A STUDY OF SELECTED BWDB SMALL SCALE PROJECTS

BY

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A Post Graduate Diploma Project

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CERTIFICATE

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

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We herby recommend that the project presented by Mr. Md. Matiur Rahman entitled "A STUDY OF SELECTED BWDB SMALL SCALE PROJECTS" be accepted as fulfilling this part of the requirements for award of Post Graduate Diploma in Water Resources Engineering.

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ABSTRACT

To get an immediate impact on the food-grain self-sufficiency, the Government of Bangladesh took initiative in implementing Small Scale Water development projects to get quick benefit at least cost. This strategy helped to develop some potential area for agriculture on a priority basis. It was also aimed to take the benefits of development works in a distributive way to the target group of population(Landless and Marginal farmers group). Following the concept, a large number of small scale projects have already been completed and many are still now being implemented by BWDB. Three such projects which are already in operation have been chosen for the present study to visualise the level of their performance. These are Mashajan-Lauhajong project, Polder 65/A-3 project, Mondakini Khal irrigation project.

The study reveals that Mondakini khal irrigation project is a successful one. It is being maintained as and when needed. It was evaluated well after its completion. The study reveals clearly its success in respect of different aspects of national development through increased agricultural production and also through socio-economic well-being. Mashajan-Lauhajong project is an incomplete one and Polder 65/A-3 project is in serious state of disrepair; but the result of this study shows their potentiality in obtaining the desired goal if rehabilitated properly. The study reveals the need for completing the excavation of the drainage canals upto the design requirement in Mashajan-Lauhajong project and raising of embankment height by another meter with reconstruction of breached portions of embankment in Polder 65/A-3 project for their proper functioning.

It is found from the present study that Mondakini Khal Irrigation Project, which is a completed and reasonably maintained BWDB Small Scale Project, has helped increase agricultural production to achieve self-sufficiency in food-grain. It is felt that rehabilitation work need to be carried out for projects having serious complaints of incompleteness and disrepair like Mashajan-Lauhajong Project and Polder 65/A-3 Project. It is also felt that completed projects should be supported with adequate maintenance fund and fostered by a local project maintenance committee formed of the members from the beneficiaries and backed by Bangladesh Water Development Board. This aspect should be given due importance in all projects. An implemented project should also be backed by farm support measures to attain increased agricultural productivity. This also deserves due attention for getting optimum benefit from any such project.

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List of Abbreviations

ADB	Asian Development Bank
B. Aman	Broadcasted Aman
B. Aus	Broadcasted Aus
BADC	Bangladesh Agricultural Development Corporation
BETS	Bangladesh Engineering and Technological Services
BNC	Bangladesh National Consultant
BUP	Bangladesh Unnayan Parished
BWDB	Bangladesh Water Development Board
CIDA	Canadian International Development Agency
C/S	Country Side
D	Drainage
D/S(d/s)	Down Stream
EEC	European Economic Community
EIP	Early Implementation Project
FC	Flood Control
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation
FY	Financial Year
GOB	Government of Bangladesh
H/H	Household
HYV	High Yielding Variety
I	Irrigation
IDA	International Development Association

IFAD	International Fund for Agricultural Development
Km	Kilometer
m	Meter
M	Million
PWD	Public Works Department
R/S	River Side
SIDA	Swedish International Development Agency
SSISP	Small Scale Irrigation Sector Project
T. Aman	Transplanted Aman
T. Aus	Transplanted Aus
UAA	Union Agricultural Assistant
U/S(u/s)	Up Stream
VEA	Village Extension Agent
WD	World Bank
WRS	Water Retention Structure

CHAPTER ONE

INTRODUCTION

1.1 General

Bangladesh has an area of 14.30 million hectares lying in the delta formed by world's three great rivers ---- the Ganges, the Brahmaputra and the Megna of which 8.6 M. hectares(60%) are cultivated. Out of 8.6 M. hectares, only 0.7 M. hectare is triple cropped and 3.3 M. hectares are double cropped and 4.6 M. hectares are single cropped. The cropping intensity is 1.54 [Khan, 1987].

After gaining independence in 1971, attaining foodgrain self-sufficiency emerged as one of the major policy objectives in Bangladesh for its burgeoning population. The population growth rate surpassed that of food production in those years, necessitating the annual imports of more than 1.6 M. tons of grains. It gave rise to a serious problem in a country which depends primarily on agriculture. Consequently, the overall development program, particularly agricultural investment have been geared to achieve self-sufficiency in foodgrain.

The strategy of the Government of Bangladesh(GOB) in the water sub-sector was to give emphasis short term, low capital investment per unit area, high rate of return projects, in order to fulfill its objective of achieving food self-sufficiency. Accordingly, priority was being given to minor irrigation schemes in areas of little or no flooding and to flood and salinity control and drainage schemes in areas of intermediate flooding. And so the trend of implementation of small scale projects emerged.

Among the aid giving agencies, those who showed interest to provide assistance in this type of projects include Asian Development Bank(ADB), World Bank(WB), International Development Association(IDA), the Netherlands Government, Swedish International Development agency(SIDA), and the Canadian International Development agency(CIDA).

In 1977 CIDA started its Food for Works(FFW) program. In 1978 it first started the Appurtenant Structure program. Early Implementation Projects(EIP) cell of BWDB with the technical and financial support from the Government of the Netherlands started its early implementation type small scale projects in 1975. Later the Swedish International Development Agency (SIDA) joined the program in 1981.

ADB aided Projects started by the end of 1983(December).

WB and IDA started appraising this type of projects on 1984.

Each of the agencies set forth some distinct criteria for accepting this type of projects. So for each agency, there is a different criteria for small scale projects. There are mainly three types of small scale projects are being implemented. These are----------

1) The small scale irrigation sector project(SSISP), financed by the Asian Development Bank(ADB) and European Economic Community(EEC).
2) BWDB Small Scheme Project, financed by IDA, WB and IFAD.
3) EIP cell guided small scale project financed by the Dutch Government and SIDA

Moreover, CIDA took a Small Scale Appurtenant Structure project to provide small scale water control structures at some potential area.

1.2 Criteria Of Different Small scale Projects

SSISP (ADB Aided) Projects :

1) Maximum benefitted area is 800 hectares.

2) Maximum Investment cost is US $ 1000(Tk. 31000) per hectare and

3) Involves simple engineering and labour intensive works.

EIP (SIDA and Dutch aided) Projects :

1) The project should be technically feasible.

2) The project needs to be economically viable and

3) It should be socially acceptable.

BWDB Small Schemes Projects(IDA, IFAD and WB aided) :

1) The project should have short gestation period.

2) It needs to invest low capital cost per unit area and

3) It should give high rates of return.

Appurtenant Structure Projects(CIDA aided) :

It maintains the same criteria as that of IDA aided project except the process of fund disbursement to the contractor.

1.3 Accomplishment upto this time

The projects which have been taken by Bangladesh Water Development Board(BWDB) by this time have been presented in Table 1.1, 1.2, and 1.3[Figure 1.1, 1.2, 1.3]. The extent of their progress has been indicated along with the listings.

1.4 Objectives Of the Present Study

After the inclination of the GOB to the Small scale Water Development Projects, a notable number of projects have been completed and are in operation by this time. Some of these projects have also been evaluated in terms of technical and agro-socio-economic impact.

The aim of the present study is to review the feasibility reports and appraisal reports of these projects along with their evaluation study reports and to discuss how these projects have been successful in fulfilling their objectives and contributing to the national development.

1.5 Methodology

The following methodology has been followed in this study :

1) Available documentation regarding the background of introduction of BWDB small scale projects and also information about the accomplishment of these projects upto this time has been collected and reviewed.

2) The feasibility reports, the appraisal reports and the evaluation study reports based on the technical and agro-socio-economical impact of the selected projects have been collected and critically reviewed.

3) Field visits have been made to collect the recent information about the level of performance of the projects.

4) A discussion based on the review of the feasibility reports, appraisal reports,evaluation study reports and the field visits has been presented and suggestions aiming at better performance of this type of projects have been provided.

1.6 The Selection of Projects For Present Study

Three projects have been selected from all over Bangladesh for review and study of their level of performance[Fig. 1.4]. These are --------

1) Mashajan-Lauhajong Project(Dutch and SIDA aided)

2) Polder 65/A-3 Project(Dutch and SIDA aided)

3) Mondakini khal Irrigation Project(IDA aided)

The first project is located in the district of Tangail. It is a drainage type project. It has been completed on June,1986 and was evaluated on 1987. The project was declared complete without completing the physical works as per design requirement. This resulted in many problems and the project could not attain the desired target.

The second project is located in the district of Cox's Bazar. It is very near to costal region. It serves for flood control, drainage and salinity control. This project had been completed in the year 1986-87 and was evaluated on 1987. It is a fresh project.

The third and last one is an irrigation type of project. It is located in the district of Chittagong. It was completed in the year 1982-83(April,'83) and was evaluated on 1987. It is a comparatively older project.

Among these three projects, the first one was completely devoid of any maintenance work. It was also not completed upto design level. The second one received minor yearly maintenance. The third one was well maintained. This maintenance aspect was considered as a major criteria in selecting the projects for the present study to show the differences in benefit achievement from these projects.

CHAPTER TWO

MASHAJAN-LAUHAJONG PROJECT

2.1 Location:

The project is located in Mirzapur Upazila under Tangail district about 24 km south-east of Tangail town and almost at the same distance from Mirzapur upazila proper. The Lauhajong river is in the north-east and the Bansi river is in the south-west of the project area[Fig. 2.1].

The area consists of a large number of Beels, namely---Kumilli beel, Mashajan beel, Bhaiyakura beel, Kuralia haor. The gross area of the project is about 11000 acres and net benefitted area is 4500 acres[Appraisal Mission Report, 1982].

2.2 Pre-project Problem and project concept:

The major problem in the area was early floods in March/April, caused by heavy local rainfall. These floods could not be evacuated quickly enough as the drainage capacity of the khals was insufficient and caused crop damage partially or fully. The other major problem with this project was late and slow drainage during post monsoon period.This used to hamper the harvest of Aman, cause delay in land preparation for Boro, prohibit the introduction of HYV paddy in the area and make Rabi cultivation only in limited areas.

Inflow into the area through the Nordana, Ufulki and Borrah khals used to occur during the monsoon, but was delayed, because the local people used to construct cross dams in these khals in June/July, before the Lauhajong

river rose above the "danger level". The cross-dams were either allowed to be washed away (2 years out of 5) or cut during August for quicker drainage [Appraisal Mission Report,1982].

In order to get rid of pre-monsoon drainage congestion due to rainfall and post-monsoon delayed drainage due to the inadequate drainage capacity of the khals and ill-effect of flooding due to high stage in Lauhajong river the following proposals were suggested[BETS, 1988, Engg. Study: Phase-I] :-

---- to excavate the Nordana khal(11.84 km) and its side channel, Nandapur khal(3.04 km).

---- to excavate the Borrah khal (3.68 km) and its three branch channels(total length 1.28 km).

---- to construct a 4-vent drainage sluice at the outfall of the Nordana khal and a 2-vent drainage sluice with provision for boat crossing at the outfall of the Borrah khal, and

---- to close the Ufulki khal.

2.3 Planning and execution

The project was scheduled for execution during 1983-84. But due to land acquisition problem the execution started in January'85 with the construction of two regulators only on the outfall of the Borrah khal and the Nordana khal. It was successfully completed within June, 1986. Due to land acquisition problem, the earthwork on khals started at the end of 1984-85 and was severely hampered due to public opposition. The spoil earth was heaped beside the khals instead of spreading over the agricultural fields. The sections also were not excavated upto design cross-section. The project was declared complete in June 1986 although the necessary excavation work could not be completed.

Nordana (2-vent) regulator was built as per revised design from its original plan of 4-vent. The Borrah regulator was modified in May 1985 as per the demand of the local people to have a vehicle passing in addition to the boat crossing type of structure.

The completed canal excavation work was quite different from the original plan due to land acquisition problem and public opposition[BETS, 1988, Engg. Study: Phase I].

2.4 The status of the physical work as mentioned in the evaluation report of 1987

During the Consultant's visit, they assessed that Borrah khal was more or less functioning well including its side channels even though it has some discrepancies in bed width and depth at some points. They also noted the siltation problem at the outfall of Borrah khal. Nordana khal was reported to be in serious problem due to improper construction comprising of inadequate sections ------ lesser bed width, higher bed level, milder or even reverse bed slopes etc. at some points. It was also reported that the outfall could not be excavated at all due to land dispute and suffered serious siltation problem. The condition of side channel ----- the Nandapur khal was also reported to be unsatisfactory. But the 2 regulators ---- Nordana (2 vent) and Borrah (1-vent) were reported to be in more or less good condition except some minor problems.

2.5 Present status of physical works

The present status of the physical works remained the same as that reported in the evaluation report of 1987. The present visit was made during the first 10-days of the month of August, i.e. monsoon period. So the canal sections

could not be inspected and verified. But the information as gathered from the local people and BWDB officials during this visit and those mentioned in the evaluation report of 1987 are summarised as follows:

Nordana khal

This khal is about 11.9 km long originating from Mashajan beel and runs through kumilli and Bhabkhanda beel and falls at Lauhajong river at Nordana. The over all condition of this khal is not good at all. Due to land acquisition problem and public opposition, necessary excavation work could not be completed and the khal remained irregular. At Chamari Fotehpur, the bed is at a higher level than upstream and the bed width was also less than that as per design. At Nordana the bed of the khal was badly silted up (upto 0.9 m at certain points) which was greatly hampering the drainage. The outfall of Nordana khal at Lauhajong river was badly silted upto the river bank level and also was hampering the drainage. For proper functioning as per planning, Nordana khal still needs to be brought to the design section from the outfall upto the Kumilli beel.

Nandapur khal

This khal is about 3 km long and originates from Nandapur beel and falls in Nordana khal near Patuli. The over all condition of this khal is not satisfactory. Width of this khal varied from 1.80 m to 3.00 m, depth of flow 0.30 m to 0.90 m without slope. During the visit it was observed that water hyacinth closed the khal at many locations. It needs to be re-excavated properly for quick drainage.

Borrah khal

This khal is about 3.70 km long originating from Bhaiyakura beel and falls at Lauhajong river at Chukuria. This khal is also connected by three side khals which carry water from Bottola beel, Mailakola beel and Chelota beel. The side channels were found to be in good condition. The Borrah main khal was also more or less in good condition except at a small portion at Gramatia and Deojani where bed width and depth were less than the design. From the downstream of Borrah sluice to the outfall of this khal is badly silted and thus hampering quick drainage.

Regulator on Borrah khal

This regulator is located at Chukuria near the outfall of Borrah khal. The construction of this regulator started in January, 1985 and completed in June, 1986. This is a 1-vent regulator having opening 3.05x11.90 m^2 with stoplogs and hoisting devices[Photo 3]. As the hoisting apparatus did not work properly, people found it easier to operate the logs with manual labour which was not much a problem. Some stoplogs were reported to be stolen. Part of loose apron in u/s and d/s were silted up.

Regulator on Nordana khal

This regulator is located at Nordana near the outfall of Nordana khal. The construction of this regulator started in January, 1985 and was completed in June, 1986. This is a 2-vent regulator of vent size 1.50x1.80 m^2. It was reported by the local farmers that the gates were not operated properly. The u/s and d/s loose apron on right side slopped portion are partly damaged[Photo 1 & 2]. The gates and lifting devices were in good condition.

2.6 Impact of Physical Works

2.6.1 Impact of the Project on Agriculture.

Background

Except two regulators, the canal excavation works could not be completed upto the design requirement due to public opposition and land acquisition problems. Nevertheless, the project was declared complete in 1985-86. An incomplete project is not expected to give the desired result and any evaluation of such a project will not give a proper performance picture. But this project however has been evaluated in 1987 based on only one year (1986-87) data regarding cropping pattern, yield per acre and cropping intensity.

Cropping pattern and cropping intensity

It can be seen from Table 2.4 and 2.5 that the implementation of the project has not introduced any new crop in the area. But the share of different crops has changed. The area under HYV rice has increased from pre-project level of 48% to 55% of the net cropped area. The area under local Boro has remained unchanged. The area under jute cultivation has declined from its pre-project level of more than 30% to less than 25%. But this declination can't be attributed to the implementation of the project, because the relatively lower price of jute may be responsible for it[BUP, Final Report on Mashajan-Lauhajong project,1988].

The area under oil seeds and potato has increased by about 15%. The area under wheat has increased upto 2.25% at present from less than 1%.

The cropping intensity has increased from 137 to 141[Bangladesh Unnayan Parishod(BUP), Final Report on Mashajan-Lauhajong Project,1988].

Productivity

Table 2.4 and 2.5 depicts present and pre-project productivity. Productivity per acre has increased in the case of almost all the crops. HYV (Boro) rice grow about 52 mounds per acre now compared to 47 mounds of the pre-project period and local boro grows 30 mounds per acre in place of 22 mounds. Aman rice, wheat and rabi crops also have a higher productivity now than before. Jute which has declined in acreage has grown almost the same quantity through increased productivity. The increase in productivity is largely attributable to the project[BUP, Final Report on Mashajan-Lauhajong project,1988].

Incidence of HYV

Table 2.4, 2.5 and 2.6 show the extent of HYV incidence. The incidence of HYV in the study area is more than twice that of Bangladesh as a whole (Table 2.3)

Benefit-cost ratio in agriculture

Table 2.4 and 2.5 show the B/C ratio in agriculture. It appears that the over all B/C ratio has lowered to 2.41 from 2.44.

2.6.2 Socio-economic Impact

Land Market

The project has some positive contribution towards increased agricultural productivity in the study area. This in turn influenced the market price of land which is evident from Table 2.7. This table depicts that the value

of land per acre on average has increased by more than 17% after the implementation of the project.

Share cropping

Share cropping is in practice on some 8% of the total cultivated land which was about 7.5% in the pre-project condition [Table 2.8].

Fishing as a source of income.

The fishing area is about 10% of the project area including khals, beels, rivers. According to the fishermen's version, the sluices had an adverse impact on the availability of fish compared to pre-project time. As can be seen from Table 2.9 and 2.10, fishing avenue for employment represents about 4.39% of the total mandays obtaining in the area. Prior to the implementation of the project this percentage was higher at 4.78%.

Employment labour Market.

A broad view of the occupational pattern obtaining in the project area has been given in the Tables 2.1 and 2.2. It was observed that 83% of households living in the area have agriculture as their primary occupation and 17% of them have a non-agricultural occupation.

Wage level

The wage rates have increased by about one fifth during the last year. But the increase could not be attributed fully to the project implementation. Rather it could be very much due to the inflationary price level obtaining in

the country as a whole and not much due to the project[BUP, Final Report on Mashajan-Lauhajong Project,1988].

Boatman in the area are greatly disappointed with the sluices as these obstruct their course[Photo 4].

Direct contribution of the project to Employment

The project involved a total cost of taka 156.22 lakh, about 75% of which was construction cost. Local workers, work supervisors,suppliers and contractors were the direct beneficiaries of these expenditures which generated new employment as well as income in the area[BUP, Final Report on Mashajan-Lauhajong Project,1988].

Impact on Communication.

No notable development on communication came into existence except that of the two sluices serving the area for bridge on the Nordana and Borrah khal.

Institutional Changes.

No notable institutional change occurred by the implementation of the project in the area.

2.6.3 Impact of the Project on Environment and Navigation

The country faced two big floods after the completion of the project. During the devastating flood of 1986/87 a large quantity of silt deposited at the outfall of Nordana khal. Due to the land acquisition dispute the outfall could not be re excavated. Thus the Nordana regulator became inoperative

leaving the part of the project area to its original problem of drainage congestion[BUP, Final Report on Mashajan-Lauhajong Project,1988].

The implementation of the project introduced problems for the navigation in the area. Because of the two sluices at Nordana and Borrah, navigation has been disrupted, especially at the time when flood water recedes to the khal level.

2.7 Discussions and Recommendations

2.7.1 Discussions

The agricultural impact as has been shown is based only on one year data, i.e. just before the flood of 1987/88 as after that the Nordana sluice and khal virtually became inoperative. The area which was reclaimed by the Nordana khal is no longer a reclaimed area as pre-monsoon and post-monsoon drainage congestion now again remains the same as before the project. Thus the cropping pattern, cropping intensity, productivity etc. are evidently not at the desired level at present.

The socio-economic impact may remain more or less at the level as expected but not wholly.

2.7.2 Recommendations

To reach to the desired goal of the project the following recommendations are made :

1) The land acquisition dispute must be reconciliated with land owner and villagers efficiently.

2) The khals must be excavated upto the designed section and slope and water hyacinth should be cleared up.

3) Adequate flood damage rehabilitation fund and yearly maintenance fund must be provided with for proper repair and maintenance work.

4) BWDB should have better control over the structures by appointing sluice khalashies for each regulator.

5) The sluices should be operated properly by a sluice committee formed from the villagers(beneficiaries).

CHAPTER THREE

POLDER 65/A-3 PROJECT

3.1 Project Location

The project is located some 64 km north of Cox's Bazar town and is bounded by Manikchari khal in the south, Harbang khal in the east, Barabakia Fari khal in the west and hilly areas in the north[Figure 3.1].

3.2 Benefited Area

The gross area of the project is about 1,300 acres. The net benefited area is 1,200 acres and the population is about 6,000[Appraisal Mission Report,1982].

3.3 Pre-project Problems And Proposed Solution

Pre-monsoon and monsoon flood water used to enter into the project area through the branches of Matamuhuri river by over topping the bank. When there was heavy rainfall in the hills, flash floods entered the area through Harbang khal and Barabakia Fari khal causing damages to T. Aman crops in most of the years. High salinity levels also aggravated the problem during pre-monsoon due to saline water intrusion through the Manikchari and Harbang khals[BETS, 1988, Engg. Study : Phase I].

To get rid of the aforesaid problems the following proposals were made[BETS, 1988, Engg. Study Phase I] :

a) Construction of 8.69 km of interior type embankment of which 4.50 km in the east having crest level 5.49 m +PWD and 4.18 km in the west having crest

level 5.18 m +PWD, having a design crest width of 4.27 m, slopes 1 : 3 (R/S) and 1 : 2 (C/S).

b) Re-excavation of 2.41 km of link channels and

c) Construction of 2 drainage sluices, each 1-vent one--- (0.90 x 1.20 m^2) in the eastern portion and the other (1.50 x 1.80 m^2) in the western portion.

3.4 Completed Physical Works

The completed physical works comprised of the followings[BETS,1988, Engg. Study: phase I] :

a) 9.63 km of embankment.

b) 3 drainage sluices, one 1-vent(0.91 x 1.22 m^2), one 1-vent (1.52 x 1.83 m^2) and one 2-vent(1.50 x 1.83 m^2).

c) 12 Nos. of Irrigation inlets by PVC pipe of 40 cm diameter.

d) 9 Nos. of spurs across the Manikchari khal.

The execution of the project started in the fiscal year 1982-83. The project was declared complete during the fiscal year 1985-86. During 86-87 some maintenance had been done which included repair of embankment, protection of PVC pipes with earth cover and new construction of 9 spurs from chainage 169.00 to 189.00. During the year 1987-88, the repair work of some breaches of the embankment were in progress.

3.5 Discrepancies in Work and Innovations

The length of the embankment was increased by 0.94 km compared to the length mentioned in the proposed solution due to the modification of alignment in order to keep proper set back. The construction of link channel was

dropped and in leu of link channel, a 2-vent(1.50 x 1.83 m^2) sluice was constructed across the Tarabonia khal because the cost involvement for link channel was higher than the sluice and more over it involves much trouble to acquire for constructing a link channel[BETS, 1988, Engg. Study, Phase I].

Nine spurs were constructed to protect the embankment because due to meandering of Manikchari khal the rate of erosion at the right bank of the khal was too high. Twelve Irrigation inlets were constructed to protect the embankment from cutting by the farmers to bring irrigation water in the project area.

3.6 Present Status of Physical Works

Embankment

During the tidal surges on July, 1989 the embankment breached at several locations and are waiting to be repaired. C/S slope of the embankment were found to be seriously damaged due to overtopping at so many locations.

From chainage 0.00 to 54.00

Within the above chainage two major breaches approximately 15 m and 25 m at chainage 36.00 and 24.00 respectively had been observed(photo 5 & 6). On the embankment top, water hyacinth were observed as the trace of over topping the embankment by flood water. From the local people it was learnt that water passed over about 1 m depth above the embankment top. The country side slope were found to be damaged seriously at so many places.

From chainage 54.00 to 110.00

In between the above chainage of the embankment R & H Department has built a brick soling road. This road was also over topped by the recent flood and was damaged at several locations.

At chainage 308.00 near Sluice no.3.

The closure of Tarabonia khal was completely washed away by the recent flood [Photo 7]. It breached several time before, i.e. in 1987, 88 etc.

Drainage Sluices

The three sluices were designed with flap gates on river side. Among the sluices, No. 1 of 1-vent(0.9 x 1.2 m^2) is located at Dingicuta, No. 2 of 1-vent (1.5 x 1.8 m^2) located at West Paharchanda, No.3 of 2-vent (1.5 x 1.8 m^2) located at West Paharchanda. Sluice No.1 & 2 were in more or less good condition. The backfill of sluice no.3 was washed away by overtopping water [Photo 8 & 9]. The sluices were found to be used as flushing sluices by the farmer to meet their irrigation demand for land preparation by lifting the flap gates with the help of ropes etc.

Irrigation Inlets

Twelve irrigation inlets were built under the embankment of this project at location of existing irrigation canals[Photo 10]. These are made of PVC pipes of 40 cm diameter and about 3.60 m long and plastered. These are functioning properly. During off season the inlets are plugged to prevent flood water to enter.

Spurs

Nine spurs were constructed across the Manikchari khal in between the Chainage 169.00 to 189.00 near the village Gobindapur during the year 1986-87. During the floods of 1987, 88 and 89 some of the spurs were partially damaged.

3.7 Impact of Physical Works

3.7.1 Impact of The Project on Agriculture

Background

The project was completed in the year 1985-86. Some minor repair, maintenance and construction works were done in the following year. An evaluation study was carried on taking the data of 1986-87 only, which reflects the post project condition if there is no flood hazard. The following years----- 1987, 88 and 89 may be considered as most unusual years for the farmers as in these years the project was subjected to severe flood problem by overtopping the embankment and severe breaching of the embankment. So the desired impact of the project could not be attained.

Cropping Pattern And Cropping Intensity

The project has not made any major change in the cropping pattern. However the area under different crops have changed to a great extent. The major crops cultivated in the area during pre-project period were Aus, Aman and Boro(HYV) and among the minor crops only chili, tomato, brinjal and rabi crops were cultivated to a smaller extent. During post project period the cultivation of Aus has been stopped. None of the households was found cultivating Aus in the post project period. This may be due to the large scale introduction of HYV Boro as irrigation facility has been increased considerably after the project(Table 3.1). Different types of seasonal vegetables are also cultivated within the homestead precinct and land available between main embankment and matamohori river. Table 3.2 depicts that a sizeable income of the household income is earned through selling these products. This is shown in terms of money value.

Cropping intensity by different land holding class have been shown in Table 3.3, which depicts that the average cropping intensity of the project area has been increased to 199% in the post-project time from 186% in the pre-project time.

Productivity

Table 3.4 indicates the per acre productivity of paddy cultivated in different crop season by various land holding classes. It is seen from the table that the productivity of Aman and Boro has been increased in all the land holding groups in the post-project period. Aus cultivation has been dropped in the area. The cause may be the lower productivity. As can be seen from the table that per acre productivity of Aus paddy is 77% of Aman paddy and 45% of Boro paddy production of post-project period. The average productivity of Aman per acre is 33 maund and that of boro is 55 maunds per acre while those in pre-project time were 28 maunds and 46 maunds respectively.

Use Of Irrigation

The farming society associated to the project area has been practising irrigation due to its position since long before the project commencement. The people started using irrigation to land by making a cross-dame at the down stream of a distributary canal of the Matamohuri river which is locally known as Barabakia khal. This cross-dame also controlled the salinity intrusion to the project area during pre-monsoon. Later on the supply of water through Matamohuri river decreased due to large scale withdrawal of water for irrigation in the upstream region. To face the shortage of supply of water the people started sinking hand tube well for irrigation purpose[BUP, Final Report on Polder 65/A-3, 1988].

The Benefit Cost Ratio In Agriculture

The benefit cost ratios has been shown in Table 3.6. This table indicates that investment in paddy cultivation yields 148.21% of invested cost at present against 101.54% in pre-project period. However, incremental benefit cost ratio indicates a significantly larger return by 268.44% more on incremental investment. Thus it may be concluded from these facts that the project has achieved expected target in agriculture by assuring higher return on individual investment.

3.7.2 Socio-economic Impact

Tenurial Arrangement

The share of land operated under tenurial system existing in post and pre-project period have been presented in Table 3.7 as has been found during the evaluation of 1987. This table shows that the share of pure tenants has gone to 16.16% at present from 11.29% in pre-project period. The share of owner farmers of different classes in the post-project period have significantly increased compared to their corresponding share in pre-project period except large farmer.

It is also revealed from Table 3.8 that the changes of average size of land operated by different land holding class in post-project period over pre-project period is progressively becoming lower with the size of landholding groups. Thus it may be concluded from these facts that the project has at least achieved its target by improving the condition of small land operating groups through providing security of crops, improved yield rate of cultivated crops.

Employment And Labour Market

The findings of the BUP intensive sample survey on labour use have been presented in Table 3.9 and Table 3.10. The area operated by different landholding class by crop wise in post and pre-project has been shown in Table 3.1.

It can be seen from Table 3.10 that the labour use per acre is higher in the post-project period than in the pre-project period. The over all use of all type of labour use pattern has shown downward trend as in other rural areas of Bangladesh. As the table depicts that the casual labour and periodical labour mainly have come from landless and marginal farmer families. Thus it can be concluded from this figures that the project has obtained its one of basic ambitions by creating scope of employment for target group people in agriculture with a minimum daily average wage rate of Tk.36/-[BUP, 1988, Final Report on Polder 65/A-3].

Impact on Communication

The road transport has been playing most important role in improving the over all environment of the area. The polder dike is now used for the plying of motor vehicles and rickshaws operated between Baniar chara and Barabakia union. Many well to do people of this area now start investing on transport vehicle along with the investment in agricultural land[BUP, 1988, Final Report on Polder 65/A-3].

The improvement of transport facility may be treated as another impact of the project other than agriculture. With the improvement of both road and other transport in the post-project period, the fishermen, the farmers and other pity traders do not face any trouble and difficulty in selling their product.

Institutional Changes

No notable institutional change has been found to occur in the project area due to the implementation of the project.

3.7.3 Impact of the Project on Environment

The project has made a remarkable impact on the environment of the project area. With the installation of irrigation inlets along the perimeter dike at planned and suitable points the irrigation water from the Matamohuri river can be supplied to almost all the area through low lift pumps for the cultivation of boro crop(HYV). This is one of the direct help of the project to the cultivators to facilitate equatable distribution of irrigation water[BUP, 1988, Final Report on Polder 65/A-3].

The fishermen used to fish in the natural outlets of the project during high tide in pre-project time. With the introduction of the EIP scheme, the whole fishing activity of traditional fishermen have been stopped. But the availability of fish in those natural outlets has been raised to a substantial amount. This is partly attributed to the availability of water in those places for longer time at present due to large scale introduction of irrigation in the project area[BUP, 1988, Final Report on Polder 65/A-3].

3.8 Discussions and Recommendations

3.8.1 Discussions

After the completion of the project, the people of the area got 1986-87 as the normal monsoon year. The evaluation study of 1988, was carried on taking the data of that year only. The study reveals that the impact on agriculture ----- especially in productivity, cropping pattern and cropping

intensity, and B/C ratio is in a positive trend. The socio-economic impact is also an inspiring one.

However, after that year the project area experienced devastating floods in three consecutive years, namely ---- the flood of 1987, 1988 and the surge of 1989(July). In every year the embankment was damaged seriously. Flood water overtopped the embankment and the embankment breached at several places. To get relieve from the stagnant flood water, public cut the embankment at several locations deliberately. Obviously peoples are now quitely dubious about the fruitful outcome of the project. But if we consider the impacts in agriculture and socio-economic aspects as depicted in the evaluation study report of 1988, it can be said that if the project is rehabilitated and maintained effectively, it will be able to achieve the target.

3.8.2 Recommendations

To attain the desired effect the following recommendations may be suggested :

1) Embankment top level needs to be raised with proper flood frequency analysis. The local people demand to raise it by another meter.

2) The sluices need to be operated properly by trained sluice khalashies.

3) It is attributed that the embankment is cut by the people deliberately at some points to get relieve from the flood water which entered the project area by overtopping the embankment. This problem needs to be taken care for reducing maintenance cost.

4) A detailed study of the project need to be carried out to review the need of additional sluices to facilitate quicker drainage.

CHAPTER FOUR

MONDAKINI KHAL IRRIGATION SUB-PROJECT

4.1 Project Location

The sub-project area lies between latitudes 22°-36'-20" and 22°-38'-20" north and longitudes 91°-46'-0" and 91°-48'-20" east. The area is within Hathazari Upazila under Chittagong district and situated at about 32 km north-west of Chittagong city on the left side of Chittagong Rangamati R&H road. On the south of the sub-project area, there is the Sitakundu Hill Range and on the east, Chittagong-Nazirhat Railway line[Figure 4.1].

4.2 Benefited Area

The sub-project covers a gross area of 1100 acres and net cultivated area of 706 acres[BNC, 1987].

4.3 Pre-project Problem and Proposed Solution

The project area was suffering from lack of irrigation facility. Only one crop, Aus was grown in the area without irrigation. People started using dry weather flow of Mondakini khal during winter for heading up water and diverting the same to the field which offered them gravity flow irrigation facility. The system had more than one difficulties. Firstly, in case of rain in the late winter the cross-dame used to be breached causing losses to the crops. Secondly, the cross-dames were to be removed at the advent of each monsoon season to allow flood water to pass and reconstructed again in the winter for storage purpose[BNC, 1987].

The concept of the sub-project was developed in order to overcome the aforesaid difficulties and to utilise water of the Mondakini khal in a more permanent, systematic and efficient manner by the provision of a Water Retention Structure(WRS) on the Mondakini khal which will ensure more retention of water for irrigation facility and afford gravity irrigation flow to the field and allow flood water during monsoon to pass through the structure. Five field outlets would provide distribution of irrigation water to the field. The sub-project was intended to provide gravity flow irrigation facilities to an area of 1100 acres gross and 706 acres net[BNC, 1987].

4.4 Status of Physical Work as Mentioned in the Evaluation Report of 1987

Under FFW programme the Mondakini khal was excavated in 1981-82. Water Retention Structure (WRS) was constructed during financial year(FY) 1982-83. WRS has centrally 9 vents 1.52m x 3.51m(water retention height 3.05m) and 6 vents(three vents each side) 1.52m x 2.59m(water retention height 1.07m).

Five field outlets made of 0.30m dia. R.C.C pipes over c.c bed were constructed. The structural condition of all these constructions are reasonably good except minor patches required here and there.

4.5 Present Status of Work

All the components of the project is working satisfactorily as major maintenance work was done after the flood damage of 1987&88.

4.6 Impact of Physical Works

4.6.1 Impact of the Project on Agriculture

Cropping Pattern And Cropping Intensity

In the pre-project condition the cropping pattern was local B. Aus followed by Rabi and also T. Aus followed by Rabi and local T.Aman singly. The farmers of Mondakini project are at present cultivating HYV Boro which was not done in the pre-project condition. The farmers have also switched from T. Aman (local) to T. Aman(HYV). The main cropping pattern in the post-project condition is HYV Aman followed by HYV Boro. The other pattern is local B. Aus followed by Rabi crop[BNC, 1987].

As is seen from Table 4.1, the total cropped area has increased from 982 acres in pre-project condition to 1412 acres in post-project condition and thereby raising the cropping intensity from 139 in pre-project condition to 200 in post-project condition .

Productivity

Yield per acre of major crops has considerably increased in the post-project period as compared to the pre-project period. This has been achieved mainly due to the introduction of HYV paddy in the sub-project area which is made possible by project implementation. As Mondakini khal irrigation sub-project is a paddy dominated area, the increase in yield per acre is very significant for paddy. For the sample household, average per acre production of paddy during the period prior to project implementation was 633 kg(17 mds), the figure for the post-project period being 1600 kg(43 mds), an increase of 976 kg(26 mds), per acre[Table 4.2].

Incidence of HYV and Other New Crops

Table 4.2 shows that after completion of the project T. Aman(HYV) covered about 36.10 acres and Boro(HYV) covered 32.10 acres of area which were not the cultural practices before the project. Flower cultivation on commercial basis has been enhanced by irrigation water.

B/C Ratio and IRR in Agriculture

In Table 4.3 the B/C ratio in agriculture has been shown to be 4.62 and IRR has been shown to be 27.00%, thus showing the project viable one.

4.6.2 Socio-economic Impact

The project has increased the productivity of land by providing irrigation facilities and also it provided with the emergence of HYV paddy. Thus it influenced greatly the market price of land. The local people supported the fact that the implementation of the project has elevated the land price.

The seasonal characteristics of employment in the area has been greatly changed. As cropping intensity, cropping pattern and cultivating area has changed notably [Table 4.4, Table 4.5 and Table 4.1], the seasonality of employment has been reduced greatly. Present seasonal characteristics of employment is shown in Table 4.6.

During the implementation period of the project 2.93 million Taka was expended, whose direct beneficiaries were the local suppliers, contractors, skilled labours, day labours(semi-skilled and unskilled) etc. This is a direct contribution of the project to the local people[BNC, 1987].

The WRS on the Mondakini khal is serving as a bridge adding on the village road communication.

Awareness regarding agriculture has been increased in the area. Table 4.7 shows that a high percentage of the farmers are aware of the existence of agricultural extension services provided by Village Extension Agent(VEA)/Union Agricultural Assistant(UAA) block supervisors and such institutions like BWDB, Bangladesh Agricultural Development Corporation(BADC), Fisheries department, Forestry department etc.

4.6.3 Impact of the Project on Environment

After the implementation of the project the area is ensured with irrigation water facilitating more intensive cultivation, thus creating a positive environmental change.

4.7 Discussions and Recommendations

4.7.1 Discussions

The project was started on 1981-82 and was completed on 1982-83. It has been evaluated on 1987. The evaluation reveals that the project is a successful one. The local people has been benefitted as desired. HYV has been introduced in cultivation practice. Cropping intensity, cropping pattern, productivity etc. have been notably increased.

As and when required major and minor maintenance work was done, which lead the project to reach the goal. Nevertheless, there exist some problems as described in the evaluation report. The recommendations as suggested in the evaluation report was not implemented yet.

4.7.2 Recommendations

It is important that the recommendations made in the previous evaluation study report be implemented for making the project more efficient one, which have been reiterated here[BNC, 1987] as:

1) The stoplogs in the WRS are made of wood which needs replacement every year. This is very costly. So it should be replaced by plastic fall-boards.

2) There is no O&M Manual for this project. O&M Manual needs to be prepared by BWDB based on their operation and maintenance experience.

3) A technical unit needs to be created for O&M purpose. The technical unit should be trained to understand drawings, preliminary design and function of the structure and its operation and maintenance requirement. This is vital for the effective performance of the structure and realisation of the intended benefit of the project.

Moreover as has been described in socio-economic impact that the people of the project area is aware of agricultural extension services, but could not receive any help from them, it needs to ensure frequent meeting of Agricultural extension staff with the farmers to provide the farmers with requisite advices to make the project more successful.

CHAPTER FIVE

DISCUSSIONS AND RECOMMENDATIONS

5.1 Discussions

After implementation of any project, the people of the project area needs to be made conversant about the project utility and usefulness. Peoples usually run through a critical transition period before accommodating themselves with the project facilities and contribution. So a period needs to be passed to reach the project to the desired goal. Thus to see the consequence of the project, it should be evaluated well after its completion.

The present study shows that Mondakini khal irrigation project is a successful one. It has been evaluated well after its completion. So the impact study reveals clearly its performance in different aspects.It is contributing to national development through increased agricultural production and also through socio-economic aspect.

Mashajan-Lauhajong and Polder 65/A-3 project have been evaluated immediately after their completion. So it is very much probable that those projects could not reach their goal. Moreover, these projects were not implemented upto the design requirement, and also yearly maintenance works were not done properly as required. So the impact study for such projects can not be expected to give any conclusion regarding their performance. Nevertheless, we see from this review that the implemented projects have contributed a great deal to the national development. The impact of the projects on Agriculture, reveals a positive trend of introduction of HYV crops, and increase of cropped area and crop security. Cropping intensity has also increased significantly. Productivity

of almost all crops has increased. Though the B/C ratio in case of Mashajan-Lauhajong project is found to be decreased, we can see the thing in other ways. Increased productivity and cropped area led to an increase in total production of crops, which in turn helped us to feed our burgeoning hungry population and helped reduce import of grains. So it can be seen as a benefit in the sphere of self-sufficiency of food.

From socio-economic point of view, though no significant institutional changes occurred, still the projects may be thought to be successful as share cropping system and wage level had soared up by benefitting the target group, which was a major objective of this type of projects. Yet, the target group of population remains, at best, on the periphery of the benefits of the projects in terms of increased agricultural productivity and income. There is no indication that landownership will go in their favour in any foreseeable future. Manipulation with operation of the structures by local elites adversely effect them. More importantly, a number of traditional occupation groups, minority though and belonging to the target group of population, have also been adversely affected.

Still, the conclusion should be that the Small Scale Water Development Projects are vital to increase agricultural production and adding to national development by achieving self-sufficiency in food-grain. But the projects need to be planned, designed, and implemented to realise fully the production oriented goal, and articulate distributive mechanism to be introduced to realise the target-group-oriented goal.

5.2 Suggestions and Recommendations

Though specific recommendations have been made at the end of each project review, the following general recommendations may be forwarded in achieving the physical target of BWDB Small Scale Projects, reaching the production oriented goal, and conveying the benefits of the projects to the target group of people, and or the adversely affected groups.

5.2.1 Rehabilitation of Existing projects

The projects should be made structurally sound. After all, a defective plant cannot produce a quality output. Before the question of the routine operation and maintenance of the projects is considered, rehabilitation work should be carried out for projects having serious complaints of incompleteness and disrepair.

The rehabilitation program should be preceded by detailed technical studies, but somewhat different from the traditional one in approach. Unlike a new project proposal, the old and already completed projects have generated sufficient public awareness about their good as well as bad effects. Their real need regarding irrigation and drainage have already been identified clearly. Therefore, the technical studies should address to the popular views on technical aspects and see to what extent those could be accommodated technically. If certain views are found untenable, they should be convinced about it.

5.2.2 Operation and Maintenance

In operation and maintenance of the project components the following suggestions are recommended:

a) Each components of the projects should be maintained by a maintenance committee with administrative backing from the BWDB and proper balanced representation of the concerned section of the local people.

b) The operation and maintenance committee should have adequately trained technical personnel with requisite tools and equipments.

c) Proper representation of the interest groups in the maintenance committee is essential for neutralising unauthorised activities detrimental to maintenance of project components.

d) Provision for adequate maintenance budget should be kept.

5.2.3 Achieving Production Oriented Goal

An implemented project should be backed by farm support measures to attain increased agricultural productivity, a goal which does not depend on development of physical base only. Such farm support measures should centre on irrigation management, input delivery and proper extension services.

5.2.4 Reaching Benefits to the Target Group

The project should be planned and executed keeping a bias in favour of the poor people so that during and after completion of the projects they could be benefitted in real sense, avoiding the rich and well-placed to be benefitted exclusively.

5.2.5 Planning and Execution of New Projects:

New projects should be planned with more meticulous care. A set of alternative technical and socio-economic feasibility study may be made and the people's opinion can be asked on these. The final selection should depend on the findings of the study.

TABLES

Table 1.1
ADB and EEC aided Projects

Sl. no.	Name of Project	Location	Objective	Area(hectare) Gross	Net	FC	I	D	Physical Progress%
1.	Barnai River sub-project	Natore	D/FC/I	5080	3811	2430	1251	810	100%
2.	Barkati Beel Sub-project	Tangail	D/FC	445	365	365	----	122	100%
3.	Hanger Khal Irrigation Scheme	Chittagong	I	765	367	---	367	---	100%
4.	Pakuria Beel Sub-project	Faridpur	D	2590	2228	---	---	2228	100%
5.	Haijda Embankment Project	Neytrokona	FC/I	9717	8097	5830	3240	810	60%
6.	Tirnai River Sub-project	Panchagarh	I	328	316	----	316	316	100%
7.	Ramchandi River Project	--Do--	I	380	364	----	364	364	100%
8.	Versa River sub-project	--Do--	I	433	417	----	417	417	100%
9.	Tangon sub-project	Thakurgaon	I	4632	4454	----	4453	4453	72%
10.	Tulshi Beel sub-project	Panchagarh	I	202	202	----	202	----	100%
11.	Aglar Chak Irri. project	Dhaka	FC/I	7935	4656	2996	2632	405	20%
12.	Keraniganj Irri. project	Dhaka	FC/I	10931	6883	4453	3240	810	16%
13.	Boalkhali Irrigation Project	Chittagong	FC/I	12550	7287	4858	4858	3644	6%
14.	Balali Padmasree Irri. Project	Netrokona	FC/I	2389	2024	1620	405	----	38%
15.	Gugrajola Irrigation Project	Commilla	FC/I	8705	4656	3240	4292	----	0.5%
16.	Gurmar Haor Irri. Project	Sunamganj	FC/I	7247	5263	4858	4312	810	47%
17.	Sonamoral Haor Irri. Project	---Do---	FC/I	3725	3158	2429	1620	405	50%
18.	Patuakhali Polder 43/2B Sub-project	Patuakhali	FC/I	5466	5247	5247	3036	2024	33%
19.	Patuakhali polder 52/2C Sub-project	Patuakhali	FC/I	6275	6024	6024	3563	2029	33%
20.	Tarail Pachuria Polder 2 sub-project	Gopalganj	FC/I	8300	5810	5810	2753	1619	42%
21.	Madhukhali Baliakandi Irri. Project	Rajbari	FC/D/I	9448	8048	6480	1000	1000	15%
22.	Patuakhali Polder 55/3 Project	Patuakhali	FC/I	9545	7403	7403	----	7403	14%
23.	Patuakhali Polder 55/4 Project	Patuakhali	FC/I	5142	4288	4288	----	4288	24%
24.	Kamarnogaon FCD Project	Tangail	FC/D	5652	4409	4000	----	2000	2%

Source : Directorate of Planning Schemes II, BWDB, Dhaka.
Note : FC = Flood Control, D = Drainage, I = Irrigation.

Table 1.2
IDA Aided Project

Sl. No.	Name of Project	Location	Objective	Area(hectare) Gross	Net	FC	I	D	Physical Progress%
1.	Kalaroa Drainage Project	Sithkhira	D	8090	---	---	---	8090	93%
2.	Chenchury Beel Project	Narail	I	----	1090	---	1090	245	0%
3.	Kangsha River Project	Netrokona	FC/D	11620	11620	11620	---	11620	---
4.	Bighai River Project	Patuakhali	FC	-----	6980	6980	900	----	100%
5.	Sutki River Project	Habiganj	FCD	810	810	810	810	810	90%
6.	Perizpur-Hizalgachi Project	Rajshahi	I	----	----	----	672	203	---
7.	Polder 39/A Project	Barguna	FC	----	----	11750	3000	----	---
8.	Rahimpur khal Regulator		FC	----	----	10930	----	----	---
9.	Polder 39/1C Project	Barguna	FC	----	----	5870	1200	----	---
10.	Kalidaskhali-Arpara Project	Magura	FC/D	16150	16150	16150	2210	16150	---
11.	Madhabpur sub-project	Habiganj	FC/D	9550	9550	9550	----	9550	---
12.	Polder 56/57 Extension Project	Bhola	FC	----	----	4520	----	----	---
13.	Gangajuri Haor Sub-project	Habiganj	FC/D	15850	----	15850	1130	15850	---
14.	Arol Beel Project	Jessore	D	----	----	-----	2800	15750	---
15.	Paisarhat Ramsil Project	Barisal	FC/D	----	----	7280	2988	-----	---
16.	Halda Extension Project	Chittagong	I	----	----	----	2820	1410	---
17.	Polder 52/53(A&B) Project	Patuakhali	FC	----	----	8030	4395	----	---
18.	Shakuchia Island (Polder 59/2) project	Bhola	FC	----	----	4310	2100	----	---
19.	Tarail-Pachuria-Polder 485 Project	Gopalganj	FC/D	4150	----	4150	2214	4150	---

Source : Directorate of Planning Schemes III, BWDB, Dhaka.
Note : FC = Flood Control, D = Drainage, I = Irrigation.

Table 1.3

EIP-Cell Guided Projects(Dutch & SIDA Aided)

Sl. No.	Name of Project	Location	Objective	Benefited Area (hectare) Gross	Net	FC	I	D	Physical Progress%
Projects Taken in : 1975-76									
1.	Repair of Dhohamata Closure Polder 10-12	Khulna	Closure	16194					completed (75-76)
2.	Re-excavation of Singua River	Kishoreganj	D	5263					,, (77-78)
3.	Re-excavation of Batkazal khal	Patuakhali	D	2834					,, (78-79)
4.	Re-excavation of Roachala khal	Comilla	D	3644					,, (78-79)
5.	Strenthening Embankment and Re-excavation Works G.K. Project	Kustia	Rehab.	27530					,, (78-79)
6.	Construction of Embankment in Hizla	Borisal	FC	5263					,, (78-79)
7.	Re-excavation of Chandana Borasia River	Faridpur	I	3239					,, (78-79)
8.	Satla-Bagda Project(Main)	Borisal & Pirojpur	FC	1619					,, (78-79)
9.	Development of Karnahar Barabila	Rajshahi	FC	3502					,, (78-79)
10.	Madargang Closure (Dropped in 1981)								
11.	Polder 27/2	Khulna	Closure	486					,, (78-79)
Projects Taken in : 1977-78									
12.	Raktodhoha Lahachura Scheme	Naogaon & Bogra	FCD	8907					,, (81-82)
13.	G.K. Project Phase-I	Kushtia	Rehab.	60729					,, (80-81)
14.	Somespur Beel Drainage Scheme	Pabna	D	1619					,, (78-79)
15.	Lohagara Flood Protection	Narail	FC	6073					,, (78-79)
16.	Lashagate Nolgora khal	Borisal	DI & Navi.	2429					,, (79-80)
Projects Taken in : 1976-77									
17.	Polder 26	Khulna	FC	2024					,, (81-82)
18.	Tala Thana	Satkhira	FCD	3441					,, (81-82)
19.	Sati Nadi	Lalmonirhat	FC	5263					,, (81-82)
20.	Rouha Bakchari	Jamalpur	D	4170					,, (81-82)
21.	Patakhali Kona	Tangail	FC	1377					,, (81-82)
22.	Chagutia	Faridpur	I	1012					,, (81-82)
23.	Bhitabari Damosh	Nowabganj	D	3239					,, (81-82)
24.	Tulshi Ganga	Joypurhat	FCD	5263					,, (82-83)
25.	G.K. Project Phase-I	Kushtia	Rehab.	60729					,, (81-82)
26.	Tista Right Embankment	Nilphamari	FC	33603					,, (81-82)
Projects Taken in : 1978-79									
27.	Chakamaya-Panchakuraila Closure	Barguna	Closure	10121					,, (81-82)
28.	Kalaiya-Nehalganj	Patuakhali	D	2429					,, (80-81)
29.	Padrishibpur	Barisal	D	2834					,, (81-82)
30.	Faliar Beel	Rajshahi	D	2429					,, (81-82)
31.	Polder 34/3	Bagerhat	FCD	2429					,, (81-82)
32.	Jamuna Khal	Comilla	DI	6073					,, (81-82)
Projects Taken in : 1979-80									
33.	Singla-Nabugati	Narail & Jessore	FCD	7693					,, (83-84)
34.	Polder 63/1B(Dropped in 1985)								
35.	Amtali Closure	Barguna	Closure	4049					,, (82-83)
36.	Bordal Khal	Kishoregonj	D	2632					,, (83-84)
37.	Extension Polder 6/S	Satkhira	FCD	3644					,, (83-84)
38.	Sandwip Embankment (Special Project)	Chittagong	FC	20243					,, (86-87)
Projects Taken in : 1980-81									
39.	Bhedra Beel	Natore	D	7490					,, (82-83)
40.	Konapara Embankment	Mymensingh	FC	3117					,, (82-83)
41.	Katakhali khal	Jamalpur	FCD	2227					,, (82-83)
42.	Bhola N E Embankment	Bhola	FC	8704					,, (83-84)
43.	Char Faizuddin	Bhola	FC	1336					,, (82-83)
44.	Shanghair Haor	Sunamgonj	FC	3441					,, (83-84)

Continued Table 1.3

Sl. No.	Name of Project	Location	Objective	Benefited Area (hectare) Gross	Net	FC	I	D	Physical Progress%	
	Projects Taken in : 1981-82									
45.	polder 35/3	Bagerhat	FC		4858				,,	(84-85)
46.	Gangrail Closure	Khulna	Closure		3097				,,	(82-83)
47.	Extn. Pathakhali Konai	Tangail	FC		1822				,,	(82-83)
48.	Gazaria Beel	Kishoregonj	FCD		2591				,,	(84-85)
49.	Polder 66/3	Cox's Bazar	FCD		1012				,,	(83-84)
50.	Polder 65/A-1	Cox's Bazar	FC		2713				,,	(-----)
51.	Angeroli Haor	Sunamganj	FC		2429				,,	(84-85)
	Projects Taken in : 1982-83									
52.	Barakpur-Dighalia	Khulna	FCD		2429				,,	(84-85)
53.	Katakhal-Dublakuri khal	Jamalpur	FCD		4049				,,	(83-84)
54.	Polder 65/A-3	Cox's Bazar	FCD & SC		445				,,	(85-86)
55.	Damrir Haor	Sylhet	D		6073				,,	(85-86)
56.	Mashajan-Lauhajong	Tangail	D		1822				,,	(85-86)
57.	Chatlar-Fukurhati	Faridpur	D		1215				,,	(84-85)
	Projects Taken in : 1983-84									
58.	Zilkar Haor	Sylhet	FCI		4251				,,	(86-87)
59.	Patharchuri Haor	Sylhet	FC		4049				,,	(86-87)
60.	Nagor River	Bogra & Natore	FCD		9312				,,	(85-86)
61.	Sowra Beel	Bogra	D		1619				,,	(85-86)
62.	Hamodor Beel	Jhenidah	D		1619				,,	(85-86)
63.	Aliar Beel	Tangail & Dhaka	D		1822				On-going	
64.	Polder 43/2C	Patuakhali	FC		2146				Completed	(85-86)
65.	Nawtana Khal	Netrokona	FC		2146				Dropped	(89-90)
	Projects Taken in : 1984-85									
66.	Nagor Valley	Naogaon & Bogra	FCD		11000				Completed	(86-87)
	Projects Taken in : 1985-86									
67.	Faridpur Area-I	Rajbari & Kushtia	FCD		15000				On-going	
68.	Patakhali-Konai ROM	Tangail	FCD		2074				,,	
69.	Shanghair Haor ROM	Sunamganj	FCD		4200				,,	
	Projects Taken in : 1986-87									
70.	Boram Haor	Sunamganj	FC	5500	4500				,,	
71.	Bhutiar Beel	Khulna & Narail	FCD & SC	13300	9000					
72.	Balushair Embankment	Narsingdi	FCDI & Reclamation from Water hyacinth	2700	2300				Dropped	
73.	Sonail Embankment	Gaibandha	FC	5700	4600				On-going	
74.	Nuruller Beel	Gaibandha & Bogra	FCD	16600	8500				,,	
75.	Bhanda Beel									
76.	Satdamua Katler Beel	Gaibanda	FCD		4500				,,	
77.	Upper Nagor River	Bogra & Natore	FCD		10000				,,	
78.	Surjamoni Khal	Patuakhali	DI		1800				,,	
79.	Satla-Bagda P-3(Rehab.) ROM	Barisal	FCD & Reclamation from Water Hyachinth		1450					
80.	Flood Damage Repair									
	Projects Taken in : 1988-89									
81.	Upper Nagore Valley	Bogra	FC		3350				,,	
82.	Badalgachi	Naogaon	FC		11400				,,	
83.	Bamankhali-Baronali	Narail & Magura	FCDI		13500				,,	
84.	Shakpaldia	Faridpur	FCD		1220				,,	
85.	Polder 43/2E	Patuakhali	FC		1350				,,	
86.	Tangua Haor	Sunamganj	FC		4500				,,	

Continued Table 1.3

Sl. No.	Name of Project	Location	Objective	Benefited Area (hectare) Gross	Net	FC	I	D	Physical Progress%
*	Bibichini	Barguna	FCDI	2700	2300				
*	Atrai-Kakra	Dinajpur	FC	6000	3000				

Note : FC = Flood Control; FCD = Flood Control & Drainage; FCDI = Flood Control, Drainage & Irrigation; D = Drainage; I = Irrigation; SC = Salinity Control.

Source : Directorate of Planning Schemes IV, EIP Cell, BWDB, Dhaka.

Table 2.1

Occupational Pattern in the Mashajan-Lauhajong Project area
Percentage of Heads Of H/H

Landholding Class (Area in acre)	Agriculture (Primary)	Non-agriculture (primary)	Total
Landless (0 - 0)	10.77 (12.98)	5.46 (32.20)	16.23
Marginal (0.01 - 0.99)	27.16 (32.70)	3.59 (21.19)	30.75
Small (1.00 - 2.99)	34.47 (39.10)	6.04 (35.59)	38.51
Middle (3.00 - 6.99)	10.78 (12.97)	1.58 (9.32)	12.36
Large (7 + above)	1.87 (2.25)	0.28 (1.70)	2.15
Total	83.00 (100)	17.00 (100)	100.00 (100)

Source : Table 1.6, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Figures in the parentheses indicate percentages of column total.

Table 2.2
Percentage Distribution of Head of H/H by occupation
in Mashajan-Lauhajong Project

Sector	Primary Occupation			secondary occupation		
	Male	Female	total	Male	Female	total
1. Agriculture						
Own Cultivation	421 (61.82)	----	421 (60.49)	38 (31.41)	---	38 (31.15)
Agri. Labour	157	----	157	33	---	33
2. Non-Agriculture						
Trade	17 (2.50)	----	17 (2.44)	34 (28.10)	---	34 (27.87)
Cottage Industries	15 (2.20)	1 (6.67)	16 (2.30)	---	---	---
Salaried Service	46 (6.75)	----	46 (6.61)	8 (6.61)	---	8 (6.56)
Miscellaneous	25 (3.67)	14 (93.33)	39 (5.50)	8 (6.61)	1 (100)	9 (7.38)
3. All Worker	681 (100)	15 (100)	696 (100)	121 (100)	1 (100)	122 (100)

Source : Table 1.7, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Figures in the parentheses indicate percentages of column total.

Table 2.3
Comparative picture of Some Socio-economic Indicators in Mashajan-Lauhajong Project Area with those of Bangladesh.

Indicators	Project Area	Bangladesh
1. Population density per sq. mile	2300	1851
2. Average household size	6.05	6.52
3. Percentage of household having agriculture as main occupation	83.0%	65%
4. Cultivated Land per Capita	0.27	0.29
5. Cropping Intensity	141	154
6. Percentage of Land irrigated	55%	20%
7. Percentage of area under HYV paddy	55%	26%

Source : Table 1.8, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Figures in the parentheses indicate percentages of column total.

Table 2.4
Cropping Patterns and Yield in Mashajan-Lauhajong Project(Present)

Crops	Area (Acre)	Total Production (Thousand mds)	Yield per Acre (mds)	Cost of production per Acre (Thousand Tk)	Total cost of production(Tk)	Value of products (Thousand Tk)	Net Benefit Col. 7-6	B/C Ratio	Price/mds (Tk)
HYV Rice (Boro)	2228 (55.0)	115.856	52	3320	7396.960	23171.220	15774.240	3.13	200/-
Boro (local)	31 (0.75)	0.930	30	2922	90.582	195.3	104.718	2.15	210/-
Aman/Aus(local)	1093 (27.0)	17.488	16	2123	2320.439	3934.80	1614.361	1.69	225/-
Jute	1002 (24.75)	18.036	18	3717	3724.434	4509.00	784.566	1.21	250/-
Oil Seed	800 (19.75)	9.600	12	1451	1160.800	3360.00	2191.200	2.87	350/-
Potato	243 (6.00)	2.673	110	4314	1048.302	2673.00	1624.698	2.55	100/-
Pulses	243 (6.00)	2.673	11	952	209.466	668.25	458.784	3.19	250/-
Wheat	91 (2.25)	1.729	19	1658	150.878	345.80	194.922	2.29	200/-
Total	5731				16109.861	38857.35	2247.489	2.41	

Cropped Land = 5731 acre
Net Land = 4050 acre
Cropping Intensity = 1.41, B/C ratio = 2.41

Figures in the parentheses indicate percentages of column total.

Source : Table 2.1, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Table 2.5
Cropping patterns and Yield in Mashajan-Lauhajong Project(Pre-project)

Crops	Area (Acre)	Total Production (Thousand mds)	Yield per Acre (mds)	Cost of production per Acre (Thousand Tk)	Total cost of production(Tk)	Value of products (Thousand Tk)	Net Benefit Col. 7-6	B/C Ratio	Price/mds (Tk)
HYV Rice (Boro)	1945 (48.02)	91415	47	2651	5156.195	16454.70	11298.505	3.19	180/-
Boro (local)	30 (0.74)	660	22	2333	69.990	125.40	55.410	1.79	190/-
Aman/Aus(Local)	1077 (26.58)	15078	14	1696	1826.592	3241.77	1415.178	1.77	215/-
Jute	1235 (30.49)	18525	15	2968	3665.480	6020.625	2355.145	1.64	325/-
Oil Seed	731 (18.05)	8041	11	1167	853.077	2613.33	1760.253	3.06	325/-
Potato	227 (5.61)	22700	100	3445	782.015	1589.00	806.985	2.03	70/-
Pulses	284 (7.00)	2840	10	689	195.392	586.00	372.608	2.91	200/-
Wheat	930 (0.74)	180	16	1325	39.750	86.40	46.650	2.71	180/-
Cropped Area	5559	159739			12588.491	30699.215	18110.724	2.44	

Cropped Land = 5559 acre
Net Area = 4050 acre
Cropping Intensity = 1.37, B/C ratio = 2.44

Figures in the parentheses indicate percentages of column total.

Source : Table 2.2(A), Early Implementation Project: An Evaluation of Socio-economic And Agricultural Impact, Final Report on Mashajan-Lauhajong Project, BUP, 1988.

Table 2.6

Distribution of Benefitted area by Landholding Categories and Incidence of HYV in Mashajan-Lauhajong Project,1986-87

Landholding Category (Area in acre)	Total area (Acre)	Area under HYV (Acre)	HYV as Percentage of Total
Marginal (0.01 - 0.99)	312 (7.7)	192 (8.6)	61.54
Small (1.0 - 2.99)	1025 (25.3)	557 (25.0)	54.34
Middle (3.0 - 6.99)	1397 (34.5)	831 (37.3)	59.48
Large (7 + above)	1316 (32.5)	648 (29.1)	49.24
Total	4050 (100)	2228 (100)	55.00

Source : Table 2.7, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Figures in the parentheses are percentage of the total.

Table 2.7

Saaf Kabala Price of Land in Mashajan-Lauhajong Project

Type of Land	Price per Acre (Tk.) Present	Price per Acre(Tk.) Pre-project
Medium	100,000.00	85,000.00
Low	70,000.00	60,000.00
Weighted average	83,500.00	71,250.00

Source : Table 3.1(A), Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact,Final Report on Mashajan - Lauhajong Project, BUP, 1988.

Table 2.8

Incidence of Share Tenancy in Mashajan-Lauhajong Project Area

Landholding Group (area in acre)	Present	Pre-project
	Area Cropped under S.T.	Area Cropped under S.T.
Landless (0 - 0)	14 (4.3)	-
Marginal (0.01 - 0.99)	66 (20.37)	95 (31)
Small (1.0 - 2.99)	118 (36.42)	122 (40)
Middle (3.0 - 6.99)	122 (37.65)	88 (29)
Large (7 + above)	4 (1.24)	-
Total	324 (100)	305 (100)

Total cropped area = 4050 acres;

Pre-project S.T = (305/4050)*100 = 7.53%

Post-project S.T = (324/4050)*100 = 8%

Source : Table 3.7, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact,Final Report on Mashajan - Lauhajong Project, BUP, 1988.

* S.T. = Share Tenancy.

Table 2.9

Distribution of Standard Working Days by Landholding Groups in Mashajan-Lauhajong Project (Present)

Landholding Groups of (Area in acre)	Cultivation Own Farm	Agricultural Wage Labour	Fishing (%)	Cottage Industries(%)	Trade (%)	Boatman (%)	Salaried (%)	Others (%)	Percent of the Total
Landless (0 - 0)	---	8.96 (23.2)	2.57 (58.6)	0.36 (15.8)	0.38 (2.9)	0.19 (50.0)	0.95 (6.3)	2.21 (45.8)	(15.56)
Marginal (0.01 - 0.99)	2.52 (11.7)	14.54 (35.0)	1.44 (32.7)	1.03 (44.5)	2.51 (19.4)	0.19 (50.0)	3.35 (22.1)	1.49 (31.9)	(25.01)
Small (1.0 - 2.99)	7.39 (34.3)	13.85 (35.9)	0.38 (8.7)	0.53 (22.7)	5.78 (44.7)	---	4.77 (31.5)	0.07 (1.6)	(38.84)
Middle (3.0 - 6.99)	6.71 (31.2)	2.27 (5.9)	--	0.40 (17.0)	1.90 (14.7)	---	3.79 (25.0)	0.76 (16.4)	(15.84)
Large (7 + above)	4.90 (22.8)	---	--	--	2.36 (18.3)	---	2.29 (15.1)	0.20 (4.3)	(9.75)
Total	21.52 (100)	38.62 (100)	4.39 (100)	2.32 (100)	12.94 (100)	0.38 (100)	15.15 (100)	4.66 (100)	(100)

Source : Table 4.1, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan-Lauhajong Project, BUP, 1988.

* Figures in the Parentheses Indicate Column Total.

Table 2.10

Distribution of Standard Working Days by Landholding Groups in Mashajan-Lauhajong Project (Pre-project)

Landholding Groups (Area in acre)	Cultivation of Own Farm	Agricultural Wage Labour	Fishing (%)	Cottage Industries(%)	Trade (%)	Boatman (%)	Salaried (%)	Others (%)	Percent of the Total
Landless (0 - 0)	---	8.94 (23.2)	2.52 (52.7)	0.34 (18.2)	0.38 (3.0)	0.19 (50.0)	0.96 (6.6)	2.14 (51.5)	(15.48)
Marginal (0.01 - 0.99)	2.29 (10.4)	13.92 (35.3)	0.77 (16.1)	0.90 (48.4)	2.54 (19.8)	0.19 (50.0)	3.00 (20.6)	1.04 (35.1)	(24.65)
Small (1.0 - 2.99)	7.74 (35.4)	14.31 (36.2)	1.49 (31.2)	0.22 (12.0)	5.59 (43.4)	---	4.43 (30.5)	---	(33.79)
Middle (3.0 - 6.99)	6.93 (31.6)	2.30 (5.8)	--	0.41 (21.4)	2.00 (15.0)	---	3.84 (26.4)	0.77 (18.6)	(16.25)
Large (7 + above)	4.96 (22.6)	---	--	--	2.35 (18.20)	---	2.32 (15.9)	0.20 (4.8)	(9.83)
Total	21.92 (100)	39.46 (100)	4.78 (100)	1.87 (100)	12.87 (100)	0.38 (100)	14.55 (100)	4.66 (100)	(100)

Source : Table 4.2, Early Implementation Project: An Evaluation of Socio-economic and Agricultural Impact, Final Report on Mashajan - Lauhajong Project, BUP, 1988.

* Figures in the Parentheses Indicate Column Total.

Table 3.1

Distribution of Land under various crops operated by inner and outsider cultivators classified by landholding groups in post and pre-project period in Polder 65/A-3 Project

Types of farmer	Post project period			Pre-project period			
	Aman	Boro	Total	Aus	Aman	Boro	total
Landless Tenants	191	191	382	20	116	86	222
Marginal Farmer	331	341	672	35	326	252	613
Small Farmer	269	250	519	7	272	246	525
Medium Farmer	255	254	509	3	310	221	534
Large Farmer	54	54	108	3	76	71	150
Total	1100	1090	2190	68	1100	876	2044

Note : Gross land operated by the outsiders in the post and pre project periods are 136 acres and 620 acres respectively.

Source : Table 2.1, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.2
Average income from homesteads and orchards on landholding group in the post and pre project period in polder 65/A-3 project

Landholding group	Average income per household		Incremental income(Tk)	Proportion of household using Homestead and orchard	
	Pre-proj.	post proj.		Pre-project	post-project
Landless wage labour	162	162	---	33.33	33.33
Fisherman	226	160	66	80.00	80.00
Rickshaw puller	1300	1006	294	61.9	57.14
Landless Tenant	1462	1173	289	76.92	69.23
Marginal Farmer	1493	591	902	71.67	60.00
Small Farmer	2766	1479	1287	89.66	79.31
Medium Farmer	6748	3282	3466	89.29	78.57
Large Farmer	8129	3080	5049	100.00	100.00
Total	2309	1138	756	71.72	63.64

Source : Table 2.2, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.3
Changes in Cropping Intensity by Landholding groups during Post and Pre-project Period in the Polder 65/A-3 Project

Landholding groups	Post-project period	Pre-project period	% Change
Marginal Farmer	200.00	186.41	7.29
Small Farmer	198.71	198.74	-0.01
Medium Farmer	178.67	175.37	13.29
Large Farmer	200.00	197.00	1.11
Total	199.00	185.80	7.13

Source : Table 2.3, Early Implementation Project : An Evaluation of Socio-economic And Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.BUP, 1988.

Table 3.4

Distribution of Output of paddy of various season by different landholding groups in post and pre project period in Polder 65/A-3 Project

(Figures in maund)

Class	Post project period			Pre project period				Loss of production due to flood	Net Production	Gross incremental output
	Aman	Boro	Total	Aus	Aman	Boro	total			
Landless Tenant	660 (34.87)	10052 (52.63)	16712 (43.75)	540 (27.00)	3250 (28.02)	3901 (45.26)	7691 (34.64)	1923 (8.66)	5768 (25.98)	10944
Marginal Farmer	8642 (37.41)	19297 (56.59)	27939 (41.58)	853 (24.38)	9992 (30.65)	12792 (59.76)	23637 (38.56)	5909 (9.64)	17728 (28.92)	10211
Small farmer	9364 (34.81)	14475 (57.90)	23839 (45.93)	140 (20.00)	7034 (25.96)	10615 (43.15)	17789 (33.88)	4447 (8.47)	13342 (25.41)	10492
Medium farmer	9310 (36.51)	13049 (51.37)	22358 (43.93)	75 (25.00)	8609 (27.77)	9434 (42.69)	18118 (33.93)	4530 (8.48)	13588 (25.45)	8770
Large farmer	2029 (37.57)	3268 (60.52)	5297 (49.05)	69 (22.92)	2074 (27.30)	3097 (43.62)	5240 (35.46)	1310 (8.73)	3930 (26.20)	1367
Total	86005 (32.73)	60140 (55.17)	96145 (43.90)	1677 (24.66)	30959 (28.14)	39839 (45.48)	72475 (35.45)	18119 (8.87)	54356 (26.59)	41789

Figures within the parentheses represent production per acre.

Source : Table 2.4, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.5
Cost structure of different components of paddy production at 1986-87 price for post and pre project period Polder 65/A-3 project.

(Figures in Taka)

Cost components*	Post project cost	Pre project cost	Net incremental cost
Fertilizer	968659	416976	551683
Pesticides	41325	34032	7293
Seed and seedlings	364438	340142	24296
Irrigation	734000	689000	45000
Tools and Implements	37099	29720	7379
Periodical workers	2044250	1395644	648606
Casual labours	1713692	1419820	293872
Family labour	7070847	6380567	690280
Total	12974310	10705901	2268409

Source : Table 2.7, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

*Costs : Components relating to share cropping and land leasing by the share cropper and lease holder were excluded from the structure of cost in view of the fact that these are parts of benefit stream which are also enjoyed by the society either as leasee or as share cropper.

Table 3.6
Cost benefit ratio of paddy cultivation in Polder 65/A-3

Period	Benefit(Tk.)	Cost of production(Tk.)	Benefit cost ratio
Post project period	19229000	12974310	1.4821
Pre project period	10871200	10705901	1.0154
Incremental	8357800	2268409	3.6844

Source : Table 2.8, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.7
Tenurial status of farmers during post and pre project period in Polder 65/A-3 Project

	Census survey (Post-project period)				base line survey (Pre-project period)			
	Owner farmer	Owner cum share	Share cropper/ tenant	Total	Owner farmer	Owner cum share cropper	Share cropper/ tenant	Total
Landless Tenant	---	---	16.16	16.16	---	---	11.29	11.29
Marginal farmer	11.72	15.73	---	27.45	4.13	13.51	---	17.64
Small farmer	4.43	7.29	---	11.72	2.86	13.04	---	15.90
Medium farmer	13.06	2.01	---	5.07	4.13	3.66	---	7.79
Large farmer	0.74	0.11	---	0.85	1.91	0.48	---	2.39
Total	29.95	25.03	16.16	61.14	13.03	30.68	11.29	55.00

Source : Table 3.2, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.8
Changes in average size of land operated and average productivity of land in Polder 65/A-3

Landholding groups	Average size of land operated(acre)			Average productivity of land(maund)		
	Post-project	Pre-project	%Change	Post-project	Pre-project	%Change
Landless tenant	2.34	1.17	100	43.75	25.98	68
Marginal farmer	2.42	1.64	48	41.58	28.92	44
Small farmer	4.38	3.29	33	45.93	25.41	81
Medium farmer	9.91	7.76	28	43.93	25.45	73
Large farmer	12.67	12.89	-2	49.05	26.20	87
Total	3.54	2.64	44	43.90	26.59	65

Source : Table 3.3, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact,Final Report on Polder 65/A-3, BUP, 1988.

Table 3.9

Distribution of different types of workers employed in cultivation during post and pre project period in Polder 65/A-3

Landholding groups	Post-project period				Pre-project period			
	Family members	periodical worker	Casual worker	Total	Family members	periodical worker	Casual worker	Total
Landless tenant	24830 (89.74)	1330 (4.30)	1510 (5.46)	27670 (100.00)	2629 (60.51)	657 (15.12)	1059 (24.37)	4345 (100)
Marginal farmer	53068 (60.04)	24729 (27.98)	10598 (11.99)	88395 (100.00)	54796 (82.49)	3466 (5.22)	8163 (12.29)	66425 (100)
Small farmer	33141 (52.97)	20474 (32.72)	9951 (14.31)	62566 (100.00)	29205 (67.49)	14073 (24.23)	4808 (8.28)	58086 (100)
Medium farmer	17440 (36.82)	19845 (41.91)	10068 (21.26)	47354 (100.00)	17810 (33.96)	23417 (44.65)	11217 (21.39)	52444 (100)
Large farmer	1003 (12.43)	5771 (71.55)	1292 (16.02)	8066 (100.00)	1492 (13.88)	7645 (71.12)	1613 (15.00)	10750 (100)
Total	129482 (55.32)	72150 (30.83)	32419 (13.85)	23051 (100.00)	115922 (60.36)	49258 (25.65)	26860 (13.99)	192040 (1000

Figures in the parentheses represent the percentage of respective row total.

Source : Table 4.1, Early Implementation Project : An Evaluation of Socio-economic and Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 3.10

Per acre use of family and hired labour during post and pre project period classified by landholding groups

Landholding class	Post-project					pre-project				
	Family labour	hired periodical	casual labour	total	all	Family labour	hired periodical	casual labour	total	all
Landless tenants	65	3	4	7	72	12	3	5	8	20
Marginal farmer	79	37	16	53	132	89	6	13	19	108
Small farmer	64	39	17	56	121	75	27	9	36	111
Medium farmer	34	39	20	59	92	33	44	21	65	98
Large farmer	9	53	12	65	75	10	51	11	62	72
Total	59	33	15	48	107	57	24	13	37	94

Source : Table 4.2, Early Implementation Project : An Evaluation of Socio-economic And Agricultural Impact, Final Report on Polder 65/A-3, BUP, 1988.

Table 4.1

Cropping Intensity in Mondakini Irrigation Project

Period	Net cropped area(ac)	total cropped area(ac)	cropping Intensity
Pre-project (FY 1982-83)	706	982	139
Post-project (Fy 1985-86)	706	1412	200

Source : Table 3.5, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1, Mondakini Khal Irrigation Sub-project etc., BNC, 1987.

Table 4.2
Cropping Pattern by crops, acreage and yield per acre in Mondakini Khal Irrigation Project

Name of the crop	Before project		After project	
	Total acreage of the sample H/H(acre)	Yield per acre Kg(mds)	Total acreage of the sample H/H (acre)	Yield per acre Kg(mds)
B. Aus	132.69 (35.00)	593 (16)	73.04 (13.90)	930 (25)
T. Aus (HYV)	3.68 (1.00)	1005 (27)	---	---
T. Aman (Local)	138.00 (36.30	670 (18)	---	---
T. Aman (HYV)	---	---	189.69 (36.10)	1674 (45)
Boro (HYV)	---	---	168.67 (32.10)	1860 (50)
Pulses	75.90 (20.00)	223 (6)	59.90 (11.40)	223 (6)
Chilies	11.39 (3.00)	223 (6)	3.70 (0.7)	446 (12)
Vegetables	10.25 (2.70)	4093 (110)	9.40 (1.80)	5580 (150)
Misc. crops	7.59 (2.00)	---	21.00 (4.00)	---
Total	379.50 (100)		525.45 (100)	

Figures in the parenthesis indicate percentage of column total.

Source : Table 3.19, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1, Mondakini Khal Irrigation Sub-project etc., BNC, 1987.

Table 4.3
Calculation of Benefit-Cost Ratio in Mondakini Khal Irrigation Project

	Year 1 1981-82	Year 2	Year 3	Year 4	Year 5	year 6	Year 7-10
A. Costs :							
i) Fixed cost (investment) at current prices	110.00	2480.00	---	---	210.00	130.00	---
ii) Fixed cost (investment) at 1981-82 prices	110.00	2254.00	---	---	143.43	80.72	---
iii) OMR at 1981-82 prices	---	---	99.88	99.88	99.88	99.88	99.88
B. Total cost at 1981-82 prices	110.00	2254.00	99.88	99.88	243.31	180.60	99.88
C. Benefits :							
With project							
Total income at 1985-86 prices	---	---	---	---	14835.00	14835.00	14835.00
at 1981-82 prices	---	---	---	---	10160.00	10160.00	10160.00
Without project(control)							
Total income at 1985-86 prices	---	---	---	---	12983.00	12983.00	12983.00
at 1981-82 prices	---	---	---	---	8892.46	8892.46	8892.46
D. Incremental benefit	---	---	---	---	1267.54	1267.54	1267.54
E. Benefit - Cost (D - B)	-110.00	-2254.00	-99.88	-99.88	1024.23	1086.94	1167.66

Total investment Cost at 1981-82 prices = 4385.99 thousand Taka;

Neat Incremental Benefit at 1981-82 prices = 20280.69 thousand Taka;

B/C Ratio = 20280.69/4385.99 = 4.62.

Source : Table 3.28, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1., Mondakini Khal Irrigation Sub-project etc., Bangladesh National Consultants(BNC), 1987.

Table 4.4
Land Category Based Cropping Pattern (Before Project)
in Mondakini Khal Irrigation Project

Land Category	% Under Different crops									Net cropped area(ac)
	Aus (L)	Aus (HYV)	B. aman	T. aman (L)	T.Aman (HYV)	Boro (L)	Boro (HYV)	pulse	spices	
Medium high land	100							67	10	300
Medium low land	2	2		95						406

Source : Table 3.3A, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1., Mondakini Khal Irrigation Sub-project etc., Bangladesh National Consultants, 1987.

Table 4.5
Land Category Based Cropping Pattern (After Project)
in Mondakini Khal Irrigation Project

Land Category	% Under Different crops									Net cropped area(ac)
	Aus (L)	Aus (HYV)	B. aman	T. aman (L)	T.Aman (HYV)	Boro (L)	Boro (HYV)	pulse	spices	
Medium high land Not irrigated	100							81	10	196
Medium high land irrigated					100		100			104
Medium low land Not irrigated										
Medium low land Irrigated					100		100			406

Source : Table 3.3B, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1., Mondakini Khal Irrigation Sub-project etc., Bangladesh National Consultants, 1987.

Table 4.6
Average Seasonal pattern of Employment for Crop Sector (Man days) in Mondakini Khal Irrigation Project

Month	Average Mandays
January	10.83
February	8.55
March	7.55
April	7.44
May	11.59
June	8.07
July	9.69
August	10.93
September	6.52
October	6.08
November	7.34
December	11.40
Total	106.00
(Mean)	(8.83)

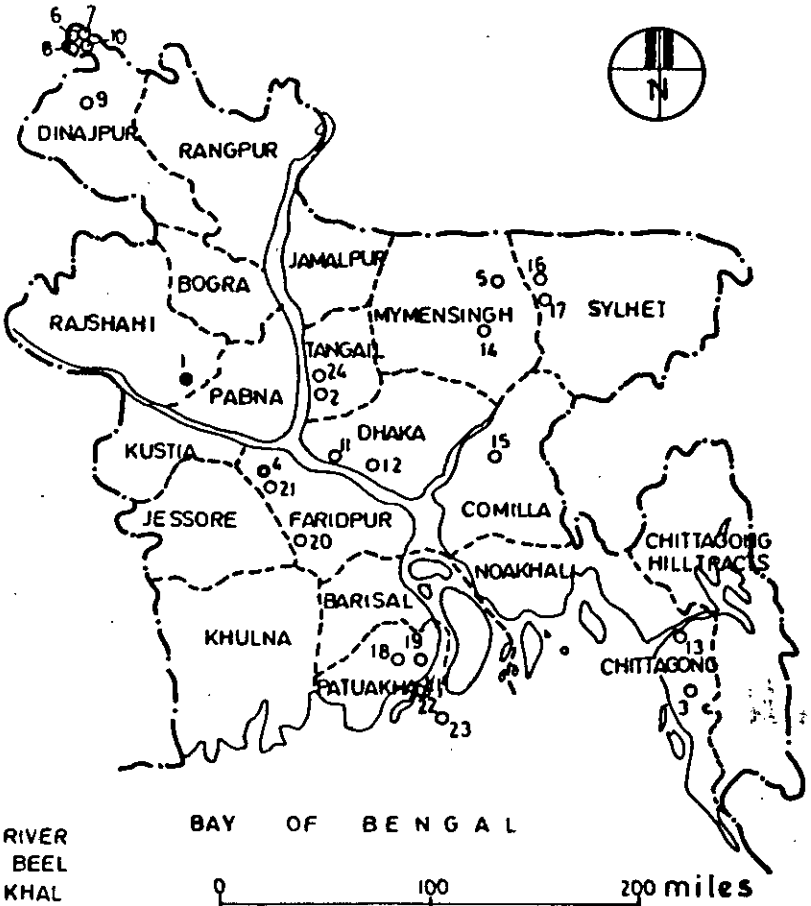
Source : Table B, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1., Mondakini Khal Irrigation Sub-project etc., Bangladesh National Consultants, 1987.

Table 4.7
Agricultural extension Services in Mondakini Khal Irrigation Project

Farm Size Groups (By operational Holding)	% of Respondent			Average No. of Meeting per Year
	Having knowledge of it	Meeting Extension Agent/Officer	receiving Help From VEA - UAA	
Landless	81.50	---	---	---
Marginal	85.60	3.50	1.50	1
Small	92.00	4.00	2.30	2
Medium	96.00	6.50	2.80	1
Big	100.00	4.50	3.00	2

Source : Table C, Report on Evaluation Studies of BWDB Small Scale Drainage and Flood Control Sub-projects Under IDA Credit No. 955-BD, Volume 1., Mondakini Khal Irrigation Sub-project etc., Bangladesh National Consultants, 1987.

FIGURES



1. BARNAI RIVER
2. BARKATI BEEL
3. HANGER KHAL
4. PAKURIA BEEL
5. HAIJDA EMBANKMENT
6. TIRNAI RIVER
7. RAMCHANDI RIVER
8. VERSA RIVER
9. TANGON
10. TULSHI BEEL
11. AGLAR CHAK
12. KERANIGANJ
13. BOALKHALI
14. BALALI PADMASREE
15. GUGRAJOLA
16. GURMAR HAOR
17. SONAMORAL HAOR
18. PATUAKHALI POLDER 43/2B
19. PATUAKHALI POLDER 52/2C
20. TARAIL PACHURIA POLDER 2
21. MADHUKHALI BALIKANDI
22. PATUAKHALI POLDER 55/3
23. PATUAKHALI POLDER 55/4
24. KAMARNOGAON FCD

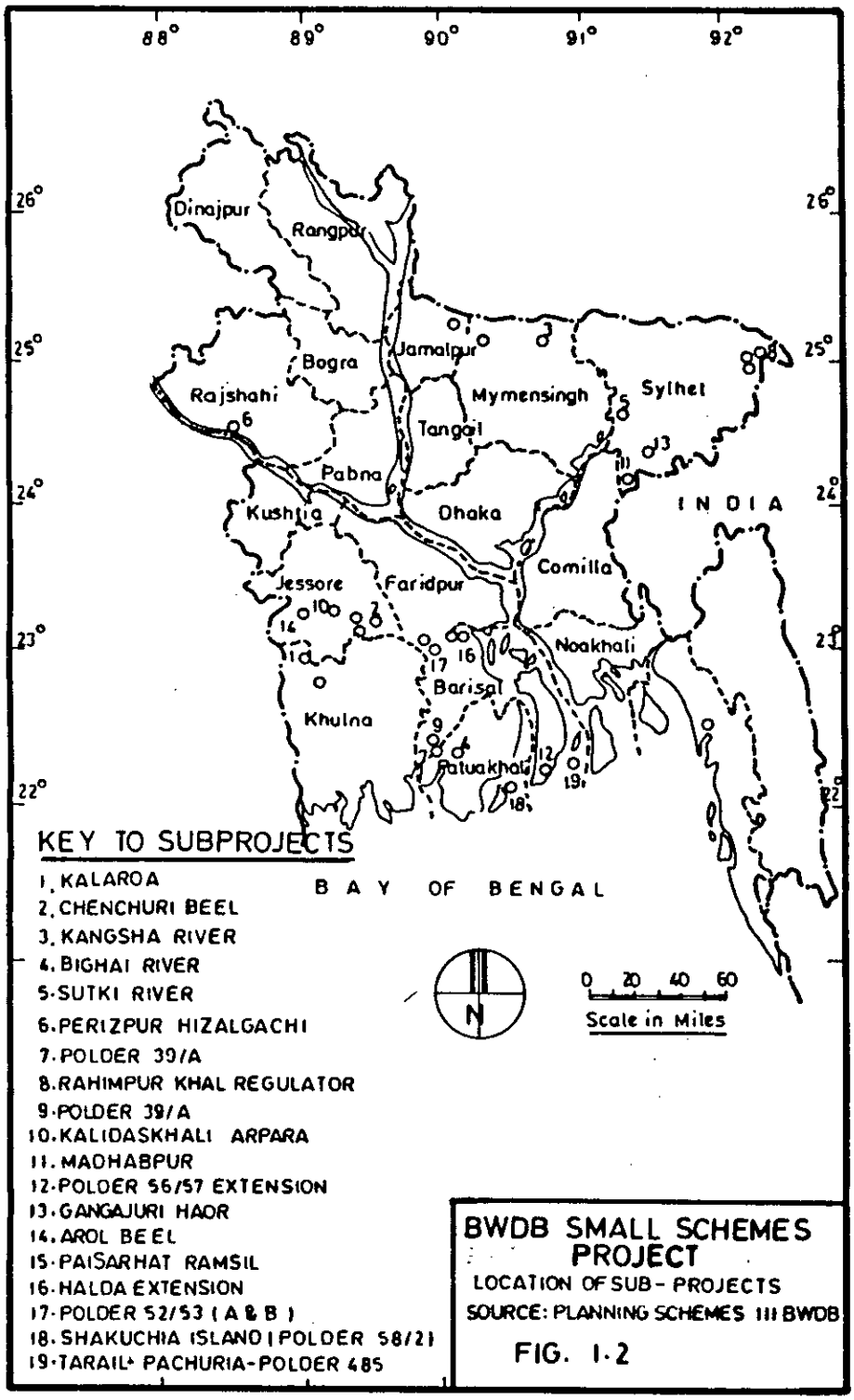
LEGEND

INTERNATIONAL BOUNDARY

DISTRICT BOUNDARY

RIVER

SMALL SCALE IRRIGATION SECTOR PROJECT
PROJECT LOCATION MAP
SOURCE: PLANNING SCHEME II, BWDB
FIG. 1-1

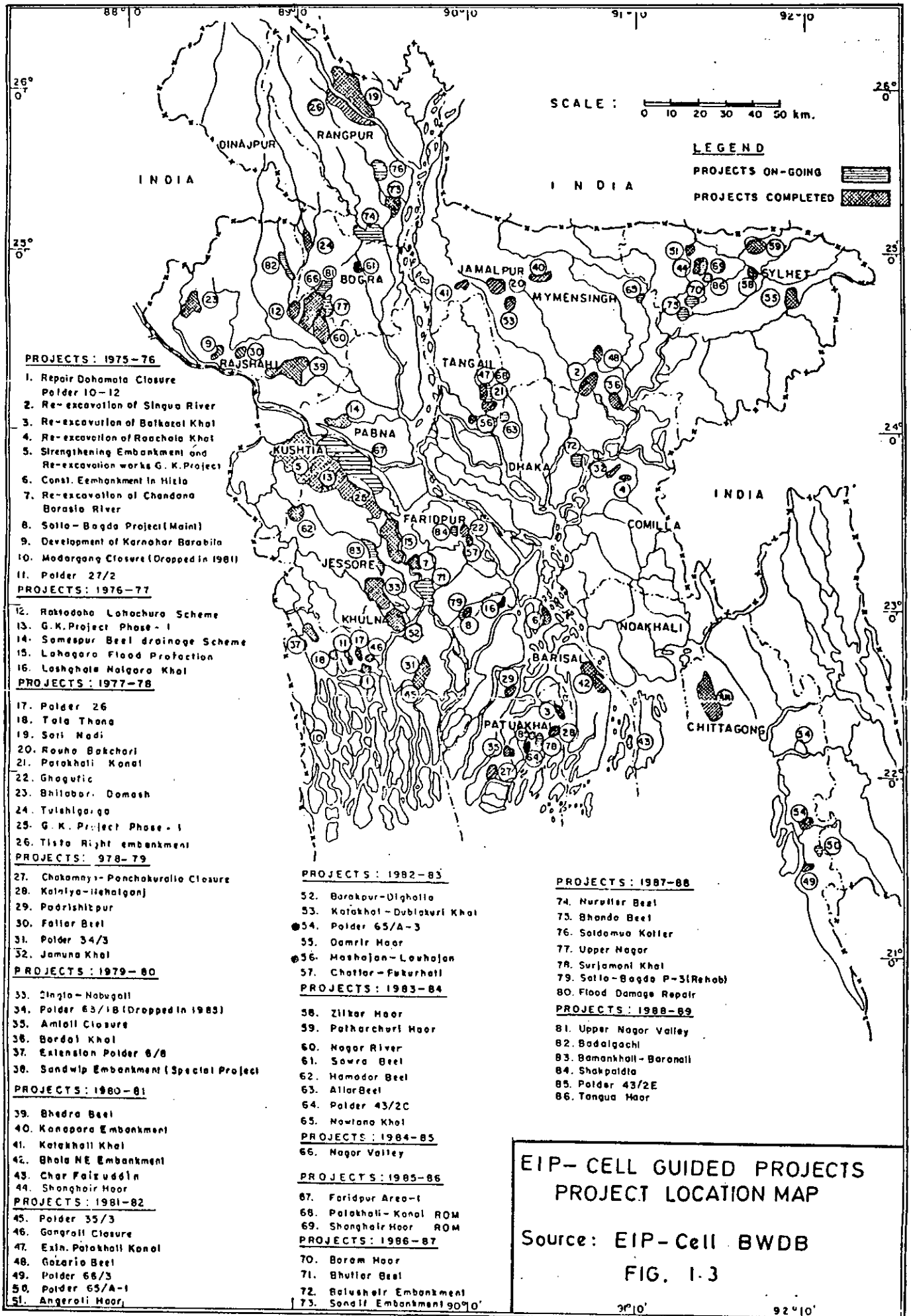


BWDB SMALL SCHEMES PROJECT

LOCATION OF SUB-PROJECTS

SOURCE: PLANNING SCHEMES III BWDB

FIG. 1.2



PROJECTS : 1975-76

1. Repair Dohamata Closure Polder 10-12
2. Re-excavation of Singua River
3. Re-excavation of Balkata Khal
4. Re-excavation of Raachala Khal
5. Strengthening Embankment and Re-excavation works G. K. Project
6. Const. Eemhankment in Hizla
7. Re-excavation of Chandana Borasia River
8. Satla-Bagda Project (Maint)
9. Development of Karnahar Barabila
10. Modargang Closure (Dropped in 1981)
11. Polder 27/2

PROJECTS : 1976-77

12. Raktadaha Lohachura Scheme
13. G.K. Project Phase - I
14. Somespur Beel drainage Scheme
15. Lohagara Flood Protection
16. Loshghata Nalgara Khal

PROJECTS : 1977-78

17. Polder 26
18. Tala Thana
19. Sori Nadi
20. Rauha Bakchari
21. Patakhali Kanal
22. Ghagutia
23. Bhilabari Damash
24. Tulshigarga
25. G. K. Project Phase - I
26. Tista Right embankment

PROJECTS : 978-79

27. Chakamaya-Panchakuralia Closure
28. Kalaiya-Ilehalganj
29. Padrishibpur
30. Fatlar Beel
31. Polder 34/3
32. Jamuna Khal

PROJECTS : 1979-80

33. Singia-Nabagali
34. Polder 63/1B (Dropped in 1983)
35. Amtali Closure
36. Bardal Khal
37. Extension Polder 8/8
38. Sandwip Embankment (Special Project

PROJECTS : 1980-81

39. Bhadra Beel
40. Kanapara Embankment
41. Katakhali Khal
42. Bhola NE Embankment
43. Char Faizuddin
44. Shanghair Haor

PROJECTS : 1981-82

45. Polder 35/3
46. Gangrali Closure
47. Exin. Patakhali Kanal
48. Gazaria Beel
49. Polder 66/3
50. Polder 65/A-1
51. Angaroli Haor

PROJECTS : 1982-83

52. Barakpur-Dighalia
53. Katakhal-Dubiakuri Khal
54. Polder 65/A-3
55. Damrir Haor
56. Mashajan-Lauhajan
57. Chatlar-Fukurhati

PROJECTS : 1983-84

58. Zilkar Haor
59. Patharchari Haor
60. Nagar River
61. Sowra Beel
62. Hamadar Beel
63. Allar Beel
64. Polder 43/2C
65. Nawtana Khal

PROJECTS : 1984-85

66. Nagar Valley

PROJECTS : 1985-86

67. Faridpur Area-I
68. Patakhali-Kanal ROM
69. Shanghair Haor ROM

PROJECTS : 1986-87

70. Baram Haor
71. Bhutiar Beel
72. Baluchair Embankment
73. Sonaii Embankment

PROJECTS : 1987-88

74. Nurullar Beel
75. Bhando Beel
76. Saldamua Kollar
77. Upper Nagar
78. Surjamani Khal
79. Satla-Bagda P-3 (Rehab)
80. Flood Damage Repair

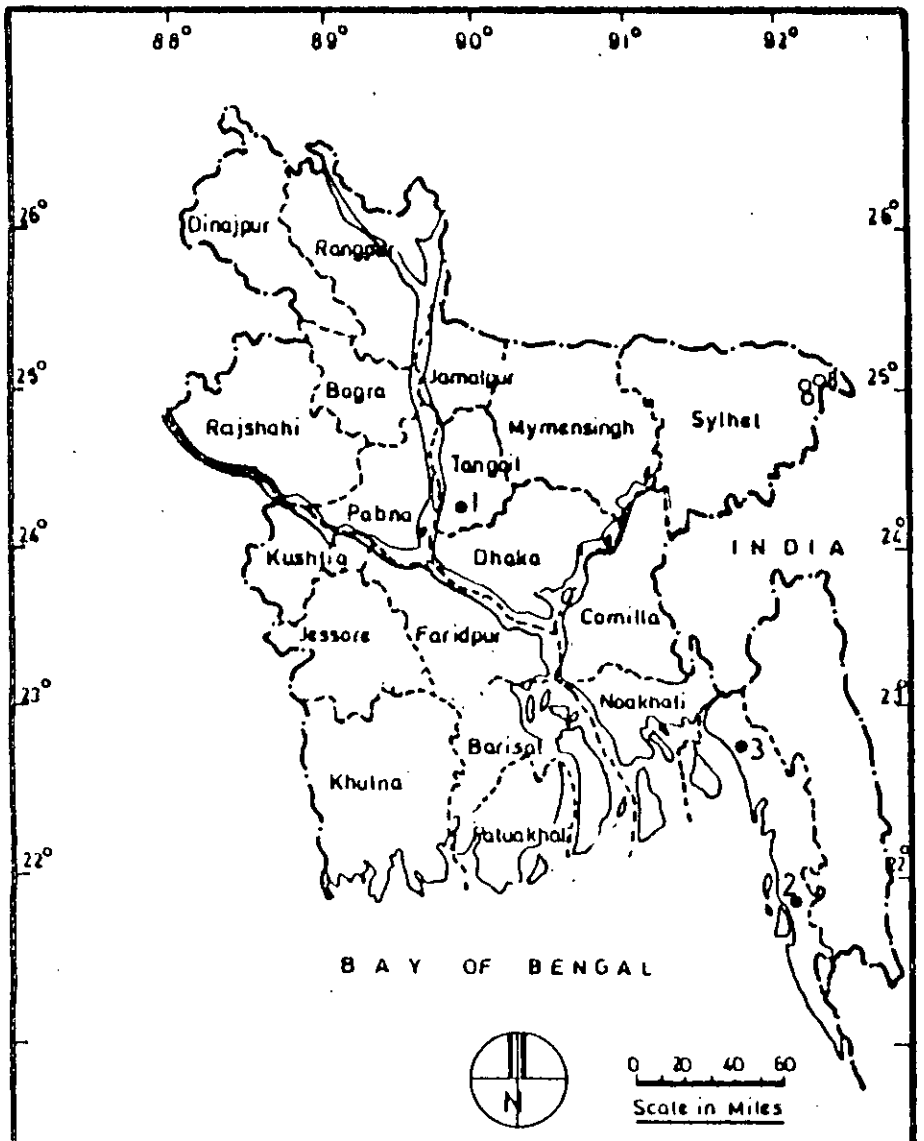
PROJECTS : 1988-89

81. Upper Nagar Valley
82. Badalgachi
83. Bamankhali-Baronali
84. Shakpalda
85. Polder 43/2E
86. Tangua Haor

EIP-CELL GUIDED PROJECTS PROJECT LOCATION MAP

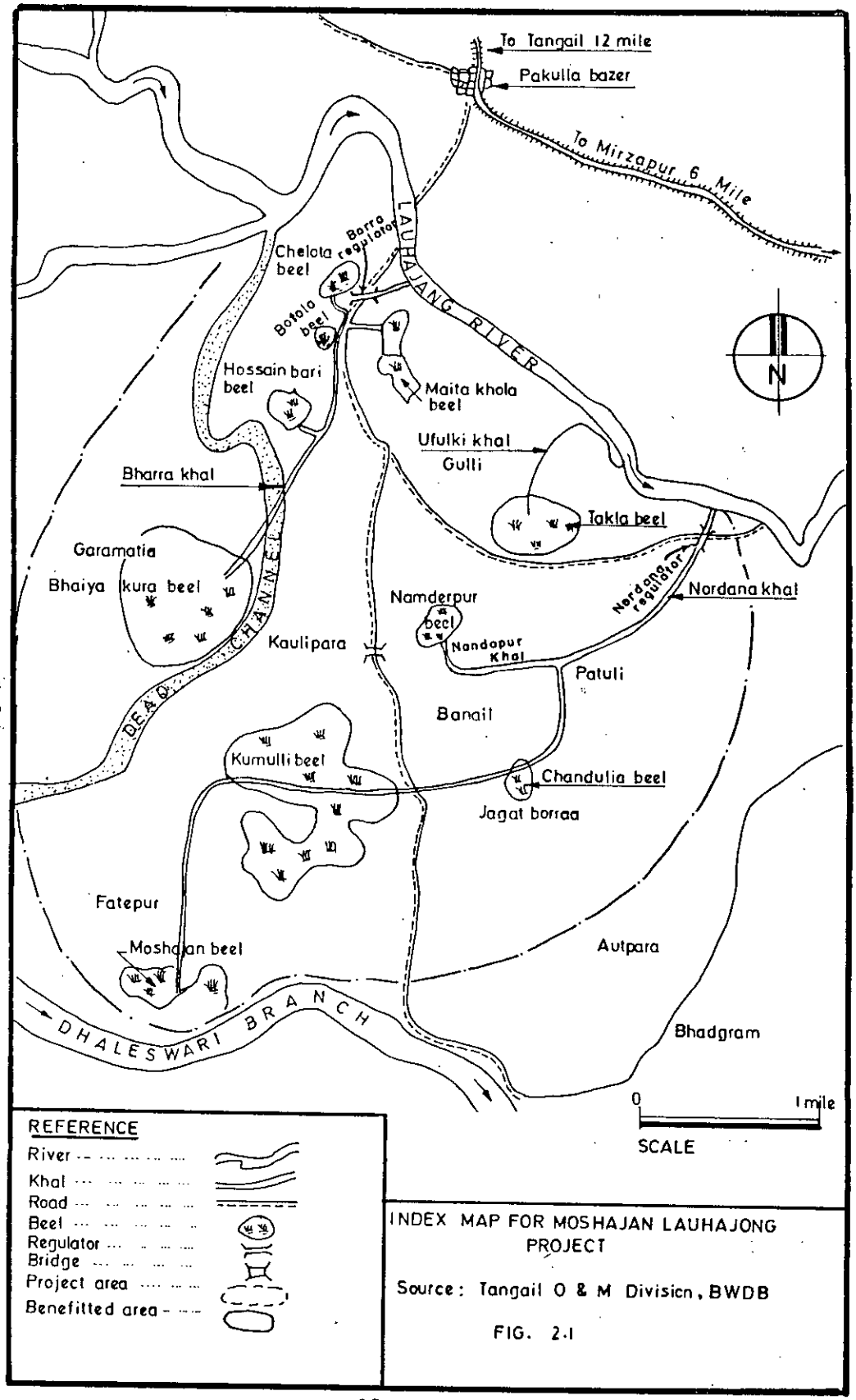
Source: EIP-Cell BWDB

FIG. 1.3



LOCATION OF SELECTED PROJECTS FOR THIS STUDY

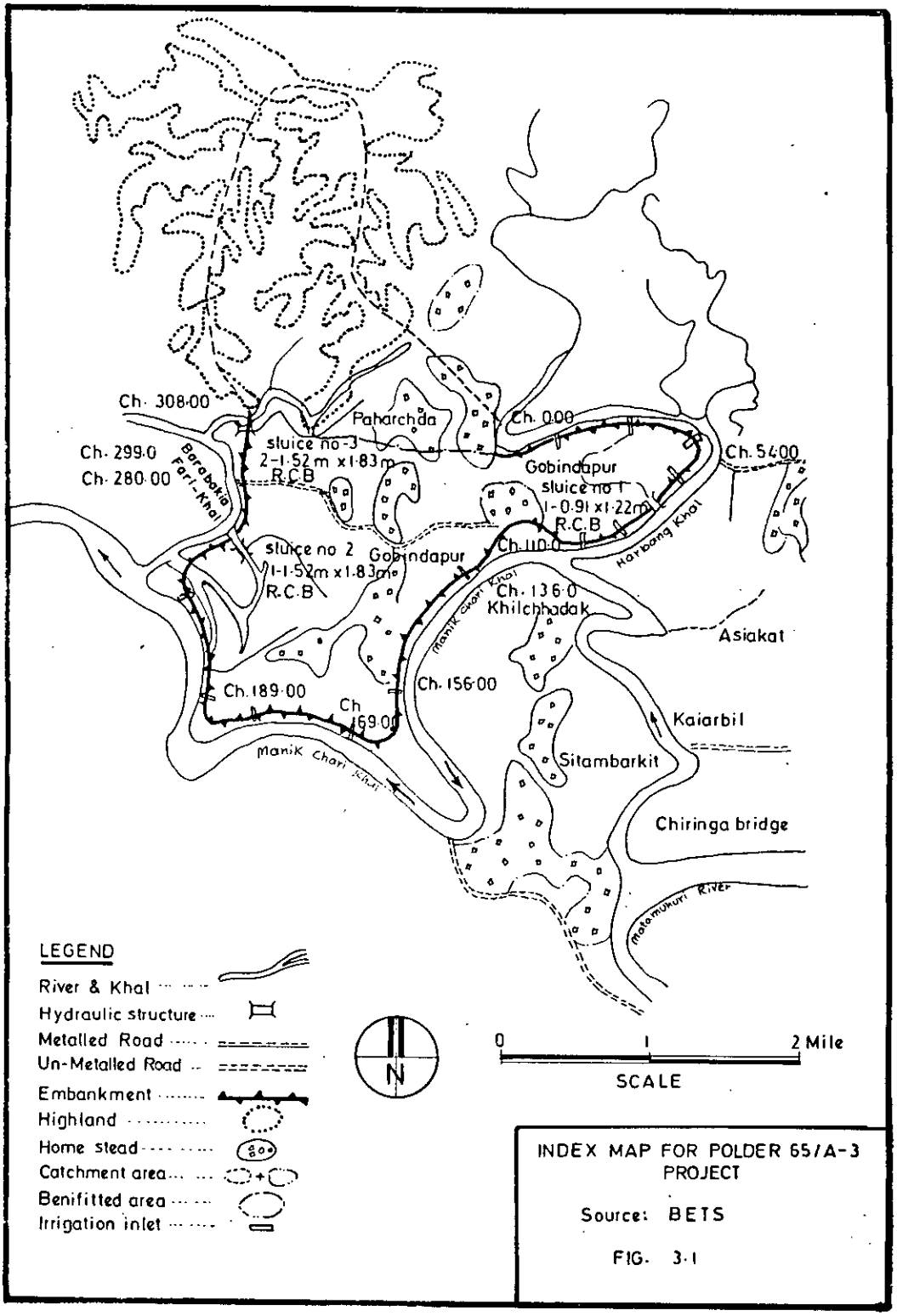
FIG. 1.4



INDEX MAP FOR MOSHAJAN LAUHAJONG PROJECT

Source: Tangail O & M Division, BWDB

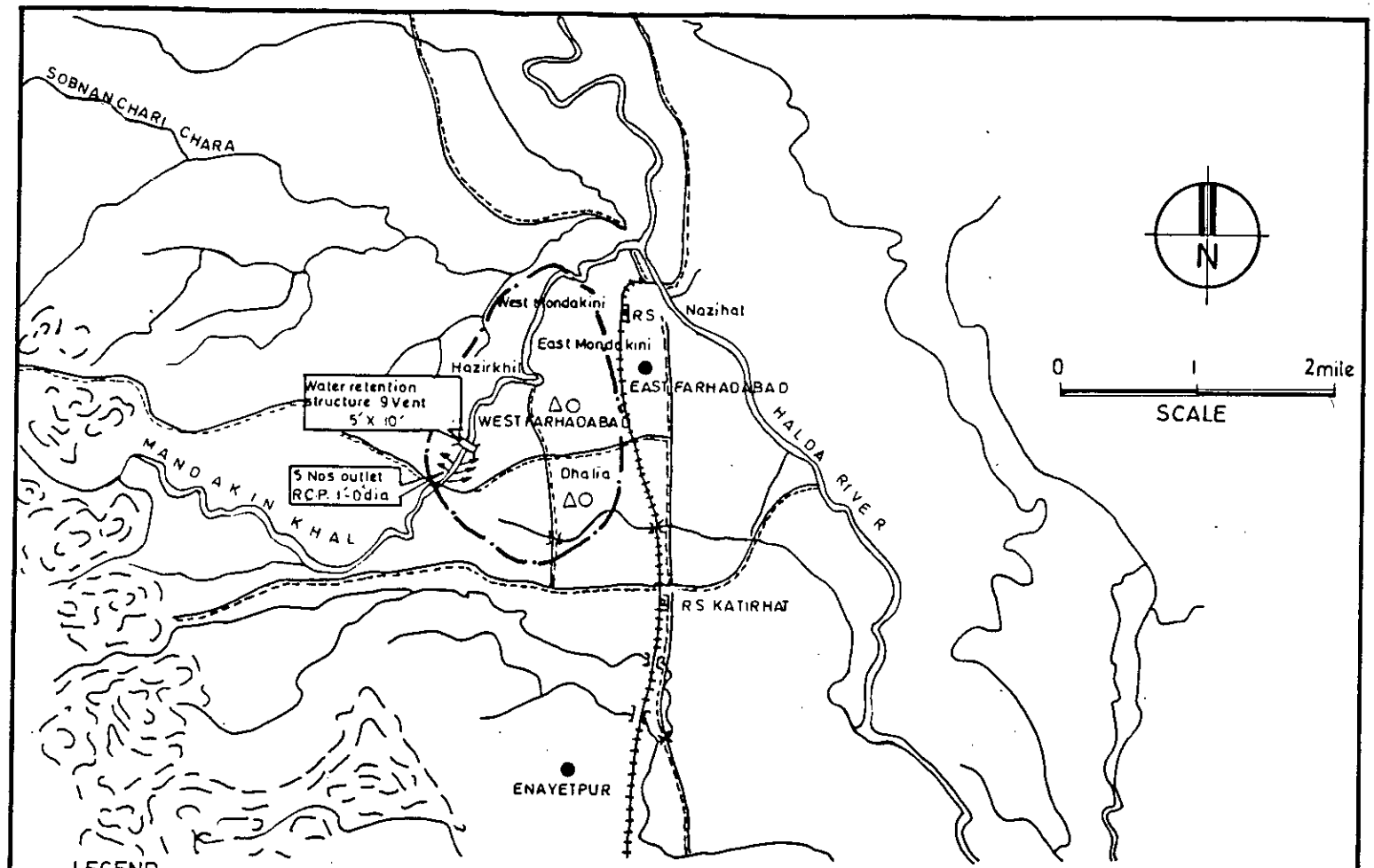
FIG. 2.1



INDEX MAP FOR POLDER 65/A-3 PROJECT

Source: BETS

FIG. 3·1



INDEX MAP FOR MONDAKINI KHAL IRRIGATION PROJECT

Source : Bangladesh National Consultant

FIG. 4.1

Photo 1 : Protection work of Slopped portion of the R/S loose apron of Nordana Regulator in Mashajan-Lauhajong Project has been damaged.

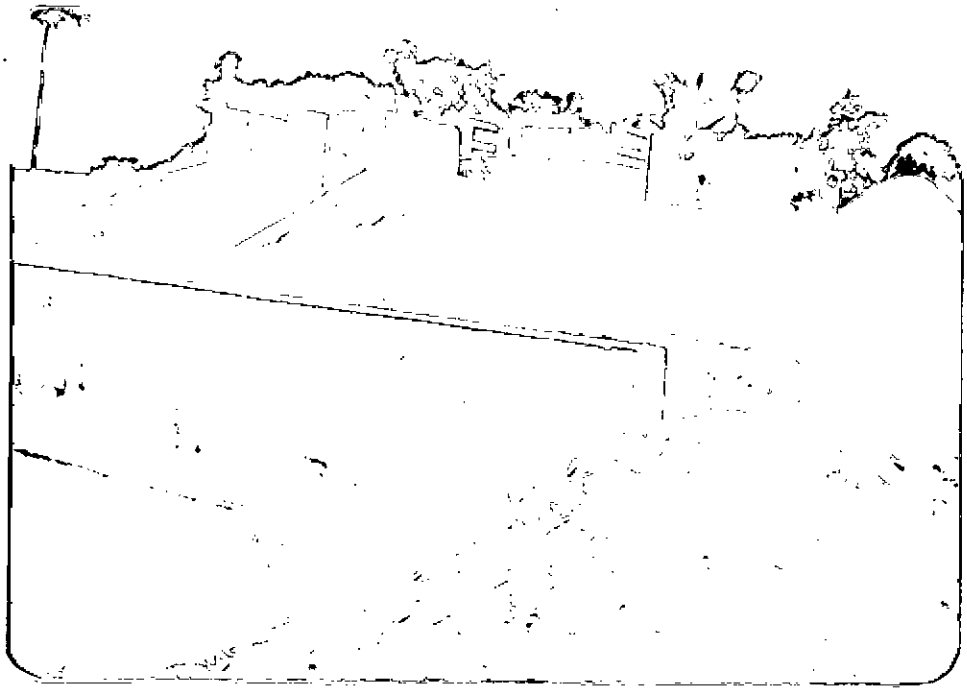


Photo 2 : Washed Out Backfill of C/S Return Wall of Nordana Regulator in Mashajan-Lauhajong Project.

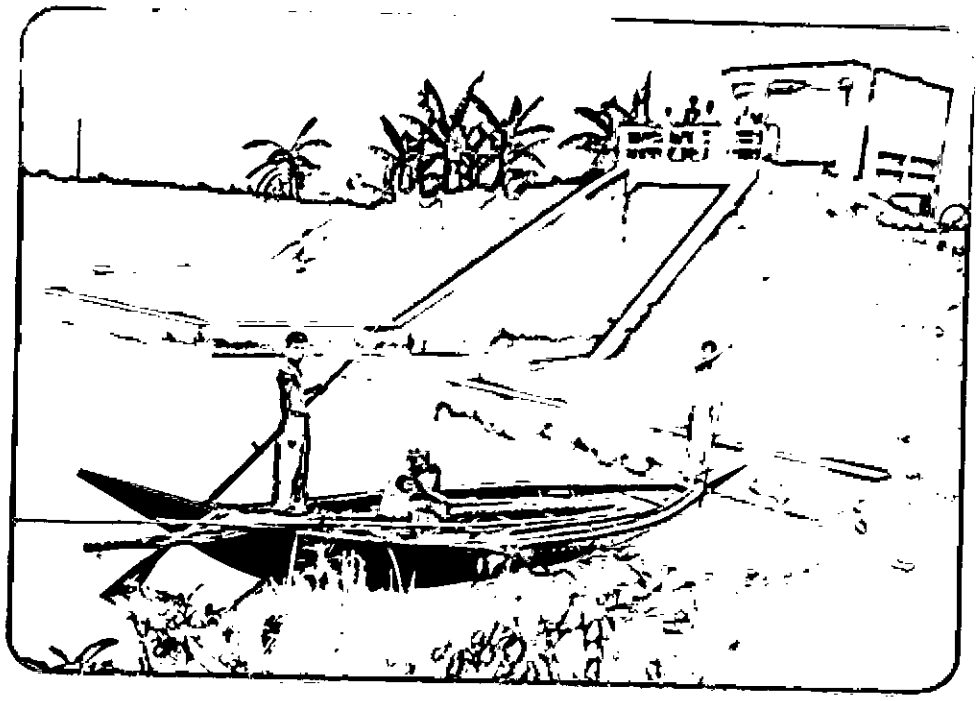


Photo 3 : Regulator on Borrah Khal in Mashajan-Lauhajong Project.

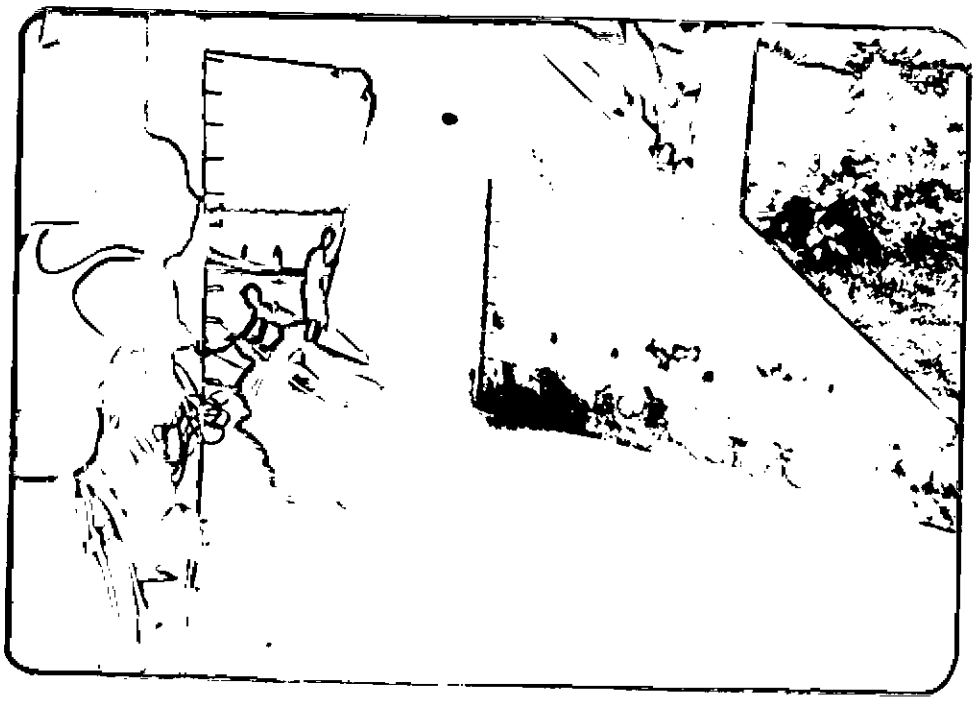


Photo 4 : Boat-crossing is difficult through Borrah Regulator in Mashajan-Lauhajong Project.

Photo 5: Embankment Breaches in Polder 65/A-3 Project.

Photo 6 : Embankment Breaches in Polder 65/A-3 Project.

Photo 7 : Closure at Tarabonia in Polder 65/A-3 Project Washed away.

Photo 8 : Backfill of Sluice no. 3 in Polder 65/A-3 Project washed away.

Photo 9 : Backfill of Sluice no. 3 in Polder 65/A-3 Project washed away.

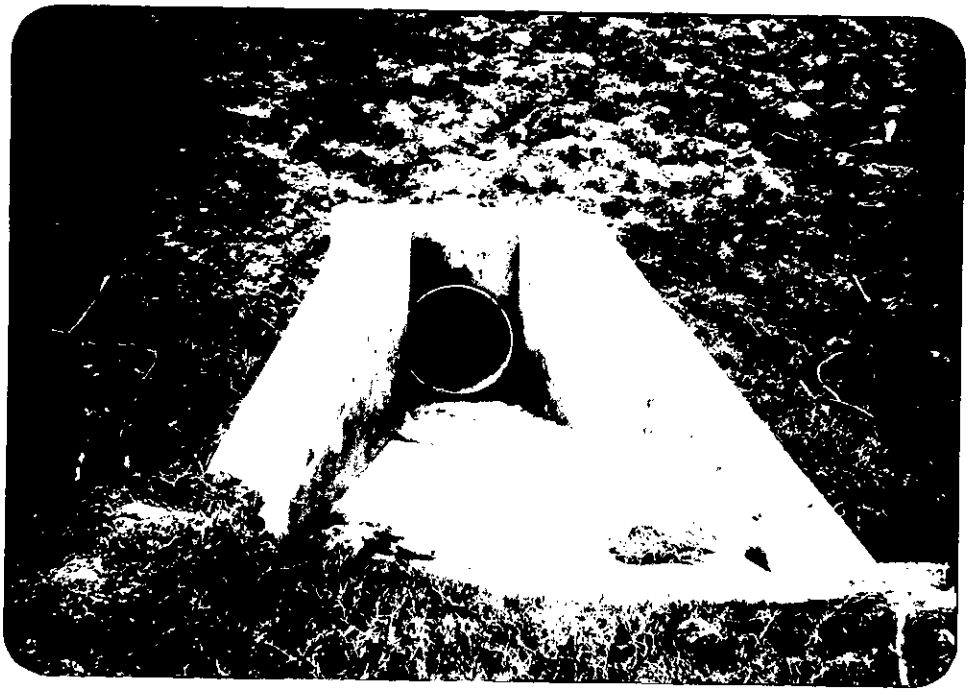


Photo 10 : Irrigation Inlet in Polder 65/A-3 Project.

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