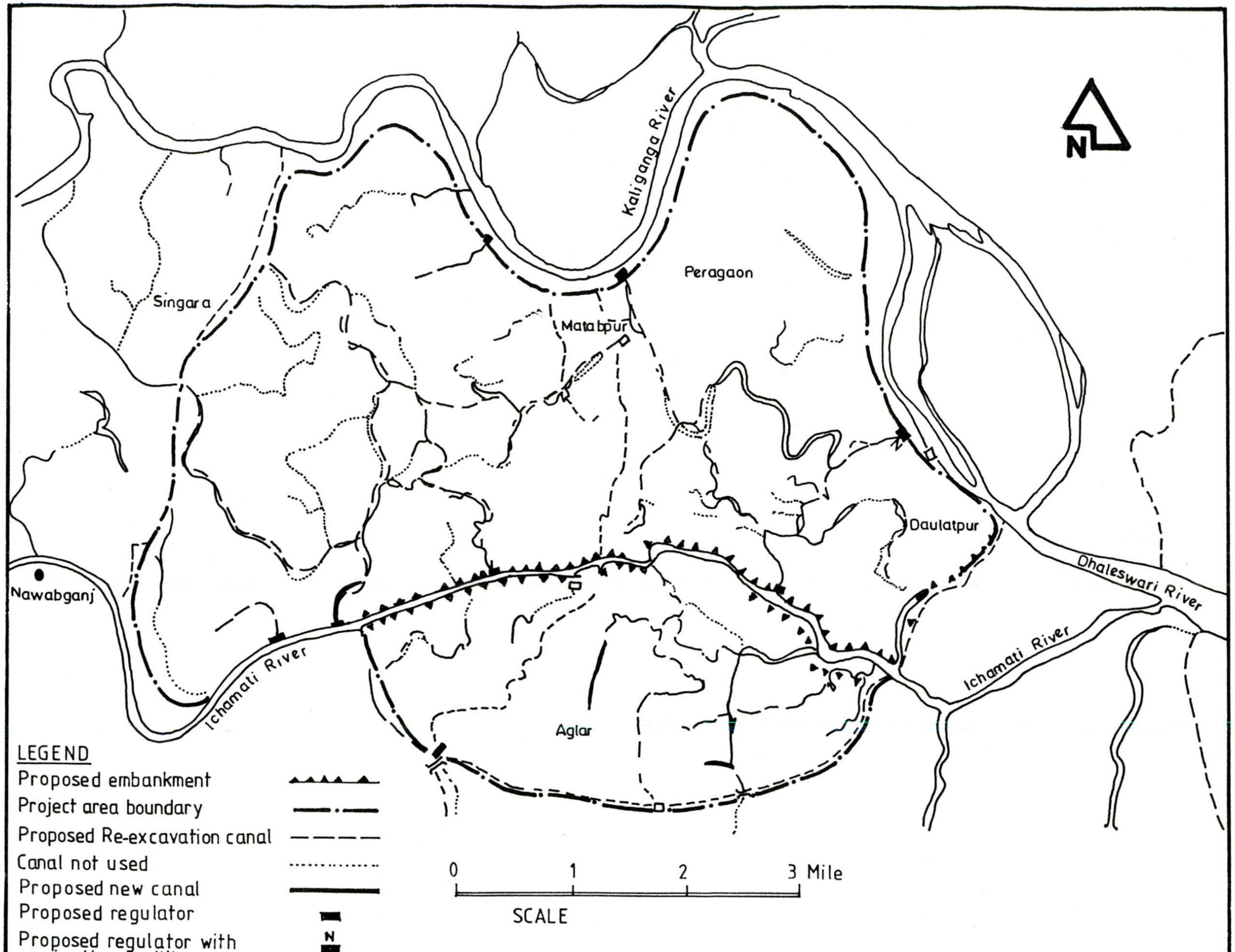

Fig. 4.6: Key features of Aglar chak irrigation project

4.1.7 Dublakuri khal-kata khal project

General Information	
Name of the Project	: Dublakuri khal - kata khal Flood control Drainage & Irrigation Scheme
Type of the Project	: EIP
Location of the Project	: Muktagacha Thana District: Mymensingh
Objectives of the Project	: Flood Control, Drainage & Irrigation improvement
Gross project Area	: 4921 ha
Net Cultivable Area	: 4209 ha
Implementing Agency	: EIP, under Netherland Technical Assistance Programme
Implementing Agency	: BWDB
Schedule Completion	: FY 1983/84
Actual Completion	: FY 1984/85
Original Cost Estimate	: N.A.
Final Cost Estimate	: Tk. 113.40 lakh
Infrastructure of the Project	
Re-excavation of the channel	: 0.55 miles
Flank Embankment	: 0.27 miles
Khal Improvement	: 29 miles
Cross Dam	: 1 Nos
Construction of regulator	
- 3 vent	: 1 Nos
- 2 vent	: 1 Nos
- 1 vent	: 1 Nos

Background of the Project:

The project area is located in Muktagacha thana of Mymensingh District (Fig. 4.7a, 4.7b).

The project area is 8 to 10 miles to the west of Mymensingh Dist town.

The project area consists of several low lying beel areas, such as Dublakuri, Subornakhila, Medha, Larki, Darichatil, kala beel. The early Flood water of the old Brahmaputra river enters into the project area and damage to the standing crops of the project area. In post monsoon period the water of these area is drained out through the khals. In consequences of which the project area is over drained through this khals during post monsoon period and the cultivation of the project area during winter season suffers badly for want of irrigation water. The people of the area are eager to irrigation T. Aman by the application of indigenous method. In order to solve this problem and with a view to increase the production of crops and intensity of cultivation the project was implemented.

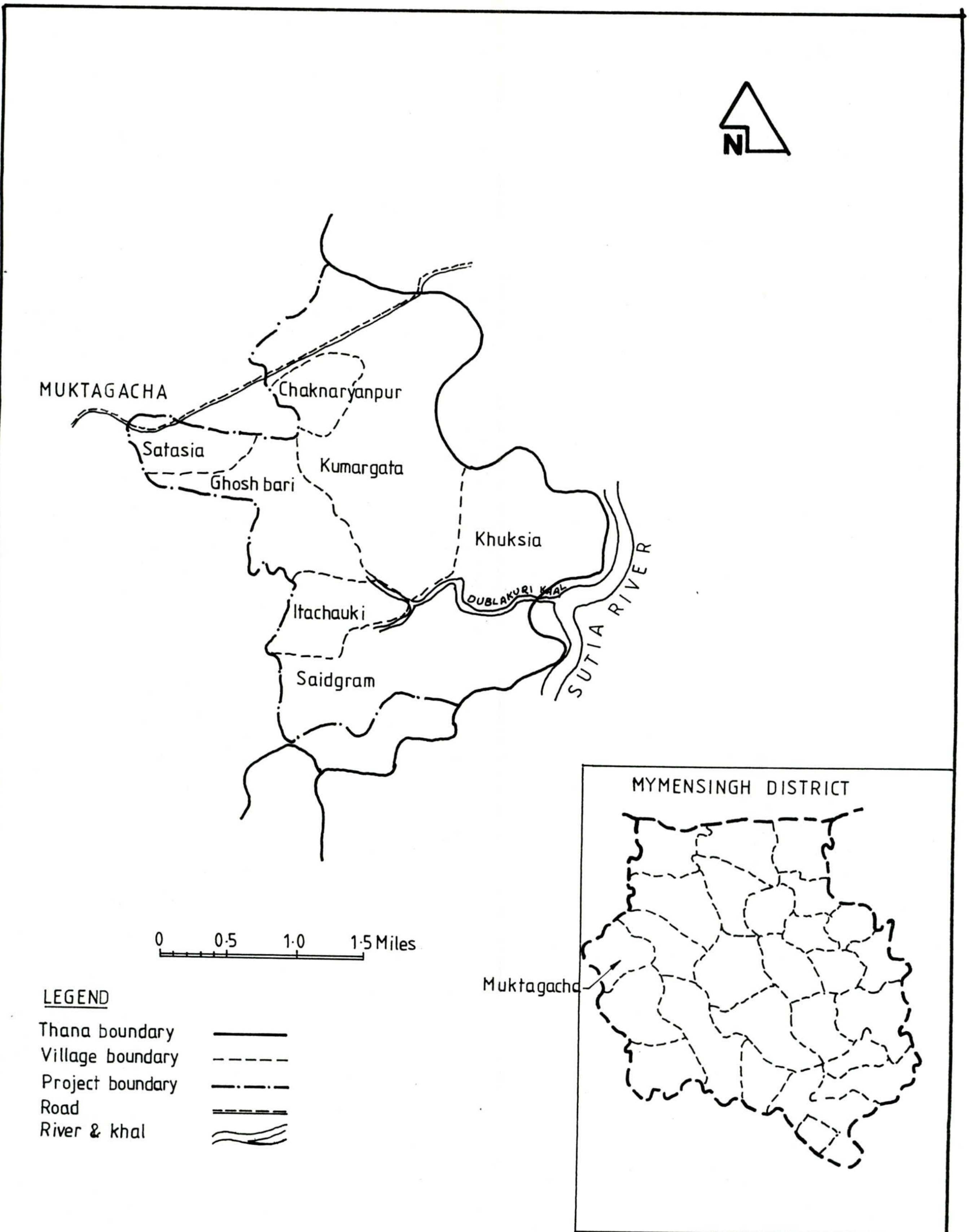

Fig. 4·7a: Dublakuri khal project

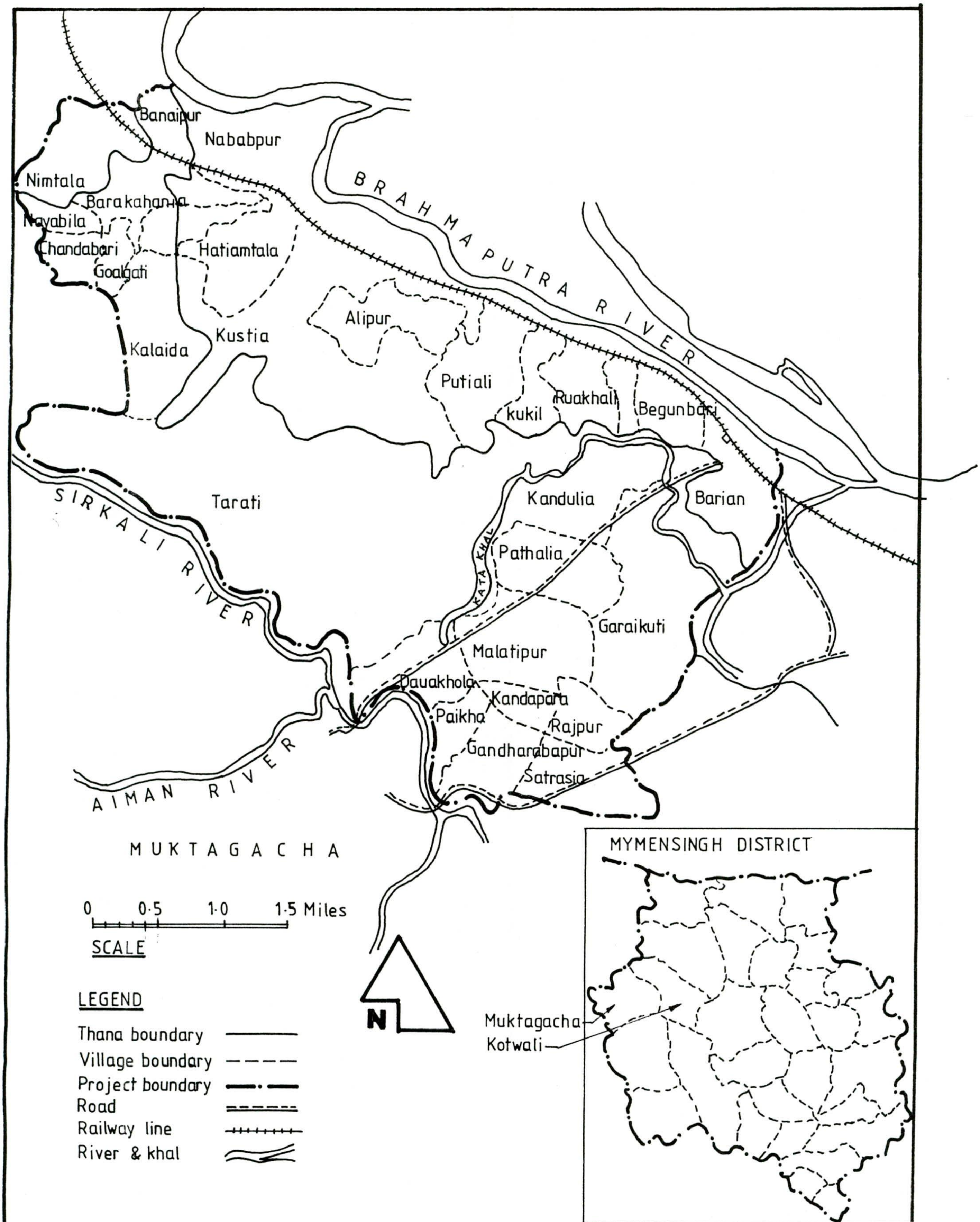

Fig. 4·7b: Katakhal project

4.2 Monitoring and Data Collection Status

The checklist of data required for performance evaluation and their availability from the secondary sources for selected projects are shown in Table 4.1.

From the Table 4.1 it is seen that the data required to evaluate the performance are partially collected by the concerned authority. Although, for large scale projects many of the data are collected but in small scale project most of the data are not collected. This may be due to inadequate project personnel or lack of interest. It is also seen that the data related to irrigation water discharge are not collected by the project officials although water is the main input for an irrigation project. Area utilization and yield data are available because these are regularly collected by the project authority and published in their monthly and annual progress report. Many of the data related to environmental aspect are collected as because this considerations are not still ignored.

Table 4.1 Checklist of Data Required to Evaluate the Performance and Their Availability in the Secondary Sources for the Selected Project

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keraniigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Engineering	1	Planned or Designed Irrigable area (ha)	A	A	A	A	A	A	A
	2	Actual Irrigated area at Present(ha)	A	A	A	A	A	A	A
	3	Total volume of water diverted from the head works for irrigation (ha)	NA	A	NA	NA	NA	NA	NA
	4	Total volume of water delivered to the field by irrigation canal system (m^3)	A	A	NA	NA	NA	NA	NA

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi subproject	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Engineering (Contd.)	5	Total length of irrigation canal (m) at present	A	A	A	A	A	A	A
	6	Total length of drainage canal (m) at present	A	A	A	A	A	A	A
	7	Adequacy of water supply: Depth of water supplied per day (h-cm) for different crops	A	A	NA	NA	NA	NA	NA

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Kerangong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Engineering (Contd.)	8	Equity in water distribution: relative equity rate (r.e.r) = supply at head (m^3/ha) / supply at middle or tail (m^3)/ha							
		a) r.e.r at head	NA	A	NA	NA	NA	NA	NA
		b) r.e.r at middle	NA	A	NA	NA	NA	NA	NA
		c) r.e.r at tail	NA	A	NA	NA	NA	NA	NA

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Kerangigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Engineering (Contd.)	9	No. of facilities of different catagories for irrigation & drainage (Nos)	A	A	A	A	A	A	A
	10	No. of facilities of those catagories in good conditions (Nos)	A	A	A	A	A	A	A
	11	Marketing and storage facilities	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dubla kuri khal kata khal project
Agricultural	1	Present yields of the major crops per unit area (kg/ha)	A	A	A	A	A	A	A
	2	Present cropping pattern (% of area)	A	A	A	A	A	A	A
	3	Present cropping intensity (% of area)	A	A	A	A	A	A	A
Economic	1	Project investment cost (Tk.)	A	A	A	A	A	A	A
	2	Annual expenditure for operation & maintenance of the project (Tk.)	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secodary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Economic (Contd.)	3	Annual expenditure per unit area for irrigation which includes salaries, administrative expenses & O&M expenses	A	A	A	A	A	A	A
	4	Total annual income from water charges and other revenue sources (Tk.)	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Economic (Contd.)	5	Total annual production cost per ha for the different crops which includes cost of all inputs, irrigation charges and labour cost (Tk.)	A	A	A	A	A	A	A
	6	Net benefit per ha(Tk)= value of different crops per ha - Annual production cost per ha	A	A	A	A	A	A	A
	7	Prevent Avg. land price per hacter (Tk.)	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Social	1	Repayment capacity of project beneficiaries							
		i) capable (% of total)	NA	A	NA	NA	NA	NA	NA
		ii) partially capable (% of total)	NA	A	NA	NA	NA	NA	NA
		iii) Not capable (% of total)	NA	A	NA	NA	NA	NA	NA
	2	Farmer's or beneficiaries of the project under different economic classes (at present)							
		i) Big farmers (%)	A	A	A	A	A	A	A
		ii) Medium farmers (%)	A	A	A	A	A	A	A
		iii) Small or landless farmers (%)	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi subproject	North kalkini sub project	Kerangong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Social (Contd.)	3	Employment & wages							
		i) Annual labour use per ha of major crops (Man-days)	A	A	A	A	A	A	A
		ii) Avg. wages of farm labour (Tk./day)	A	A	A	A	A	A	A
	4	Ownership of the irrigation equipment							
		i) Owned by Government							
		a) LLP Nos	A	A	A	A	A	A	A
		b) STW Nos	A	A	A	A	A	A	A
		c) DTW Nos	A	A	A	A	A	A	A
		ii) Owned by private agencies							
		a) LLP Nos	A	A	A	A	A	A	A
		b) STW Nos	A	A	A	A	A	A	A
		c) DTW Nos	A	A	A	A	A	A	A
		iii) Owned by farmers							
		a) LLP Nos	A	A	A	A	A	A	A
		b) STW Nos	A	A	A	A	A	A	A
		c) DTW Nos	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disci- plines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Environmental	1	Area under drainage congestion (ha)	A	A	A	A	A	A	A
	2	Project impact on (i) Land elevation (ha) (siltation)	A	A	A	A	A	A	A
		(ii) Land erosion (ha)	A	A	A	A	A	A	A
	3	Present soil salinity (electrical conductivity micro mhos/cm)	NA	A	NA	NA	NA	NA	NA

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Kerangigong Irrigation project	Aglar Chack Irrigation Project	Dubla kuri khal kata khal project
Environmental (Contd.)	4	Irrigation water quality	NA	A	NA	NA	NA	NA	NA
	5	Drainage problem and associated health issue	NA	A	NA	NA	NA	NA	NA
Institutional	1	Formation of efficient water users group	A	A	A	A	A	A	A

Table 4.1 (Contd.)

Disciplines	SL No	Data needed for evaluating Irrigation Project Performance	Availability of data for the different selected projects from the secondary sources						
			Bhola Irrigation Project	Meghna Dhonagoda Irrigation project	Baramanikdi sub-project	North kalkini sub project	Keranigong Irrigation project	Aglar Chack Irrigation Project	Dublakuri khal kata khal project
Institutional (Contd.)	2	Cooperation and coordination among various institution involved	A	A	A	A	A	A	A
	3	Direct or indirect communication between the water users group and support agencies	A	A	A	A	A	A	A
	4	Accountability of the concerned institutions	A	A	A	A	A	A	A
	5	Skill and level of performance of support staff	A	A	A	A	A	A	A

Note: A = Data Available
NA = Data Not Available

CHAPTER-5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Over the past three decades irrigation projects in developing countries have received massive financial support. With such massive investment in irrigation, it is thus essential to evaluate the performance of completed projects for getting feedback for planning of new projects and improvement of existing ones.

The appropriate methodology for evaluation of irrigation project performance depend not only on the objective of evaluation, but also on the resources and time allocation for the purpose, the scope and limitation for data, the diverse local settings, project type and cost effectiveness.

For rapid evaluation, Rapid Rural Appraisal (RRA) technique may be effectively used because it can provide cost effective means of assessing project impact without too great a sacrifice interms of data quality and comprehensiveness. When it is needed to full evaluation, then the Project Impact Evaluation (PIE) methodology can be used. Because it is the only methodology which can provide a more comprehensive and reliable information on project impact including agriculture, livestock, fisheries, communications, environment, nutrition, social, institutions etc.

For conducting the performance evaluation of completed projects the major difficulty is the lack of adequate base line data concerning physical socio-economic and demographic condition in the project area. Also there has been a lack of monitoring of environmental factors. It can be concluded that the present monitoring and data collected by the concerned authority are not quite sufficient for evaluating the performance of the irrigation project.

Monitoring and evaluation should be an integral part of the irrigation project management and in planning stages this should be considered and for this purpose sufficient budget should be allocated. For evaluating the project performance, emphasis should be given on intensive data collection by the project authorities through regular monitoring of the completed project.

5.2 Recommendations for Further Study

For proper evaluation of the performance of irrigation projects, the related terms and terminology are needed to be distinctly defined and generalized in order to avoid the confusion and misunderstanding.

The key project performance indicators and factors and their interrelationship are needed to be properly identified.

To simplify the monitoring process of the irrigation project a common and systematic data checklist considering all important aspects of the project should be established.

Some performance standards for the different indicators are needed to be established so that the measured performance can be compared with the standard performance and measured performance can be quantified accordingly.

To quantify the irrigation project performance a multidisciplinary and comprehensive evaluation methodology should be developed and for this purpose Garces's ISOPI model can be taken for more detailed study and research to adapt this model for our country.

REFERENCES

ADB (1985), "Appraisal Report on Aglar Chak Irrigation Project", Asian Development Bank, 1985.

Ahmed, F. (1987), Evaluation of the Benefits of Source Flood Control Measures in Bangladesh, M.Sc. Thesis, BUET, Dhaka, Bangladesh.

Ali, Mohammad (1990), RRA, Concepts, Methods & Applications.

Bellekens, Y.S. (1985), Evaluation Irrigation Project Development and ystem Performance: Source Lessons Learned from Experience, Proc. of a Regional Workshops on "Methodology to Evaluate Performance of Irrigation Systems" held from 25-27 June 1985 in BARC, Dhaka, Bangladesh.

BETS, (1988), Fourth Evaluation of EIP Projects, Engg. Study Phase-II, September 1988.

Bhuiyan, S. (1982), Irrigation System Management Research and Selected Methodological Issues, IRRI Research Paper Series, No. 81, October, 1982.

Biswas, A.K. (1985), Evaluating the Impact of Irrigation Projects, Proc. of a Regional Workshop on "Methodology to Evaluate Performance of Irrigation Systems" held from 25-27 June 1985 in BARC, Dhaka, Bangladesh.

BNC, (1987), Evaluation Studies of BWDB Small Scale DFC Project, 1987.

BUP (1982), A Socio-Ecnomic Evaluation of Chandpur IP, Phase II, 1982.

BUP (1988), EIP Synthesis Report, Phase I Study, 1988.

BWDB (1979), Comprehensive Evaluation Report on CIP, 1979.

BWDB (1982), "Project Proforma for Dublakuri Khal Katakhal flood control drainage and irrigation project", BWDB, 1982.

BWDB (1984), "Project Proforma (PP) for Baramanikdi Sub-Project", BWDB, October 1984.

BWDB (1985), "Project Proforma for North Kalkini Sub Project", BWDB, 1985.

BWDB (1985), "project proforma on Meghna-Dhonagoda Irrigation Project", BWDB, July 1988.

BWDB (1986), "Project Proforma for Keranigong irrigation Project", February 1986.

BWDB (1989), "Project Proforma for Bhola Irrigation Project", BWDB, October 1989.

BWDB "Project Proforma for Aglar chak Irrigation Project" BWDB.

FAO (1985), Proc. of National Workshop on "Evaluation of Small Scale Irrigation Project Performance, Thailand", held on Bangkok, Thailand, 17-20 December 1985.

FAO (1986), "The Small Scale Water Resources Projects Performance Evaluation System" Prepared by Research Team FAO/TCP/THA/4516-1/3/36 October 1986.

FAP 13, (1991), Operation and Maintenance Study, Methodology Report, March, 1991.

FAP12, (1991), FCD/I Agricultural Study, Methodology Report 1 & 2 (September 1991).

FAP-12 (1992), FCD/1 Agricultural Study Project Impact Evaluation of Meghna-Dhonagoda Irrigation on Project, February, 1992.

Naqi S.A. (1982), "Socio Economic Feasibility Study of Kata khal and Dublakuri khal Project", University of Dhaka, 1982.

FPCO (1992), "Guidelines for Project Assessment", Bangladesh Action Plan for Flood Control, May 1992.

Garces C. and et. al. (1985), Methodology to Evaluate the Performance of Irrigation System in Bangladesh, Proc. of Regional Workshop on "Methodology to Evaluate Performance of Irrigation System" held from 25-17 June 1985 in BARC, Dhaka, Bangladesh.

Hoque, Md. Rafiqul (1990), A Special Study Report on Performance Evaluation of Irrigation Projects in South and South-East Asian Countries.

Jones, S. (1985), Considerations in Evaluation of Flood Control, Drainage and Irrigation Projects, Proc. of a Regional Workshop on "Methodology to Evaluate Performance of Irrigation Systems" held from 25-27 June 1985 in BARC, Dhaka, Bangladesh.

Levin, G. (1985), Performance Monitoring of Large Irrigation Systems - A view from India. Proc. of a Regional Workshop on "Methodologies to Evaluate Performance of Irrigation Systems" held from 25-27 June 1985, BARC, Dhaka, Bangladesh.

Mao Zhi (1989), Identification of Causes of Poor Performance of a Typical Large-sized Irrigation Scheme in South China. ODI/IIMI Irrigation Management Network Paper 89/1b, June 1989.

MPO (1985), General Guide lines on undertaking Evaluation of FCDI Projects. Draft Technical Report No. 25, November, 1985.

MPO (1985), Field Evaluation, Pathakhali-Konac Beel, MPO/HARZA, 1985.

MPO (1990), Evaluation of Historic Water Resource Development and Implications for the National Water Plan. National Water Plan Project, Phase-11, MPO, 1990.

Plusquellec H.L. and et. al (1990), Review of Irrigation System performance with respect to Initial Objectives, Irrigation and Drainage Systems 4, pp. 313-327, 1990, Kluwer Academic Publishers, Netherlands.

Sagardoy T.A. 91985), Methodology for Evaluation of Small Irrigation Systems. Nat. Workshop on Evaluation of Small Scale Irrigation Project Performance, FAO, June 1985.

Sevendson M. and et. al (1990), A frame work For Assessing Irrigation System Performance, Research Report, International Food Policy Research Institute, Washington, D.C., January 1990.

Technoconsult (1990), "Post Evaluation Study of Baramanikdi Sub Project" Technoconsult, 1990.

Thompson, P.M. (1990), The Impact of Flood Control On Agriculture and Rural Development in Bangladesh: Post-Evaluation of the Chandpur Project.

Zohir S. (1991), Economics of Surface Water Management, Bhola Irrigation Project, 1991.