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SMALL SCALE WATER RESOURCE MANAGEMENT IN BANGLADESH: SOCIOECONOMIC APPRAISAL OF PATUAKHALI POLDER 43/2B PROJECT

RN BY

BIMAL KUMAR SAHA*

February 1995

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PREFACE

This working paper is a part of the report of the BIDS Socio-Economic Evaluation Study of Small Scale Irrigation Sector Project (SSISP) in Bangladesh. This study attempts to assess the socio-economic impacts of Patuakhali Polder 43/2B Project. Basing on the performance of this project, the study draws lessons for future design and implementation of such a small scale water management project.

In conducting the study, I have received generous help from other members of the Research Team, in particular from various consultant specialists engaged in this study. Dr. Rushidan Islam Rahman has prepared the chapter analysing the impact on the situation of women in the project area. Dr. Shahidullah Talukder has contributed to the preparation of the chapter evaluating the effectiveness of project structures and their operation and maintenance. Dr. Parvin Sultana contributed to the drafting of the chapter on environment and livelihood security, while Ms. Nasima Sultana provided some useful field level insights in analyzing the institutional and organizational aspects of this study.

The members of the Project Team spent several months in the project area during 1992. In the course of their work, they received whole-hearted cooperation everywhere. I would like to take this opportunity to express my thanks to all those concerned. Special thanks are due to Mr. M.A. Mannaf Majumder, Director, Planning Schemes-II (ADB), BWDB, Mr. Harunur Rashid Bhuiyan, Executive Engineer, Mr. Shamsul Arifin, Sub-Divisional Engineer, and Thana level officers, staff of field offices and local people who provided their support and extended their cooperation in the conduct of this study. Thanks are also due to my colleagues of the BIDS-SSISP Research Team, as well as those who provided excellent assistance in computer programming, word processing, and in carrying out the field survey and subsequently in the tabulation of data (names are listed at Annex-1 of the Report).

I owe a special debt to the authorities of the Bangladesh Institute of Development Studies for initiating the project with financial support of the Commission of the European Communities. I express my gratitude to Dr. Quazi Shahabuddin, Director of the Project for his sincere efforts of providing logistics for conducting the study.

Bimal Kumar Saha
February, 1995

EXECUTIVE SUMMARY

The Small Scale Irrigation Sector Project (SSISP) was planned to enhance foodgrain production in order to attain food selfsufficiency through the provision of combinations of flood control, irrigation and drainage facilities. The SSISP, primarily designed under the Medium Term Foodgrain Production Plan (MTFPP) of the Second Five Year Plan (1980-85), encompasses 31 small sub-projects scattered over different regions of Bangladesh. The Patuakhali Polder 43/2B Sub-Project is one of these and was implemented in the fourth cycle of the SSISP. This sub-project was initiated in 1986-87 and completed in 1990-91 with the financial support of ADB and EEC.

The project area is located in secluded basin separated from the river Lohalia by a relatively close network of tiny crecks and narrow channels mainly in the Galachipa Thana under the district of Patuakhali. The objective of the project is to achieve an integrated engineering and agricultural development for the increase of foodgrain production in the area. The project is primarily designed to provide full flood protection and extended use of irrigation by low lift pumps and gravity means to increase production of both winter and summer rice crops. Thus the physical structures of the project mainly consist of embankments for flood control with regulators equipped with flap gates for drainage and irrigation.

This evaluation study of the Patuakhali Polder 43/2B Sub-Project analyses whether its primary objective has been achieved in terms of provisions of flood protection, drainage and irrigation facilities and the overall impact of water resource management on the rural economy and society.

The engineering survey data pertaining to the structures of the project reveal that the construction of the embankment without providing adequate measures to drain out the accumulated water inside the project has caused acute drainage congestion in certain parts of the project area. More importantly, complementary measures to increase irrigated area and provision of modern inputs and extension services have not so far been implemented. The embankment is

subjected to breaches and has encountered the problem of erosion. Some of the canals have already been silted up and remain ineffective for irrigation and drainage of excess water. The budget for O&M activities is inadequate to properly complete the required and routine works.

In respect of proper management of the project, one important shortcoming has been the lack of local participation and cooperation among various government agencies in planning and implementation of the project. In absence of any effective local (project) committee of the beneficiaries of the project, there does not exist any opportunity of interaction between local people and government departments. Thus the project could not generate much enthusiasm amongst the beneficiaries to bring desired economic benefits through adoption of irrigation and related new technological inputs.

In order to evaluate the socio-economic impact of the project, we have made a comparison of cross-section data on the selected socio-economic indicators (e.g. production, employment, income, education etc.) in the project and control areas. For the purpose of this evaluation, we have also considered the situations prevailing in the pre and post-project periods in both project and control areas.

It has been observed in the study that cropping pattern, cropping intensity and yield rates of various crops have significantly changed/increased due to the realization of the provision of full flood protection under the project. The overall crop performances evaluated in terms of value show that gross returns, net returns and value-added of all crops taken together and most of the individual crops are significantly higher in the project area than in the control area. This provides an indication that the project has a significant positive impact on the performance of crop-agriculture. If the flood protection measures could be combined with irrigation measures for expansion of HYV adoption, the direct impact of the project on crop production would have been further stimulated. In respect of non-crop agriculture, the project area has also higher employment and income than the control area. But this can not be fully attributed to the impact of the project.

In spite of the positive direct impact of the project on the performance of crop sector, the indirect impacts of the project on land, labour and credit markets appear to be far-fetched. Land prices have been observed to be significantly increased in the project area indicating that the project intervention has improved the quality of land and its productive uses. Labour market, in terms of employment situation and wages rates, appears to be somewhat more developed in the project area than in the control area. This is very likely due to the positive impact of the project on the land productivity. The project, however does not appear to have any impact on credit market.

In most of the indicators reflecting the quality of life of the people (e.g. household income, employment, occupational pattern, asset formation, food intake etc.), the control area lags behind the project area. Thus, the overall situations in respect of maintaining the livelihood through meeting the subsistence and basic needs appear to be better off in the project area than in the control area. The distress condition of small farms in respect of food shortage has been observed to coincide with the pre-harvest periods (Ashar and Sravan; Ashwin and Kartic) of Aus and Aman paddy, the main crops in the study area. The seasonal pattern of food shortage is more acute in the control area than in the project area.

The average rates of literacy do not have any significant and systematic variation in the project and control areas. But enrollment rates of the children are observed to be higher in the control area than in the project area. The higher achievement in enrollment by the control area may be explained by the fact that the control area is much nearer to the urban centre. The overall health conditions do not appear to have been much improved, rather static situations in health condition have been cropped up in most of the villages in both the project and control areas.

The project impact on the lives of women has not significantly been felt, though the project has significant impact on agricultural productivity. The lack of impact of the project on women's situation may be due to the fact that it had been only recently constructed. Women's access to food and clothing and their status in the decision making process are determined by long term cultural factors which do not change immediately after the implementation of the project.

The project has a strong positive impact on the environment and livelihood security, though in some cases adverse impacts have been reported. The major impact has been the security of the area from tidal inundation and salinity intrusion. The extent of water-logging has significantly been reduced in the project area. But in certain areas, particularly in the control village, water-logging has substantially increased as an adverse impact of the project and/or due to improper drainage. The project has some positive impacts on livestock sector through making available of grazing fields. But there has been a strong negative impact of the project on wet-lands and water-bodies leading to substantial reduction of fish culture and fish capture opportunities. Afforestation along the embankment of the project has not taken place at any significant extent.

The project needs rehabilitations in order to overcome the existing formidable difficulties for fulfilling the unrealized objectives and better functioning of the project. This is essential for ensuring the flow of benefits to the people. This evaluation study points out for resorting to a policy pertaining to strong inter-departmental cooperation and people's participation in the project management activities through project committees and other related local institutions.

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The Bengali Calendar

The Bengali Calendar has been used in the socio-economic surveys for this study. This has been done because of its familiarity to the respondents and some of the tables are presented by Bengali months. The Bengali months start on the 14, 15 or 16 of the Gregorian months. The Bengali year starts on 1 Baishakh (Mid-April).

The equivalence of Bengali and Gregorian months are shown below.

Bengali Month	Gregorian Month
Baishakh	Mid-April to Mid-May
Jaistha	Mid-May to Mid-June
Ashar	Mid-June to Mid-July
Sravan	Mid-July to Mid-August
Bhadra	Mid-August to Mid-September
Aswin	Mid-September to Mid-October
Kartik	Mid-October to Mid-November
Aghrayan	Mid-November to Mid-December
Poush	Mid-December to Mid-January
Magh	Mid-January to Mid-February
Falgun	Mid-February to Mid-March
Chaitra	Mid-March to Mid-April

CHAPTER 1

INTRODUCTION

1.1 Background

By now it is widely acknowledged that irrigation acts as the key input for improving agricultural production and productivity in developing countries like Bangladesh. Irrigation is the sine qua non of the "Green Revolution". Thus irrigation development and management constitute an integral part for the development of Bangladesh agriculture sector which continues to be dominant in respect of its contribution to the growth of the economy, generation of employment, attainment of food self-sufficiency, alleviation of poverty and malnutrition.

In view of the above consideration, the Government of Bangladesh sets its policy options for water resource development which is essential for accelerating the process of technological, institutional and social transformation of agriculture. Thus the Second Five Year Plan advocates water resource development particularly irrigation, drainage, and flood control to constitute the main instrument of bringing about rapid changes in respect of adoption of new technologies and its impact on production, productivity and growth performance of agriculture. These changes in agriculture particularly in the food sub-sector are, nevertheless, contingent upon the efficient management of the water resources and rapid expansion of irrigation facilities. In this respect the plan documents of the Government of Bangladesh provide emphasis on minor irrigation and small-scale drainage and flood control due to their low capital requirement and high and quick returns that contribute directly to increasing foodgrain production.

1.2 Brief Genesis of the Small Scale Irrigation Sector Project (SSISP)

The Small Scale Irrigation Sector Project (SSISP) was primarily designed within the Medium Term Foodgrain Production Plan (MTFPP) under the Second Five Year Plan (1980-85) of Bangladesh. This production plan, as a detailed sub-sectoral plan for the development of agricultural sector, water and other rural infrastructure, aimed at the attainment of the objective of food selfsufficiency.

The plan stressed upon the provision of investment portfolio for providing additional irrigation, drainage and flood control facilities to effectively improve the food production environment through reduction of vulnerability of crop sector due to unpredictable rainfall and water supply particularly floods.

The enhancement of food production was sought through implementation of small projects comprising the construction and rehabilitation of irrigation, drainage and flood control facilities and installation of appropriate equipments such as low lift pumps, deep and shallow tubewells. The sub-projects, funded by ADB loans, EEC grants and local counterpart fund of the government, are selected in accordance with the criteria suggested by the Asian Development Bank so that for balanced development of water resources, an equitable distribution of sub-projects throughout Bangladesh is achieved.

The SSISP was initially planned to encompass 31 sub-projects with various components (e.g. flood control, drainage, irrigation, protection from high tides). The sub-projects are dispersed in all regions of Bangladesh with a net area of 103,874 ha, 67.26 percent of which are to be brought under flood control, 47.45 percent under irrigation and 32.66 percent under drainage facilities (see Annexure 1). Moreover, there are wide variations in sizes (i.e. net project area) varying from 202 ha to 8097 ha, irrigation modes practised (utilization of ground water and/or surface water) and involvement of public agencies in Command Area Development (CAD) (i.e. BADC and BRDB national programmes). Furthermore, they are planned to be implemented in different times, broadly in four cycles. In terms of the status of implementation, 15 sub-projects have already been completed in different cycles, 10 sub-projects are still being implemented (on going) and 6 sub-projects have already been abandoned at the time of undertaking the study in March 1992 (for list of sub-projects, see Annexure 1).

The Small Scale Irrigation Sector Project (SSISP) consists mainly of short gestation, high priority and divisible sub-projects ready for immediate appraisal and implementation. The projects cover small areas taking into account of local agro-climatic and other natural conditions. Thus they have the scope to accommodate the felt needs of the local people through people's participation in proper planning, implementation and cooperation of the concerned government agencies.

1.3 Patuakhali Polder 43/2B Project : Objective and Nature of Benefit

The project is one of several polders that were planned for irrigation in the area through flood control and drainage works. This project, as one of the 4th cycle sub-projects under SSISP, was expected to provide full flood protection and extended use of irrigation from Khals using low liftpumps and gravity means to increase production of both winter and summer rice crops. This was sought to be achieved by enlarging areas for the cultivation of HYV boro and HYV aman. It was envisaged that after the completion of the project, supplementary irrigation by gravity means would be possible for an estimated 80 per cent of area in the cultivation of HYV aman crops. The provisions of low liftpumps were considered essential for the HYV boro crop. It was expected that agricultural benefits would be obtained effectively from the whole area (net cultivated) of 4370 ha.

The expected benefit is thus to be derived through reduced flood damage and risk of crop failure (as a result of full flood production measures) and conversion of LT aman to HYV aman area and expansion of HYV boro (as a result of the provision of irrigation). It has been estimated (basing on the Appraisal Report on Patuakhali 43/2B Project, BWDB 1986) that paddy production would increase at the extent of 121.34 per cent as a result of the provision of full flood protection and at the extent of 189.21 per cent as a result of both flood protection and irrigation. Apart from actual construction and maintenance of the project structure, it was also expected that the project would lead to the increase in demand for farm labour. This indicates that the project would create employment opportunities which would likely improve the socio-economic conditions of the people.

In addition to the direct benefit on paddy production and subsequent increase in farm employment and income, the project was also expected to provide some protection to dwelling and livestock from periodic high flooding and tidal inundation. While such benefits could not be quantified, it was maintained that the added security provided to crops and other property would enhance the wellbeing of the population in the area. Life would become more secure and stable.

1.4 Evaluation Study: Scope and Objectives

From our earlier discussions, it is clear that the SSISP involves a number of sub-projects, regionally dispersed over the whole country with variations in terms of infrastructure related to water management. However, two common ingredients of the sub-projects are noteworthy: (i) the sub-projects with various components (e.g. flood control, drainage and irrigation) are relatively small in terms of area covered; and (ii) they aim at increasing foodgrain production through efforts of water control and enhancement of irrigation coverage.

Recognizing the above commonalities, the major objectives of the evaluation study are two-fold:

(a) assess the socio-economic (including agriculture) impacts of the project; and

(b) identify, basing on the experience of the performance of the project, lessons for future design and implementation of the project.

Under the first objective, we have attempted here to identify the socio-economic impacts of a sample sub-project, namely, Patuakhali Polder 43/2B Project. One major focus of the study is to identify the constraining factors on expected impacts of the sub-project and to capture attitude, expectations, experiences and opinions of the people regarding impacts (both beneficial and adverse), if any of the project.

Under the second objective, the major emphasis has been made to examine the appropriateness of structure and design of the sub-project in the light of their functional and/or disfunctional performance. Local participation and cooperation among various government agencies in planning and implementation of the project has been examined in order to visualize general technical and social problems of the sub-project. This has been done in order to provide guidelines and/or recommendations for developing strategies for improved planning and implementation of similar projects in future.

The impact of the project, if any, on overall production and employment has been examined in terms of changes in cropping pattern, cropping intensity and

crop yield due to the project. Besides these aspects, the impacts of the project on non-crop agriculture and non-agricultural activities are also important for this evaluation study.

The pertinent issue as to how these changes in the aggregate picture lead to changes in household income, expenditure and employment has been dealt in detail in this study. No doubt all these effects taken together influence the social and economic situation of the study area. Among various social aspects, the impacts on family structure, education, health and status of women are critical areas for evaluation.

These analyses may bring out some indicators to provide us an insight to judge the impacts, if any of the project in true perspective. This is, nevertheless, useful for identifying the conducive and/or retarding factors for the prospect of overall development of the country.

1.5 Structure of the Report

The report is structured in eleven chapters. Methodological aspects pertaining to project selection, data collection and method of analyses are presented in chapter 2. Chapter 3 provides a description of the project structures, their existing condition and effectiveness to fulfill the objectives of the project. Aspects of various institutions/organizations and their coordination and interaction in relation to the project are delineated in chapter 4. Chapter 5 attempts to analyse the impact of the project on crop production and overall performance in agriculture. Chapter 6 assesses the indirect impacts of the project on land, labour and credit markets. Chapter 7 presents a brief discussion on the situation of education, health and nutrition obtaining in the project vis-a-vis control area. Chapter 8 attempts to assess the indirect impacts of the project on occupational pattern, asset formation, employment, distribution of income and other related socio-economic aspects. An examination of the impact of the project on the situation of women has been done in chapter 9. Chapter 10 attempts to assess the expected and/or realized environmental impact, if any, of the project. The final chapter brings forth the major conclusions of the study and provides recommendations for better functioning of the project.

CHAPTER 2

METHODOLOGY AND SOURCES OF DATA

2.1 The Selection of the Patuakhali Polder 43/2B Sub-project

In view of the main characteristics of the SSISP and objective of the evaluation study, one may suggest to evaluate each of the sub-projects in order to capture all specificities. Such an exercise, nevertheless, may not be cost effective in terms of finance and time. Under this consideration, we attempt to select ten sub-projects - Patuakhali Polder 43/2B being one of them - in such a fashion that they may be considered as representative of the whole project.[1] The following criteria, however, have been adopted for selection of the sub-projects:

(a) At least one of the sub-projects must be selected from each of the five broader regions (for regional classification, see Table 2.1) over which the sub-projects are dispersed.

(b) From each region, at least one sub-project must be chosen from each type of sub-projects grouped in terms of similarities in components involved (D/FC or D; D/FC/I or FC/I; and I or D/I).

(c) From each region, at least one sub-project must be chosen from each class of sub-projects grouped according to the size (i.e., net area of the projects). Sub-projects with net area greater than 4000 ha have been considered here to be large and those with net area less than or equal to 4000 ha have been treated as small.

(d) Selected projects must have been completed preferably in earlier periods or cycles so as to enable us to make proper assessment of the impact, if any.

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[1] Annexure 1 provides a list of all projects and their status. Footnote 1 of this Annexure describes the nature of changes in the the status of sub-projects during the period of our study.

To satisfy the above criteria for selection of sub-projects, the distribution of 15 completed sub-projects, as shown in Table 2.1, can be brought into sharp focus. Sub-projects Baranai, Barkati, Pakuria Beel, Aglar Chak and Kamarnogaon (Nos. 01, 02, 04, 12 and 27 respectively) do not have their competitors for satisfying the above mentioned criteria. So they could easily be selected for evaluation.

Table 2.1

Distribution of Completed Projects by Region, Type and Size

Region		Project type	Size of the project	
			Large	Small
I	Rajshahi	A=D/FC or D	-	[01]
	Kushtia	B=D/FC/I or FC/I	-	-
	Dinajpur	C=I or D/I	-	06,07,[08],10
II	Faridpur	A	[27]	[04]
	Dhaka-Tangail	B	[12]	[02]
	Comilla	C	-	-
III	Mymensingh	A	-	-
	Sylhet	B	[18]	19
		C	-	-
IV	Barisal	A	-	-
	Patuakhali	B	[21],[22],26	-
		C	-	-
V	Chittagong	A	-	-
		B	-	-
		C	-	[03]

Source: BWDB Report (1991)

Note: All the figures indicate serial numbers of the sub-projects used by BWDB. Figures in brackets indicate the serial number of sub-projects selected for this study.
D = Drainage, FC = Flood Control, I = Irrigation.

Table 2.2

Basic Information of Completed and Selected Sub-projects

Sl. no.	Name of the sub-project	Year of completion	Location upazila	Type	Size	Project No.	
						Cycle	Serial
A.	1st phases						
1.	Barnai	1985-86	Natore	D/FC/I	S	1	01
2.	Aglarchak	1990-91	Nawabganj	FC/I	L	3	12
3.	Versha	1986-87	Tetulia	I	S	2	08
4.	Poldar 55/2C	1989-90	Galachipa	FC/I	L	4	22
5.	Barkatibeel	1985-86	Basail/ Mirzapur	FC/I	S	1	02
B.	2nd phase						
6.	Kamarnaogaon	1985-86	Delduar	D/FC	L	4	27
7.	Gormur Haor	1990-91	Sunamganj	FC/I	L	3	18
8.	Pukuria Beel	1985-86	Balaikandi	D	S	1	04
9.	Poldar 43/2B	1990-91	Galachipa	FC/I	L	4	21
10.	Hangor Khal	1985-86	Satkania	I	S	1	03
C.	Completed Projects, but not selected for evaluation						
11.	Tirnai	1986-87	Tetulia	I	S	2	06
12.	Sonamoral Haor	1990-91	Sunamganj	FC/I	S	3	19
13.	Tulshia Beel	1985-86	Tetulia	I	S	2	10
14.	Ramchandi	1986-87	Tetulia	I	S	2	07
15.	Poldar 55/4	1990-91	Galachipa	FC/I	L	4	26

Source: Consultancy Complition Report (1990) and BWDB Report (1991).
Note : D = Drainage; FC = Flood Control; I = Irrigation; S = Small; L = Large.

Amongst Versa, Ramchandi and tulshia (Nos. 6, 7, 8 and 10) of type C of small size in Region I, two sub-projects can be selected. Considering the recent evaluation of Ramchandi sub-project by BWDB and the small size of both Tinai (316 ha) and Tulshia Beel (202 ha), Versa (No. 8) completed in 1986/87 have been chosen for evaluation. Gurmar and Sonamoral haors (Nos. 18 and 19) belong to type B (D/FC/I or FC/I) in Region III. It is decided to evaluate the larger one

(i.e. Gurmar haor). In order to satisfy the regional criterion [2.1(a)]. Hangor Khal Irrigation Scheme, a sub-project of the first cycle belonging to smaller size category, was selected. Amongst the three polders in Patuakhali (55/2C, 43/2B and 55/4) there remains two sub-projects to be selected. In this case, the preference is for the earlier completed sub-project (55/2C) and the larger one (43/2B).

The Patuakhali Polder 43/2B, as one of the few polders implemented for irrigation through flood control and drainage, has been taken up for the present evaluation study. This is a coastal embankment project and is large in size under the formulated scheme of SSISP. Characteristics of other selected projects vis-a-vis the remaining projects (completed) not selected for evaluation are presented in Table 2.2.

2.2 Methodology for Data Collection

This evaluation study is based mainly on primary data collected through field level surveys. Some secondary information has been used from BWDB's reports and project feasibility studies (e.g. BWDB 1986, 1990, 1991). The secondary sources mainly provide information on the pre-project situation, project structure, design and objectives. The main features of data collection procedure are, however, presented below:

2.2.1 Village Level Survey (VLS)

For collecting community level information, the technique of Village Level Survey (VLS) was adopted. The VLS was conducted in all the 29 project-villages. Moreover, for evaluation, 5 control villages were also selected in order to capture all possible changes due to project intervention. These control villages were selected in such a way that they were adjacent to the project, but were not affected in any way either by the project itself or by any other neighbouring project.

Thus, for Village Level Survey, selected villages (project/control) were brought under various groups on the basis of location and possible benefits that would have been derived by the farmers. This can be seen in Table 2.3.

Table 2.3

Distribution of Villages for Village Level Survey in Patuakhali Polder 43/2B

Groups	Number of Villages	Number of Households	Number of Population	Number of Households Per Village (Approx.)	Number of members per household
Project:	29	8651	46789	298	5.4
Southern	20	5058	27904	253	5.5
Northern	9	3593	18885	399	5.3
Control	5	2331	12940	466	5.6
Total	34	10982	59729	283	5.4

Source: BIDS/SSISP Village Level Survey, 1992.

Key Informant System (KIS) was adopted to collect information from the selected villages. Accordingly village questionnaire was filled in through discussion meeting(s) with group(s) of informed key persons from each village. Such informed key persons included educated old persons, school teachers, religious leaders, important occupation groups like traders, wage workers etc. to get most often agreed answers to structured questions.

It was expected that the Village Level Survey (VLS) based on the Key Informant System (KIS), would provide some preliminary socio-economic indicators towards understanding the project area. This would also be helpful to be consistently integrated and comprehended with the data collected at the household level from the intensive survey project villages in contrast with the control village.

2.2.2 Household Level Survey (HLS)

Project and control villages are brought under various groups (see Table 2.3). We selected three project villages and one control village from these groups of villages in such a manner that the selected villages can represent the whole project and control area with all possible specificities[2]. The selected villages for intensive survey were not likely be very large in respect of the number of household and/or population. This criterion was taken into consideration for the sake of household sample selection (discussed below) from these villages.

For selection of sample households for the study, we collected census data of some key variables (e.g. cultivable owned land and main occupation) of each of the household. We stratified them, on the basis of cultivable landownership, into 4 size categories: landless (owning no cultivable land), small (0.01-1.01 ha), medium (1.02-2.02 ha) and large (2.03 ha and above).

The sample design was what is known as 'stratified random sample' with the village as the primary unit and the household as the ultimate unit of the study. Probability sampling was adopted. The random number table was used to draw samples based on two way classification according to farm size and main occupation of the household. The sample was designed to maintain the equal proportionality ratio of the sample households to the total households in each cell of the two way table (see Table 2.4). The proportionality ratio was determined at around 15 percent of the total households. The number of household stands at around 25 from each village of the project and 35 from control village. Thus in total 114 households were chosen from 4 intensive survey villages (including a control village) (see Table 2.4).

There are, however, some discrepancies between the ex-anti and ex-post samples which can be discerned from Table 2.4. These discrepancies, though insignificant, may be due to the reason that the data collected from the key informants are not as accurate as those from the households themselves.

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[2]For a list of the intensive survey villages and their accessibility, see Annexure-2.

The detailed impact evaluation were carried out with formal questionnaire surveys on the sample households. Two sets of questionnaires were utilized. The first set relates to information mainly on all aspects of household production activities, income, expenditure, assets and employment. Direct questions were also asked about the influence of the project on flood damage, drainage problems,

Table 2.4

Household Sample Selection Process in Patuakhali Polder 43/2B

Farm Size Categories (ha)	Number of Households in					
	Project Village			Control Village		
	Total	Ex-anti Sample	Ex-post Sample	Total	Ex-anti Sample	Ex-post Sample
Landless (0)	84	15	17	68	10	10
Small (0.01 - 1.01)	287	48	47	97	15	16
Medium (1.02 - 2.02)	42	9	8	49	7	5
Large (2.03 & above)	26	7	7	24	4	4
All Farms	439	79	79 (18.0)	238	36	35 (14.71)

Source: BIDS/SSISP Village Level Survey, 1992.

Note : Figures in parentheses are percentages of ex-post sample households to total households.

salinity conditions and irrigation practices. Information was obtained by interviewing the head of the household. The second set of questionnaire relates to information on the situation of women and the household position in terms of access to water for domestic uses and access to fuel. Since these issues concern

the women members of a household more than others, these questions were asked to the female member who is most important within the household. This questionnaire was administered by female Field Officers.

The information thus collected from two sets of household questionnaires was rigorously checked and supplemented by field observations by professional researchers taking cognizance of Field Reports prepared by Supervisors and other Field Officers.

The assessment of project impacts is largely done by control area approach. This involves comparison of situation over time; and in terms of project and control units, assuming that the initial conditions of the both are the same and similar, but the control area is free of any intervention during the whole period. This suggests that choosing the initial condition of a control unit poses a very difficult task, since the control unit does not usually remain 'controlled' as in a laboratory experiment. And for that matter, the control village was selected with great care with emphasis on similarity to the project villages in terms of pre-project conditions.

2.2.3 Specialists' Study

The VLS and HLS were further supplemented by the studies and observations made by specialists in the fields of engineering, agronomy and sociology. The engineering study contains observations and evaluations on project structures, design, operation and maintenance and their effectiveness. The Agronomist mainly deals with land use, soil structure, cropping pattern and problems related to environmental issues. The Sociologist attempts to explore institutional relationships regarding project related activities. The specialists in connection with their studies, consulted secondary documents, made a number of field visits, and conducted interview with staff and officials of relevant government departments as well as villagers involved in operation and maintenance of the project. These exercises provided both qualitative and quantitative information to arrive at informed judgements by experienced specialists.

2.3 Description of the Study Area

The study area is mainly located in the Galachipa Thana under the district of Patuakhali. The project area covers the whole of the Amkhola Union under the Galachipa Thana and a part of Auliapur Union under the Patuakhali Sadar Thana

(for the location of the project area, see Map in Figure 2.1). Amongst the study villages, household level intensive survey was confined to four villages - three villages within the project area and one (control) village outside the project area. Some information pertaining to the basic characteristics of the area and study villges are presented below.

The communication system of the area is very poor. Few Kucha roads within villages and/or connecting the thana are used only for walking on foot. Accesses to the polder and within the study villages are by engine boat and motor launch. No other vehicles and communication facilities are available to reach the project area from Galachipa and Patuakhali. It takes about 2 hours time by motor launch to reach the polder from Patuakhali. A list of the distance of the study villages from the union and thana offices and the means of communication are provided in Annexure-2. The social infrastructure factilities available to the study villages, however, are not very poor. The distance of the study villages to schools, colleges, markets and banks as the indicators of social infrastructure facilities can be seen in Annexure-3.

The detailed information on the characteristics of population, type of land, cropping pattern etc. will be provided in the forthcoming chapters evaluating the impact of the project. We can, however, provide some information below characterising the whole area of the localities e.g. district, thana and unions to which the study villages are hierachically linked up.

The whole area suffers from regular flood and tidal inundation. Most often cyclone surges cause damage to lives, properties and standing crops. Aman paddy particularly T. Aman is the main crop in the locality, followed by Local Aus paddy. About 80 percent of land is devoted to Aus and Aman (see Table 2.5). The cropping intensity is around 150 and very insignificant portion (around 1 per cent) of land is irrigated (see Table 2.6). The distribution pattern of land is very much skewed where about 65 per cent of households own only 32 per cent of land and about 8 per cent of households have 31 per cent of land (see Table 2.7). About 65 per cent of households are involved in farming and around 50 per cent of those farm households are agricultural labourers (see Table 2.8) indicating a situation of abject poverty of the region.

Figure 2.1

PROJECT LOCATION MAP

PATUAKHALI POLDER 43/2B SUB-PROJECT

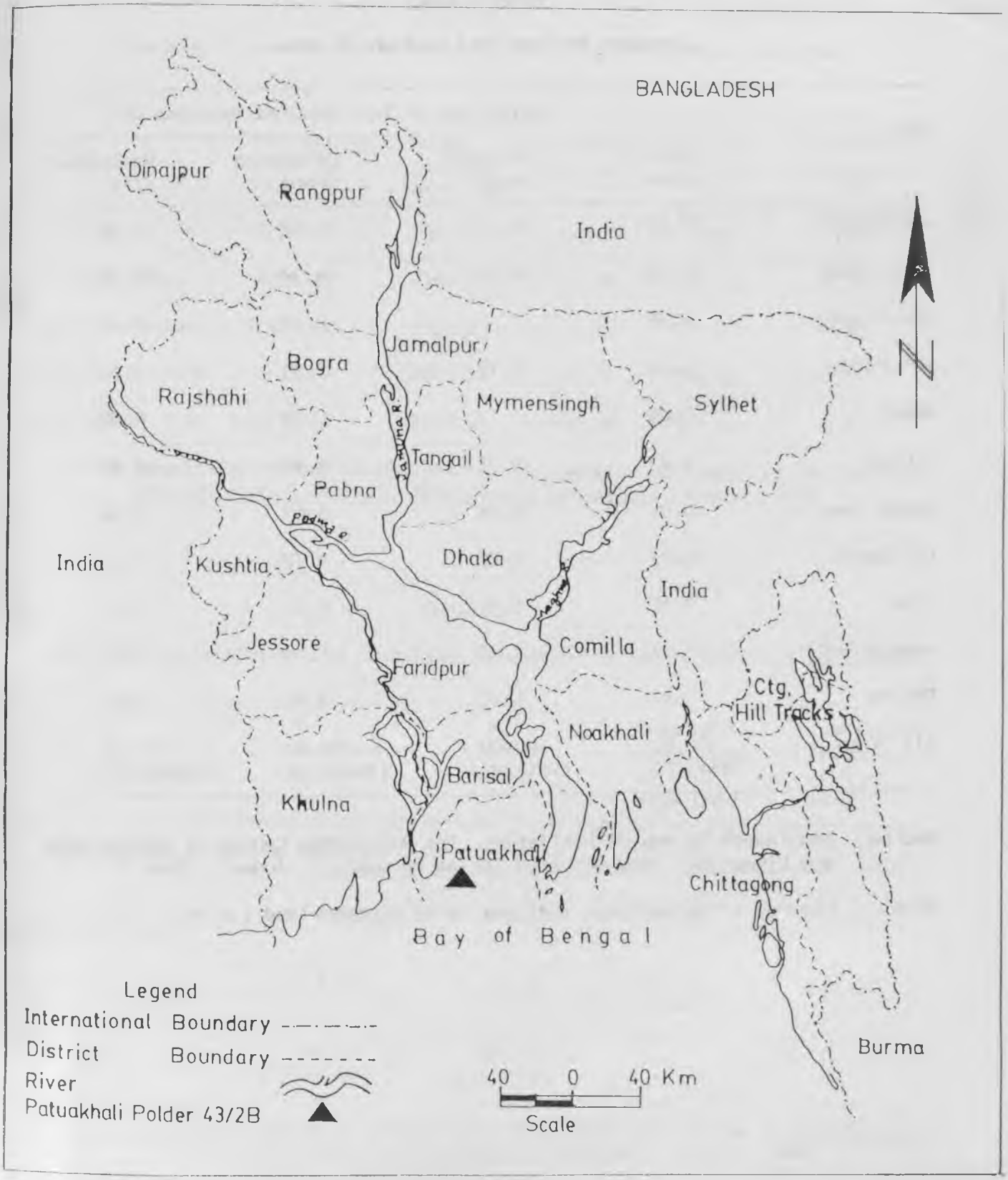


Table - 2.5

Cropping Pattern by Location of Area

Crops	Percentage of land devoted to crops in			
	Amkhola Union	Auliapur Union	Galachipa Thana	Patuakhali Zila
Aus Paddy	27.67	33.13	11.96	19.46
Aman Paddy	62.69	58.08	64.37	58.65
Boro Paddy	0.39	-	0.70	0.51
HYV Paddy	0.36	0.77	1.26	1.40
Wheat	0.06	-	0.03	0.02
Pulses	5.03	2.21	14.49	13.64
Sugar Cane	0.01	0.04	0.03	0.04
Oil-Seeds	0.77	0.20	1.72	1.40
Jute	0.12	0.65	0.31	0.34
Vegetables	1.27	2.92	1.79	2.00
Spices	1.63	1.99	3.34	2.55
All Crops	100.00 (4143.72)	100.00 (2852.23)	100.00 (59828.34)	100.00 (539468.97)

Source: Bangladesh Bureau of Statistics, The Bangladesh Census of Agriculture and Livestock; 1983-84, Zila Series Patuakhali, August, 1988.

Note : Figures in parentheses indicate total cropped land (in ha).

Table - 2.6

Cropping Intensity and Extent of Irrigation by Location of Area

Location	Cultivated area (ha)	Gross cropped area (ha)	Irrigated area (ha)	Cropping intensity (3) (5)=--X100	Extent of irrigation (4) (6)=---X100
(1)	(2)	(3)	(4)	(2)	(2)
Amkhola Union	2751.42	4143.72	21.86	150.60	0.79
Antiapur Union	1813.36	2852.23	5.67	157.29	0.31
Galachipa Thana	43782.59	59828.34	265.18	136.65	0.61
Patuakhali Zila	143293.11	218408.48	2190.28	152.42	1.53

Source: Bangladesh Bureau of Statistics, The Bangladesh Census of Agriculture and Livestock: 1983-84, Zila Series Patuakhali, August, 1988.

Table 2.7

Land Distribution Pattern by Farm Size Categories in the District of Patuakhali

Farm Size (ha)	% household	% owned land	Cumulative frequency of % of household	Cumulative frequency of % of land
0.02 - 1.01 (Small farms)	65.40	31.82	65.40	31.82
1.02 - 3.03 (Medium farms)	26.88	37.13	92.28	68.95
3.04 and above (Large farms)	7.72	31.05	100.00	100.00
All farms	100.00 (57808.10)	100.00 (146320.64)	-	-

Source: Bangladesh Bureau of Statistics, The Bangladesh Census of Agriculture and Livestock: 1983-84, Zila Series Patuakhali, August, 1988.

Note: Figures in parentheses indicate member of household/owned land (ha).

Table 2.8

Types of Households by Location of Area

Location	% of household			Agricultural labour household	Agricultural labour household	
	Farm	Non-farm	Total		as % of all households	as % of all farm households
Amkhola Union	69.9 (2940)	30.1 (1265)	100.00 (4205)	(1702)	40.5	57.9
Auliapur Union	77.8 (2323)	22.2 (662)	100.00 (2985)	(1031)	34.5	44.4
Galachipa Thana	72.4 (33446)	27.1 (12440)	100.00 (45886)	(18976)	41.4	56.7
Patuakhali Zila	74.9 (142786)	25.1 (47765)	100.00 (190551)	(67348)	35.3	47.2

Source: Bangladesh Bureau of Statistics. The Bangladesh Census of Agriculture and Livestock: 1983-84. Zila Series Patuakhali. August. 1988.

Note: Figures in parentheses indicate number of housleholds.

CHAPTER 3

PROJECT STRUCTURES, ENGINEERING DESIGN AND IMPLEMENTATION

3.1 Introduction

The Patuakhali Polder 43/2B is one of the fourth cycle sub-project under SSISP. The sub-project is a part of polder 43/2 of the Coastal Embankment Project (CES), Phase II to provide irrigation through full flood protection measures and drainage works. This project is expected to increase rice production in both winter and summer seasons by enhancing the acreage and yield of HYV Boro and HYV Aman. The project preparation was done by the Directorate of Planning Scheme II in association with a group of consultants (e.g. Code and partners, U.K., Minster Agriculture Ltd, U.K. and Planning, Engineers and Consultants, Bangladesh). The sub-project was implemented by the existing Patuakhali O&M Division under the supervision of the Directorate of Planning Scheme II, BWDB. The sub-project was financed by the Asian Development Bank (ADB) under the credit No. 558-BAN(SF). The construction works of the engineering features were initiated in 1986-87 and completed in 1990-91. In spite of the fact that planning, design and construction works had been fully completed to provide protection against flood damages and tidal inundation through reducing the risk to crops, the sub-project has not yet been able to provide irrigation facilities. In absence of irrigation facilities in the area, the major objective of the project of increasing food grain production through adoption of HYVs has not been fulfilled.

This chapter, however, gives a description of the project structures, their existing conditions and effectiveness to fulfill the objective of the project.

3.2 The Engineering Aspect of the Structure

3.2.1 Project Structures

The Polder 43/2B is a multipurpose project aimed to provide irrigation, improved drainage and total flood protection in the area. It is one of the several polders developed for irrigation by means of flood control and drainage works. Irrigation is proposed to be accomplished by installing 130 low lift pumps (LLPs) each having 2 cusec capacity or by gravity means. The benefits to agriculture are best achieved by combining the facilities for drainage of internal rainfall run-off at low tide and for supplementary irrigation at high tide after monsoon. The polder is located in a secluded basin separated from the river Lohalia by a relatively close network of tiny creeks and narrow channels (Khals). The hydrological events such as flood peak river levels for designing height of flood protection embankment, dry season river levels for regulators, spring tide river levels for getting suitable level for flushing sluices having timber slide gates to irrigate the higher land in March and October and levels to which the internal rain water can drain down in the monsoon months for growing aus and aman crops are important parameters for planning and executing the project[1]. The index map of the Polder 43/2B showing the location of the engineering features is given in Figure 3.1. The main design features of the project are summarized in Table 3.1.

[1]Detailed information relating to the hydrological events including climatic data and internal run-off are available in the Appraisal Report on Patuakhali 43/2B Project (BWDB, 1986).

Table 3.1

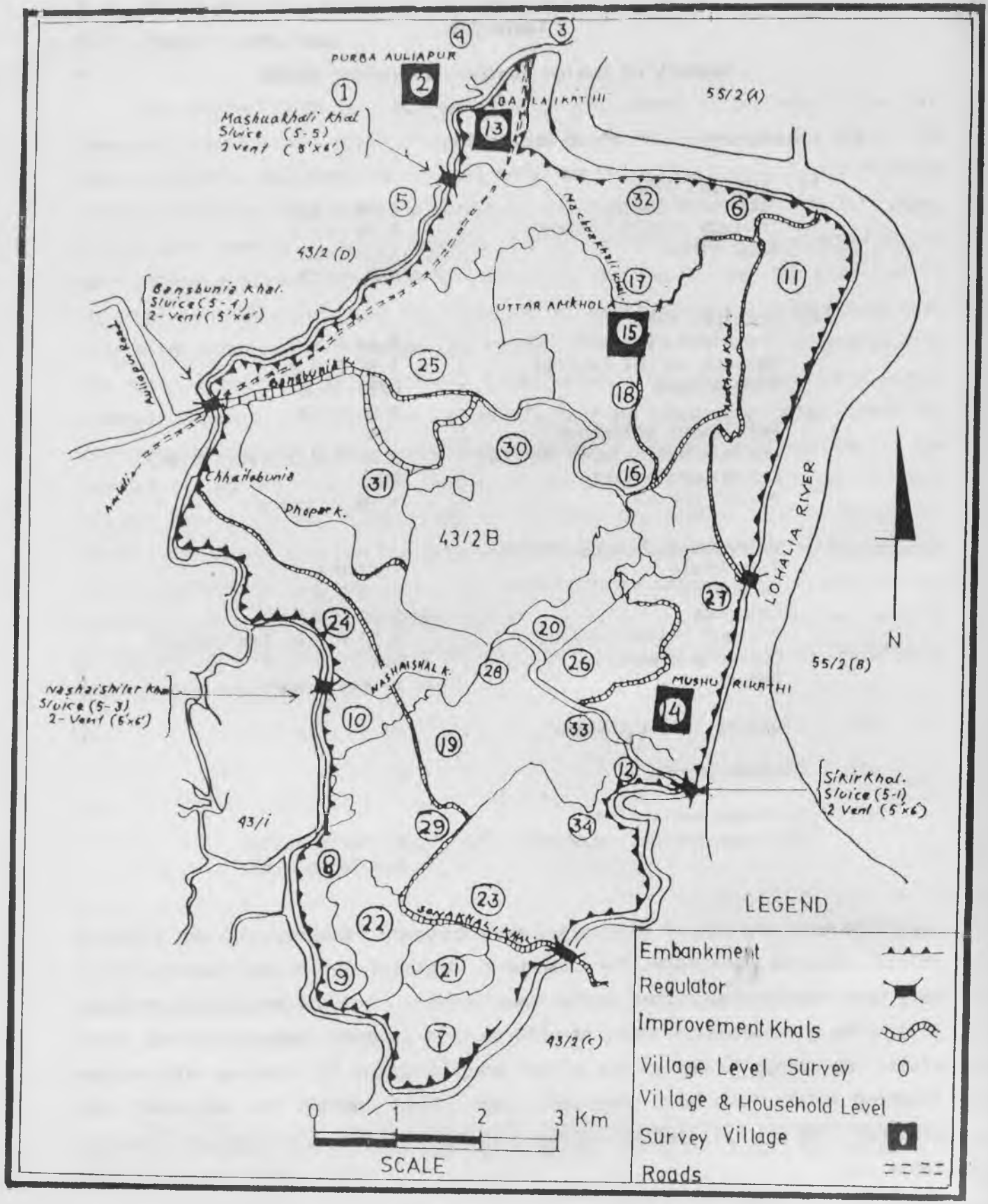
Summary of Design Features of Polder 43/2B

A)	Embankments (Full Flood Protection)		
	i) Interior dyke		
	Top width (metre)	:	4.26 P.W.D.
	Maximum height (metre)	:	1.98 P.W.D.
	Side Slope	:	C/S - 1:2
		:	R/S - 1:3
	ii) Marginal dyke		
	Top width (metre)	:	2.44 P.W.D.
	Maximum height (metre)	:	1.98 P.W.D.
	Side slopes	:	C/S - 1:2
		:	R/S - 1:3
	Settlement allowance	:	20%
	Maximum water level (metre)	:	3.30 P.W.D. (estimated)
	Design probability	:	98%
	Return period	:	1 in 50 years
	iii) Water Level Record (metre)		
	Patuakhali	:	2.87 P.W.D.
	Galachipa	:	3.83 P.W.D.
	Dasmonia	:	3.60 P.W.D.
	Project (Polder 43/2B)	:	3.30 P.W.D. (estimated)
	Design probability	:	98%
	Return	:	1 in 50 years.
B)	Flushing Inlets (Number)	:	24
C)	Closure (Number)	:	8
D)	Drainage and surface drainage sluices (Number)	:	6 (for details, see Table 3.2).

The main features of the project are embankment, drainage sluices, flushing inlets, closures and canals. The embankment, drainage sluices and flushing inlets have been constructed as per design specifications set out in project proforma (PP). The dimensions of these structures were randomly measured during field visit. No change in design and actual specifications for drainage sluices and flushing inlets have been observed except slight changes for embankment and closure. The main project structures and their present condition are given in Table 3.2.

FIGURE 3.1

PATUAKHALI POLDER 43/2B PROJECT MAP



Village List

Sl. No. of the Villages	Name of the Villages
1.	Parba Auliapur (Household)
2.	Bara Auliapur
3.	Thengri
4.	Keshabpur
5.	Chotta Auliapur
6.	Char Amkhola
7.	Shonakhali
8.	Garabunia
9.	Alki
10.	Bujra
11.	Dori Baherchar
12.	Shiki Shuhori
13.	Boloikathi (Household)
14.	Moshurikathi (Household)
15.	Uttar Amkhola (Household)
16.	Dakhin Amkhola
17.	Dakhin Balaikathi
18.	Maddha Amkhola
19.	Ramananda
20.	Kuralbhanga
21.	Khontakhali
22.	Kanchanbaria
23.	Kismat Bauria
24.	Soilabunia
25.	Badura
26.	Kalai Kishor
27.	Bhangra
28.	Niz Shuhori
29.	Chalitabunia
30.	Ramdula
31.	Banshbunia
32.	Chinguria
33.	Algi Tapalbaria
34.	Shiki Bouria

Table 3.2

Main Engineering Structures and Their Present Conditions

Location of Structure	Present Condition of Structures													Present Condition of Embankment Km	Present Condition of Closure	Present Condition of Khal (drainage/irrigation channels)
	Drainage Sluice								Gate							
	No. of Vent-age	Size of Ventage (HXV)m	Type of Gate	Wing Wall		Box	Apron		Gate	Fall Board	Rubber Seal/ Groove	Chain Pulley	Flushing Inlets			
				C/S	R/S		C/S	R/S								
Musurikati Khal Drainage	2	1.5 X 1.8	VL	G	G	G	F	P	G	G	C/S and R/S to be provided	provided but short	Total Nos. = 24 R/S - Gate and fall board system C/S - Fall board Diameter of Pipe = .61 m pipe culvert having 5 pipes each 6 ft in length R.C.C. Pipe Invert level = 1.28 m (4.2 ft) P.W.D. G	Total Length = 41.50 km Top width = 4.26 m for 15.74 km having side slopes C/S - 1:2 R/S - 1:3 and 2.44 m for 25.76 km having side slopes C/S - 1:2 R/S - 1:2 Height = 1.98 m (6.5 ft) Needs minor repairing	Total No. = 8 G Need minor repairing	Total Length (Target) = 25.75 km Actual khal improvement = 25.75 km Bed width = 3.05 m (10 ft) Maximum depth = 1.52 m (5 ft) Bed levels: (-) .61 m (2 ft) P.W.D. Side Slopes = 1:2 Needs minor re-excavation
Bacoria (Sona-Khali Khal) Drainage Sluice	2	1.5 X 1.8	VL	G	G	G	F	P	G	G	C/S and R/S to be provided	Provi-ded but short				
Sailaburia (Nashaisill Khal) Drainage Sluice	2	1.5 X 1.8	VL	G	G	G	P	P	[P] 1 gate at the C/S is broken and protected by fall board & another at R/S is broken	G	C/S and R/S to be provided	Provi-ded but short				
Badura Khal Drainage Sluice (Banshbaria Khal)	2	1.5 X 1.8	VL	G	G	G	P	P	[P] 1 gate at R/S is totally broken & another is partially broken. 1 gate is broken at C/S	G	C/S and R/S to be provided	Provi-ded but Short				
Amkhola Khal Drainage Sluice	2	1.5 X 1.8	VL	G	G	G	G	P	[P] 1 gate on the C/S is totally broken	G	C/S and R/S to be provided	Provi-ded but short		Needs minor repairing		
Masuakhali Surface Drainage Sluice	1	1.5 X 1.8	VL	G	G	G	F	F	[P] 1 gate at C/S is broken	C/S G	C/S and R/S to be provided	Provi-ded but short				

Note: C/S : Country Side;
R/S : River Side;
VL : Vertical Lift;
G : Good;
F : Fair;
P : Poor

Source: BIDS/SSISP Survey 1992.

3.2.1.1 *Embankment*

The project consists of a full flood control embankment, the total length of which is 41.50 km. The length of the interior dyke is 15.74 km having top width of 4.26 m and side slopes on C/S - 1:2 and R/S - 1:3. The length of the marginal dyke is 25.76 km with top width of 2.44 m and side slopes on C/S and R/S - 1:2. The height of the embankment is 1.98 m (6.5 ft). The side slope (SIS) of interior dyke and marginal dyke on the R/S was designed at 1:3 and 1:2; but random measurements showed that in major portions this is no longer available due to wave action. The embankment is subjected to huge wave and is cording, since it floats in large water bodies on the river side at several locations. The hitting of the embankment by these huge waves caused slip failure on the embankment slopes to different degrees depending on the type of soil, side slopes, compaction and turfing used. The top width thus has been reduced throughout the embankment by about 0.61 m (2 ft). However, the general condition of the embankment is good. The embankment is subjected to numerous piping in about 100 places throughout the embankment especially in Sailabunia (Nashaisill khal closure) Badura (near Banshbaria khal closure) and masuakhali khal surface drainage sluice. Piping occurred when the water level in the river or khal started increasing. These have been observed in the farmers field as the water automatically comes out in the field through the holes. It takes the shape of an underground tunnel and may cause complete collapse of the embankment. The beneficiaries somehow repaired piping to protect the embankment from total collapse. According to BWDB authority this is an usual phenomenon for this type of polder. This can be repaired by digging 7 to 8 ft soil below the embankment and then refilling and compacting the same. Turfing throughout the embankment is not adequate. Small sloughing was observed on the embankment. Sloughing is enlarging day by day which may cause the embankment to collapse unless properly protected as reported by the beneficiaries. The embankment was also damaged due to rain-cuts which need to be repaired.

3.2.1.2 *Flushing Inlets*

There are 24 flushing inlets of fall board type constructed throughout the entire length of the embankment. Supplemental irrigation during spring tides to aman crops can be provided into the polder at a higher level through these flushing inlets. These could be used to irrigate medium high land and are not

required where the land is flooded by internal run-off which can not be drained and is therefore, not suitable for T. Aman. Each flushing inlet covers an area of about 40.5 ha. Interviews with local people indicate the need to construct more flushing inlets specially near the regulators where the land is at higher elevation. The villagers have already approached the local BWDB officials for more flushing inlets. It has been complained that the existing flushing inlets are not effective due to their construction at inappropriate places. More flushing inlets need to be constructed at appropriate places covering around 20 ha by each of the structure and should be spaced at about 300 m intervals.

3.2.1.3 Closure

Piping and sloughing are observed on the closures which need to be repaired. The closure near Sailabunia has been damaged due to piping. A small pond is constructed near this closure causing formation of ghogs.

3.2.1.4 Drainage Sluices

Six drainage sluices including one surface drainage sluice have been constructed as per PP. The location of the drainage sluices are shown in Table 3.2. The ventage of the drainage sluices are same each having 2 vents and the surface drainage sluice having a single vent with vertical lift gates. The size of ventage of the drainage sluices is (1.5 X 1.8) m and that of surface drainage sluice is (0.9 X 1.2) m. These structures have been constructed as per design specifications. Three drainage sluices and one surface drainage sluice have been found to be in defective condition due to problems associated with gates. Two gates of Sailabunia drainage sluice have been broken - one on the C/S and the other on the R/S. The gate on the C/S is totally broken and protected by fall board. In Badura khal drainage sluice one gate on R/S has been found to be totally broken, one gate on R/S is partially broken and another gate on C/S is also broken. One gate on C/S has been found to be totally broken in Amkhola khal drainage sluice. During site inspection we have observed that one gate on C/S to be broken in Masuakhali surface drainage sluice. These gates, remaining either broken or washed away due to improper operation and high pressure of currents, needs to be operated as per O & M manual.

The gate operating arrangements are, however, complex. The chain pulleys provided for operating the gate are not sufficient. Lifting of gates by means

of chain pulley is done by providing a gantry above the head wall to which the chain pulley remains attached above each gate in turn. Arrangement may be made to provide long chain pulley to the sluice committee for easy operation of the gates. All the gates are leaking as their rubber seals are partially damaged. Rubber seals both on C/S and R/S need to be provided in all the gates.

It can be seen from Table 3.2 that the wing walls and boxes of all the drainage sluices including the surface drainage sluices are in good condition. The condition of loose aprons on C/S and R/S of all the drainage sluices are categorized as poor, fair and good. As a whole the loose aprons (blocks) at the extreme end of R/S are totally damaged and at the extreme end of C/S are partially damaged. The loose aprons need to be repaired in order to prevent serious scouring on C/S and R/S of the drainage sluices.

3.3 Overall Condition of the Project

In the project area, rainfall, river water and khals are the perennial sources of water. According to the BWDB, water level during flood, depth of khal, quantity of water flowing through the khal and the soil condition of the bed of the khal have been considered in constructing closures across the embankment and natural canal. Drainage, salinity control and increase in yield are some of the advantages achieved due to construction of the water control structures. The disadvantages are water logging in some pocket areas, water pollution causing drinking water scarcity, increase in mosquito menace, outbreak of diarrhoea and pressure exerted by water on the adjacent areas due to construction of the project. All the beneficiaries interviewed stated to construct more flushing inlets to appropriate places so as to allow water to enter into the field which can be used for irrigating high and medium high land. It is noted that there is no wastage of irrigation water as modern irrigation is not yet practiced rather tidal water is used for planting and growing rice. All the farmers indicated that conjunctive use of water would be appropriate for the project. It is interesting to note that there is no pump/tubewell in the project area.

Extreme salinity has been observed in Sailabunia drainage sluice causing damage to the sluice gate and difficult to catch fish in the khal. Internal

canals are to be excavated to link the closed khals with the khals against which drainage structures have been constructed. Some tide meeting points which have already been dried up is necessary to be deepened for preservation of water. The length of these dried up canals would be about 30 km throughout the polder. Moreover, about 10 flushing inlets needs to be constructed against old/closed khals for flushing and removing pollution in the stagnant water.

3.4 Project Costs and Present Status

The present position of the Patuakhali Polder 43/2B Project with respect to physical and financial achievement may be seen in Table 3.3. This table shows that though most of the structures have been completed, canal excavation has not been completed. In terms of physical performance, nearly 70 per cent of works in canal excavation have been done with nearly 83 per cent of targeted expenditure. Financially the project shows more than 84 per cent of achievement, though construction of most of the engineering structures have been fully done. Table 3.3 shows that approximately 80 per cent of costs have been incurred for construction of various structures, while a paltry amount (5 per cent) has been spent for O & M activities (including management and transportation cost).

The irrigation input of the project requires to deepen khals and provide low lift pumps (LLPs) to raise the water from the canals to the fields. It was estimated that 130 LLPs of 2 cusec capacity would be required for the purpose. During our survey year (1991-92), it has, however, been observed that only 3 LLPs are in operational condition to cover a marginal portion of about 40 ha of land for the cultivation of HYV Boro paddy in the project area. These 3 LLPs are fielded in a single village of Sailabunia located in the western part of the project. For command area development (CAD) in 4370 ha of net land as envisaged under the project, no further effective measures are observed to be followed.

3.5 Hydrological Impacts

The direct impacts of the project intervention are primarily hydrological changes reflecting changes in pre and post-project water conditions. The intended targets of such changes are protection against flood, tidal inundation and provision of improved drainage of internal run-off and thereby facilitate supplemental irrigation by surface flushing sluices.

Table 3.3

Physical and Financial Achievements of Patuakhali Polder 43/2B

Items	Physical			Financial			
	Target	Achievement upto June 1992	Achievement as % Target	Target	Achievement upto June 1992	Percentage of Total	Achievement as % Target
Embankment	27.75 km	27.75 km	100.00	133.00	129.31	19.02	97.23
Land Acquisition	110 ha	74.37 ha	67.61	114.00	86.62	12.74	75.98
Regulator including Khalashi Shed	6 Nos	6 Nos	100.00	290.00	306.58	45.10	105.72
Flushing Inlet	24 Nos	24 Nos	100.00	35.00	47.49	6.99	135.69
Closure	8 Nos	8 Nos	100.00	70.00	48.44	7.13	69.20
Canal Excavation	10.75 km	7.48 km	69.58	30.00	24.84	3.66	82.80
O & M including management Fuel and Transport	1 Instalment	1 Instalment	70.00*	75.76	34.42	5.06	45.43
Levelling Instrument	2 Nos	-	-	1.00	-	-	-
Consultancy	1 Instalment	-	-	36.48	-	-	-
Speed Boat Engine	1 Instalment	1 Instalment	100.00*	1.50	0.93	0.14	62.00
Spares	1 Instalment	1 Instalment	100.00*	1.10	1.10	0.16	100.00
Inflation & Invisible cost	1 Instalment	-	-	57.45	-	-	-
Total				845.29	679.73	100.00	84.41

Source: Patuakhali O & M Office, BWDB.

Note: * Official assessment.

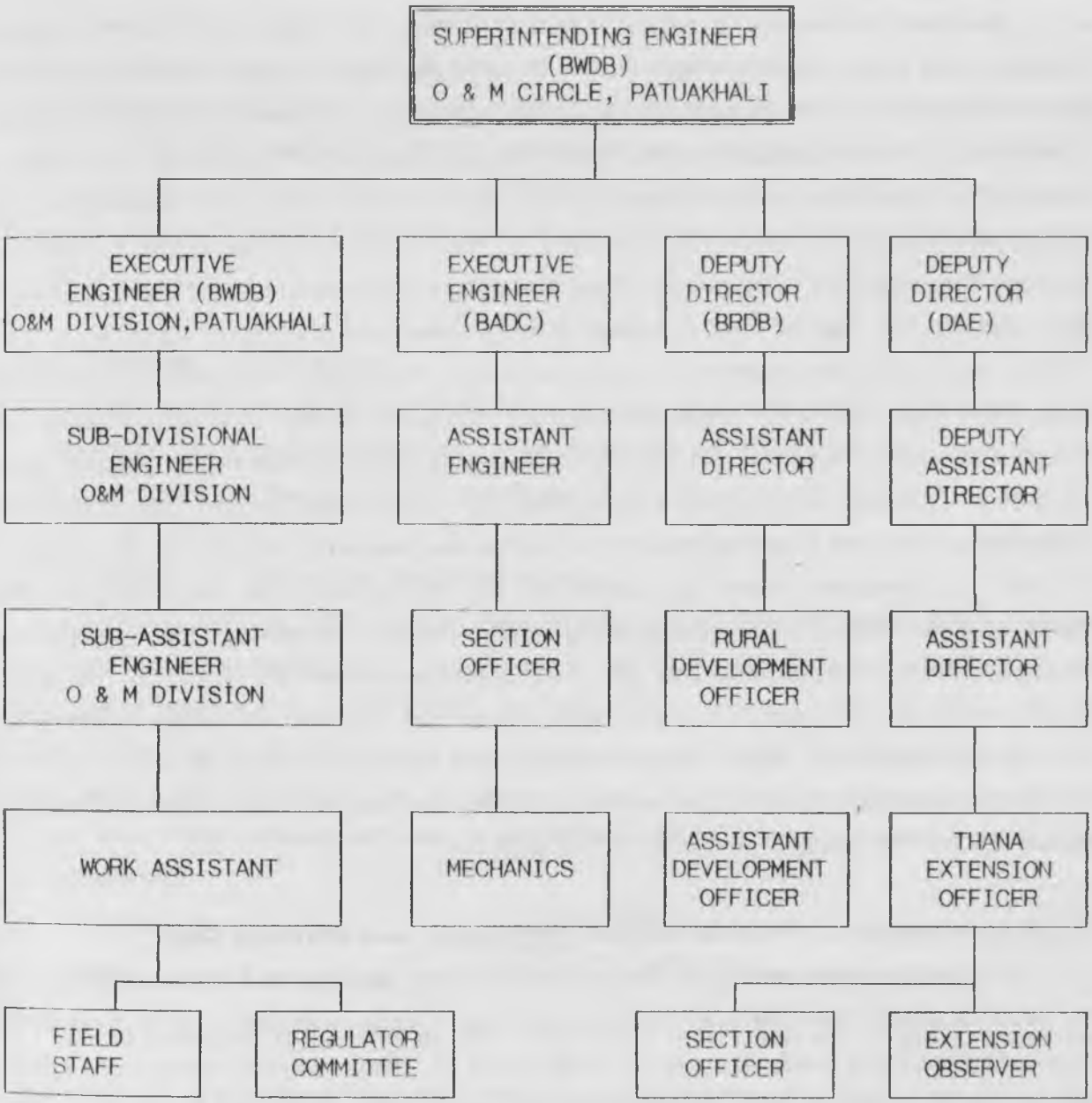
From Village Level Survey (VLS) data and field visits, we have come to know that in the villages where some project structures have been constructed, the benefit flows have been substantial. This is particularly true for flood and salinity control embankments, drainage canals and regulators. However, most of villages do not have irrigation canal to get full benefits of the project structures. It has been observed that only 5 villages (i.e. less than 20 per cent of study villages) could get some benefits of irrigation from the project structures.

3.6 Organization and Management of the Project

The organizations involved in operation and maintenance (O & M) of the Patuakhali Polder 43/2B are Bangladesh Water Development Board (BWDB), Bangladesh Agricultural Development Corporation (BADC), Bangladesh Rural Development Board (BRDB) and the Directorate of Agricultural Extension (DAE). The project is under the jurisdiction of the Superintending Engineer, Barisal O & M circle and under the direct administrative supervision of the Executive Engineer, Patuakhali O & M division of the BWDB. The Superintending Engineer is responsible for supervision and coordination of activities of all the four organizations involved. The Executive Engineer, Patuakhali O & M division is responsible for operation and maintenance of all physical structures of the project. The Sub-divisional Engineer Galachipa O & M Sub-division is responsible for overall O & M of the project. He also supervises the activities of the Section Officer in charge of the project. The Work-Assistant is responsible for constant supervision and reporting to Section Officer about the O & M activities of the project. Others supposed to be involved with the project are regulator Khalashi, Zillader and Patwary having distinct duties to be performed by them. BADC was planned to assume the responsibility for procurement, installation and subsequent maintenance of LLPs. BRDB was responsible for formation of farmers' cooperatives (KSS), training of cooperative staff and distribution of agricultural loan. The DAE was supposed to be responsible for motivation and training of farmers, extension of HYV cultivation, demonstration and promotion of new technologies in the project area. The work mostly would be carried out by the Thana Extension Officer and Block Supervisors. The officers would be responsible to their respective organizations. However, in actual practice activities of other organizations except BWDB are virtually non-existent. The organogram of the project can be seen in Figure 3.2.

FIGURE 3.2

ORGANOGRAM OF PATUAKHALI POLDER 43/2B



3.7 Present Operation and Maintenance of the Project

The present operation and maintenance of the polder together with irrigation management are summarized below.

3.7.1 Operation of Drainage Sluice

The BWDB authority expresses the view that the operation of the gates (opening and closing) are done by the sluice committee through participation of the beneficiaries. This has also been expressed by the beneficiaries. During our field visit it appears to us that the gate operation technique is faulty. The sluice committee is not provided with chain pulley which is essential for easy operation of vertical lift gates. It is to be noted here that 15 to 20 persons are required to open and close the gate using rope connecting with hooks provided at the top of the drainage sluice beam and the gate itself. It is really very tough to operate the gate and risky for those who operate it as the rope might tear-off with consequent danger to human lives. Leakage of water is noticed through the sides and bottom of the gates due to removal of rubber seal from these places. It is also seen that the beneficiaries are operating the drainage sluice and flushing inlets for bringing the water into main canals and fields. As regards existing condition of the gates, the majority of the beneficiaries report that these need some repair. However, the irrigating network within the polder has not yet been developed to fulfill the main objective of the project. The drainage sluice can be used for quick release of the accumulated rain water from the project during monsoon as well as for retaining water during the dry season. Sluice Khalashies are needed for smooth operation of the gates.

3.7.2 Maintenance of Drainage Sluice, Embankment and Drainage Canal

All maintenance works of the structures are carried out by the BWDB. It has been evident from the field survey that due to non-availability of fund from Government revenue head, the maintenance works of these control structures could not be done properly and at the time of need. The embankment, closure and drainage/irrigation canals are maintained through food for works programme (FFW). If any serious damage and fault, gully, breach, sand-piping, rain-cuts, slip, intentional cutting and under cutting of the structures are observed or identified, they are needed to be repaired quickly taking permission from the

BWDB higher authority. Indeed, the maintenance services are not enough due to lack of fund, staff and wheat.

Respondents at household and village levels complaine that the drainage sluice and flush inlet do not operate properly due to lack of maintenance. They also inform us that maintenance work at the drainage canal is not done properly and timely due to lack of adequate fund. In order to perform the maintenance works, sufficient number of tools, equipment and material should be stocked in the store to make available to the persons concerned as and when necessary. However, the villagers expressed general satisfaction over the performance of the project.

3.7.3 Manpower and Training

For smooth operation, the project requires a number of officials and staff in addition to sluice Khalashies. The BWDB has no provision for in house and local training of the personnel involved in O & M of the project.

3.7.4 Budget for Operation and Maintenance

During 1991-92, 120 metric tons of wheat was alloted under FFW programme for repairing the embankment. An amount of Tk. 6.0 lakh (Taka six lakh only) has been sanctioned during 1991-92 but was not spent. During 1992-93, Tk. 3.0 lakh (Taka three lakh only) has been sanctioned for repairing the embankment and the same amount for repairing the drainage sluices. Due to procedural complexities, it is likely that unnecessary delay would be cropped up in accomplishing the task of repairing.

3.7.5 Transport and Vehicle

The vehicles to be used by the field level staff are not enough. Speed and engine boats are required in this type of project and should always be kept stand by or should be readily available on demand.

3.8 Conclusions

Our discussions in the preceding sections indicate that this sub-project is a case which has been experiencing partial success in terms of water control and management. From the engineering points of view, the following problems have been identified through field visits, questionnaire surveys, discussions with BWDB authorities and local people and/or beneficiaries of the project area:

— The gate lifting chain pulleys of drainage sluices have been observed to be non-functional. It is really difficult to operate the drainage sluice with the existing mechanism.

— The rubber seals provided at the sides and bottom of the gates were washed away due to high velocity of the water while flowing through the gates into the khals or teared-off due to operating the gates.

— Erosions of banks have been threatening the embankment.

— Breaches, piping, surface erosion and slips have been common features which require to be immediately repaired and properly maintained.

From the management point of view, we have observed that expenses of repairing and maintenance works have been met up from the Government revenue budget as well as through FFW Programme. Due to procedural complexities in administration and lack of coordinations among various organizations and beneficiaries, proper management of the sub-project so far has not been possible.

CHAPTER 4

INSTITUTIONAL ASPECTS: COORDINATION AND INTERACTIONS

4.1 Introduction

For the Small Scale of Irrigation Sector Project (SSISP), institutional aspects are of prime importance, since the project is proposed, planned, implemented and even maintained through institutions. Originally, it was conceived under the Second Five Year Plan (1980-85) of the Government of Bangladesh, financed by ADB and EEC and designed by the Directorate of Planning Scheme II of BWDB. A kind of inter-departmental coordination was also outlined in the feasibility study where BWDB, BADC, BRDB and DAE were supposed to work together in the project area. In fact, the feasibility study was a joint work of all these agencies - BWDB being intrusted with the responsibility of executing the project, after completion of the project, BADC to supply irrigation equipments through BRDB cooperatives in the project area and DAE to disseminate technological innovations to the farmers for growing high yielding variety of crops. The project area was assumed to be small and the structure in question to be simple so that planning and implementation activities may be done by the local people. A kind of coordination was considered to be the sin qua non for performing the roles by the concerned departments and agencies.

This chapter delineates the aspects of various institutions/organizations and their coordination and interactions in relation to the Patuakhali Polder 43/2B Project.

4.2 The Proposed Framework For Institutional Linkage and People's Participation

While the project intervention under the SSISP were expected to create conditions under which potential benefits could be derived, it was emphasized that farmer's organizations and participation were necessary to expedite the generation and diffusion of the envisaged project benefits at the farm level. For this purpose, an inter-disciplinary approach was proposed for the project itself with a number of agencies performing various independent, interdependent and mutually reinforcing activities at the planning and implementation levels. The roles and supportive activities were identified for bringing about possible

coordination of efforts for the success of the project. The major responsibilities of the concerned agencies/authorities are summarized below:

4.2.1 Bangladesh Water Development Board (BWDB)

The BWDB was the principal executing agency for the project. Its Project Office, located in Dhaka under the Directorate of Planning Scheme II, was specifically responsible for :

- Selection, formulation, appraisal and detailed design of the project;
- operation and maintenance of completed structure.

4.2.2 Bangladesh Agricultural Development Corporation (BADC)

The BADC, the co-executing agency for the project, with head office in Dhaka, was entrusted with the following responsibilities:

- procurement, distribution and installation of irrigation equipments;
- repair of mechanical facilities;
- supply of farm inputs such as seeds and fertilizers;
- selection of field demonstration farms in coordination with the BRDB and DAE.

4.2.3 Bangladesh Rural Development Board (BRDB)

The BRDB, as the lead agency for the development of cooperatives (e.g. TCCA/KSS) at the local levels, was expected to perform the following activities:

- promotion, organization and supervision of TCCA/KSS for joint ownership and/or maintenance of facilities;
- field demonstration farms in collaboration with the BADC and DAE.

4.2.4 Department of Agricultural Extension (DAE)

The DAE was charged with the following responsibilities:

- dissemination of innovation on farm technologies including fertilizer use, pest control and water management;
- development of appropriate field demonstration farms in collaboration with the BRDB and BADC.

4.2.5 Banks and Financial Institutions (BFI)

With the support of Bangladesh Bank (BB), the Bangladesh Krishi Bank (BKB), Bangladesh Samabaya Bank Ltd. (BSBL) and Sonali Bank (SB) were supposed to constitute the main sources of institutional credit - short, medium and long-terms - for purchase of inputs and equipments.

It was proposed that a Project Coordinating Committee (PCC) would be constituted for overall coordination amongst the above mentioned agencies. The PCC would be assisted by Project Monitoring and Evaluation Unit (PMEU). For irrigation development adequate liaison was emphasized between SSISP, BRDB and BADC to maximize irrigation facilities at the farm level in the project area. Moreover, it was planned that SSISP (BWDB) officials would visit all union and Thana Parishad Chairmen to inform them of the project. It was also emphasized that people's participation through their involvement in local (project) committees would be of much help, since SSISP project addresses specific needs felt within a small area where there are scope for assessment of the problems through discussion with local people.

4.3 Institutional Linkage and Coordination in Actual Practice

Very little coordination has been observed in the Patuakhali Polder 43/2B Project along the framework outlined in section 4.2. The coordination plan amongst the agencies appears to have not been adopted. Indeed, there exists no inter-agency linkage programme at present nor is there any sign of its existence in the past. Many of the concerned officials at the thana level are quite surprisingly not aware of the existence of the project. The concerned agencies are, however, observed to follow their own programmes quite independently in the project area without making any coordinated efforts for deriving the full potential benefits of the project interventions.

During the project implementation, it was likely that BWDB would maintain close liaison with other agencies to implement the proposed institutional and other action plans needed for realizing the potential benefits of the project. Such liaison appears to have been missing. After the completion of the polder project in June 1991, BWDB is, in principle, mainly concerned with the operation and maintenance of the project. Regarding operation and maintenance of the

project structure(s), there does not seem to exist any policy.[1] The concerned Section Officer and Work Assistant occasionally visit the project site as their routine work, while the SDE and XEN visit only on special circumstances. There exists no system of monitoring the project. Communication with higher officials (e.g. SE, CE and the like) usually involves budget allocation for maintenance work.

Discussions with officials of the concerned agencies manifests that they are not explicitly aware about their coordinating roles for materializing the project benefits. Their on-going programmes in the project and the neighbouring area are largely guided by their respective departmental concerns without being contingent upon the need for coordination with other agencies. For example, the BADC has been changing its focus of activities overtime and has already withdrawn from the process of supplying irrigation equipment and inputs at subsidized prices. The distribution of minor-irrigation equipments is now completely in private hands. Under these changed circumstances, there exists no coordinating roles of BADC with private enterprise in this respect.

Similarly, other organizations like BRDB, DAE and Commercial Banks have not been able to play their coordinating roles. Their activities have also been very limited in the project area. Demonstration farms, as the joint responsibilities of BADC, BRDB and DAE are not even observed to exist in the project area. This is reflected in the non-availability of irrigated area and lower adoption of HYVs. The primary objective of the project has been to expand the cultivation of HYV rice in all crop seasons through provision of flood control measures and irrigation. The project, although has been successful in preventing floods and tidal inundation, could not achieve the expected changes in cropping pattern to increase food production. During aus and aman seasons, local varieties of rice are still the dominant crops with small portion of land under HYV cultivation. On the other hand, though cultivation during rabi season has somewhat expanded, it does not encompass HYV boro. Yield raising material inputs are not used extensively to realise the potential benefits of the project. The BKB and other

[1]For a detailed analysis of O&M of the project, see chapter 3.

financial institutions are supposed to provide the required credit, but could not make the funds available to meet the demand of the households in the villages.

The above experience suggests that the inter-agency coordination as perceived under the project has not been materialised since the completion of the project. The situation could never be improved to combine flood protection and drainage works with irrigation facilities for providing full benefits of project to the farmers. The Project Coordinating Comittee (PCC) in collaboration with the Project Monitoring and Evaluation Unit (PMEU) could not ensure the minimum required coordination amongst the various agencies at various stages (e.g. planning, implementing etc.) of project management in order to realize the full potential benefits of the project. The consequential implication is that the improved physical environment of the project fails to bring perceived economic benefits so as to generate enthusiasm amongst the expected beneficiaries.

4.4 Institutional Interaction with the Beneficiaries and Local People

Institutions evolved in the planning and implementation of the project and those which are expected to provide supplememtary services (e.g. BWDB, BADC, BRDB, DAE etc.) would require to have adequate interaction with the beneficiaries and the various groups of the local people within the project area for performing their functions. In this section, we attempt to assess the extent of such interaction which might have the bearing upon the reaping of project benefits.

It is widely acknowledged that the local people have rarely been consulted during the planning and/or implementation phases of the project. It has been observed that a few influencial local leaders in the project area were consulted during planning and implementation phases of the project[2]. The officials of BWDB and other concerned departments are supposed to visit the project sites, but it is reported that only BWDB officials particularly Section Officer and Work Assistant occasionally visit the area in connection with the accomplishment of their responsibilities.

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[2]Reported from HLS data.

For the Patuakhali Polder 43/2B sub project, there does not exist any effective local committee of the potential beneficiaries of the project. At the planning phase of the project in 1986, project committees were formed in two villages only, namely Garabunia and Alki located in the extreme southern part of the project. These committees could not meet more than once or twice and thus largely remained disfunctional. Thus there remains little chance for the concerned departments to interact with local people through the local committee. In absence of local committees, the BWDB officials accomplished their routine works relating to operation and maintenance of the project structures.

In order to assess the interaction between various departments and beneficiaries of the project, we investigated regarding the awareness of our sample households about the concerned departments and their officials who are supposed to be in contact with local people. We have observed that there is little such awareness since most of the household do not have the opportunity to come in contact with the concerned departments and/or their respective officials. However the respondents appear to be aware about the benefits of the physical structure of the project to protect their lives, property and crops.

4.5 Activities of Cooperatives and Non-Government Organizations (NGOs)

There are limited cooperative activities in the project area as in other parts of Bangladesh. More than 50 per cent of the project villages report the existence of cooperatives of which about 50 per cent are found active. Amongst the various types of Cooperatives, Krishi Samabay Samities (KSS) (Agricultural Cooperatives) mainly concentrating on agricultural credits appear to be predominant in the project area. The number and percentage of villages with various types of cooperatives and their memberships can be observed in Table 4.1

Like Cooperatives, there are various NGOs, namely, Grameen Bank, ASA, Swanirbhar Bangladesh, to operate in the study villages, but more in the control villages than in the project villages (see Table 4.1). These NGOs mainly concentrate on credit and self-employment generation programmes. A list of study villages with NGOs and their activities are presented in Table 4.2.

Table 4.1

Cooperative and Non-Government Organizations (NGOs)
in Project and Control Villages

Name of Cooperative/ NGO	Percentage of villages with cooperatives/NGOs		Number of member per cooperative/NGO	
	Project	Control	Project	Control
Cooperative:				
Krishi Samabay Samity (KSS)	55.17 (16)	20.00 (1)	39	20
Pally Mangal Samabay Samity	3.45 (1)	-	130	-
Bidyaheen Samabay Samity	3.40 (1)	-	25	-
Kishor Samabay Samity	3.40 (1)	-	50	-
Juba Kalyan Samity	-	20.00 (1)	-	70
Jalley Samabay Samity	3.40 (1)	-	12	-
Samaj Kalyan Samity	-	20.00 (1)	-	50
NGO:				
Grameen Bank	10.34 (3)	100.00 (5)	57	77
Association for Social Advancement (ASA)	-	80.00 (4)	-	39
Swanirbhar Bangladesh	-	20.00 (1)	-	25

Source: BIDS/SSISP Village Level Survey, 1991.

Note: Figures in parentheses indicate number of vilages.

Table 4.2

A List of Study Villages with NGOs and Their Activities

Villages		Name of NGO	Year of Establishment	Aims and Activities	Number of Household who Participated	Extent of usefulness: not good = 1 more or less good = 2, good = 3, very good = 4
Southern Project:						
Shonakhali		Grameen Bank	1989	Women's group formation, credit programme	80	2
Northern Project:						
Boloikathi*		Grameen Bank	1988	Credit Programme	20	2
Badura		Grameen Bank	1984	Women's group formation, credit programme	70	2
Control Area:						
Purba Auliapur*		Grameen Bank	1988	Economic development by credit programme	110	3
Bara Auliapur	(a)	Grameen Bank	1985	Credit programme for farmers	40	3
	(b)	ASA	1989	Credit programme for farmers	20	2
Thengri	(a)	Grameen Bank	1984	Credit programme	70	2
	(b)	ASA	1991	Credit programme	30	2
	(c)	Swanirbhar	1991	Credit programme	25	2
Keshabpur	(a)	Grameen Bank	1984	Credit programme for livestock	100	2
	(b)	ASA	1989	Credit programme for farming poultry, and livestock (for landless)	25	2
Chotta Auliapur	(a)	Grameen Bank	1988	Credit programme	175	3
	(b)	ASA	1990	Credit programme	80	3

Source: BIDS/SSISP Village Level Survey, 1992.

Note: ASA = Association for Social Advancement

* Intensive Survey villages. Villages without NGOS are not incorporated in the table.

The above mentioned Cooperatives and NGOs are operating their programmes independently and are not related in any way with planning and implementation of the Patuakhali Polder 43/2B project. Infact, most of these organization have been operating in our study area for some time even before the initiation of the project. The Small Scale Irrigation Project (SSISP) does not have any programme of associating these government and non-government organization for planning and implementation of the project. Thus in absence of any interaction between these organizations and the project, perceptible changes in the benefits of the people are not generated in the project area through enhancement of their roles in village development activities.

4.6 Conclusion

In the preceding sections, it has been observed that the coordination and interactions amongst various institutions are missing, though the institutional aspects are considered to be of prime importance. The local people have rarely been consulted during the planning and implementation phases of the project. There does not exist any effective local committee of the beneficiaries of the sub-project. Thus the concerned departments of the government do not have the opportunity to interact with the people through the local committee.

The consequential implication of the above observation is that the project could not go much beyond the improvement of the physical environment of the area and thus fails to generate the needed enthusiasm amongst the beneficiaries to bring desired economic benefits through adoption of irrigation and related new technologies.

CHAPTER 5

IMPACT ON AGRICULTURAL PRODUCTION

5.1 Introduction

The objective of the project is to increase foodgrain production in both winter and summer seasons through provisions of full flood control, improved drainage and irrigation by gravity means. It was sought to be achieved by enabling larger areas of HYVs to be grown so that agricultural benefits would be obtained effectively from almost all of the net cultivated area of the project.

This chapter, however, attempts to assess the impact of the project on the performance of agriculture, depending on pre and post-project situations in project and control areas. The assessment involves an analysis of few interrelated aspects to be done in the following sequence:

1) The present (existing) cropping pattern and cropping intensity compared with those in the pre-project situation in the project area.

2) The present cropping pattern and yield in the project area compared with those targeted for the project.

3) A comparison of project area with control area in terms of cropping pattern, yield, cost structure, input use and returns from crop-agriculture.

4) A comparison of project area with control area in terms of the performance in non-crop sector.

5.2 The Pre-project Situation and the Expected Impact of the Project

The soils of the project area are developed from estuarine tidal deposits of the old lower Meghna tidal flood plain. The land is slightly undulating with gentle slope towards the south. Although the agricultural soils are seasonally flooded and poorly drained, they are generally fertile and suitable for rice

cultivation. In the pre-project situation, the whole project area was normally flooded under 2 feet - 3 feet indicating that the main paddy crop could only be Local T. Aman. In absence of irrigation facilities, only a marginal portion of land could be devoted for the cultivation of HYV and local boro paddy.

Cropping pattern in pre-project period evolved to take into account the climatic and topographical conditions of the area at various seasons. Paddy is the main crop, but there are also some minor crops with smaller acreage, such as mustard, potatoes, pulses, vegetables etc. The cropping pattern, cropping intensity and yield rates of various crops of the project area in pre-project period can be seen in Table 5.1. The table shows that in pre-project period, T. Aman (Local) is the most predominant crop followed by B. Aus. T. Aman devotes to about 66 per cent of gross cropped area and 81 per cent of net cropped area, while the corresponding figures for B. Aus are about 11 and 14 per cent. It can be seen from the table that only about 18 per cent of gross cropped area could be devoted to HYVs of rice of which only about 2 per cent was under HYV Boro. The cropping intensity is only 124 per cent indicating that the cultivable lands were mostly single cropped in the pre-project period. Rabi crops were observed to be minor crops with much smaller portion (about 8 per cent) of land under these crops. The main problem for cultivation was monsoon flooding and lack of adequate irrigation during the dry season. The cropping pattern was adjusted mainly to the flooding pattern.

It can be seen from the table that yield rates for almost all crops are very low. This may be attributed to low input use which in its turn is due to flood risks and lack of irrigation facilities. Extension of HYV area did not occur, no use of mechanized pumping was reported and whatever little irrigation that was undertaken was by traditional means. Floods lowered both crop yields and production with little incentives to farmers for adopting HYVs as well as yield-raising material inputs.

The expected benefits of the project were, inter alia, the reduction of flood damage and risk of crop failure, conversion of LT Aman to HYV Aman area, expansion of HYV boro area, increased supply of irrigation and enhancement of yield rates and production of rice. The net cultivable area and the net area to

benefit from the project were expected to be the same (4372.47 ha). In evaluating the benefits of project, two scenarios were considered. The first assumed that benefits would be obtained only from the change in cropping pattern that was expected to occur as a result of the provision of full flood protection. The second scenario assumed that changes in cropping pattern would occur as a result of the use of pumped irrigation in addition to benefits from the embankment. Under the two scenarios, expected cropping pattern, cropping intensity and yield rates of various crops are presented in Table 5.2.

Table 5.1

Pre-project Cropping Pattern and Yield in the Project Area

Crops	Area (ha)	Percentage of net cropped area	Percentage of gross cropped area	Yield (mt/ha)
LT Aus	607.29	13.89	11.19	1.29
HYV Aus	445.34	10.19	8.21	2.76
LT Aman	3562.75	81.48	65.67	1.38
HYV Aman	445.34	10.19	8.21	2.76
L. Boro	60.73	1.39	1.12	1.84
HYV Boro	101.22	2.31	1.87	3.23
Rabi (Khesari, oil seed, till, mung, Lentil, Chillies etc.)	202.43	4.63	3.73	0.65
Gross cropped area (ha)	5425.10			
Net Cultivated area (ha)	4372.47			
Cropping intensity (per cent)		124.07		

Source: BWDB (1986).

Table 5.2

Expected Post-project Cropping Pattern and Yield

Crops	Project with Embankment only (Scenario I)				Project with Embankment and Irrigation Benefits (Scenario II)			
	Area (ha)	Percentage of net cropped area	Percentage of gross cropped area	Yield (mt/ha)	Area (ha)	Percentage of net cropped area	Percentage of gross cropped area	Yield (mt/ha)
LT Aus	3076.92	70.37	33.48	1.66	1336.03	30.56	13.92	1.66
HYV Aus	1174.09	26.85	12.78	2.58	404.86	9.26	4.22	3.23
LT Aman	1295.55	29.63	14.10	1.66	890.69	20.37	9.28	1.66
HYV Aman	3076.92	70.37	33.48	2.76	3481.78	79.63	36.29	2.95
L. Boro	0.00	0.00	0.00	1.84	0.00	0.00	0.00	1.84
HYV Boro	121.46	2.78	1.31	3.23	2631.58	60.19	27.43	3.69
Rabi (Khesari, oil seed, till, mung, Lentil Chillies etc.)	445.34	10.19	4.85	0.65	850.20	19.44	8.86	0.65
Gross cropped area (ha)	9190.28				9595.14			
Net Cultivated area (ha)	4372.47				4372.47			
Cropping intensity (per cent)		210.19				219.44		

Source: BWDB (1986).

It can be seen from the table that the expected benefit of the project would depend on a major shift in cropping through a large expansion of HYV paddy. In the first scenario, LT Aman would be replaced by HYV Aman and in the second scenario, the large expansion of HYV boro would occur through significant reduction of acreage in Aus paddy. Thus in the first scenario, T. Aman, particularly HYV Aman would remain to be the predominant crop followed by Aus paddy, while in the second scenario, the predominancy of T. Aman, particularly HYV Aman would still remain, but the position of Aus paddy would be replaced by HYV Boro. Cropping intensity would significantly be increased from 124 per cent in the pre-project situation to 210 per cent and further to 219 per cent in post-project expected situations under the first and second scenarios respectively.

From Table 5.3, one can see the expected change in yield rates and acreage of various crops in the pre-project situations under the two scenarios compared to the pre-project situations. The table shows that in the first scenario, the area of LT Aman is significantly reduced and replaced by corresponding significant increase of acreage in HYV Aman. Under this scenario, yield rates of LT Aman and LT Aus are observed to be significantly increased, while the yield rate for HYV Aman would remain constant. This indicates that production would be enhanced mainly through shift of cropping from LT Aman to HYV Aman under the first scenario in the absence of irrigation by LLPs. In the second scenario, the expansion of HYVs particularly in the Boro season would immensely be increased and yield rates of most of the crops particularly LT Aus, HYV Aus, LT Aman and HYV Boro would significantly be increased. This indicates that significant improvement in yield rates built into the cropping options would come in the surface in a circumstance of combined benefits of full flood protection and irrigation as envisaged under the second scenario of the expected post-project situation.

The above analyses of pre-project and expected post-project situations under two scenarios bring the point to the fore that as impacts of the Patuakhali Polder 43/2B project, there are likely to have significant changes in cropping pattern, cropping intensity and yield rates of various crops. But there would not

be any increase in net cultivated area (by bringing previously uncultivated area under cultivation), since most of the potential cultivable land in the area has already been brought under cultivation in at least one season in the pre-project period.

Table 5.3

Percentage Change Expected in Area and Yield in Crops in Post Project Situation Over Pre-project Situation

Crops	Project with Embankment only (Scenario I) Percentage change in		Project with Embankment and Irrigation Benefits (Scenario II) Percentage change in	
	Area	Yield	Area	Yield
LT Aus	406.66	28.68	120.00	28.68
HYV Aus	163.64	-6.52	-9.09	17.03
LT Aman	-63.63	20.29	-75.00	20.29
HYV Aman	590.91	0.00	681.83	6.88
L Boro	0.00	0.00	0.00	0.00
HYV Boro	20.00	0.00	2499.86	14.24
Rabi (Khasari, oil seeds, till, mung, Lentil, Chillies etc.)	120.00	0.00	320.00	0.00

Source: Calculation is made on the basis of the data in Tables 5.1 and 5.2.

[1] The net cultivated area of 4372.47 ha in the pre-project period is expected to remain fixed even at the post-project situations under two scenarios (see Tables 5.1 and 5.2).

5.3 Cropping Pattern, Cropping Intensity and Yield: A Comparison between Pre-project and Post-project Situation

Table 5.4 shows the present cropping pattern and yield in the project area. For comparison between pre-project and post-project situation, this table may be compared with Table 5.1 presented in the previous section. The cropping pattern has significantly been changed as compared to the pre-project situation. In the post-project period (survey year of 1992), T. Aman still remains as the predominant crop, in terms of percentage of land devoted to this crop, in the project area. The percentage of gross cultivated land for this crop has decreased from about 74 per cent to about 49 per cent. The percentage of gross cultivated land for Aus paddy has somewhat decreased from about 19 per cent to about 17 per cent. The noteworthy point is that crop (including boro paddy) in Rabi season have significantly expanded from about 7 per cent to more than 34 per cent of gross land. It may also be noted that during rabi season, a large number of crops are now grown so that cropping pattern in this season is more diversified, compared to the pre-project situation.

The comparison of Table 5.4 with Table 5.1 shows that cropping intensity has also significantly increased from 124 per cent to about 188 per cent. Yield rates for all of the crops have significantly been increased compared to those in pre-project period (see Table 5.5). This change may be attributed to higher intensity in the use of new inputs (e.g. HYVs, fertilizers and pesticides). Which, however, has been possible due to the realization of the provision of full flood protection under the project.

5.4 A Comparison of Post-project Situation with the Targets

For the purpose of comparison of the present (post-project) situation with the targets with respect to cropping pattern, cropping intensity and yield, Table 5.4 may be compared with Table 5.2. It can be noted here that the project so far could, realize some benefits expected under the first scenario (project embankment only), but the second scenario (project with embankment and irrigation benefits) remained beyond the scope of realization. It was expected that nearly 50 and 70 per cent of gross land would be brought under HYV paddy (in all crop seasons) under the first and second scenarios respectively. It has been observed that a marginal portion (4.43 per cent) of gross land is now devoted to HYV

Table 5.4

Area Under the Major Crops, Yield Rate and Cropping Intensity in the Project Area

Crops	Area (ha) under a crop	Percentage of net cultivated area	Percentage of gross cropped area	Yield (mt/ha)
Aus Season				
Local Aus	17.59	32.30	17.23	1.75
Aman Season				
Local Aman	45.02	82.68	44.09	2.04
HYV Aman	4.52	8.30	4.43	3.25
Rabi Season				
Oil Seeds	2.82	5.18	2.76	2.37
Sweet Potato/ Other Potato	3.73	6.85	3.65	11.47
Chillies	3.44	6.32	3.37	1.00
Onion	0.11	0.20	0.11	1.46
Garlic	0.13	0.24	0.13	1.30
Termeric	0.08	0.15	0.08	0.92
Vegetables	0.11	0.20	0.11	41.23
Nut/Pea nut	1.18	2.17	1.16	1.31
Lentil	0.31	0.57	0.30	0.83
Khasari	15.96	29.31	15.63	1.15
Mung	6.46	11.86	6.33	0.56
Other Pulses	0.64	1.18	0.63	0.66
Gross cropped area (ha)	102.10			
Net cropped area (ha)	54.45			
Cropping intensity (per cent)		187.51		

Source: BIDS/SSISP Household Level Survey, 1992.

paddy. Thus the target of HYV expansion largely remains unrealized. It was expected that cropping intensity would increase from 124 per cent to 210 per cent under the first scenario and further to 219 per cent under the second scenario. But the present situation shows that it has increased to about 188 per cent indicating much realization of the target.

Table 5.5 shows that targeted yield rates of all crop have been achieved. And this achievement has been more than what was targeted. This is, nevertheless, true in respect of individual crops. But since irrigation and HYVs could not be adopted, over all production could not be raised through shift of cropping from local to high yielding varieties. Thus the major objective of transforming the cropping system could not be achieved, though yield rates of individual crops have been realized more than the targets.

Table 5.5

Percentage Difference of Present Yield in Project Area over Pre-project and Target Situations

Crops	Percentage difference over Pre-Project	Percentage difference over Targets	
		Scenario I	Scenario II
Local Aus	35.66	5.42	5.42
Local Aman	47.83	22.89	22.89
HYV Aman	17.75	17.75	10.17
Rabi (Khasari, oil seed, till, mung Lentil, Chillies etc.)*	72.31	72.31	72.31

Source: Calculations are based on data of yield rates in Tables 5.1, 5.2 and 5.4.

Note: * Estimated present yield (per ha) (weighted average) is 1.12 (m.ton).

5.5 Crop Agriculture in Project and Control Areas: A Comparison

In this section, we attempt a comparative assessment of the performance of crop-agriculture in project and control areas. This assessment has been done to provide some indication for identifying the impact of the project on the performance of crop agriculture. The major indicators used for assessment of project impact on crop-agriculture are: changes in cropped area, cropping pattern, cropping intensity, extent of HYV adoption, use of crop inputs, costs of production, crop yield rates, production, value of outputs and net income from this sector.

5.5.1 Crop Areas, Cropping Pattern and Cropping Intensity

The crop cultivation is by far the most important activity particularly in the project area. It can be seen from Table 5.6 that about 76 and 82 per cent of physical area are used for cultivation in project and control villages respectively. The percentage of cultivable land to total land is, however, observed to be higher for the larger size categories. Only marginal land is used for homestead, river and water bodies. The percentage figures of land under homestead, river and water bodies to total land have been observed to be higher for smaller size categories than their larger counterparts (see Table 5.6). It does not appear to have significant variations in land use pattern of project and control areas.

For a better comprehension of the land use pattern of the area, village level survey data relating to allocation of cultivable land to individual crops (i.e. cropping pattern) in project and control areas in post-project (survey year) and pre-project periods are presented in Table 5.7. This table shows that there are no significant variations in cropping pattern between the project and control areas, since both the areas concentrate on the cultivation of paddy. Aman paddy is the most predominant crop in both the project and control areas in pre and post-project situations, but higher percentage of area is observed to be devoted in this crop in control area than in project area in both the periods (see Table 5.7).

Table 5.6

Pattern of Land Use by Farm Size Categories in Project and Control Villages

Farm Size (ha)	% of land in different use									
	Project					Control				
	Homestead	Cultivated	River and water bodies	Others	Total	Homestead	Cultivated	River and water bodies	Others	Total
0.00 - 0.20 (Marginal)	35.71	42.86	21.43	--	100.0 (4.34)	37.50	31.25	12.50	18.75	100.00 (2.24)
0.21 - 1.01 (Small)	7.41	70.37	17.28	4.94	100.0 (26.73)	10.14	75.36	13.04	1.45	100.0 (8.28)
1.02 - 2.02 (Medium)	6.96	89.24	2.53	1.27	100.0 (12.64)	5.76	91.37	2.88	--	100.0 (6.95)
2.03 & above	3.14	81.41	11.26	4.19	100.0 (26.74)	2.36	91.25	6.06	0.34	100.0 (11.88)
All Farms	**7.78**	**75.56**	**13.33**	**3.33**	**100.00 (70.45)**	**8.33**	**82.14**	**7.14**	**2.38**	**100.0 (29.35)**

Source: BIDS/SSISP Household Level Survey 1992.

Note : Figures in Parentheses indicate amount of land (ha).

Table 5.7

Cropping Pattern in Project and Control Areas

Crops	% of land developed to crops					
	Survey Year (1992)			Pre-Project Year (1986)		
	Project	Control	Difference (Project-Control)	Project	Control	Difference (Project-Control)
Aus Season						
Local Aus	12.88	18.63	- 5.75	35.60	24.76	10.84
Aman Season						
Local Aman	47.88	60.17	-12.29	63.79	68.90	- 5.11
HYV Aman	7.55	8.64	- 1.09	0.09	1.15	- 1.06
Rabi Season						
HYV Boro	0.52	2.24	- 1.72	--	--	--
Oil Seeds	0.08	0.00	0.08	--	--	--
Sweet/other Potato	4.20	2.04	2.16	0.01	0.97	- 0.96
Chillies	4.15	1.32	2.83	0.13	0.46	- 0.33
Nut/Peanut	2.96	0.00	2.96	--	--	--
Khasari	18.11	6.73	11.38	0.25	3.29	- 3.04
Mung	1.68	0.22	1.46	0.12	0.46	- 0.34
All Crops	100.00	100.00	--	100.00	100.00	--
Gross Land (ha)	7751.85	1804.04	--	6638.50	1757.50	--
Net cultivated Land (ha)	4410.93	1239.27	--	4410.93	1239.27	--
Cropping intensity (per cent)	175.74	145.57	30.17	150.50	141.82	8.68

Source: BIDS/SSISP Village Level Survey, 1992.

In the pre-project situations, only a marginal land could be devoted to crops in rabi season. It can be observed from Table 5.7 that during the rabi season, less than 1 per cent and more than 5 per cent of land were devoted in

project and control areas respectively in the pre-project period. After the implementation of the project, a dramatic change has now occurred so that about 32 per cent of land in the project area and 13 per cent of land in the control area are presently devoted to the cultivation of rabi crops. Rabi crops are also now observed to be diversified, more in the project area than in the control area. In respect of seasonal coverage, aman is the most predominant crop season followed by rabi in the project area, while rabi has now the least coverage in the control area as well as in both the areas in the pre-project situations. This indicates that the project has direct impact on the changes in cropping pattern in the project area. This change is also manifested in the change of cropping intensity from about 150 per cent in the pre-project period to about 176 in the survey period, the corresponding figures being from about 142 to 146 in the control area.[2]

The observed cropping pattern can further be substantiated, if we consider the household level intensive survey data relating to the allocation of cultivable land by seasons and individual crops in project and control areas. These data are presented in Table 5.8 to show that in no season, all of the net physical cultivable land can actually be cultivated. This table substantiates our earlier finding that Aman is the most predominant crop-season followed by Boro season in the project area and Aus season in the control area. These differential trends in the seasonal cropping pattern in project and control areas are, nevertheless, attributable to the impact of the project for providing more opportunities to a number of crops grown in the rabi season in the project area. The household level data, however, show that cropping intensity is more or less similar, though it is somewhat higher in the project area (188 per cent) than in the control area (185 per cent).

The cropping pattern and cropping intensity can also be looked into by farm size categories in project and control areas as presented in Table 5.9. From this table, we can see that there exists no systematic relationship between farm-size and percentage of land devoted to crops in project and control areas, though very small (near landless owning land upto .20 ha) farms have the highest cropping intensity in both the areas.

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[2]This observation has been made by the Village Level Survey (VLS) data. If we consider the Household Level Survey (HLS) data for the present situation and BWDB data for the pre-project situation, the similar emerging pattern in this regard may be observed, though there are some differences in the corresponding figures arrived at by VLS and HLS data. These differences are, however, not unlikely, due to difference in the method of data collection.

Table 5.8

Cropping Pattern and Cropping Intensity in Project and Control Areas

Crops	Percentage of net cultivated land			Percentage of gross cultivated land		
	Project	Control	Difference (Project-Control)	Project	Control	Difference (Project-Control)
Aus Season						
Local Aus	32.30	50.04	-17.74	17.23	27.00	-9.77
Aman Season						
Local Aman	82.68	98.79	-16.11	44.09	53.32	-9.23
HYV Aman	8.30	0.78	7.52	4.43	0.42	4.01
Rabi Season						
Oil Seeds	5.18	--	5.18	2.76	--	2.76
Sweet Potato/ Other Potato	6.85	2.43	4.42	3.65	1.31	2.34
Chillies	6.32	6.68	-0.36	3.37	3.62	-0.25
Onion	0.20	--	0.20	0.11	--	0.11
Garlic	0.24	--	0.24	0.13	--	0.13
Termeric	0.15	--	0.15	0.08	--	0.08
Vegetables	0.20	--	0.20	0.11	--	0.11
Nut/Pea nut	2.17	--	2.17	1.16	--	1.16
Lentil	0.57	--	0.57	0.30	--	0.30
Khasari	29.31	19.17	10.14	15.63	10.35	5.28
Mung	11.86	7.37	4.49	6.33	3.98	2.35
Other Pulses	1.18	--	1.18	0.63	--	0.63
Gross cropped area (ha)	--	--	--	102.10	21.36	--
Net cropped area (ha)	54.45	11.53	--	--	--	--
Cropping intensity (per cent)	187.51	185.26	2.26	--	--	--

Source: BIDS/SSISP Household Level Survey 1992.

Table 5.9

Cropping Pattern by Farm Size Categories in Project and Control Areas

Crops	% of land in crop by farm size (ha)									
	Project					Control				
	0.0-0.20	0.21-1.01	1.02-2.02	2.03 & above	All farms	0.0-0.20	0.21-1.01	1.02-2.02	2.03 & above	All farms
Aus Season:										
Local Aus	24.41	16.42	23.18	13.57	17.23	33.33	17.75	35.69	26.15	27.01
Aman Season:										
Local Aman	29.99	41.45	40.73	50.73	44.09	33.33	54.55	50.18	55.77	53.32
HYV Aman	9.48	3.28	5.47	3.75	4.43	-	3.90	-	-	0.42
Rabi Season:										
Oil Seeds	-	1.98	2.55	4.06	2.76	6.67	18.61	8.48	-	3.60
Sweet/Other Potato	8.58	4.74	2.50	2.28	3.65	-	-	-	-	-
Chillies	4.35	4.52	3.39	2.26	3.37	-	-	-	-	-
Onion	-	-	0.57	-	0.11	-	-	-	-	-
Garlic	-	-	0.68	-	0.13	-	-	-	-	-
Termeric	-	-	0.42	-	0.08	-	-	-	-	-
Vegetables	-	0.15	0.21	0.05	0.11	-	-	-	-	-
Nut/Pea nut	0.11	1.24	1.20	1.30	1.16	-	-	-	-	-
Lentil	2.01	0.40	-	-	0.30	-	-	-	-	-
Khasari	19.62	20.44	12.60	12.44	15.63	20.00	3.90	-	12.36	10.35
Mung	1.00	5.36	6.51	8.14	6.33	2.67	-	-	5.50	3.98
Other Pulses	0.45	-	-	1.44	0.63	4.00	1.30	5.65	0.20	1.31
Total	100.0 (8.97)	100.0 (32.28)	100.0 (19.20)	100.0 (41.65)	100.0 (102.10)	100.0 (1.50)	100.0 (2.31)	100.0 (2.83)	100.0 (14.72)	100.0 (21.36)
Gross Cultivated area (ha)	8.97	32.28	19.20	41.65	102.10	1.50	2.31	2.83	14.72	21.36
Net Cultivated area (ha)	3.54	16.93	9.35	24.62	54.45	0.54	1.36	1.42	8.21	11.53
Cropping intensity (per cent)	253.39	190.67	205.35	169.17	187.51	277.78	169.85	199.30	179.29	185.26

Source: BIDS/SSISP Household Level Survey 1992.

5.5.2 Adoption of High Yielding Varieties (HYVs)

Enhancement of crop production, as envisaged in the Small Scale Irrigation Sector Project (SSISP), is contingent upon the expansion of high yielding varieties of paddy in different crop seasons. Again, the adoption of HYV is largely determined by the access to irrigation. The primary objective of the Patuakhali Polder 43/2B Project has been to provide irrigation by using LLPs and by gravity means to increase production of both winter and summer rice crops. In absence of irrigation facilities, the project could not induce the expansion of high yielding varieties of paddy, though it has largely been successful to provide full flood protection measures to reduce the risk of crops. Under this circumstance, the project area would obviously face formidable obstacles for expansion of high yielding varieties, particularly in Boro season, unless adequate measures are taken to combine irrigation benefits to those benefits derived from flood control measures.

In spite of the above constraints imposed upon the project, high yielding varieties are adopted in a very small portion of land in Aman paddy (see Tables 5.8 and 5.9). The adoption rate of HYV paddy is, however, higher in the project area than in the control area. For example, the project area devotes 4.42 per cent of gross land and 6.73 per cent of foodgrains area for cultivation of HYV paddy, while the corresponding figures stand at 0.42 and 0.52 per cent in the control area (see Table 5.10).

While adoption rate is measured in terms of percentage of gross and/or foodgrains area devoted to high yielding varieties, we can observe no systematic relationship between farm-size and HYV adoption in the project area, though the very small size category (owning upto .20 ha) has the highest rate of adoption (see Table 5.10). In the control area, on the other hand, only a single farmer belonging to the size group of 0.21 - 1.01 ha adopts HYV Aman paddy in .09 ha of land.

Adoption can be measured in terms of percentage of households using new inputs, such as irrigation, HYVs, fertilizers and pesticides. It is to be

mentioned here that irrigation is not used at all in our study areas (project and control areas). Thus Table 5.11 shows that adoption rate, measured in terms of percentage of households using HYVs, fertilizers and pesticides, is significantly higher in the project area than in the control area. In this table, adoption rate is observed to be higher for the larger farms than their smaller counterparts in both project and control areas. That is to say, there exists a positive relation between farm-size and percentage of households adopting new inputs.

Table 5.10

HYV Adoption by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Land (ha) under HYVs	Net land (ha)	Gross land (ha)	Gross land (ha) under foodgrains	% of land under HYVs		
					% of net land	% of gross land	% of land under food-grains
Project Area:							
0.00 - 0.20	0.85	3.54	8.96	5.73	24.01	9.49	14.83
0.21 - 1.01	1.06	16.93	32.30	19.74	6.26	3.28	5.37
1.02 - 2.02	1.05	9.35	19.23	13.32	11.23	5.46	7.88
2.03 & above	1.56	24.62	41.77	28.34	6.34	3.73	5.50
All farms	**4.52**	**54.45**	**102.26**	**67.13**	**8.30**	**4.42**	**6.73**
Control Area:							
0.00 - 0.20	--	0.54	1.51	1.00	--	--	--
0.21 - 1.01	0.09	1.36	2.30	1.76	6.62	3.91	5.11
1.02 - 2.02	--	1.42	2.83	2.43	--	--	--
2.03 & above	--	8.21	14.72	12.06	--	--	--
All farms	**0.09**	**11.53**	**21.36**	**17.25**	**0.78**	**0.42**	**0.52**

Source: BIDS/SSISP Household Level Survey, 1992

Table 5.11

Adoption of Inputs by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Number of House-holds	Percentage of households using		
		HYVs	Fertilizers	Pesticides
Project Area				
0.00 - 0.20	31	9.68	22.58	9.68
0.21 - 1.01	33	15.15	57.58	15.15
1.02 - 2.02	8	25.00	75.00	25.00
2.03 & above	7	42.86	85.71	85.71
All farms	79	16.46	48.10	20.25
Control Area				
0.00 - 0.20	14	--	14.29	--
0.21 - 1.01	12	8.33	25.00	16.00
1.02 - 2.02	5	--	--	20.00
2.03 & above	4	--	50.00	75.00
All farms	35	2.86	20.00	17.14

Source: BIDS/SSISP Household Level Survey, 1992.

5.5.3 Input Use and Cost of Production

Chemical fertilizers, pesticides and human labour are the major inputs for the production of crops in project and control areas. Irrigation is not used at all for any crop cultivated in both the areas. All the crops are rain-fed or dependent on residual soil moistures. On the whole, it appears that almost the same level of technique of production is adopted in both the areas.

Table 5.12 shows the level of use of some major inputs for the production of crops in both project and control areas. The table shows that, the intensities of use of fertilizers, pesticides and human labour are higher in the project area for almost all the crops. The higher uses of these material and human inputs, however, reflect in higher yields for almost all crops in the project area.

Table 5.12

Use of Major Production Inputs in Crop Production

Crops	Project			Control		
	Human labour mandays/ha	Fertilizer Kg/ha	Pesticides Tk./ha	Human labour mandays/ha	Fertilizer Kg/ha	Pesticides Tk./ha
Aus Season						
Local Aus	76.44	45.98	49.45	40.73	21.84	39.87
Aman Season						
Local Aman	65.52	45.15	47.99	36.60	19.14	125.52
HYV Aman	83.81	69.66	183.54	123.50	67.75	0.00
Rabi Season						
Oil Seeds	59.27	0.00	17.74	--	--	--
Sweet Potato/ Other Potato	143.48	7.78	41.57	156.55	13.92	0.00
Chillies	154.01	56.96	113.33	78.88	33.92	168.12
Onion	199.50	66.50	0.00	--	--	--
Garlic	223.84	77.19	0.00	--	--	--
Termeric	49.40	0.00	0.00	--	--	--
Vegetables	136.28	34.07	0.00	--	--	--
Nut/Peanut	112.50	2.54	0.00	--	--	--
Lentil	70.57	0.00	0.00	--	--	--
Khasari	30.74	6.35	0.00	34.83	1.36	0.00
Mung	39.58	0.46	123.19	34.11	2.35	0.83
Other Pulses	58.21	0.00	0.00	--	--	--

Source: BIDS/SSISP Household Level Survey, 1992.

Labour use per unit of land for almost all crops except HYV Aman, potato and Khesari has been observed to be higher in the project area than in the control area (see Table 5.13). But the percentage figures of hired labour to total labour for all the crops taken together and for most of the individual crops are significantly higher in the control area than in the project area. This is due to the occupation pattern prevalent in the control area where most of the households depend on non-agricultural income so that they have to employ hired labour more for cultivation. This indicates that the project area is more family labour-based which may lead to the absorption of more labour (family and hired labour taken together) per unit of land in different crops in the project area than in the control area.

The material costs per unit of land for the production of major crops in project and control areas can be seen in Table 5.14. This table shows that material costs per unit of land for all the crops taken together and for most of the individual crops are significantly higher in the project area than in the control area. There exists no systematic relation between farm size and material costs per unit of land for most of the individual crops in project and control areas (see Table 5.14).

5.5.4 Yield Rates, Returns and Value-Added

Yield rates of major crops in project and control areas are presented in Table 5.15. Looking at this table, one can see that yield rates for most of the crops except HYV Aman are significantly higher in project area than in control area. The significantly higher yield rates observed in the project area can be explained by higher intensities in use of material and non-material (human) inputs in the project area. In the control area, only a single farmer in the farm-size category of 0.21 - 1.01 ha cultivates HYV Aman paddy in 0.09 ha of land for which yield rates and cost incurment per ha are observed to be higher than those in the project area.

Table 5.13

Use of Labour in Different Crops of Project and Control Areas

(Labour use in mandays per ha)

Crops	Project				Control				% Difference in Project over Control
	Wage labour	Family labour	Total labour	Wage labour as % of total labour	Wage labour	Family labour	Total labour	Wage labour as % of total labour	
Aus Season									
Local Aus	18.58	57.86	76.44	11.68	15.43	25.31	40.73	22.69	87.67
Aman Season									
Local Aman	18.13	47.39	65.52	17.37	17.64	18.96	36.60	30.43	79.02
HYV Aman	27.86	55.95	83.81	19.25	37.05	86.45	123.50	30.00	-32.14
Kabi Season									
Oil Seeds	5.32	53.94	59.27	3.42	--	--	--	--	--
Sweet Potato/ Other Potato	17.43	126.05	143.48	7.51	27.83	128.72	156.55	14.31	- 8.35
Chillies	22.96	131.06	154.01	9.43	29.74	49.14	78.88	9.57	95.25
Onion	0.00	199.50	199.50	0.00	--	--	--	--	--
Garlic	23.16	200.69	223.84	7.09	--	--	--	--	--
Termeric	0.00	49.40	49.40	0.00	--	--	--	--	--
Vegetables	0.00	136.28	136.28	0.00	--	--	--	--	--
Nut/Peanut	3.38	109.12	112.50	1.37	--	--	--	--	--
Lentil	6.42	64.16	70.57	10.89	--	--	--	--	--
Khasari	4.85	25.88	30.74	8.29	11.76	23.07	34.83	9.08	-11.74
Mung	7.70	31.88	39.58	11.63	7.06	27.05	34.11	5.71	16.04
Other Pulses	7.87	50.34	58.21	13.78	--	--	--	--	--
All Crops	**15.35**	**52.30**	**67.66**	**9.75**	**16.66**	**24.25**	**40.91**	**17.47**	**65.39**

Source: BIDS/SSISP Household Level Survey, 1992.

Table 5.14

Material Costs Per Unit of Land in Major Crops by Farm Size Categories

	Farm Size (ha)									
	Project Villages					Control Villages				
Crops	0.0-0.20	0.21-1.01	1.02-2.02	2.03 & Above	All Farms	0.0-0.20	0.21-1.01	1.02-2.02	2.03 & Above	All Farms
Aus Season										
Local Aus	3155.76	2388.11	2625.16	2397.28	2546.61	2748.87	2161.86	1501.76	1953.90	1958.49
Aman Season										
Local Aman	2775.31	2645.76	2800.78	2481.36	2603.28	3147.26	2717.00	1693.71	2059.55	2134.87
HYV Aman	3305.10	3021.29	2889.61	3022.38	3044.49	--	3211.00	--	--	3211.00
Rabi Season										
Oil Seeds	--	1597.68	1265.88	1281.09	1350.34	--	--	--	--	--
Sweet Potato/ Other Potato	3574.31	3510.14	5091.52	2575.56	3490.18	4923.53	3396.25	3705.00	4940.00	4066.80
Chillies	3133.81	4161.84	4597.29	3509.94	4033.95	3813.68	2493.30	2305.33	--	2607.08
Onion	--	--	3866.50	--	3866.50	--	--	--	--	--
Garlic	--	--	4090.94	--	4090.94	--	--	--	--	--
Terneric	--	--	5681.00	--	5681.00	--	--	--	--	--
Vegetables	--	4370.00	3136.90	1852.50	3423.93	--	--	--	--	--
Nut/Pea nut	4940.00	3592.73	4758.00	2154.29	3178.86	--	--	--	--	--
Lentil	1740.23	2245.45	--	--	1956.75	--	--	--	--	--
Khasari	788.24	919.36	1064.41	823.33	895.24	1712.31	1122.73	--	1207.56	1272.55
Mung	3705.00	2676.60	2024.31	2042.61	2229.93	2519.40	--	--	2223.00	2237.11
Other Pulses	2223.00	--	--	1666.83	1702.25	--	--	--	--	--

Source: BIDS/SSISP Household Level Survey, 1991.

Table 5.15

Comparison of Yield Rates of Project and Control Areas for Selected Crops

Crops	Yield rates (MT/ha) in crops		% difference in project villages over control village
	Project	Control	
Aus Season			
Local Aus	1.75	1.55	12.90
Aman Season			
Local Aman	2.04	1.73	17.92
HYV Aman	3.25	3.69	-11.92
Rabi Season			
Oil Seeds	2.37	--	--
Sweet Potato/ Other Potato	11.47	11.34	1.15
Chillies	1.00	0.87	14.94
Onion	1.46	--	--
Garlic	1.30	--	--
Termeric	0.92	--	--
Vegetables	41.23	--	--
Nut/Pea nut	1.31	--	--
Lentil	0.83	--	--
Khasari	1.15	1.14	0.88
Mung	0.56	0.41	36.59
Other Pulses	0.66	--	--

Source: BIDS/SSISP Household Level Survey, 1992.

If we look at the village level data relating to yield rates of major crops in project and control areas in the post-project (survey year) and pre-project periods presented in Table 5.16, we can observe that yield rates of all crops are significantly and consistently higher in the project area than in the control area in both the periods. If we compare the data relating to yield rates contained in Table 5.15 and 5.16, we can find that household level data are very nearer to the village level data indicating their reliability and consistency.

Table 5.16

Yield Rates (Ton/ha) of Different Crops in Project and Control Areas

Crops	Survey Year (1992)		Pre-Project Year (1986)		% change in yield in project over control	
	Project	Control	Project	Control	Survey year	Pre-Project year
Aus Season						
Local Aus	1.72	1.70	1.81	1.72	1.18	5.23
Aman Season						
Local Aman	2.09	1.80	1.86	1.83	16.11	1.64
HYV Aman	3.05	2.92	2.77	2.77	4.45	0.00
Rabi Season						
HYV Boro	4.61	4.15	--	--	11.08	--
Oil Seeds	0.92	--	--	--	--	--
Sweet/other Potato	8.39	6.89	14.00	6.10	21.77	129.51
Chillies	1.10	0.95	1.34	0.92	15.79	45.65
Nut/Peanut	1.61	--	--	--	--	--
Khasari	1.46	0.84	1.54	0.97	73.81	58.76
Mung	0.68	0.46	1.11	0.92	47.83	20.65

Source: BIDS/SSISP Village Level Survey, 1992.

Yield rates of major crops by farm size categories in project and control areas are presented in Table 5.17. From this table, it is difficult to establish inverse relationship between farm size and yield rates for mostly of the crops in project and control areas. For crops, such as pulse and lentil in the project

Table 5.17

Yield Rates (MT/ha) of Different Crops by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Yield rates (Mt/ha) in crops in Project Areas														
	Local Aus (N=41)	Local Aman (N=51)	HYV Aman (N=15)	Oilseeds (N=17)	Sweets/ other Potato (N=38)	Chillies (N=36)	Onion (N=2)	Garlic (N=2)	Turmeric (N=1)	Vege-tables (N=4)	Nut/ Peanut (N=10)	Lentil (N=4)	Khesari (N=42)	Mung (N=20)	Other pulses (N=6)
Project Area															
0.00 - 0.20	1.84	2.14	3.76	-	12.86	1.05	-	-	-	-	1.54	0.84	1.29	0.44	0.92
0.21 - 1.01	1.71	2.03	3.06	0.55	10.54	1.06	-	-	-	8.51	1.03	0.82	1.02	0.59	-
1.02 - 2.02	1.76	2.09	3.28	10.73	12.89	1.06	1.46	1.30	0.92	2.77	1.47	-	1.21	0.46	-
2.03 & above	1.69	1.91	2.70	0.62	10.92	0.75	-	-	-	76.83	1.36	-	1.30	0.59	0.61
All farms	**1.75**	**2.04**	**3.25**	**2.37**	**11.47**	**1.00**	**1.46**	**1.30**	**0.92**	**41.23**	**1.31**	**0.83**	**1.15**	**0.56**	**0.66**
Control Area	Local Aus (N= 9)	Local Aman (N=11)	HYV Aman (N= 1)	Oilseeds (N= 5)	Sweets/ other Potato (N= 5)	Chillies (N= 5)	Onion (N=0)	Garlic (N=0)	Turmeric (N=0)	Vege-tables (N=0)	Nut/ Peanut (N=0)	Lentil (N= 0)	Khesari (N= 6)	Mung (N= 2)	Other pulses (N=0)
0.00 - 0.20	1.94	2.31	-	-	11.06	0.69	-	-	-	-	-	-	1.02	0.46	-
0.21 - 1.01	1.60	1.70	3.69	-	11.52	1.26	-	-	-	-	-	-	1.54	-	-
1.02 - 2.02	1.48	1.53	-	-	13.83	0.46	-	-	-	-	-	-	0.83	-	-
2.03 & above	1.14	1.36	-	-	9.22	-	-	-	-	-	-	-	0.32	0.37	-
All farms	**1.55**	**1.73**	**3.69**	-	**11.34**	**0.87**	-	-	-	-	-		**1.14**	**0.41**	-

Source: BIDS/SSISP Household Level Survey, 1992.

Note : N = Number of farmers

area and Local Aus in the control area, inverse relationships between farm size and yield rates are observed to exist. For most of the crops, systematic relationships between farm size and yield rates are not observed to emerge in the project and control areas, though very small farms (owning upto 0.20 ha) mostly have the highest yield rates in both the areas.

Gross returns (gross value of output, i.e. output X price), net returns (gross returns - total costs) and value-added (gross returns - material costs) are presented in Table 5.18. This table shows that gross returns, net returns and value added for all individual crops taken together and in isolation are observed to be higher in the project area than in the control area. The only exception is for HYV Aman paddy of which the returns are observed to be higher in the control area than in the project area. We have explained this a bit earlier.

Percentage figures relating to differences of yield rates, gross returns, net returns and value-added between project and control areas are presented in Table 5.19. This table shows that all of the parameters for most of the crops in isolation and all of the crops taken together are significantly higher in the project area than in the control area. This indicates that the project provides significant positive impacts on the performance of crop agriculture.

Table 5.20 shows gross returns, net returns and value-added by farm size-categories in project and control areas. From this table, we can see that the farm size categories do not have systematic relations with these parameters. What is noteworthy is that in respect of the most of the parameters, the very small farms (owning upto 0.20 ha) performs the best, while the very large farms (owning 2.03 ha and above) perform the worst, though inverse relations are not established here.

5.6 A Comparison of Non-Crop Agriculture in Project and Control Areas

Among non-crop agriculture, we consider here livestock, forestry and fishery. These activities are recognized as integral parts of the farming system wherein crop activities constitute the main occupation of most of the households in project and control areas.

Table 5.18

Return (Per Ha) of Different Crops in Project and Control Areas

(Taka Per ha)

Crops	Project				Control			
		Net Return (Per Ha)				Net Return (Per Ha)		
	Gross Return	Net Return at full costs	Value Added	Net Return at Cash costs	Gross Return	Net Return at full costs	Value Added	Net Return at cash costs
Local Aus	8184.02	4395.08	7632.62	6834.95	7018.74	3775.37	5552.04	4853.51
Local Aman	10471.03	7385.23	10225.13	9430.12	8368.29	5464.28	7099.10	6296.83
HYV Aman	15551.01	13442.80	17051.62	15811.10	17153.87	14943.50	19883.50	18401.50
Oil Seeds	12953.99	2325.92	4805.12	4625.57	-	-	-	-
Sweet/Other Potato	5453.48	4374.39	10360.32	9618.79	7597.95	6230.66	12805.73	11553.34
Chillies	27276.08	12923.33	19359.86	18382.03	20597.62	5358.99	8514.39	7524.03
Onion	5275.94	-2340.50	5633.50	5633.50	-	-	-	-
Garlic	11668.09	1620.94	10574.69	9648.44	-	-	-	-
Turmeric	9170.15	864.50	2840.50	2840.50	-	-	-	-
Vegetables	22418.19	21446.41	27067.79	27067.79	-	-	-	-
Nut/Peanut	16976.92	9086.55	13768.56	13641.67	-	-	-	-
Lentil	19331.66	13135.91	16055.00	15782.34	-	-	-	-
Khesari	11049.11	8028.50	9314.82	9102.04	7869.26	2244.71	3787.33	3235.43
Mung	18090.11	8626.37	10297.16	9975.32	17166.94	5249.34	6760.74	6443.17
Other Pulses	11731.17	4153.38	6654.84	6300.86	-	-	-	-
All Crops	12787.41	7266.47	10152.82	9484.58	9938.63	4708.96	6501.67	5749.95

Source: BIDS/SSISP Household Level Survey 1992.

Note : Gross Return = output X price
Net Return = gross return - total costs
Value-Added = gross return - material cost

Table 5.19

Percentage Difference of Yield Rates, Gross Returns, Net Returns and Value Added of Project Area over Control Area for Selected Crops

Crops	% difference in project area over control area in respect of			
	Yield Rates	Gross Return	Net Returns	Value Added
Aus Season				
Local Aus	12.90	16.60	16.41	37.47
Aman Season				
Local Aman	17.72	25.13	35.15	44.03
HYV Aman	-11.32	- 9.34	10.04	-14.24
Rabi Season				
Oil Seeds	-	-	-	-
Sweet Potato/ Other Potato	1.15	-28.22	-29.79	21.68
Chillies	14.94	32.42	141.15	127.38
Onion	-	-	-	-
Garlic	-	-	-	-
Turmeric	-	-	-	-
Vegetables	-	-	-	-
Nut/Pea nut	-	-	-	-
Lentil	-	-	-	-
Khasari	0.88	40.41	257.66	145.95
Mung	36.59	5.38	64.33	58.31
Other Pulses	-	-	-	-
All Crops	-	28.66	54.31	56.16

Source: BIDS/SSISP Household Level Survey 1992.
Note : For concepts of gross return, net return and value-added, See Table 5.18

Table 5.20

Gross Return, Net Return and Value Added Per Unit of Net Cultivated Land (Ha) by Farm Size Categories in Project and Control Areas

(Taka Per ha)

Farm Size (ha)	Project				Control			
	Gross Return Per Unit	Net Return at full costs	Net Return at cash costs	Value Added	Gross Return Per Unit	Net Return at full costs	Net Return at cash costs	Value Added
0.00 - 0.20	15453.52	9475.29	12627.25	12852.15	13677.96	5803.17	10796.29	10849.41
0.21 - 1.01	12229.92	6613.76	9352.68	9854.30	10659.20	5460.48	6582.62	8117.14
1.02 - 2.02	13732.97	7187.65	9966.08	11108.50	9837.66	6901.89	7537.03	8045.14
2.03 & above	11569.49	7333.64	8690.76	9364.64	7448.72	4057.23	4759.30	5506.89
All farms	12525.26	7266.47	9484.58	10152.82	8550.92	4708.96	5749.95	6501.67

Source: BIDS/SSISP Household Level Survey, 1992.
Note: For concepts of gross return, net return and value-added, see Table 5.18

The importance of non-crop activities can be assessed in terms of income and employment. Although these activities are carried out mostly as self employment, a large percentage of households are observed to be involved to derive income from these activities in project and control areas (see Table 5.21). From Table 5.21, it can also be observed that higher percentage of households are involved in these non-crop activities in the project area than in the control area. In terms of income, the percentage contribution of non-crop agriculture in the project area is small (17.67 per cent) and in the control area the contribution is even smaller (8.22 per cent) (see Table 5.21).

It may be emphasized here that while formulating the project, no explicit plans or programmes related to livestock, forestry and fishery development were envisaged. It was, however, expected that intensification of crop production in the project area as well as the project structure would have considerable impacts on the non-crop activities. Specific enquiry on this problem related to various aspects of development activities would, however, be dealt in a forthcoming chapter on environment (see Chapter 10).

Table 5.22 shows the picture of income derived by farm-size categories from each sector in project and control areas. The average income from non-crop activities is low in the project area and even lower in the control area. This is very likely, since this source does not constitute a primary or even secondary occupation. Another feature of non-crop income is that average income derived from this source varies significantly across different farm-size groups, though it is difficult to establish any systematic relation between farm size and average non-cop income. It is, however,observed that the very small farms (owning land upto 0.20 ha) in the project area have the highest average income while the very large farms (owning 2.03 ha and above) in the control area have the largest average income from this sector (see Table 5.22).

Table 5.21

Importance of Non-Crop Agriculture as a Source of Income in Project and Control Areas

Type of area	Percentage share of non-crop agriculture in total household income	Households deriving income from non-crop agriculture as percentage of total sample households
Project	17.67	75.95 (60)
Control	8.22	65.71 (23)

Source: BIDS/SSISP Household Level Survey, 1992.
Note: Figures in parentheses indicate number of hosueholds.

Table 5.22

Average Income (in Taka) by Farm Size Categories in Different Sectors

Farm Size (ha)	Average income (Taka) in different activities*							
	Agriculture		Non-Agriculture			Non-agri-cultural wage	Non-agri-cultural others	Total
	Crop (including agricul-tural wage income)	Non-crop	Trade	Industry	Transport			
Project Area								
0.00 - 0.20	12861.93	6533.00	9560.00	-	-	11050.28	2856.25	20826.19
0.21 - 1.01	12630.85	3689.69	5960.67	2500.00	12000.00	17669.89	10485.42	23680.18
1.02 - 2.02	22031.33	4963.75	26250.00	-	-	22287.50	12000.00	42193.50
2.03 & above	37287.29	3496.43	13500.00	-	-	20880.00	11160.00	53795.00
All farms	**17012.60**	**4912.27**	**10861.33**	**2500.00**	**12000.00**	**14813.45**	**8142.79**	**27103.44**
Control Area								
0.00 - 0.20	4045.00	2630.00	14480.00	-	16333.33	12315.83	3445.00	18516.43
0.21 - 1.01	5976.80	1511.25	17050.00	-	-	15615.00	5980.00	22595.33
1.02 - 2.02	9830.00	1680.00	33000.00	-	-	21600.00	15130.00	35236.00
2.03 & above	17453.33	3212.50	30000.00	-	-	26280.00	50000.00	55372.50
All farms	**8141.93**	**2177.29**	**19511.54**	**-**	**16333.33**	**15373.08**	**12622.78**	**26515.54**

Source: BIDS/SSISP Household Level Survey, 1992.

Note: * Average relate to households involved in each activity.

5.7 Conclusion

In the foregoing sections, we have attempted to analyse the impact of the Patuakhali Polder 43/2B Sub-Project on crop production and overall performance in agriculture. The assessment has been done through comparisons of the present performance of agriculture in the project area with the pre-project and targeted situations and more importantly with the control area, treated as comparable to the without project situation.

It has been observed that cropping pattern, cropping intensity and yield rates of various crops have significantly changed/increased due to the realization of the provision of full flood protection under the project. Since the benefit of embankment for protecting floods could not be combined with the benefit of irrigation for adoption of HYVs, the major objective of transforming the cropping system through shift of cropping from local to HYVs to enhance the overall production performance remains largely unrealized.

The comparative assessment of the performance of crop agriculture in respect of cropping pattern, cropping intensity and yield rates of various crops in project and control areas shows a significant improvement in the project area. To evaluate the overall performance of crop-agriculture in value terms, it has been observed that gross returns, net returns and value-added of all the crops taken together and most of the individual crops in isolation are significantly higher in the project area than in the control area. This indicates that the project provides significant positive economic impact on the performance of crop-agriculture.

It has been observed that the project area has higher employment and income from non-crop agricultural activities than in the control area. But it is very difficult to attribute this observation to the impact of the project.

CHAPTER 6

LAND, LABOUR AND CREDIT MARKETS

6.1 Introduction

In the preceding chapter, we have seen that the Patuakhali Polcer 43/2B sub-project has positive impact on agricultural production and land productivity which, in its turn, would have bearing on land market by raising the price of land. The project is also expected to increase the demand for material and labour inputs, ultimately leading to the creation of employment opportunities. These, in turn, would have impact on cash requirement and thereby might affect credit market as well.

We, however, attempt here to assess the indirect impacts of the project on land, labour and credit markets in the following sections through comparison of cross section data in project and control areas along with their pre and post-project situations.

6.2 Land Market

In the rural economy, land is the most important asset which basically determines the access to other resources and services. Analyses pertaining to size, distributional pattern, fragmentation, tenurial practices, transactions and prices of land in project and control areas are done below.

6.2.1 Size of Owned and Operated Land

Like Bangladesh, our study area is also the land of small farms. From Table 6.1, one can see that average size of land (both ownership and operational) is very small. The average ownership size in the project area is equal to that in the control area, but the average operational size[1] is significantly lower in the control area than in the project area.

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[1]Average operational size figure of 0.69 ha in the project area is very nearer to national average figure of 0.68 ha. (see Table 6.1 and BBS 1991, p. 123).

In the project area, for all size groups taken together, average operational size equals to average ownership size, but varies across the size-group. From Table 6.1, one can see that operated land as percentage of owned land is significantly higher for the very small size group (0.0-0.20 ha) in the project area, indicating that this group of farms operate significantly more than what they own. In the control area, operated land is significantly lower than the owned land for all size categories indicating that they rent-out more than what they rent-in. This may be due to the reason that the farmers in the control area are involved more in non-agricultural activities than agricultural ones and for this reason, they might have been operating much less land than what they own. The operated land as percentage of own land is, however, much lower for the medium size category (0.21 - 2.02 ha) than for other categories in the control area (see Table 6.1).

Table 6.1

Average Size of Land Owned and Operated by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Project			Control		
	Average owned land	Average operated land	Operated land as % of own land	Average owned land	Average operated land	Operated land as % of own land
.00 - 0.20	0.06	0.11	183.33	0.05	0.04	80.00
0.21 - 1.01	0.58	0.51	87.93	0.52	0.11	21.53
1.02 - 2.02	1.41	1.17	82.98	1.27	0.28	22.05
2.03 and above	3.17	3.52	110.04	2.71	2.05	75.64
All Farms	0.69	0.69	100.00	0.69	0.33	47.83

Source: BIDS/SSISP Household Level Survey, 1992.

6.2.2 The Distributional Pattern of Land

The description of our study area as a 'land of small farms' can not conceal the unequal pattern of distribution. The distribution of land owned and operated in both the project and control areas is very much skewed. Table 6.2 shows that in the project area about 22 per cent of households do not own any cultivable land, while about 9 per cent of households own about 41 per cent of land. The extent of landlessness is observed to be somewhat lower in the project area than in the control area where the upper 11 per cent of households own about 45 per cent of land. This indicates that the ownership distribution of land is more or less equally skewed in both the areas.

Table 6.2 also demonstrates the operational distribution of land in project and control areas. From this table, one can see that in the project area, about 39 per cent of households operate only about 7 per cent of land, while about 19 per cent of households operate about 69 per cent of land. In the control area, about 40 per cent of households operate about 5 per cent of land, while upper 11 per cent of households operate 71 per cent of land. This indicates that the distribution pattern of operated land is similarly skewed in both project and control areas.

6.2.3 Land Fragmentation

It is very rare to find agricultural holdings without any fragmentation. In our study area, most of the cultivable land is fragmented into tiny plots with average size of 0.15 ha in the project area and 0.11 in the control area (see table 6.3). The average number of plots per household is 4.59 and 2.97 for project and control areas respectively. That is to say, the number of plots per household and average size of plot are observed to be higher in the project area than in the control area.

Fragmentation takes place across all categories of farms, irrespective of size. The bigger ownership units are not necessarily bigger consolidation of operating units. Table 6.3 shows that in both the project and control areas, the number of plots increases with the size of farm. Thus, although there is considerable difference in the size of farms, the difference in the average size of plots across different size categories are only marginal in our study area (see Table 6.3).

Table 6.2

Percentage Distribution of Households, Owned and Operated Land by Farm Size Categories in Project and Control Areas

Farm Size (ha)	House-hold number	% of house-hold	Own Land				Operated Land		
			Area (ha)	% of area	Cumulative % of Household	Cumulative % of Area	Area (ha)	% of area	Cumu-lative % of area
Project Area									
0	17	21.52	0.00	0.00	21.52	0.00	1.07	1.96	1.96
.01 - 0.20	14	17.72	1.79	3.30	39.24	3.30	2.47	4.54	6.50
0.21 - 1.01	33	41.77	18.36	33.83	81.01	37.13	13.15	24.15	30.65
1.02 - 2.02	8	10.13	11.95	22.02	91.14	59.15	13.13	24.12	54.77	
2.03 and above	7	8.86	22.17	40.85	100.00	100.00	24.62	45.22	100.00
All Farms	79	100.00	54.27	100.00			54.45	100.00	
Control Area									
0	10	28.57	0.00	0.00	28.57	0.00	0.00	0.00	0.00
.01 - 0.20	4	11.43	0.74	3.06	40.00	3.06	0.54	4.70	4.70
.21 - 1.01	12	34.29	6.26	25.85	74.29	28.91	1.36	11.80	16.50
1.02 - 2.02	5	14.29	6.36	26.30	88.58	55.21	1.42	12.29	28.79
2.03 and above	4	11.43	10.84	44.80	100.00	100.00	8.21	71.21	100.00
All Farms	35	100.00	24.20	100.00			11.53	100.00	

Source: BIDS/SSISP Household Level Survey, 1992.

Table 6.3

Fragmentation By Farm Size Categories in Project and Control Areas

Farm Size (ha)	Number of household	Total number of plots	Total net cultivated land	Number of plots per household	Cultivable (net) land per plot
Project					
0.00 - 0.20	31	57	3.54	1.84	0.06
0.21 - 1.01	33	164	16.93	4.67	0.10
1.02 - 2.02	8	64	9.35	8.00	0.15
2.03 and above	7	78	24.62	11.14	0.32
All Farms	79	363	54.45	4.59	0.15
Control					
0.00 - 0.20	14	10	0.54	0.71	0.05
0.21 - 1.01	12	47	1.36	3.92	0.03
1.02 - 2.02	5	22	1.42	4.40	0.06
2.03 and above	4	25	8.21	6.25	0.33
All Farms	35	104	11.53	2.97	0.11

Source: BIDS/SSISP Household Level Survey, 1992.

6.2.4 Tenurial Arrangements and Practices

Table 6.4 shows the tenurial status of the sample households. From this table, it can be observed that owner farmers are predominant in both the project and control areas. But the predominancy of this tenurial category is more pronounced in the control area than in the project area. This can be

substantiated by the evidence that the owner farmers in the project area constitute about 54 per cent of households operating about 53 per cent of land, whereas in the control area the corresponding figures are somewhat higher and stand at 78 and 72 per cent respectively. It may also be noted here that pure tenants are quite non-existent in the control areas, while they constitute about 5 per ent of household and about 3 per cent of land in the project area.

Table 6.4

Tenurial Arrangement by Farm Size Categories in Project and Control Areas

Tenurial Group	No. of household	%	Farm area	%	Average
Project					
Owner	22	53.66	28.72	52.75	1.31
Owner cum tenants	17	41.46	24.25	44.54	1.43
Tenants	2	4.88	1.48	2.72	0.74
All	41	100.00	54.45	100.00	1.33
Control					
Owner	7	77.78	8.32	72.16	1.19
Owner cum tenants	2	22.22	3.21	27.84	1.61
Tenants	-	-	-	-	-
All	9	100.00	11.53	100.00	1.28

Source: BIDS/SSISP Household Level Survey, 1992.

Table 6.4 also shows that the owner cum tenants have higher average size of land than other tenurial categories in both the project and control areas. The average size of land for all tenurial groups (e.g. owner, owner cum tenants and tenants), taken together and/or in isolation, are observed to be higher in the project area than in the control area (see Table 6.4).

It may be mentioned here that 38 households constituting about 48 per cent of total sample households in the project area and 26 households constituting about 74 per cent of households in the control area are not observed to be involved in the tenurial arrangements classified above. The leftout households in both the project and control areas are mostly agricultural labourers who neither own nor rent-in land. In the production process, they are involved as wage earners who are not usually preferred as cultivators by landowners due to their meagre resource base to carry out the agricultural operations. The agricultural labourers without being involved in the tenurial arrangements are, nevertheless, an integral part in the production and distribution system in the rural economy.

To turn to the distribution of rented-in and rented-out land by farm-size categories, Table 6.5 is presented here. It can be observed from the table that in the project area 25.85 per cent of cultivated land is rented-in, while this figure is as much low as 7.29 per cent in the control area. The rented-out land as percentage of cultivated land is observed, in the contrary, to be as high as 117 per cent implying that rented-out land exceeds land operated by the farmers in the control area and thus this percentage is significantly higher than what has been found in the project area (26.28 per cent).

The distribution of rented-in and rented-out land in project and control areas can be seen in Table 6.5. No systematic pattern of renting-in and renting-out in relation to farm-size categories can be discerned. In the project area, about 63 per cent of rented-in land are observed to be operated by the farms owning upto 1.01 ha of land who also contribute almost equal percentage of rented-out land. In the control area, large farms (2.03 had and above) operate 76 per cent of rented-in land, while medium farms (0.21 - 2.02 ha) contribute 73 per cent of rented-out land. All size groups in the project area participate in the practice of renting-in and renting-out of land. In the control area, all farm-size categories also participate in renting-out of land, but in renting-in land, farm-size categories of 0.21 to 1.01 ha and 1.02 to 2.02 ha do not participate.

Table 6.5

Distribution Rented-in and Rented-out Land by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Rented in			Rented out		
	Area (ha)	% of house-hold	% of land	Area (ha)	% of house-hold	% of land
Project						
0.0 - 0.20	2.75	16.13 (5)	20.33	1.00	25.81 (8)	6.99
0.21 - 1.01	5.81	27.27 (9)	42.94	7.92	42.42 (14)	55.38
1.02 - 2.02	2.12	37.50 (3)	15.67	4.02	37.50 (3)	28.11
2.03 and above	2.85	28.57 (2)	21.06	1.36	28.57 (2)	9.51
All Farms	13.53 [25.85]	24.05 (19)	100.00	14.31 [26.28]	34.18 (27)	100.00
Control						
0.0 - 0.20	0.20	7.14 (1)	23.81	0.40	14.29 (2)	2.96
0.21 - 1.01	-	-	-	4.89	75.00 (9)	36.20
1.02 - 2.02	-	-	-	4.95	80.00 (4)	36.64
2.03 and above	0.64	25.00 (1)	76.19	3.27	25.00 (1)	24.20
All Farms	0.84 [7.29]	5.71 (2)	100.00	13.51 [117.17]	45.71 (16)	100.00

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Figures in first bracket indicate number of households renting in and/or out, while figurs in third bracket indicate percentage of rented in/out land to total operated land.

The half-share (Adhi Barga) under the sharecropping system as mostly practised in Bangladesh villages are not usually observed in our study villages in project and control areas.[1] For the cultivation of paddy (local and HVYs in all crop seasons), landlords are generally observed to bear 2/3rd portion of costs for fertilizers to get 2/3rd portion of output. For the cultivation of rabi crops such as pulses, oilseeds, potatos etc. landlords get 1/3rd portion of output, if they do not bear any cost. But they can get 50 per cent of output for rabi crops, if they contribute full cost for seeds. In the practice of costs and crop sharing, the similar trend has been observed in both project and control villages.

6.2.5 Land Transactions and Permanent Transfer

Changes in land market may take place through permanent transfer in terms of sale and purchase of land. The sale and purchase of land are, indeed, very limited in rural Bangladesh. From Table 6.6, one can find that only 2.17 and 1.68 per cent of owned land had been sold and purchased respectively during the last 5 years in the project area. While the corresponding figures stand at 1.57 and 3.35 per cent in the control area. Thus the per year transactions (sale and purchase taken together) would be less than 1 per cent of the total owned land in project and control areas. This indicates that land transactions (sale and purchase) in both project and control areas are extremely limited, though the project area has somewhat higher incidence (in terms of percentage of land and percentage of households involved) in sales, while the control area has higher incidence in purchases.

The distribution pattern of land permanently transferred through such transactions (sale and purchase) can be seen in Table 6.7. This table shows that land is mostly sold by the smaller size categories and mostly purchased by the larger size categories in both the project and control areas. This pattern of transaction tends to make the distribution pattern of land more unequal overtime in both the project and control areas. Since significant and systematic variations in these transactions are not observed in project and control areas,

[1]Informationon crop-share and cost-share are based on the Village Level Survey and field studies undertaken by the Researh Team.

the unequalising tendency in the distribution of land overtime is likely to have been similar in both the areas.

Table 6.6

Land Transactions in Project and Control Areas During the Last Five Years

Year	Project				Control			
	Number household who sold	Amount of land sold (ha)	Number of household who purchased	Amount of land purchased (ha)	Number household who sold	Amount of land sold (ha)	Number of household who purchased	Amount of land purchased (ha)
1987-88	1	0.06	-	-	-	-	-	-
1988-89	1	0.04	1	0.18	-	-	1	0.08
1989-90	3	0.94	2	0.16	-	-	3	0.35
1990-91	1	0.06	-	-	-	-	1	0.08
1991-92	2	0.07	3	0.57	2	0.38	2	0.30
Total for 5 years	5* (6.33)	1.18 (2.17)	5* (6.33)	0.91 (1.68)	2 (5.71)	0.38 (1.57)	4* (11.43)	0.81 (3.35)

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Figures in parentheses indicate percentage of total sample households and/or percentage of cultivable land owned by the sample households. Year 1987-88 refers to Bengali year 1394.

*Total number of households being less than total number of incidence.

6.2.6 Land Prices

Table 6.8 shows that land prices in the project area have increased by more than 40 per cent compared to the pre-project situation due to inflationary forces as well as expected/realized productivity gains through improvement in the quality of land due to project intervention. The increased land prices in the

control area (by 23-30 per cent) is much less than that in project area indicating the impact of the project on the enhancement of the prices in land.

Furthermore, it can be discerned from the table that in the pre-project period absolute prices in project and control areas remain more or less at the same level. But in the post-project period (survey year), the prices of irrigable and non-irrigable land are higher at the extent of 14 and 10 per cent respectively in the project area than in the control area. This reflects the intervention of the project to improve the quality of land and enhance its productive use.

In both project and control areas, homestead land is highly valued. There is no significant variation in price (per ha) of homestead land in project and control areas. The percentage change in price of this category of land has been observed to be more or less similar in project and control areas.

Table 6.7

Distribution of Land Sold and Purchased by Farm Size in Project and Control Areas

Farm Size (ha)	Project		Control	
	Percentage of land		Percentage of land	
	Sold (ha)	Purchased (ha)	Sold (ha)	Purchased (ha)
0.00 - 0.20	5.08	-	100.00	-
0.21 - 1.01	94.92	26.37	-	16.05
1.02 - 2.02	-	-	-	33.33
2.03 and above	-	73.63	-	49.38
All Farms	100.00 (1.18)	100.00 (0.91)	100.00 (0.38)	100.00 (0.81)

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Figures in parentheses indicate the amount of cultivabale land (in ha)

Table 6.8

Land Price (per ha) by Types of Land in Project and Control Areas

Type of land	Project			Control		
	1991	Pre-project	% change	1991	Pre-project	% change
Irrigable	98800.00	70200.00	40.74	86450.00	70100.00	23.32
Non-irrigable	93434.14	65156.90	43.40	84848.00	65100.00	30.33
Homestead	109531.72	86279.66	26.95	105000.00	85000.00	23.53

Source: BIDS/SSISP Village Level Survey, 1992.

6.3 Labour Market

6.3.1 Types and Uses of Labour

There are usually three types of labour (e.g. family, hired and permanent) used in the project and control areas. In chapter 5, we have seen that higher percentage of wage labour is used in the cultivation of most of the crops in the control area than in the project area. Regarding the use of permanent labour, it can be seen from Table 6.9 that in the project area 12.66 per cent of households use permanent labour and the number of permanent labour per household employing such type of labour is 1.50. In the control area, the corresponding figures stand at 5.71 per cent and 1.0. This indicates that the percentage of household using permanent labour and number of permanent labour per household employing this type of labour are observed to be higher in the project area than in the control area.

Table 6.9

Use of Permanent Labour by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Project		Control	
	Percentage of household using permanent labour	Average number of permanent labour (per employer household)	Percentage of household using permanent labour	Average number of permanent labour (per employer household)
0.00 - 0.20	-	-	7.14	1.00
0.21 - 1.01	6.06	1.00	-	-
1.02 - 2.02	37.50	1.33	20.00	1.00
2.03 & above	71.43	1.80	-	-
All Farms	12.66 (10)	1.50	5.71 (2)	1.00

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Figures in parentheses indicate the number of households using permanent labour.

6.3.2 Labour-Force Participation

It can be observed from Table 6.10 that earner per household is higher in control area than in project area. The table also shows that larger size categories have higher earner per household than their small counterparts in both the project and control areas. Female earner has not been found in the project area, while a very insignificant number of female earner per household has been found in the control area.

The participation rate defined in terms of percentage of earner members to all members of age 10 and above has been presented in Table 6.10. This table shows that the project area has somewhat higher participation rate than the control area. The smaller size categories, however, have higher participation rate than their larger counterparts in both the project and control areas.

Table 6.10

Labour Force Participation by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Earner per household			Participation rate*		
	Male	Female	All	Male	Female	All
Project						
0.00 - 0.20	1.42	0.00	1.45	78.57	1.96	42.06
0.21 - 1.01	1.67	0.00	1.67	68.75	0.00	39.86
1.02 - 2.02	1.75	0.00	1.75	73.68	0.00	38.89
2.03 and above	2.14	0.00	2.14	60.00	0.00	36.59
All Farms	1.63	0.00	1.63	71.11	0.70	40.06
Control						
0.00 - 0.20	1.64	0.00	1.64	82.14	0.00	40.35
0.21 - 1.01	1.58	0.00	1.58	70.37	0.00	38.00
1.02 - 2.02	2.00	0.00	2.00	66.67	0.00	35.71
2.03 and above	1.75	0.25	2.00	58.33	8.33	33.33
All Farms	1.69	0.03	1.71	71.95	1.30	38.36

Source: BIDS/SSISP Household Level Survey, 1992.

Note:*Participation rate = $\frac{\text{Earners}}{\text{Earners+non-earning members of age 10 and above}} \times 100$

6.3.3 Employment and Unemployment Situation

Annual work intensity measured in terms of number of days during the whole year for heads of households and all members by size categories in both the project and control areas has been presented in Table 6.11. This table shows that annual work intensity is higher in the project area than in the control area. This observation is tenable for both heads and all earners in the project and control areas.

From Table 6.11, one can find no systematic relation between farm size categories and annual work intensity in both the project and control areas. This observation appears to be tenable for both heads and all earners in project and control areas.

From Table 6.11, it can be observed that work intensities are significantly higher for non-agiruclturaI activities than for agriultural activities in both project and control areas. But the degree of non-agricultural work intensity appears to be much higher in the control area than in the project area indicating that the households in the control area depend more on the non-agricultural activities for maintaining their livelihood.

Employment situations of heads and all earners by months in project and control areas are presented in Table 6.12. The table shows that the heads and all earners have consistently higher employment (in mandays) in all months in the project area than in the control area, but percentage difference of employment appears to be higher for the head of the households than for the earners. All earners have somewhat higher intensity of work per month than the heads of households in both the project and control areas (see Table 6.12). The month of Agrahayan is observed to be the peak period of work and the month of Kartic is the slack period for both the heads of households and earners in the project and control areas.

From Table 6.13, one can observe that agricultural work as percentage of total work is significantly higher and wage labour as percentage of total labour is somewhat higher in the project area than in the control area.

Table 6.11

Average Number of Days of Employment during the Survey Year in Project and Control Areas

Farm Size (ha)	Household Head			All Members		
	Agriculture	Non-agriculture	Total	Agriculture	Non-agriculture	Total
Project:						
0.00 - 0.20	107.03	200.87	307.90	117.58	196.65	314.23
0.21 - 1.01	179.48	108.16	287.64	196.12	105.73	301.85
1.02 - 2.02	133.00	186.63	319.63	133.13	192.75	325.88
2.03 and above	191.43	78.43	269.86	288.86	74.85	303.71
All farms	147.41	149.84	297.25	161.82	147.48	309.30
Control:						
0.00 - 0.20	49.36	218.78	268.14	40.07	253.93	294.00
0.21 - 1.01	82.08	133.67	215.75	96.83	148.34	245.17
1.02 - 2.02	87.20	108.40	195.60	62.80	172.80	235.60
2.03 and above	237.75	99.25	337.00	237.75	99.25	337.00
All farms	87.51	160.18	247.69	85.37	208.74	294.11

Source: BIDS/SSISP Household Level Survey, 1992.

Table 6.12

Percentage Difference of Employment (mandays/months) in Project and Control Areas

Months	Average days of employment				% Difference	
	Project		Control			
	Head	Earners	Head	Earners	Head	Earners
Baishakh	24.86	24.72	20.86	22.14	19.18	11.65
Jaistha	25.11	24.97	20.06	21.46	25.17	16.36
Ashar	25.28	25.25	20.29	21.67	24.59	16.52
Shraban	26.00	26.05	20.69	21.89	25.66	19.00
Bhadra	26.05	25.88	21.97	22.91	18.57	12.96
Aswin	21.97	22.39	19.03	20.71	15.45	8.11
Kartik	21.51	21.59	18.91	20.61	13.75	4.75
Agrahayan	25.98	26.16	22.23	23.06	16.87	13.44
Poush	25.99	26.04	21.74	22.96	19.55	13.41
Magh	25.38	25.27	21.43	22.67	18.43	11.47
Falgun	25.05	24.93	20.11	21.32	24.56	16.93
Chaitra	24.08	24.25	20.37	21.67	18.21	11.91
All months	24.77	24.79	20.64	21.92	20.01	13.09

Source: BIDS/SSISP Household Level Survey, 1992.

The co-efficients of variations (in percentage) for heads of households in self and wage employment (mandays) under agricultural and non-agricultural sector have been presented in Table 6.13. The estimated co-efficients show that in the use of non-agricultural labour and total labour over months, variations are not as high as those in the use of agricultural labour in project and control areas. The variations in these respects are, however, higher in the project area than in the control area.

For monthly distribution of employment for all earning members as presented in Table 6.14, the similar trend as in Table 6.13 is observable. The only dissimilarity in the trend is that wage labour as percentage of total labour for earners is somewhat higher in the control area than in the project area. The noteworthy point is to be made here that work intensities for all earning members are higher than those of the heads of households in both the project and control areas (see Tables 5.13 and 5.14).

Monthly unemployment situations in study villages in project and control areas during the post-project (present) and pre-project periods can be seen in Table 6.15. This table shows that the number and percentage of villages with very high rates (above 30 percent) of unemployment have somewhat been reduced in the project area. During three months (from Magh to Chaitra), extreme unemploymen does not currently appear to exist in any village in the project area. This indicates significant improvement in the employment situation in the project area. This improvement has been possible due to crop diversificant that has taken place in the rabi season as an impact of the project. But in the control area, the number and percentage of villages with various degrees of unemployment remain, more or less, constant. This indicates that the unemployment problem in the project area has been reduced, but in the control area, there has not been any change in the unemployment situation.

Table 6.13

Monthly Distribution of Employment for Household Heads in the Project and Control Areas

Months	Average days of employment in					Agricultural work (mandays) as % of total works	Wage labour as % total labour
	Agriculture		Non-agriculture		Total (days)		
	Self	Wage	Self	Wage			
Project area							
Baishakh	9.14	3.49	5.99	6.24	24.86	50.80	39.14
Jaistha	8.92	4.09	5.75	6.35	25.11	51.81	41.58
Ashar	9.24	3.91	5.84	6.29	25.28	52.02	40.35
Shraban	10.23	3.75	5.53	6.49	26.00	53.77	39.38
Bhadra	10.08	3.89	5.68	6.41	26.05	53.63	39.54
Aswin	5.97	1.61	6.87	7.52	21.97	34.50	41.56
Kartik	5.49	1.62	7.09	7.30	21.51	33.05	41.47
Agrahayan	10.28	4.53	5.28	5.89	25.98	57.01	40.11
Poush	10.20	4.23	5.38	6.18	25.99	55.52	40.05
Magh	9.54	3.27	5.61	6.96	25.38	50.47	40.31
Falgun	9.08	3.41	5.70	6.87	25.05	49.86	41.04
Chaitra	8.22	3.23	5.52	7.11	24.08	47.55	42.94
All months	8.87	3.42	5.85	6.63	24.77	49.62	40.57
Co-efficient of variation (%)	17.23	26.00	9.19	7.28	6.19		
Control area							
Baishakh	5.54	2.09	8.46	4.77	20.86	36.58	32.89
Jaistha	5.14	2.17	8.31	4.43	20.06	36.44	32.90
Ashar	4.94	2.43	8.03	4.88	20.29	36.32	36.03
Shraban	5.57	2.91	7.94	4.26	20.69	40.99	34.65
Bhadra	5.11	3.03	8.51	5.31	21.97	37.05	37.96
Aswin	3.89	2.06	8.46	4.63	19.03	31.27	35.16
Kartik	3.31	1.97	8.49	5.14	18.91	27.92	37.60
Agrahayan	5.17	3.17	8.97	4.91	22.23	37.52	36.35
Poush	5.03	2.80	8.80	5.11	21.74	36.02	36.38
Magh	5.17	2.40	8.60	5.26	21.43	35.32	35.74
Falgun	4.63	2.26	8.40	4.83	20.11	34.26	35.26
Chaitra	4.34	2.37	8.51	5.14	20.37	32.94	36.87
All months	4.82	2.47	8.46	4.89	20.64	35.32	35.66
Co-efficient of variation (%)	13.37	15.75	3.21	6.42	4.96		

Source: BIDS/SSISP Household Level Survey, 1992.

Table 6.14

Monthly Distribution of Emoployment for all Earning Members in the Project and Control Areas

Months	Average days of employment in					Agricultural work (mandays) as % of total works	Wage labour as % total labour
	Agriculture		Non-agriculture		Total (days)		
	Self	Wage	Self	Wage			
Project area							
Baishakh	8.94	3.54	5.89	6.35	24.72	50.49	40.01
Jaistha	8.75	4.09	5.59	6.54	24.97	51.42	42.57
Ashar	9.15	4.09	5.59	6.42	25.25	52.44	41.62
Shraban	10.15	3.94	5.24	6.72	26.05	54.09	40.92
Bhadra	9.76	4.06	5.60	6.46	25.88	53.40	40.65
Aswin	5.75	1.90	6.92	7.82	22.39	34.12	43.41
Kartik	5.11	1.88	7.06	7.53	22.59	30.94	41.66
Agrahayan	10.03	4.87	5.28	5.99	26.17	56.94	41.50
Poush	9.84	4.62	5.37	6.21	26.04	55.53	41.59
Magh	9.29	3.63	5.46	6.90	25.27	51.13	41.67
Falgun	8.71	3.76	5.57	6.89	24.93	50.02	42.72
Chaitra	7.95	3.57	5.62	7.11	24.25	47.51	44.04
All months	8.62	3.66	5.76	6.75	24.79	49.54	41.99
Co-efficient of variation (%)	18.05	24.03	9.93	7.64	5.58		
Control area							
Baishakh	4.63	2.66	8.42	6.44	22.14	32.93	41.10
Jaistha	4.41	2.74	8.24	6.07	21.46	33.32	41.05
Ashar	4.28	2.91	7.92	6.55	21.67	33.18	43.65
Shraban	4.80	3.25	7.85	6.00	21.89	36.77	42.26
Bhadra	4.45	3.36	8.33	6.77	22.91	34.09	44.22
Aswin	3.43	2.54	8.23	6.51	20.71	28.83	43.70
Kartik	2.89	2.46	8.33	6.94	20.61	25.96	45.61
Agrahayan	4.43	3.37	8.68	6.58	23.06	33.82	43.15
Poush	4.41	3.29	8.45	6.81	22.96	33.54	43.99
Magh	4.60	2.89	8.23	6.95	22.67	33.04	43.41
Falgun	3.98	2.74	8.19	6.41	21.32	31.52	42.92
Chaitra	3.78	2.86	8.30	6.72	21.67	30.64	44.21
All months	4.18	2.92	8.26	6.56	21.92	32.39	43.25
Co-efficient of variation (%)	12.83	10.52	2.57	4.45	3.69		

Source: BIDS/SSISP Household Level Survey, 1992.

Table 6.15

Monthly Unemployment Rate in Project and Control Areas in the Pre and Post Project Period

Months	Number and percentage of villages with unemployment rates of				Number and percentage of villages with unemployment rates of			
	Current year (1991-92)		Pre-project year (1986)		Current year (1991-92)		Pre-project year (1986)	
	0.00% to 30.00%	30.1% to above	0.00% to 30.00%	30.1% to above	0.00% to 30.00%	30.1% to above	0.00% to 30.00%	30.1% to above
Baishak	96.6 (28)	3.4 (1)	93.1 (27)	6.9 (2)	60.0 (3)	40.0 (2)	40.0 (2)	60.0 (3)
Jaistha	93.1 (27)	6.9 (2)	89.66 (26)	10.34 (3)	80.0 (4)	20.0 (1)	80.0 (4)	20.0 (1)
Ashar	93.1 (27)	6.9 (2)	89.66 (26)	10.34 (3)	80.0 (4)	20.0 (1)	80.0 (4)	20.0 (1)
Sraban	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)	-
Bhadra	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)	-
Aswin	-	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)
Kartic	-	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)
Agrahayan	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)	-
Poush	100.0 (29)	-	100.0 (29)	-	100.0 (5)	-	100.0 (5)	-
Magh	100.0 (29)	-	41.4 (12)	58.6 (17)	100.0 (5)	-	40.0 (2)	60.0 (3)
Falgun	100.0 (29)	-	3.4 (1)	96.6 (28)	40.0 (2)	60.0 (3)	20.0 (1)	80.0 (4)
Chaitra	100.0 (29)	-	3.4 (1)	96.6 (28)	20.0 (1)	80.0 (4)	20.0 (1)	80.0 (4)

Source: BIDS/SSISP Village Level Survey, 1992.

Note : Figures in parentheses indicate number of villages.

The duration of unemployment in the study villages of project and control areas in pre and post-project periods can be seen in Table 6.16. This table shows that in the project area, high degree of unemployment (unemployment rate of above 30 per cent) has been observed to be prevalent for 4 months and above in 97 percent of villages in the pre-project period. The figure has significantly been reduced to 10 per cent of villages in the project area. This indicates that extreme unemployment problem has immensely been reduced in the project area. In villages of the control area, the extreme unemployment situation does not appear to undergo any significant change (see Table 6.16).

Table 6.16

Duration of Unemployment in the Project and Control Areas (in the Pre and Post Project Situation)

Unemployment rate (per cent)	Number and percentages of villages where the unemployment is prevalent									
	Post-project year (1991-92)					Pre Project Year (1986)				
	0 month	1-3 months	4-6 months	7-9 months	10-12 months	0 month	1-3 months	4-6 months	7-9 months	10-12 months
Project										
0 to 30	-	-	13.7 (4)	86.2 (25)	-	-	-	6.9 (2)	89.6 (26)	3.4 (1)
30.1 and above	-	89.6 (26)	10.3 (3)	-	-	-	3.4 (1)	96.5 (28)	-	-
Control										
0 to 30	-	-	20.0 (1)	80.0 (4)	-	-	-	20.0 (1)	80.0 (4)	-
30.1 and above	-	20.0 (1)	80.0 (4)	-	-	-	-	100.0 (5)	-	-

Source: BIDS/SSISP Village Level Survey, 1992.

Note: Figures in parentheses indicate number of villages.

6.3.4 Wage Rates

The average monthly wages rates in project and control areas are presented in Table 6.17. This table indicates that wage rates are somewhat higher in both pre and post-project periods in the project area than in the control area. The percentage change in wage rate in post-project (present) period over pre-project period has also been observed to be higher in the project area than in the control area.

Moreover, the co-efficients of variation (in percentage) showing relative variability in wage rates over months are observed to be low and similar in both the project and control areas. In both the areas, the co-efficients of variation have decreasing trend during the post-project period.

6.4 Credit Market

Credit is indeed an important input in agricultural production, particularly for extension of modern cultivation. For financing necessary farm expenses and sometimes to meet consumption requirements, farm households in our study area (project and control) have to depend on credit.

Table 6.17

Monthly Wage Rates and Changing Pattern in Project and Control Areas

Months	Project			Control		
	Wage rate		% change in wage rate	Wage rate		% change in wage rate
	1398	Pre-project		1398	Pre-project	
Baishakh	40.52	30.86	31.30	39.00	27.00	44.44
Jaishtha	41.21	31.38	31.33	40.00	31.00	29.03
Ashar	42.76	32.17	32.92	41.00	32.00	28.13
Sravan	44.66	34.14	30.81	45.00	34.00	32.35
Bhadra	45.52	34.83	30.69	45.00	34.00	32.35
Ashwin	33.97	23.86	42.37	34.00	24.00	41.67
Kartik	33.79	23.86	41.62	34.00	24.00	41.67
Agrahayan	43.62	33.86	28.82	42.00	31.00	35.48
Poush	43.10	33.28	29.51	42.00	31.00	35.48
Magh	40.86	27.76	47.19	41.00	29.00	41.38
Falgun	40.00	25.34	57.85	37.00	25.00	48.00
Chaitra	39.48	24.83	59.00	37.00	25.00	48.00
Average	40.79	29.68	37.43	39.75	28.92	37.45
Co-efficient of variation in (%)	8.74	13.79	-	8.90	12.50	-

Source: BIDS/SSISP Village Level Survey, 1992.

Table 6.18 shows the percentage of households taking loans and average borrowing per household in project and control areas. From this table it can be observed that the percentage of households taking loans (both institutional and non-institutional) and institutional loan as percentage of total loan are higher in the control area than in the project area. But average loan (in taka per borrowing household) has been observed to be higher in the project area than in the control area (see Table 6.18).

The smaller size categories particularly in the project area are observed to resort to more institutional and non-institutional credit. This may be due to the reason that larger size categories have the least requirement of credit.

Table 6.19 shows the use of institutional and non-institutional credit for productive and non-productive purposes in both the project and control areas. It can be observed that more than 50 percent of institutional credit in the project and control areas and the whole non-institutional credit in the project area are used for non-productive purposes. The households are observed to concentrate on farming activities in the project area and on non-farming acctivities in the control area for the purpose of their productive allocation of loans.

Table 6.19 also indicates that medium and large farmers particularly in project area allocate higher percentage of their loan for productive purposes than what the smaller farms allocate. This may be due to the reason that smaller farms have the tendency to allocate more for consumption purposes which are treated here as unproductive.

Table 6.18

Indebtedness by Farm Size Categories in Project and Control Areas

Farm size (ha)	% of household taking loan				Average borrowing (both institutional non-institutional)	Institutional loan as percentage of total loan
	Institutional sources only	Non-institutional sources only	Both sources	Total		
Project						
0.0 - 0.20	19.4	16.1	-	35.5 (11)	4000.00	52.27
0.21 - 1.01	24.2	3.0	-	27.2 (9)	4866.67	95.89
1.02 - 2.02	37.5	-	-	37.5 (3)	2166.67	100.00
2.03 and above	28.6	-	-	28.6 (2)	4750.00	100.00
All farms	24.1	7.6	-	31.7 (25)	4152.00	78.03
Control						
0.0 - 0.20	21.4	-	-	21.4 (3)	4833.33	100.00
0.21 - 1.01	33.3	8.3	-	41.6 (5)	4200.00	95.23
1.02 - 2.02	40.0	-	-	40.0 (2)	3000.00	100.00
2.03 and above	50.0 (2)	-	-	50.0 (2)	3250.00	100.00
All farms	31.4	2.9	-	34.3 (12)	4000.00	97.92

Source: BIDS/SSISP Household Level Survey 1992.

Note: Figures in parentheses indicate the member of households taking loan.

Table 6.19

Use of Credit by Farm Size Categories in Project and Control Areas

	Institutional credit				Non-Institutional credit			
	Productive		Non-Productive	Total	Productive		Non-Productive	Total
	Agri-cultural	Non-agri-cultural			Agri-cultural	Non-agri-cultural		
Project								
0.00-0.20	26.09	-	73.91	100.00 (23000.00)	-	-	100.00	100.00 (21000.00)
0.21-1.01	39.29	5.95	54.76	100.00 (42000.00)	25.00	-	75.00	100.00 (1800.00)
1.02-2.02	65.38	17.31	17.31	100.00 (6500.00)	-	-	-	-
2.03 and above	100.00	-	-	100.00 (9500.00)	-	-	-	-
All farms	44.75	4.48	50.77	100.00 (81000.00)	1.97	-	98.03	100.00 (22800.00)
Control								
0.00-0.20	13.79	65.52	20.69	100.00 (14500.00)	-	-	-	-
0.21-1.01	12.50	6.25	81.25	100.00 (20000.00)	50.00	50.00	-	100.00 (1000.00)
1.02-2.02	50.00	-	50.00	100.00 (6000.00)	-	-	-	-
2.03 and above	26.92	46.15	26.92	100.00 (6500.00)	-	-	-	-
All farms	19.68	29.26	51.06	100.00 (47000.00)	50.00	50.00	-	100.00 (1000.00)

Source: BIDS/SSISP Household Level Survey 1992.

Note: Figures in parentheses indiate total amount of loan (in Taka)

6.5 Conclusion

In the preceding sections, we have attempted to assess the indirect impacts of the Patuakhali Polder 43/2B Sub Project on land, labor and credit markets. The assessment has been done through a comparison of cross-section data in project and control areas along with their pre and post project situation.

It has been observed that the average size of owned of land is very small and more or less equal in both the project and control areas. The average size of operated land is also small and even smaller in the control area than in the project area. This indicates that farmers in the control area rent-out more than what they rent-in and they do this practice of renting-out even more than the farmers in the project area. This may be due to the reason that farmers in the control area are involved more in non-agricultural activities than agricultural ones and for this reason they might have been operating much less land than what they own and/or what the farmers in the project area operate.

The distribution pattern of owned and operated land is very much skewed in both the project and control areas. No significant and systematic variations in the permanent transfers of land through sale and purchase are observed in project and control areas and thus the unequalising tendency in the distribution of land overtime is likely to have been similar in both the areas. However, as an impact of the project, it has been observed that land prices in the project area have increased significantly indicating that the project intervention improves the quality of land and its productive uses.

It has been observed that the project area, compared to the control area, has better employment situation and higher wage rates particularly in the post-project period. This indicates that labor market is currently more developed in the project area than in the control area. This is very likely since the production performance particularly in the agricultural sector has been observed to be much better in the project area than in the control area.

No systematic and significant variations have been observed in respect of the percentage of households taking loans (both institutional and non-institutional) and average borrowing per household in project and control areas.

It has been observed that more than 50 per cent of institutional credit in the project and control areas and whole non-institutional credit in the project area are used for non-productive proposes. For productive allocation of loans, households concentrate on farming activities in the project area and non-farming activities in the control area. The project does not appear to have a significant impact on credit market.

CHAPTER 7

IMPACT ON EDUCATION, HEALTH AND NUTRITION

7.1 Introduction

By now, it is widely acknowledged that development of human capital through education and other social development investment plays an important role in the development process of an underdeveloped country like Bangladesh. The main concern of this chapter is, however, to present a brief discussion on the situation of education, health and nutrition obtaining in the project vis-a-vis control area.

7.2 Educational Characteristics

The educational status of the heads of households in the project and control areas can be seen in Table 7.1. This table shows that the average rate of literacy of heads of households (about 71 per cent) is quite high in the project area. This figure is somewhat higher than the average of about 69 per cent in the control area and much higher than the national aveage of about 30 per cent.

The educational status of the heads of households can also be looked into by farm-size categories in both the project and control areas. From Table 7.1, it can be seen that the larger farmers appear to gain more education than their smaller counterparts particularly in the project area. But no systematic relation between farm-size and educational level can be observed in project and control areas.

In terms of literacy of all member (population aged 5 years and above), the more or less similar picture can be obtained in Table 7.2. The noteworthy point is that the literacy rate of the members compared to the heads of households appears to be somewhat reduced from about 71 per cent to about 63 in the project area, but in the control area, this rate has increased from about 69 per cent to about 74 per cent. This indicates that the high rate of literacy among the heads of households in the project area does not necessarily have positive impact on the literacy level of other members of the households.

Table 7.1

Distribution of Heads of Households by Educational Level in Project and Control Areas

Farm Size (ha)	Project					Control				
	Percentage of heads of households					Percentage of heads of households				
	Illiterate	Primary (upto V)	Secondary (up to IX)	S.S.C. & above	Total	Illiterate	Primary (upto V)	Secondary (up to IX)	S.S.C. & above	Total
0.0 - 0.20	41.9	38.7	9.7	9.7	100.0 (31)	28.6	42.9	21.4	7.1	100.0 (14)
0.21 - 1.01	21.2	51.5	15.2	12.1	100.0 (33)	33.3	33.3	16.7	16.7	100.0 (12)
1.02 - 2.02	25.0	25.0	25.0	25.0	100.0 (8)	20.0	20.0	20.0	40.0	100.0 (5)
2.03 & above	14.3	57.1	14.3	14.3	100.0 (7)	50.0	25.0	-	25.0	100.0 (4)
All farms	29.1	44.3	13.9	12.7	100.0 (79)	31.4	34.3	17.1	17.1	100.0 (35)

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Figures in parentheses indicate the number of heads of households.

Table 7.2

Education Level of Population (5 years & above) by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Project					Control				
	Percentage of all persons (aged 5 years and above)					Percentage of all persons (aged 5 years and above)				
	Illiterate	Primary (upto V)	Secondary (up to IX)	S.S.C. & above	Total	Illiterate	Primary (upto V)	Secondary (up to IX)	S.S.C. & above	Total
0.0 - 0.20	46.9	43.1	6.3	3.8	100.0 (160)	37.3	48.0	10.7	4.0	100.0 (75)
0.21 - 1.01	37.7	45.9	6.0	10.4	100.0 (183)	20.0	61.5	10.8	7.7	100.0 (65)
1.02 - 2.02	20.5	40.9	29.5	9.1	100.0 (44)	16.7	38.9	25.0	19.4	100.0 (36)
2.01 & above	21.4	58.9	8.9	10.7	100.0 (56)	23.3	40.0	13.3	23.3	100.0 (30)
All farms	37.2	46.0	8.8	7.9	100.0 (443)	26.2	49.5	13.6	10.7	100.0 (206)

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Figures in parentheses indicate the number of persons (5 years and above).

Children's education is manifested in enrollment rates presented in Table 7.3. It can be observed from the table that the enrollment rate is higher in the control area than in the project area. The higher enrollment rate achieved by the control area may be due to the reason that the control, compared to the project area, has greater accessibility to the urban area in the district head quarters of Patuakhali.

Table 7.3

School Enrollment Rate of Children by Farm Size Categories

Farm Size (ha)	Project			Control		
	Boys	Girls	Total	Boys	Girls	Total
0.0 - 0.20	40.00	76.19	58.54	57.14	63.64	61.11
0.21 - 1.01	59.09	55.00	57.14	72.73	100.00	78.57
1.02 - 2.02	100.00	100.00	100.00	66.67	80.00	75.00
2.03 & above	85.71	42.86	64.29	33.33	100.00	60.00
All farms	57.69	65.38	61.54	62.50	76.19	68.89

Source: BIDS/SSISP Household Level Survey, 1992.

Note : Enrollment rate has been calculated for children of 6-10 years of age in the following way:

$$\text{Enrolment rate} = \frac{\text{Actual school goers}}{\text{Potential shool goers}} \times 100$$

From Table 7.3, it can also be observed that sex Variation in enrollment rates of children are significant, since the girls have significantly higher enrollment rate in both the project and control areas. The size categories of farms do not appear to have correspondence to the observed enrollment rates of children in project and control areas.

7.3 Health and Diseases

The project did not envisage any direct objective with respect to health status of the population in the project area. It is, however, expected that the general improvements in the ecological environment and socio-economic benefits of the project would lead to positive impact on health conditions in the area.

Within the limited scope of the study, the details of changes in health related variables have not been collected. Moreover, the difficulties of attributing these changes to the project related interventions (at least for constructing the structures) are obvious. A summary of the post project changes in the incidence of diseases in the study area is presented in Table 7.4. This table shows that the incidence of certain diseases have increased, while others have decreased and still others and more have remained static after the implementation of the project.

Table 7.4 shows that (except for malaria, stomach problems, rheumatism, pneumonia) most of the villages have experienced the incidence of diseases to be remain static. But most of the villages in project area have experienced the incidence of malaria to be increased and that of diarrhoea to be decreased. In some villages in project and control areas, it has been observed that diseases like pneumonia, rheumatism and stomach problems have increased. Many of these may partly be attributed to the increases in water-logging and other water related problems caused by the project. Despite the direct and material benefits of the project for protecting the area from tidal inundation and salinity, the problem of drainage congestion and lack of sanitary latrine and tubewells for drinking water might have aggravated some of the health problems in the project area.

7.4 Food Intake and Nutrition

We have not undertaken a full-fledged nutritional survey to show the level of food intake and nutritional status to judge the adequacy and trends in food consumption of the sample households. We have, however, collected limited information on some indicators of food consumption standard. A comparison of these indicators between the project and control areas is made below.

The average cereals consumption (per household/per capita) in the project and control areas can be seen in Table 7.5. This table shows that average cereals consumption per household is about 4 per cent higher and average consumption per capita is about 11 per cent higher in the project area than in the control area. The average cereals consumptions both in terms of per household and percapita is observed to be higher for the larger size categories than the smaller ones in both the project and control areas (see Table 7.5).

Table 7.4

Post-Project Change in Prevalence and Incidence of Diseases

Farm Size (ha)	Percentage of villages experiencing					
	Project			Control		
	Static	Increase	Decrease	Static	Increase	Decrease
Malaria	24.1	75.9	0.0	100.0	0.0	0.0
Diarrhoea	13.8	3.4	82.8	40.0	0.0	60.0
Stomach and abdominal pains	79.3	17.2	2.9	80.0	20.0	0.0
Stomach problems	69.0	27.6	3.4	80.0	20.0	0.0
Fever	100.0	0.0	0.0	100.0	0.0	0.0
Cough and other related problmes	62.1	0.0	37.9	80.0	20.0	0.0
Pneumonia	55.2	0.0	44.8	100.0	0.0	0.0
Typhoid	93.1	0.0	6.9	100.0	0.0	0.0
Rheumatism	65.5	34.5	0.0	80.0	20.0	0.0

Source: BIDS/SSISP Village Level Survey, 1992.

Table 7.5

Weekly Average Consumption of Cereals (Per Household/Capita) by Farm Size Categories in the Project and Control Areas

Farm Size (ha)	Average Consumption (in Kg)							
	Per Household				Per Capita			
	Rice	Wheat flour	Rice product	All cereals	Rice	Wheat flour	Rice product	All cereals
Project								
0.00 - 0.20	15.56	0.00	0.18	15.74	2.72	0.000	0.03	2.75
0.21 - 1.01	20.41	0.03	0.34	20.78	3.45	0.003	0.09	3.54
1.02 - 2.02	22.51	0.00	0.35	22.86	4.14	0.000	0.06	4.20
2.03 & above	33.45	0.00	1.60	35.05	3.79	0.000	0.16	3.96
All farms	19.88	0.01	0.39	20.28	3.26	0.001	0.07	3.33
Control								
0.00 - 0.20	18.35	0.00	0.13	18.48	3.17	0.000	0.02	3.19
0.21 - 1.01	16.46	0.00	0.39	16.85	2.78	0.000	0.06	2.84
1.02 - 2.02	18.24	0.00	0.37	18.61	2.28	0.000	0.02	2.30
2.03 and above	30.53	0.00	1.87	32.40	3.30	0.000	0.19	3.49
All farms	19.08	0.00	0.45	19.53	2.95	0.000	0.05	3.00

Soure: BIDS/SSISP Household Level Survey, 1992.

Table 7.6 provides information on the number of times for some major food items which were consumed during one week of the survey in the project and control areas. The table shows that during the period of the study week, proteins like fish, meat, milk and lentil were not consumed at all by 15, 79, 76 and 19 per cent of households respectively in the project villages. The corresponding figures stand at 3, 89, 83 and 23 per cent in the control villages. In the upper limit (of the frequency in consumption) above 3 times, 1 per cent can take meat, 25 per cent of households can take fish, 17 per cent with milk and 44 per cent with lentil in the project villages. Except for fish, these figures are lower in the control villages. Vegetables are the only item eaten very

frequently by the households in both the project and control areas. From the table, it is evident that 77 per cent of households in the project area and 80 per cent in the control area take vegetables almost every day in a week.

Table 7.6

Frequency of Consumption of Some Major Food Items During Last Seven Days

Times	Percentage of households who consumed					
	Fish	Meat	Milk	Lentil	Vegetables	Eggs
Project						
0	15.2	78.5	75.9	19.0	3.8	82.3
1	11.4	17.7	3.8	8.9	5.1	7.6
2	16.5	2.5	-	16.5	2.5	3.8
3	21.5	-	3.8	11.4	3.8	3.8
4	10.1	1.3	-	12.6	7.6	-
5-7	25.3	-	16.5	31.6	77.2	2.5
Control						
0	2.9	88.6	82.9	22.9	-	82.8
1	14.3	5.7	-	5.7	-	2.9
2	25.7	5.7	2.9	22.8	5.7	8.6
3	31.4	-	-	14.3	11.4	2.8
4	11.4	-	-	8.6	2.9	2.9
5-7	14.3	-	14.3	25.7	80.0	-

Source: BIDS/SSISP Household Level Survey, 1992.

The above evidence indicate that households in the project and control areas do not and can not have sufficient food intake and protein. In respect of food intake and protein, the condition appears to be somewhat better in the project area than in the control area. This can, however, partly be attributed to the intervention of the project.

Table 7.7 provides information on the changes in food consumption pattern in the project and control areas. From the table, one can observe that for most of the food items, the majority of households reported that the levels of consumption remained unchanged in both the project and control areas. The noteworthy point is that the overwhelming majority of households experienced deteriorating condition in the level of fish consumption in both the project and control areas -- the incidence of deterioration being higher in the project area. Only a small percentage of households have been observed to increase their levels of food consumption in the post-project situation compared to the pre-project situation. The percentage figures relating to the increase of the level of consumption are, however, higher in the project area than in the control area.

Specific enquiry has been made about food shortage among households owning less than 0.40 ha (one acre) of land, since this group most often face such shortage in different months of the year. The incidence of food shortage by this small size group in different months in the project and control areas is presented in Table 7.8. The table shows that food shortage reportedly does not exist during Agrahayan to Falgoon (4 months) in both the project and control areas. This is very likely, since these four months coincide with the post-harvest period of T. Aman, the main crop in the study area. During four months (Ashar and Sravan in the pre-harvest period of Aus and Ashwin and Kartic of the pre-harvest period of T. Aman), food shortage remains acute and majority of the small farms at this period face shortage of food. It can be observed that Sravan is the worst month when about 24 and 28 per cent of households face acute shortage of food in the project and control areas respectively. This distress condition of the small farms in the project and control areas can also be explained by the observed unemployment situation prevalent in this lean period.[1]

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[1] For this point on unemployment, see Chapter 6.

Table 7.7

Post-Project Changes in the Level of Consumption of Food Items

Food Items	Per cent of households who reported							
	Project				Control			
	Increase	Decreage	Same	N.A.	Increase	Decreage	Same	N.A.
Own fruit	11.4	13.9	40.5	34.2	2.9	25.7	42.9	28.5
Own vegetables	6.3	12.7	54.4	26.6	5.7	17.1	34.3	42.9
Purchased fruit	15.2	8.9	69.6	6.3	11.4	28.6	54.3	5.7
Purchased vegetables	17.7	13.9	62.0	6.4	14.3	34.3	48.6	2.9
Fish	7.6	82.3	10.1	-	-	71.4	28.6	-
Rice	16.5	2.5	81.0	-	-	11.4	80.0	8.6
Bread/Ruti	-	-	1.3	98.7	-	-	8.6	91.4
Snacks	1.3	1.3	55.7	41.7	-	-	57.1	42.9
Purchased food	1.3	-	43.0	55.7	-	-	42.9	57.1

Source: BIDS/SSISP Household Level Survey, 1992.

Note : N.A. : Households could not report due to various reasons: e.g. new household/the respondent was young not in charge of food management at that time/recall problem etc.

The seasonal pattern of food shortage appears to be more acute in the control than in the project area. If the flood protection measures could be combined with irrigation measures for expansion of HYV adoption in the project area, the acute food shortage would have been reduced through the enhancement of food production as a direct and stimulated impact of the project.

Table 7.8

Food Shortage in Households (with landownership below 0.40 ha.) in the Project and Control Area in Different Months

Months	Project		Control	
	Whether faced shortage (per cent of household)		Whether faced shortage (per cent of household)	
	Yes	No	Yes	No
Baishakh	4.8	95.2	-	100.0
Jaistha	4.8	95.2	-	100.0
Ashar	16.7	83.3	33.3	66.7
Sravan	23.8	76.2	27.8	72.2
Bhadra	2.4	97.6	-	100.0
Ashwin	19.0	81.0	5.6	94.4
Kartik	16.7	83.3	22.2	77.8
Agrahayan	-	100.0	-	100.0
Poush	-	100.0	-	100.0
Magh	-	100.0	-	100.0
Falgoon	-	100.0	-	100.0
Chaitra	16.7	83.3	4.8	95.2

Source: BIDS/SSISP Household Level Survey, 1992.

7.5 Conclusion

In this chapter, we have attempted to analyse educational characteristics, health, food and nutritional conditions prevailing in the project and control areas. The analysis has been done in order to provide some indications of indirect impacts of the project on these socio-economic variables.

It has been observed that the average rate of literacy of heads of households is somewhat higher in the project area than in the control area. But the average rate of literacy for all member (5 years and above) is higher in the control area than in the project area. As regards children's education, the enrollment rate has also been higher in the control area than in the project area. This higher achievement in education by the control area may be explained by the fact that the control area has better accessibility to the urban area in the district head quarters of Patuakhali.

The incidence of certain diseases have been observed to increase, while others have decreased and still others have remained static after the implementation of the project. The overall health conditions have not significantly improved, rather static situations in health conditions have mostly been cropped up. Despite the direct and material benefits of the project on the livelihood in the project area, the problem of drainage congestion and lack of appropriate arrengements for drinking water might have aggravated some of the health problems in the project area.

The average cereals consumption (per household and per capita) has been observed to be somewhat higher in the project area than in the control area. The households in the project and control areas do not have sufficient food intake and protein -- the condition being somewhat better in the project area than in the control area. For most of the food items, the level of consumption of the majority of household remained unchanged. But for fish consumption, the level has much deteriorated, more in the project area than in the control area. A few households, however, have currently been able to increase their levels of food consumption. The percentage figures relating to them are higher in the project area than in the control area.

The distress condition of small farms in respect of acute food shortage has been observed to coincide with the pre-harvest periods (Ashar - Sravan; Aswin - Kartic) of Aus and Aman paddy, the main crop in the study area. The seasonal pattern of food shortage is, however, observed to be more acute in the control than in the project area.

CHAPTER 8

OTHER SOCIO-ECONOMIC IMPACTS

8.1 Introduction

The main concern of this chapter is to assess the indirect impact of the Patuakhali Polder 43/2B Sub-Project on the welfare of the people. The welfare of the people in its turn is likely to be reflected in larger household income, employment, occupation pattern, asset formation and other related socio-economic aspects. We have, however, adopted the usual method of assessing the impacts of the project on these socio-economic variables through a comparison of cross-section data in the project and control areas along with the pre and post-project situations.

8.2 Demographic Characteristics

The demographic characteristics which influence other socio-economic aspects in the project and control areas are presented in Table 8.1. From this table, it can be observed that the average size of household[1], and male-female ratio and dependency ratio are somewhat higher in the control area than in the project area.

The above demographic variables can be looked into by farm-size categories in the project and control areas. Table 8.1 shows that a positive relation between farm-size and average size of household is emerged in both the project and control areas. But farm-size categories do not appear to have any systematic relation with the male-female and dependency ratios in either of the areas.

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[1]The concept of household involves spatial, temporal and economic aspects. Different definitions affect the accuracy of the data and change the membership of the household. In our survey, persons (excluding permanent labourers) living together and sharing a common kitchen for atleast six months are considered as the members of the household.

Table 8.1

Demographic Characteristics of Population by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Number of Households	Total Population	Average size of Households	Male Female Ratio	Dependency Ratio
Project					
0.0 - 0.20	31	186	6.00	95.79	0.90
0.21 - 1.01	33	209	6.33	122.34	0.79
1.02 - 2.02	8	45	5.63	104.55	0.39
2.03 & above	7	63	9.00	133.33	0.84
All Farms	79	503	6.37	111.34	0.79
Control					
0.0 - 0.20	14	81	5.79	88.37	0.89
0.21 - 1.01	12	71	5.92	136.67	0.90
1.02 - 2.02	5	40	8.00	100.00	0.75
2.03 & above	4	37	9.25	146.67	1.00
All Farms	35	229	6.54	112.04	0.88

Source: BIDS/SSISP Household Level Survey, 1992.

Note:

$$\text{Dependency Ratio} = \frac{\text{Number of members upto 14 years + Number of members above 65 years}}{\text{Number of earners of age 15 year and above.}}$$

The household or family for that matter can be classified into three types (e.g. nuclear, semi-nuclear and joint).[2] From Table 8.2, it can be observed that the nuclear type of family is predominant in both project and control areas.

[2]For definitions, see the note attached to Table 8.2.

Somewhat higher predominancy of this type can be observed in the project area (65.8 per cent) than in the control area (60 per cent). The semi-nuclear and joint types are observed to be somewhat higher in the control area (2.9 and 37.1 respectively) than in the project area (2.5 and 31.6 per cent respectively) (see Table 8.2).

Table 8.2

Family Type by Farm Size Categories in Project and Control Areas

Farm Size (ha)	% of households in type of families			
	Nuclear	Semi Nuclear	Joint	Total
Project				
0.0 - 0.20	71.0	3.2	25.8	100.0 (31)
0.21 - 1.01	72.7	-	27.3	100.0 (33)
1.02 - 2.02	37.5	12.5	50.0	100.0 (8)
2.03 & above	42.9	-	57.1	100.0 (7)
All Farms	65.8	2.5	31.6	100.0 (79)
Control				
0.0 - 0.20	57.1	-	42.9	100.0 (14)
0.21 - 1.01	75.0	8.3	16.7	100.0 (12)
1.02 - 2.02	40.0	-	60.0	100.0 (5)
2.03 & above	50.0	-	50.0	100.0 (4)
All Farms	60.0	2.9	37.1	100.0 (35)

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Nuclear families consist of a single couple with husband/ wife/ children, in semi-nuclear families other relatives (not another couple) also reside and in joint families more than one couple of one or more generations with children/other relatives live together.

The types of families can also be looked into by farm-size categories in the project and control area in Table 8.2. This table shows that smaller farms have higher percentage of nuclear families and the larger farms have higher percentage of joint and semi-nuclear families. This pattern is much more pronounced in the project area than in the control area.

The age distribution pattern of population in project and control areas can be seen in Table 8.3. This table shows that the emerged age distribution pattern in both the areas is more or less similar and corresponds to the national pattern. Some differences in the emerging pattern can, however, be indicated here. It can be observed in the table that 42 and 36 per cent of population are in the adult working group (15-44 age group) in the project and control areas respectively against the national figure of 38 per cent (for rural Bangladesh). This indicates that higher percentage of population in the adult working group has been observed in the project area than in the control area and/or rural Bangladesh. This has, however, influence on the average earning member which has been observed to higher in the project area than in the control area.[3]

8.3 The Occupation and Its Changing Pattern

The occupational pattern of heads of households is presented in Table 8.4. The dissimilar pattern is observable in project and control areas. The sector wise observation can be made that about 80 and 20 per cent of heads of households are primarily involved in agriculture and non-agriculture respectively in the project area. The corresponding figures in the control area stand at 38 and 62 per cent. That is to say, the project area is primarily based on agricultural activities and the control area on non-agricultural activities, considering the primary occupation of the heads of households.

[3] See Chapter 6 (Table 6.10).

Table 8.3

Age distribution of Population by Farm Size Categories

Farm Size (ha)	Percentage of population in age group					
	Below 5 Year	5-14 Year	15-44 Year	45-64 Year	65 + Year	Total
Project						
0.0 - 0.20	14	32	42	10	2	100 (186)
0.21 - 1.01	12	31	43	12	2	100 (209)
1.02 - 2.02	2	25	51	20	2	100 (45)
2.03 & above	11	32	38	14	5	100 (63)
All Farms	12	31	42	13	2	100 (503)
Control						
0.0 - 0.20	7	38	37	15	3	100 (81)
0.21 - 1.01	9	35	32	17	7	100 (71)
1.02 - 2.02	10	30	42	13	5	100 (40)
2.03 & above	19	30	32	16	3	100 (37)
All Farms	10	35	36	15	4	100 (229)
Rural Bangladesh	18	30	38	10	4	100 (75) (Million)

Source: BIDS/SSISP Household Level Survey, 1992 and BBS (1991).

Note: Figures in parentheses indicate total number of population. Rural Bangladesh figures are estimated from Population Census data, 1981.

Table 8.4

Occupational Pattern of Heads of Households by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Percentage of heads of households					Per cent of House-holds with Secondary Occupation
	Main Occupation					
	Agriculture		Non-Agriculture		Total	
	Self Employ-ment	Wage Employ-ment	Self Employ-ment	Wage Employ-ment		
Project						
0.0 - 0.20	40.0	33.3	10.0	16.7	100.0 (30)	36.7 (11)
0.21 - 1.01	66.7	16.7	6.7	10.0	100.0 (30)	60.0 (18)
1.02 - 2.02	71.4	-	-	28.6	100.0 (7)	71.4 (5)
2.03 & above	100.0	-	-	-	100.0 (7)	57.1 (4)
All Farms	59.5	20.3	6.8	13.5	100.0 (74)	51.4 (38)
Control						
0.0 - 0.20	14.3	14.3	57.1	14.3	100.0 (14)	21.4 (3)
0.21 - 1.01	16.7	16.7	66.7	-	100.0 (6)	100.0 (6)
1.02 - 2.02	33.3	-	33.3	33.33	100.0 (3)	33.3 (1)
2.03 & above	100.0	-	-	-	100.0 (3)	33.3 (1)
All Farms	26.92	11.54	50.0	11.54	100.0 (26)	42.3 (11)

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Figures in Parentheses indicate member of heads of households.

In view of the mode of employment (self and wage), in all the sectors taken together, it can be observed that wage-based employment is significantly higher in the project area (33.8 per cent) than in the project area (23.8 per cent), since the control area mainly conentrates on self-employed non-agricultural activities.

The higher percentage of heads of households with secondary occupation has been observed in the project area than in the control area. There does not exist any systematic relation between farm-size and percentage of households with secondary occupation in the project and control areas.

The similar pattern as in Table 8.4 can be observed in Table 8.5 to show the occupation pattern of all earning members. The noteworthy point to be made here is that the incidence of non-agricultural occupation of the earners is significantly higher than that of the heads of households in the control area. The earners, compared to the heads, have also lower degree of involvement in secondary occupation in both the project and control areas, though the control area lags much behind the project area. The difference between project and control areas in this respect is now widened.

The changing pattern of occupation in control and project areas can be seen in Table 8.6. This table shows that in both the project and control areas, a small percentage of earning members have been changing their occupation during the last five years, after the completion of the project. It is difficult to attribute this change to the impact of the project. This change is, however, higher in the project area than in the control area. The larger size categories are observed to have higher occcupational change in the project and more sharply in the control area.

Table 8.5

Occupational Pattern of All Earners (15 years & above aged population) of Households in Project and Control Areas

Farm Size (ha)	Percentage of all members					Per cent of House-holds with Secondary Occupation
	Main Occupation					
	Agriculture		Non-Agriculture		Total	
	Self Employ-ment	Wage Employ-ment	Self Employ-ment	Wage Employ-ment		
Project						
0.0 - 0.20	51.2	30.2	7.0	11.6	100.0 (43)	41.9 (18)
0.21 - 1.01	60.4	20.8	6.3	12.5	100.0 (48)	47.9 (23)
1.02 - 2.02	61.5	-	15.4	23.1	100.0 (13)	53.8 (7)
2.03 & above	80.0	-	6.7	13.3	100.0 (15)	46.7 (7)
All Farms	59.7	19.3	7.6	13.5	100.0 (119)	46.2 (55)
Control						
0.0 - 0.20	9.5	9.5	71.4	9.5	100.0 (21)	23.8 (5)
0.21 - 1.01	7.7	7.7	76.9	7.7	100.0 (13)	53.8 (7)
1.02 - 2.02	12.5	-	75.0	12.5	100.0 (8)	12.5 (1)
2.03 & above	66.7	-	16.7	16.7	100.0 (6)	33.3 (2)
All Farms	16.7	6.3	66.7	10.4	100.0 (48)	31.3 (15)

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Figures in parentheses indicate the member of earners.

Table 8.6

Changing Patern of Occupation by Farm Size Categories in Project and Control Areas

Farm Size (ha)	Number of Working Members	Number of Members Changing Occupation	% of Member Changing Occupation
Project			
0.0 - 0.20	79	5	6.33
0.21 - 1.01	86	16	18.60
1.02 - 2.02	22	1	4.55
2.03 & above	29	9	31.03
All Farms	216	31	14.35
Control			
0.0 - 0.20	35	2	5.71
0.21 - 1.01	30	2	6.67
1.02 - 2.02	19	3	15.79
2.03 & above	16	4	25.00
All Farms	100	11	11.00

Source:BIDS/SSISP Household Level Survey, 1992.

8.4 Ownership of Non-land Assets

The draught animal and plough are the two non-land assets which are very essential for the cultivation of land. It can be seen in Table 8.7 that the draught animal per owning household, has somewhat now decreased and plough per owning household compared to the pre-project period, has now increased in both the project and control areas. The percentage of households owning them has somewhat increased in the project area and decreased in the control area. These assets per household are, however, observed to be higher for the larger size categories than the smaller ones in both pre and post-project periods of project and control areas.

The non-land assets in our study areas can be classified in three broad categories, e.g. agricultural (non-land) productive assets, non-agricultural productive assets and non-productive fixed assets. Table 8.8 shows the composition of assets in value terms and their changing pattern overtime in project and control areas. From this table, one can see that the value of (non-land) non-productive fixed assets (constituting about 50 and 52 per cent of the total value in the present period in project and control areas respectively) are higher than the value of other categories in both the areas. The composition of non-land assets along the three broad categories of assets, does not appear to undergo any significant change overtime (in present period over the pre-project period) in both the project and control areas.

The value of non-land assets per household by farm-size categories in project and control areas can be seen in Table 8.9. This table shows that the average present value of assets (at constant price, considering the current price as constant) has decreased by 1.59 per cent in the project area over the pre-project situation, while this value has increased by 1.82 per cent in the control area.

Table 8.7

Ownership of Draught Animal and Plough in Project and Control Areas

Farm Size (ha)	Number of draught animal per household		Number of plough per household	
	Now	Pre-project period	Now	Pre-project period
Project				
0.0 - 0.20	1.83	1.60	1.00	1.00
0.21 - 1.01	1.82	2.13	1.16	1.26
1.02 - 2.02	2.00	2.17	1.50	1.33
2.03 & above	5.57	5.29	2.29	1.71
All Farms	2.58	2.71	1.39	1.32
% of households owning	45.57	43.04	48.10	46.84
Control				
0.0 - 0.20	2.00	2.00	1.00	1.00
0.21 - 1.01	2.00	2.00	1.00	1.00
1.02 - 2.02	2.00	2.00	1.00	1.00
2.03 & above	3.33	4.25	2.00	2.00
All Farms	2.57	2.82	1.36	1.31
% of households owning	20.00	31.43	31.43	37.14

Source:BIDS/SSISP Household Level Survey, 1992.

Table 8.8

Composition of Assets in Project and Control Areas

Category	Average Value (in Taka per Households)			
	Present	%	Pre-project	%
Project				
Agricultural Productive Assets	16222	38.20	16033	37.15
Non-Agricultural Productive Assets	5186	12.21	6386	14.80
Non-Productive Fixed Assets	21058	49.59	20735	48.05
All Categories of Assets	42466	100.00	43154	100.00
Control				
Agricultural Productive Assets	14706	35.53	15243	37.50
Non-Agricultural Productive Assets	5230	12.64	5183	12.75
Non-Productive Fixed Assets	21450	51.83	20221	49.75
All Categories of Assets	41386	100.00	40647	100.00

Source: BIDS/SSISP Household Level Survey, 1992.

From Table 8.9, it can also be seen that the average value of assets is somewhat higher in the project area than in the control area in both project and pre-project periods. The value of assets has usually been observed to be significantly higher for the larger farms than for their smaller counterparts in project and control areas in both the periods under consideration.

Table 8.9

Value of Assets Per Household by Farm Size Categories in Project and Control Areas

Farm Size	Value of Assets (in Tk. at current Price) per household						% of difference in Project over Control in	
	Project villages			Control villages				
	Present Value	Pre-Project Value	% Change	Present Value	Pre-Project Value	% Change	Present Period	Pre-project Period
0.0 - 0.20	20441	20307	0.66	18058	15717	14.89	13.20	29.20
0.21 - 1.01	30963	33531	7.66	21338	23046	-7.41	45.11	45.50
1.02 - 2.02	79976	73061	9.46	69136	72636	-4.82	15.68	0.59
2.03 & above	122329	120618	1.42	143910	132518	8.60	-15.00	-8.98
All Farms	42466	43154	-1.59	41386	40647	1.82	2.61	6.17

Source: BIDS/SSISP Household Level Survey, 1992.

8.5 Income Distribution Pattern

Table 8.10 shows that the distribution pattern of income is very much skewed in the project and control areas. From this table it is evident that in the project area about 23 per cent of households belonging to the lower income groups have 9 per cent of income, while about 9 per cent of households in the upper income groups derive 23 per cent of income. In the control area bottom 28 per cent of the households have 12 per cent of income and about 9 per cent of households in the top get 31 per cent of income. This indicates that the distribution pattern of income is more skewed in the control area than in the project area.

Average income per household and per capita can also be seen in Table 8.10. The table shows the average income per household to be about 2 per cent higher and the average income per capita to be about 5 per cent higher in the project area than in the control area.

Table 8.10

Income Distribution and Average Income by Various Income Groups in the Project and Control Areas

Yearly household income groups (in Taka)	Number of Households	% of Households	% of Income	Average Income (in Taka) Per Household	Per Capita
Project					
0- 8000	2	2.53	0.54	5822.50	1293.89
8000-15000	16	20.25	8.90	11906.06	2442.27
15000-30000	33	41.77	30.68	19904.15	3368.39
30000-50000	21	26.58	36.86	37588.14	5027.71
50000+	7	8.86	23.02	70406.00	7700.66
All Groups	79	100.00	100.00 (2141172)	27103.44	4256.80
Control					
0- 8000	2	5.71	1.54	7130.00	2037.14
8000-15000	8	22.86	10.69	12404.75	2067.46
15000-30000	18	51.43	40.73	20998.67	3499.78
30000-50000	4	11.43	16.21	37612.50	6018.00
50000+	3	8.57	30.83	95373.33	6978.54
All Groups	35	100.00	100.00 (928044)	26515.54	4052.59

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Figures in parentheses indicate total annual income in Taka.

Sources of income by different sectors, in project and control areas can be seen in Table 8.11. This table shows that average income (per household) from agricultural crop, wage and non-crop sectors have been emmensely higher in the project area than in the control area. In non-agricultural and other sectors, average income is higher in the control area and on balance the project area has somewhat (about 2.21 per cent) higher average income than the control area.

The pattern of income derived from various sector shows significant variations amongst the project and control areas. In the agricultural crop sector, the project area derives significantly higher percentage of income (31.72 per cent) than what is derived by the control area (8.58 per cent). In the non-agricultural sector (e.g. trade, industry and transport) as the source of income, the project area (8.28 per cent) lags much behind the control area (32.61 per cent).

Table 8.11

Source of Income by Type of Employment

Sector	Project			Control			% difference of average income in project over Control
	Total Income	% of Income	Average Income*	Total Income	% of Income	Average Income*	
Crop Agriculture	679165.00	31.72	16565.00	79644.00	8.58	7964.40	117.99
Agricultural wage	222503.00	10.39	13906.44	42485.00	4.58	8497.00	63.66
Non-crop Agriculture	378245.00	17.67	4912.27	76205.00	8.22	2177.29	125.61
Non-Agriculture (Trade + Industry + Transport)	177420.00	8.28	11828.00	302650.00	32.61	18915.63	-37.47
Non-Agricultural wage	488844.00	22.83	14813.45	199850.00	21.53	15373.08	- 3.64
Others income	194995.00	9.11	8124.79	227210.00	24.48	12622.78	-35.63
Total	2141172.00	100.00	27103.44	928044.00	100.00	26515.54	2.21

Source: BIDS/SSISP Household Level Survey, 1992.
Note: * Average relate to households involved in each activity.

8.6 Expenditure Pattern

Information presented in Table 8.12 can provide an idea about the pattern of expenditure in the project and control areas. Reliable data pertaining to the actual expenditure on food could be obtained for a reference period of one week only. Yearly recall data on other items could be collected easily with fare accuracy, because of the lumpy character of the items kept in fresh memory of the respondents. An attempt to blow up weekly expenditure data on food for deriving yearly data is expected to lead to underestimation, since the reference week in the month of October was not a normal period, rather one of the slack period when food availability and employment was likely to be worse than other periods.

Keeping aside the above limitations of the data, Table 8.12 shows that a major portion of income is spent on food in both the project and control areas. Somewhat higher percentage of income is observed to be spent on food in the project area (71.48 per cent) than in the control area (62.08 per cent). The project area spending 9.59 per cent of income also lags behind the control area allocating 14.95 per cent of income in social (education and household development) and productive investment. In spite of this difference in allocation, the overall expenditure pattern does not show much variation amongst the households in project and conrol areas.

Looking at the expenditure pattern by farm-size categories, one can see that on food items, smaller size categories spend a somewhat larger portion of income than their smaller counterparts, while on social and productive investment, larger farms allocate higher percentage of income than their smaller counterparts. This finding appears to be substantiated by evidence in both the project and control areas.

The picture on the basis of self-assessment of the households regarding their status in terms of surplus/deficit situation over the year in the project and control areas can be presented in Table 8.13. This table shows that there is no significant variation in the distribution of household by the status of surplus/deficit perceived by the respondents themselves in the project and control areas. It may, however be seen that surplus farms are more evident in the project area than in the control area where the higher percentage of deficit

farms are observed to prevail. Thus the overall perceived situation (in respect of maintaining the livelihood through meeting their subsistence and basic needs) appears to be better off in the project area than in the control area.

Table 8.12

Expenditure Pattern by Farm Size Categories in Project and Control Areas

Farm Size (ha)	% of Expenditure in items						
	Foods	Other Consumable item	Education	Household Development	Production Investment	Other Expenses	Total
Project							
0.0 - 0.20	76.21	15.47	0.68	3.26	1.16	3.21	100.00 (18741.13)
0.21 - 1.01	69.99	12.87	1.85	5.40	4.02	5.88	100.00 (24099.48)
1.02 - 2.02	69.19	11.90	3.71	1.90	5.28	7.97	100.00 (33230.38)
2.03 & above	67.83	13.35	2.20	9.65	1.22	5.75	100.00 (37598.14)
All Farms	71.48	13.59	1.80	4.85	2.94	5.34	100.00 (24117.57)
Control							
0.0 - 0.20	74.49	14.10	1.97	4.42	0.55	4.48	100.00 (16874.63)
0.21 - 1.01	71.03	15.24	3.19	5.64	0.40	4.50	100.00 (17025.06)
1.02 - 2.02	61.76	12.11	6.06	10.46	0.14	9.46	100.00 (27468.00)
2.03 & above	41.97	13.36	12.38	14.13	0.45	17.70	100.00 (56239.88)
All Farms	62.08	13.84	5.98	8.56	0.41	9.13	100.00 (22948.72)

Source: BIDS/SSISP Household Level Survey, 1992.

Note: Figures in parentheses indicate average expenditure in Taka per household.

Table - 8.13
Self-Assessment of Households on Surplus/Deficit Status in Project and Control Areas

Household Catetory by the level of Surplus/deficit	Project		Control		Per cent difference (Project-Control)
	Number of house-holds	Per cent	Number of house-holds	Per cent	
Year round deficit	4	5.1	2	5.7	-0.6
Frequent deficit	6	7.6	3	8.6	-1.0
More or less balanced	29	36.7	14	40.0	-3.3
Well balanced	19	24.1	9	25.7	-1.6
Some Surplus	9	11.4	2	5.7	5.7
Over all Surplus	12	15.2	5	14.3	0.9
Total	79	100.0	35	100.0	-

Source: BIDS/SSISP Household Level Survey, 1992.

8.7 Commercialization in Paddy Production

The sale, purchase and net sale of paddy production have been considered here as the broad indicators of commercialization in the project and control areas. The picture of these indicators manifesting the commercialization in paddy (all varieties) production in the project and control areas can be seen in Table 8.14. This table shows that average production (per household) is much higher in the project area than in the control area. Due to the non-agricultural character of economy in the control area, average sale and purchase are not much lower in the control area. This shows that sales and purchase as percentage of production appears to be higher in the control area than in the project area indicating higher commercialization without any basis of production in the control area.

Table 8.14 also shows that higher percentage of production, sale and net sale come from the larger farms, but the purchase of paddy is mostly done by the smaller size categories. This observation remains valid in both the project and control areas so much so that larger farms have positive net sale indicating sales exceed their purchases, while smaller farms have negative net sale indicating purchases exceed their sales (see Table 8.14).

Table 8.14

Sale and Perchase of Paddy Production (all Varieties) by Farm-Size Catetories in the Project and Control Areas

Farm Size (ha)	Percentage of				Average (per household) (m.ton)				Sale	Purchase	Net Sale
	Production	Sale	Purchase	Net Sale	Production	Sale	Purchase	Net Sale	(as percentage of production)		
Project Area											
0.0 - 0.20	12.66	3.00	61.96	-82.84	0.85	0.06	0.75	-0.69	7.22	88.49	-81.27
0.21 - 1.01	31.33	19.67	38.04	- 7.00	1.97	0.38	0.43	-0.06	19.15	21.96	- 2.81
1.02 - 2.02	18.88	25.48	0.00	62.50	4.91	2.02	0.00	2.02	41.17	0.00	41.17
2.03 & above	37.13	51.85	0.00	127.34	11.03	4.70	0.00	4.70	42.59	0.00	42.59
All Farms	100.00 (207.90)	100.00 (63.41)	100.00 (37.59)	100.00 (25.82)	2.63	0.80	0.48	0.33	30.50	18.08	12.42
Control Area											
0.0 - 0.20	10.87	0.51	89.17	-416.27	0.24	0.01	1.14	-1.13	3.32	482.48	-479.15
0.21 - 1.01	14.09	8.61	10.83	- 1.84	0.36	0.16	0.16	-0.01	43.59	45.22	- 1.63
1.02 - 2.02	19.74	29.01	0.00	165.35	1.20	1.26	0.00	1.26	104.83	0.00	104.83
2.03 & above	55.29	61.88	0.00	352.76	4.21	3.36	0.00	3.36	79.86	0.00	79.86
All Farms	100.0 (30.44)	100.0 (21.72)	100.0 (17.91)	100.0 (3.81)	0.87	0.62	0.51	0.11	71.35	58.84	12.52

Source: BIDS/SSISP Household Level Survey, 1992.

Note: The figures in parentheses indicate the amount of paddy in m. ton.

8.8 Conclusion

In the foregoing sections, we have attempted to assess the indirect impacts of the Patuakhali Polder 43/2B Sub-Project on occupation pattern, asset formation, employment, distribution of income and other related socio-economic aspects. The assessment has been done through a comparison of cross-section data on these socio-economic variables in the project and control areas. Pre and post-project situations in both the project and control areas have also been considered for the purpose of this assessment.

It has been observed that the average size of household is higher in the control area than in the project area. A positive relation between farm-size and average size of household has been emerged in both the areas. The nuclear type of family is predominant in both the project and control areas, but higher predominancy of this type of family prevails in the project area than in the control area.

The occupational patterns of heads of households and all earners in the households appear to be dissimilar in the project and control areas. It has been observed that the project area concentrates on the agricultural activities, but the control area on the non-agricultural activities. A small percentage of earning members have been observed to change their occupation during the last five years, after completion of the project. This change in the occupational pattern has been observed to be somewhat higher in the project area than in the control area. The project, however, does not appear to be related to this change.

It has been observed that the average value of assets has now marginally decreased in the project area, while this value has marginally increased in the control area. In spite of this results, the average value of non-land assets has been higher in the project area than in the control area. The average of value of assets is, however, significantly higher for the larger farms than their smaller counterparts in both the areas.

The distribution pattern of income is very much skewed in both the areas, but it appears that the pattern is somewhat more skewed in the control area than in the project area. The average income (per household and per capita) is somewhat higher in the project area than in the control area.

The surplus farms are more evident in the project area than in the control area. In respect of the overall situation for maintaining the livelihood through meeting their subsistence and basic needs, the project area appears to be better off than the control area.

The production base of the economy in the project area is much more sound than that in the control area. But due to the non-agricultural character of the economy in the control area, commercialization without any basis of production appears to be higher in the control area than in the project area.

The above points manifest that the project area has now been able to attain a somewhat better off position than the control area in respect of the welfare indicators used in this study.

CHAPTER 9

IMPACT ON THE SITUATION OF WOMEN

9.1 Introdution

This analysis is primarily concerned with whether a share of the gains from the project intervention reaches the female members of the households. Since the project had been, to a significant extent, successful in increasing agricultural productivity and agricultural income in the project area, it will be useful to examine whether such changes have any impact on the situation of women. Direct impact of the increase in agricultural productivity is expected to be reflected in increased employment and income among the female members of the household. The extent of indirect impact is assessed by comparing the situation of women in the project and control areas in terms of access to food, clothing and a few other aspects of personal wellbeing. At the same time, a comparison of the situations of adult men and women in both project and control areas will reveal whether male-female differences decrease with an increase in family income.

9.2 Women's Perception of the Benefits of the Project

An enquiry was made about the awareness of women about the project. It is not at all unexpected that women who live within the household premises will not know about the outside world. But when a project is successful, women are usually aware of it. This is reflected in the fact that (Table 9.1) 58 per cent of the women have correct knowledge about the project and its objectives. Another 21 per cent have partial knowledge about the project. Only 20 per cent women were unaware about the project.

To assess the benefits of the project on women's lives, information was collected on the perceived benefits resulting from the impact of the project on the economic activities in the project villages. 50 per cent of the women members reported an increase in crop activities and 35 per cent reported an increase in household activities due to the impact of the project (Table 9.2). A large proportion of women reported a positive impact on the quality of food for herself and for the family, about 55 per cent reporting such benefits (Table 9.3).

Table 9.1

Awareness of Women About the Project

Farm Size (ha)	Whether aware of the project (% of cases in each group)			
	Fully	Partly	No	Total
0.00 - 0.20	54.8	22.6	22.6	100.0
0.21 - 1.01	57.5	21.1	21.2	100.0
1.02 - 2.02	62.5	12.5	25.0	100.0
2.03 & above	71.4	28.6	-	100.0
All Farms	58.2	21.5	20.2	100.0

Source: BIDS/SSISP Household Survey 1992.

Table 9.2

Changes in Women's Activities in the Project Villages

Aspects of Change	% of cases with			
	Increase	Same	Decrease	Not Applicable
Family income	54.4	29.1	13.9	2.5
Work on crop activity	49.4	10.1	11.4	29.1
Cooking, cleaning activity	35.4	19.0	-	45.6

Source: BIDS/SSISP Household Survey 1992.

Table 9.3

Nature of Benefit Derived by Women from the Project

Items	Per cent of respondents reporting changes			
	Yes	No	Don't Know	Not Applicable
Better food for self	54.4	-	-	45.6
More clothing for self	45.6	8.9	-	45.6
More pocket money	35.4	19.0	-	45.6
Better food for husband, children	53.2	1.3	-	45.6
Schooling for children	27.8	20.3	-	52.0
More hired labour reducing burden of work	10.1	34.2	-	55.7
Others	2.5	3.8	3.8	89.9

Source: BIDS/SSISP Household Survey 1992.

9.3 Impact on Women's Employment and Earnings

Table 9.4 shows employment among women in different types of directly productive activities. The earnings reported here do not represent earnings from the total labour input supplied by women or from the activity where labour is applied. Earnings are included only if payments are made directly to women. Thus, for family activity, earning may not be related to the share of labour input. This was done to derive information on actual access to earnings. The table indicates that women's workload is much higher in the project area compared to the control area. Average amount of labour input on crop processing in the project area is less than the hours on the same activity in the control area. This happened despite the higher productivity of agriculture in the project

Table 9.4

Income Earning Activities of Women in Project and Control Area

Type of activity	Project Area			Control Area		
	No. of women engaged	Average hours last month	Average income last year	No. of women engaged	Average hours last month	Average income last year
Poultry	69	16.04	303.33	27	22.96	305.00
Livestock (goats+cows)	28	39.46	736.67	11	31.82	1420.00
Kitchen garden	20	15.00	230.00	15	12.87	467.14
Cultivation	7	19.57	93.33	-	-	-
Crop processing	24	57.71	521.25	10	72.60	724.29
Trade	-	-	-	-	-	-
Handicraft	22	49.09	262.00	10	44.50	125.00
Domestic service	3	37.33	1006.67	1	20.00	1200.00
Field employment	-	-	-	-	-	-
Other work	-	-	-	-	-	-
Total	75	69.68	704.69	30	78.47	978.57

Note : The totals do not add to total sample of women workers since many women are involved in multiple activities.

Source: BIDS/SSISP Household Survey 1992.

villages. This may have resulted from the use of hired labour and mechanized rice mills. In the project area, more time is spent on other agricultural activities, like poultry and livestock raising and kitchen gardening (Table 9.4). Earnings by women are larger in the control area compared to the project area.

9.4 Access to Food, Clothing and Leisure

The situation of women in the project and control villages will be compared in terms of their access to basic needs. In the analysis, access to food and clothing and leisure are considered. Data on leisure time are presented for women and men in Tables 9.5 and 9.6 respectively. Table 9.5 shows that women in the project and control area has similar opportunities of having leisure. About 40 and 43 percent women in project and control areas respectively enjoyed less than one hour of rest (rest being defined as time other than directly productive work, housework, essential personal activities, sleep at night) during the last 24 hours. In terms of landownership, it is observed that a larger percentage of women from landowning groups in the project villages go without leisure compared to landless women. This is because, landless/marginal farmers have less work to do for processing of crops. Table 9.6 shows that men are over-worked in both

Table 9.5

Access to Leisure by Women during Last 24 Hours

Farm size (ha)	Percentage of women with			
	No rest	Less than 1 hour	1-2 hours	More than 2 hours
PROJECT AREA				
0.00 - 0.20	6.5	32.2	35.5	25.8
0.21 - 1.01	-	39.4	36.4	24.2
1.02 - 2.02	-	37.5	50.0	12.5
2.03 & above	-	57.1	28.6	14.3
All Farms	**2.5**	**38.0**	**36.7**	**22.8**
CONTROL AREA				
0.00 - 0.20	14.3	28.6	35.7	21.4
0.21 - 1.01	8.3	41.7	25.0	25.0
1.02 - 2.02	-	40.0	20.0	40.0
2.03 & above	-	25.0	75.0	-
All Farms	**8.6**	**34.3**	**34.3**	**22.9**

Source: BIDS/SSISP Household Survey 1992.

Table 9.6

Access to Leisure by Men during Last 24 Hours

Farm size (ha)	Percentage of Men with			
	No rest	Less than 1 hour	1-2 hours	More than 2 hours
PROJECT AREA				
0.00 - 0.20	23.3	43.3	16.7	16.7
0.21 - 1.01	21.2	36.4	18.2	24.2
1.02 - 2.02	-	-	50.0	50.0
2.03 & above	-	42.9	57.1	-
All Farms	**17.9**	**35.9**	**24.4**	**21.8**
CONTROL AREA				
0.00 - 0.20	53.8	15.4	15.4	15.4
0.21 - 1.01	8.3	25.0	25.0	41.7
1.02 - 2.02	20.0	-	40.0	40.0
2.03 & above	-	33.3	33.3	33.3
All Farms	**27.3**	**18.2**	**24.2**	**30.3**

Source: BIDS/SSISP Household Survey 1992.

the project areas. In the project area, nearly 54 per cent of male workers enjoyed less than one hour of rest compared to 45 per cent in the control area.

Table 9.7 shows access to food by men and women in the family in both the project and control areas. Number of meals is taken as a broad indicator because it was not possible within the timeframe of this study and the survey work, to collect detailed data on itemwise consumption by individuals. The average number of meals taken by men and women is very close. The average number of meals taken by women is slightly smaller in the control area compared to the project area. If two half meals are considered to constitute one full meal, then the average

Table 9.7

Average Number of Meals Per Day Per Person in the Project and Control Area

Farm size (ha)	Project Area				Control Area			
	Average Number of				Average Number of			
	Full meals		Half meals		Full meals		Half meals	
	Wife	Husband	Wife	Husband	Wife	Husband	Wife	Husband
0.00 - 0.20	1.9	1.9	1.0	0.9	1.9	1.7	1.1	1.1
0.21 - 1.01	2.3	2.4	0.9	0.9	2.0	2.1	1.0	0.9
1.02 - 2.02	2.7	2.8	0.6	0.5	1.8	2.0	1.2	1.0
2.03 & above	2.6	2.7	1.1	1.0	3.0	2.3	0.5	0.3
All Farms	2.2	2.3	0.9	0.9	2.1	1.9	1.0	0.9

Source: BIDS/SSISP Household Survey 1992.

number of meals per day is 2.7 (same for men and women) in the project area and 2.6 for women in the control area and 2.4 for men in the control area. On the average, even the landless households have more than 2.4 meals a day. This high figure may be due to the fact that the period of survey was one of peak availability of food.

Higher average income in the project area is reflected in improved consumption, is also reflected in the case of clothing. Women in the project area possess 3.2 sarees compared to 2.9 per women in the control area (Table 9.8). Men and women from the two largest land-owning group enjoy a larger number of dresses compared to the control area. Women from the landless families in the project area are better off compared to the control village. In general, women possess more sarees compared to the number of shirts for men reflecting the prevailing socio- cultural norms.

Table 9.8

Number of Dresses Used by Men and Women

Farm size (ha)	Project Area		Control Area	
	Average no. of dresses		Average no. of dresses	
	Female dress (sarees)	Male dress (shirts)	Female dress (sarees)	Male dress (shirts)
0.00 - 0.20	2.6	1.9	2.3	1.6
0.21 - 1.01	2.8	1.9	2.7	1.9
1.02 - 2.02	6.3	4.6	4.0	2.8
2.03 & above	4.0	2.4	4.0	2.8
All Farms	3.2	2.2	2.9	2.0

Source: BIDS/SSISP Household Survey 1992.

9.5 Women's Decision Making Role

Another set of indicators of welfare that have been used relate to women's decision making role reflected in (i) the role of men and women in Eid shopping; (ii) consideration of women's opinion in purchasing their sarees and (iii) freedom of women in visiting other families in the village. The information on the first two issues do not reveal any large difference between the project and control areas. (Table 9.9 and 9.10). The percentage of cases of decision taken only or mainly by men is similar. Women play the major role in Eid shopping in only 4 and 3 per cent cases, in the project and control area respectively. In the project area, in a smaller percentage of cases women's opinion are considered in the purchase of their sarees. The freedom of movement without objection from male guardian is slightly larger in the project area compared to the control area (Table 9.11).

Table 9.9

Role of Men and Women in Taking Decisions About Eid Shopping

(in per cent)

Farm size (ha)	Only husband/ male gurdian	Mainly husband/ male gurdian	All house-hold members	Mainly respon-dent herself	Mainly other female members of house-hold	Only respon-dent female member
PROJECT AREA						
0.00 - 0.20	19.4	16.1	58.0	6.5	-	-
0.21 - 1.01	9.1	27.3	57.6	3.0	3.0	-
1.02 - 2.02	-	50.0	50.0	-	-	-
2.03 & above	-	28.6	71.4	-	-	-
All Farms	11.4	25.3	58.2	3.8	1.3	-
CONTROL AREA						
0.00 - 0.20	21.4	14.3	57.1	7.1	-	-
0.21 - 1.01	8.3	25.0	66.7	-	-	-
1.02 - 2.02	-	-	100.0	-	-	-
2.03 & above	-	75.0	25.0	-	-	-
All Farms	11.4	22.9	62.9	2.9	-	-

Source: BIDS/SSISP Household Survey 1992.

Table 9.10

Consideration of Women's Opinion in the Purchase of their Sarees

(in per cent)

Farm Size (ha)	Percentage of households where women's opinion is considered				
	Never	Sometimes	Always	Purchased by self	Others
PROJECT AREA					
0.00 - 0.20	22.6	51.6	16.1	3.2	6.5
0.21 - 1.01	33.3	30.3	30.3	-	6.1
1.02 - 2.02	-	75.0	25.0	-	-
2.03 & above	14.3	42.9	42.9	-	-
All Farms	24.1	44.3	25.3	1.3	5.1
CONTROL AREA					
0.00 - 0.20	42.9	28.6	21.4	-	7.1
0.21 - 1.01	41.7	25.0	33.3	-	-
1.02 - 2.02	40.0	-	60.0	-	-
2.03 & above	50.0	25.0	25.0	-	-
All Farms	42.9	22.9	31.4	-	2.9

Source: BIDS/SSISP Household Survey 1992.

Table 9.11

Freedom of Women in Visiting Other Families in the Village

(in per cent)

Farm Size (ha)	Project Area			Control Area		
	Whether male gardians raise objection			Whether male gardians raise objection		
	Always	Some-times	Hardly	Always	Some-times	Hardly
0.00 - 0.20	9.7	16.1	74.2	7.1	28.6	64.3
0.21 - 2.01	3.0	36.4	60.6	8.3	41.7	50.0
1.02 - 2.02	-	50.0	50.0	-	20.0	80.0
2.03 & above	14.3	14.3	71.4	-	50.0	50.0
All Farms	6.3	27.8	65.8	5.7	34.3	60.0

Source: BIDS/SSISP Household Survey 1992.

Thus the comparison of project and control area does not show any clear impact of project on the decision making role of women.

9.6 Conclusion

On the whole, it appears that the project impact on the village economy did not create any major change in the lives of women in the project area. Women were not required to bear a larger workload in crop processing activities even though agricultural productivity increased. Women's access to food does not show any large difference between the project and the control area. Number of sarees possessed by women were slightly higher in the project villages compared to the control area. Women's lives also have not changed in terms of independence in decision making.

The lack of impact of the project on women's situation may be due to the fact that it had been only recently constructed. Women's access to food and clothing and their status in the decision making process are determined by long term cultural factors which do not change immediately after project implementation.

CHAPTER 10

IMPACT ON ENVIRONMENT AND LIVELIHOOD SECURITY

10.1 Introduction

The Patuakhali Polder 43/2B, as a FCDI project, attempts to change the physical character of the project area by constructing physical structures which have largely been successful in avoiding and/or controlling regular flood, tidal innundation and salinity. But drainage congestion still remains as a problem in the project area. The appraisal report of the project (BWDB 1986) noted several potential environmental impact of the structures e.g. changes in sediment deposition, effects of higher chemical fertilizer and pesticide use which could have detrimental effects on the ecology of the area particularly during the pre-monsoon season due to absence of dilution effect of the rain.

The above points manifest that the project has important implications for ecology, environment, security of life and property. In view of this consideration, this chapter attempts to assess the expected and/or realised environmental impact of the project.

10.2 Agroecological Sub-regions and Pre-project Problems

Patuakhali Polder 43/2B Project lies in the physiographic sub-unit of saline Ganges Tidal Floodplain where the soils are saline in varying degrees. It has a close network of tidal rivers and creeks. Rivers are saline only in dry season. Monsoon rainfall is heavy enough to keep the soils free from salt in the rainy season. Soil salinity in the dry season is mainly derived by capillary upward movement of moisture to the surface from saline ground water. The construction of embankments to protect the land from tidal flooding has interrupted the normal patterns of alluvial deposition and drainage. One consequence has been the rapid silting up of tidal creeks and consequent impedence of drainage in enclosed polders from which water accumulating during heavy monsoon rainfall is unable to drain rapidly. Since the ground water in this area remains saline, salt will continue to accumulate on the ground surface during the dry season as a result of capillary rise of moisture through the soils.

The pre-project problems were tidal flooding in mosoon season, inadequate irrigation in dry season, slow drainage in rainy season, and salinity in April-May. Cyclonic suges often caused damage to human life and property.

10.3 Soil Type and Land Use

The project area could be classified as high, medium high, medium low and lowlands. Land levels in terms of this classification in project and control areas are presented in Table 10.1.

Table 10.1

Land Levels in Project and Control Areas

Land Level	% of area under land levels	
	Project	Control
High	22	2
Medium High	57	44
Medium Low	20	49
Low	1	5

Source : BIDS/SSISP Village Level Survey, 1992

Land levels in project and control areas indicate that after project implementation, the elevation of the area has changed. The area under high and medium high lands have significantly increased. As the flooding has been reduced, the land categorisation according to inundation period may have changed the level status. However, this change brings forth greater requirement of irrigation in the dry season. Moreover, the soil condition is also better in the project area since it contains less sandy soils. (Table 10.2). Loamy soils can hold moisture for a longer period.

In the project and control areas loamy soils predominate (Table 10.2). These soils are good for growing rice and rabi crops. During the Appraisal Phase, it was expected that if flood protection and irrigation could be provided these soils would be able to accommodate two crops in a year. In medium high lands, soils dry up quickly in dry season which needs irrigation. But irrigation has not been extended in the project area which restricts upgrading of soils and expansion of modern rice. In medium low and soil, only rabi crops grow because drainage congestion is still a problem in the area.

Highlands have been mostly used for homestead in project and control areas.[1] Medium highlands are used for HYV aus-rabi/aman and LT aus-HYV/LT Aman. Presently, local aus has occupied about 17 per cent of the area in the project villages. In contrast 27 per cent area has been utilized for local aus in control area. In the pre-project situation medium lowlands were used for single crop cultivation - either local transplanted aman or local boro. These areas remained fallow during rest of the year. Presently, due to flood control local aman varieties have been cultivated in 44 per cent of the project area against 53 per cent in the control area. During rabi season, pulses and vegetables grow in the medium high and medium low lands in the project area. Land use in the rabi season covers around 34 per cent of the cropped area and is limited in the project area mostly because of the soil moisture stress. In the control area, about 19 per cent of the land is cultivated during rabi season because of high soil salinity. Rice is not yet cultivated in the rabi (boro) season and thus a shift to modern varieties as an impact of the project has not yet occurred.

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[1] For data pertaining to land use in project and control areas, see chapter 5.

Table 10.2

Soil Types in Project and Control Areas

Area	Percentages of cultivable land under soil types			
	Clayey	Loamy	Sandy	Total
Project	4.69	84.38	10.93	100.00 (4410.93)
Control	7.00	78.00	15.00	100.00 (1239.27)

Source : BIDS/SSISP Village Level Survey, 1992.

Note : Fgures in parentheses indicate cultivable area in ha.
The classification of soil types are based on information provided by the cultivators and informed judgement of the agronomist. Due to limited scope of the survey, no technical soil survey could be undertaken.

10.4 River Flows

The project area is invaded by numerous khals and creeks. The secluded basin where the project lies is separated from the main rivers by relatively narrow channels. The tidal rivers bring lot of silts with it. The flow becomes slow at the river mouth and the bed silts up and raises the level. The project, thus, has created slight negative impact on the river flows.

10.5 Water Quality

The main indicators of water quality are pollutants, sewage, sediment load and salinity. Due to increase in the use of agrochemicals like fertilizer and pesticides, the leaching effect of these chemicals may have polluted surface water (Table 10.3). Most of the project area has been suffering from polluted surface water.

Sewage inside the project area are not flushed out which may have contributed to the pollution of the surface water and have decreased the water quality. Sedimentation in the river bed has increased due to slower flow of the rivers. The overall impact of the project on water quality is negative.

Table 10.3

Impact of Sedimentation, and Agrochemical Use on Surface Water Quality

	Percentages of project villages reporting		
	Unchanged	Increased	Decreased
Fertilizer use	0.0	100.0	0.0
Pesticide use	3.4	96.6	0.0
Surface water pollution	6.9	89.7	3.4
Sedimentation	17.2	75.9	3.4

Source : BIDS/SSISP Village Level Survey, 1992.

Salinity has decreased in both dry and wet seasons due to poldering of the project area (Table 10.4). The majority of the project area is now free of salinity.

10.6 Physical Environmental Impacts

10.6.1 Flooding and Water Logging

Flooding of the project area due to tidal inundation has been controlled after the implementation of the project. However, poldering of the area left no outlet for the excess water from the monsoon rain. The lack of poor drainage and

Table 10.4

Degrees of Salinity in Different Seasons in Project and Control Area

Area	Percentages of land under					
	No salinity during		Slight salinity during		High Salinity during	
	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season
Project	85.24	91.59	9.38	5.21	5.38	3.20
Control	70.00	87.60	25.00	10.40	5.00	2.00

Source : BIDS/SSISP Village Level Survey, 1992.

roads without culverts log the water causing flooding of about 50 per cent of the total project area. The low-lying areas have more tendency to be inundated for longer period of time (Table 10.5). The control area has relatively more land at low levels and these lands mostly remain under water for most of the year. The area inundated in the project can be cultivated when it dries up but this is not possible in the control area since soil salinity increases. In the project area inundation is mostly due to rainfall but in the control area it is due to tidal saline water.

One of the objectives of the project is to provide drainage facilities in the project area. The objective appears to be achieved substantially, since the percentage of area under water logging has been observed to be reduced from about 81 per cent to less than 1 per cent in the project area. But the noteworthy point is that water logging as an adverse impact of the project has significantly increased from 4 per cent to about 83 per cent of land in the control area (see Table 10.6). In evaluating the impact of the project, this adverse effect of the project in the control area should not be ignored in any way.

Table 10.5

Distribution of Cultivable Land by Period of Inundation

Land level	Area type	% of total area	% of area not inundated	% of the total area in different inundation periods (months)			
				<1	1-3	4-6	7-9
High	Project	22.0	100.0	0.0	0.0	0.0	0.0
	Control	2.0	100.0	0.0	0.0	0.0	0.0
Medium High	Project	57.0	18.0	74.0	8.0	0.0	0.0
	Control	44.0	0.0	4.0	67.0	29.0	0.0
Medium Low	Project	20.0	24.0	1.0	25.0	50.0	0.0
	Control	49.0	0.0	0.0	22.0	64.0	14.0
Low	Project	1.0	93.0	0.0	1.8	6.0	0.0
	Control	5.0	40.0	0.0	4.0	42.0	14.0
Total area (ha)	Project	4411					
	Control	1239					

Source: BIDS/SSISP Village Level Survey, 1992.

Table 10.6

Area of Land Affected by Waterlogging (in ha)

Area	Survey year (1992)			Pre-project Year (1986)		
	Total land owned (ha)	Total land under water-logging (ha)	% of land under water-logging	Total land owned (ha)	Total land under water-logging (ha)	% of land under water-logging
Project	54.27	0.36	0.66	54.00	43.52	80.59
Control	24.20	19.98	82.56	24.63	1.02	4.14

Source: BIDS/SSISP Household Level Survey.

The impact of the flood and water-logging on different farm sizes categories are presented in Table 10.7. It is observed that farmers of small size group (0.21 to 1.01 ha) still have some water-logging problem but the intensity of the problem has decreased to a significant extent. A major positive impact of the flood control embankment and drainage regulators on the flooding and water-logging can be substantiated by data contained in Table 10.7.

Table 10.7

Impact of the Project of Floods and Water-Logging

Farm Size (ha)	Type of change for flood damage indicated by household (in %)			Area under water-logging (ha)		
	Increase	No. change	Decrease	Post-project	Pre-project	% change
0.00 - 0.20	-	3.2	96.8	0.00	1.68	-100
0.21 - 1.01	-	-	100.0	0.36	16.02	- 98
1.02 - 2.02	-	-	100.0	0.00	9.81	-100
2.03 & above	-	-	100.0	0.00	16.01	-100
All farms	-	1.3	98.7	0.36	43.52	- 99

Source: BIDS/SSISP Household Level Survey, 1992.

10.6.2 Groundwater Level

The project area has not been associated with any decrease in groundwater level in most of the villages. This may be due to the recharge of groundwater in monsoon.

10.6.3 Groundwater Quality

Increased use of agro-chemicals for HYV paddy cultivation may increase chances of leaching of these agro-chemicals, which might also reach the groundwater. The impact has not been measured and requires long-term monitoring. However, in the project area the monsoon rainwaters wash-off the residues and dilute the effect at present. Also the incidence of HYV cultivation is marginal, so that use of agro-chemicals would not be substantial and thus there would likely be no impact on the ground water quality.

10.6.4 Wetlands and Water Bodies

In the project area, full flood protection and salinity control are mostly restricting the access of water. Thus the areas of wetlands and water bodies have decreased in most of the villages mainly due to project interventions (see Table 10.8). This has been a substantial negative impact of the project on wet lands and water bodies. Such declines in wet lands and water bodies have reduced fish culture and fish capture opportunities.

10.6.5 Soil Fertility

Soil fertility has decreased because of the long-time water retention in the crop fields, more extensive land use and use of chemical fertilizers. Natural fertilization has also decreased due to lack of natural sediments that come with the flood water. Flood water, along with sediment, brings blue-green algae which fixes nitrogen in the soil and turns it more fertile. Moreover, natural fertilizers like cowdung, compost, green manure etc. are not used in the project area as per requirement. Waterlogging also causes mineral deficiency in the soil. Reduced soil fertility has been a negative impact of the project.

10.6.6 Soil Moisture Status

The higher land area usually suffers from soil moisture stress in the dry season. The low land area remains saturated. Seepage rate is low as the soils are mostly clay and loamy. Therefore, except for the higher land soil moisture is not a problem.

10.7 Biological Environmental Impacts

Biological environmental issues affected by the Patuakhali Polder 43/2B Project are mostly examined in terms of impacts on fauna and flora. In both cases, some harmful life forms have been flourished due to available shelter and food, where as the beneficial ones decreased.

Biological environment in the project area started degrading long time before the project implementation due to high population pressure requiring more cultivable land, homestead, fuelwood and water. Overexploitation of the land and other physical resources have decreased the habitat for the wildlife and increased environmental degradation. Construction of the embankment and other structures appear to have accelerated the process.

10.7.1 Biological Impacts (Fauna)

Fish Communities/Habitats: The fish ecology has changed because of the project. The recruitment and spawning grounds of major fish species have been interrupted by the embankment. The changes in the water bodies have not increased the fishing opportunity in the project area. In particular, fish composition as well as fish habitat have decreased due to reduction in waterbodies and wetlands. Overexploitation has also limited the stock of fishes.

Insects and Pests: The incidence of insect and pest attacks has been reported to have increased significantly in the project area. Flood protection has decreased the risk of crop damage and monocropping in the project area has facilitated pest propagation. However, this is not likely to be a direct impact of the project.

Mosquito: Mosquitoes increased in all of the villages because of more aquatic plants in the stagnant water due to poldering providing better breeding grounds. The impact of the project on the mosquito population is positive with a negative impact on human health.

Rats: Rat population has increased in all of the surveyed villages. Ideally the breeding of rats needs two things: food and shelter. Embankment provides shelter ground and paddy crop provides food for the rats. This has been a strong negative impact of the project as rats damage both crops and infrastructures.

Snakes/Frogs: A positive trend in frog population has been observed in the project area. Snakes usually breed on small mammals and insects. Due to increased food availability and unchanged habitat, snake population has also increased in most of the project villages. The project interventions have created abundance of insect population in the area facilitating the increase in the number of insectivorous species like snakes and frogs.

A summary of the impacts of the project on bio-physical environment is presented in Table 10.8.

Table 10.8

Impact of the Project on Bio-physical Environment

Parameter	Percentage of villages reporting				
		Change		Change due to project	
	No change	Increase	Decrease	I	II
Area of waterbodies	13.8	-	86.2	69.0	80.0
Water-table elevation	100.0	-	-	-	-
Surface water pollution	6.9	89.7	3.4	93.1	100.0
Soil fertility	3.4	6.9	89.7	96.6	100.0
River erosion	55.2	3.4	37.9	37.9	91.7
Sedimentation in river beds	17.2	75.9	3.4	65.5	82.6
Insect and pest attack	6.9	93.1	86.2	86.2	92.6
Prevalence of mosquitoes	-	100.0	-	100.0	100.0
Prevalence of snakes	10.3	89.7	-	89.7	100.0
Prevalence of rats	-	100.0	-	100.0	100.0
Prevalence of frogs	13.8	69.0	17.2	86.2	100.0
Beneficial aquatic	3.4	3.4	93.1	96.6	100.0
Harmful aquatic plant	-	93.1	6.9	100.0	100.0

Source: BIDS/SSISP Village Level Survey, 1992.

Note : Change I (due to project) is based in relation to all study villages in the project area, while change II is in relation to the villages which have experienced changes in specific parameters.

10.7.2 Biological Impacts (Flora)

Trees: Due to flood protection fruit tree cultivation has expanded in several areas (Table 10.9). However, the stock of fruit trees has declined in certain areas due to intense population pressure and other needs, fuel wood in particular. Fruit trees are usually cultivated in homestead or area adjacent to

homestead. Protection of these areas from flooding has created conditions under which expansion of fruit tree cultivation can occur. However, there seems to exist lack of motivation and organization to initiate social awareness in this regard. Some evidence points that the number of such trees planted exceeds the number of trees felled due to security against flood damage to saplings.

Table 10.9

Impact of the Project on Plant Population

		Project	Control
Stock of fruit trees :	Static	10.3	100.0
	Increased	3.4	0.0
	Decreased	86.2	0.0
Stock of commercial trees :	Static	27.6	100.0
	Increased	58.6	0.0
	Decreased	13.8	0.0
Beneficial aquatic plants :	Static	3.4	100.0
	Increased	3.4	0.0
	Decreased	93.1	0.0
Harmful aquatic plants :	Static	0.0	80.0
	Increased	93.1	20.0
	Decreased	6.9	0.0

Source: SSISP Village and Household Level Survey, 1992

The commercial trees have increased in most project villages. Number of commercial trees decreased in certain cases due to lack of initiative for tree plantation, lack of alternate fuel for cooking and higher rate of tree felling.

Aquatic plants: Beneficial aquatic plants have declined in most villages due to decrease in running water due to the project. A positive effect on the

harmful aquatic plants has also been observed in the project area. The project has facilitated flood protection thereby reducing water bodies with consequent impact on aquatic plants. Use of fertilizer also facilitates weed production. These weeds compete with the major crops and damage crop. Stagnant water also facilitates weed growth, particularly in wet paddy fields.

10.8 Other Environmental Impacts

10.8.1 Crop Cultivation and Cropping Pattern

Crop cultivation has increased in the project area particularly in the rabi season due to decreased risk of flooding, salinity and tidal surge. Different crops are now cultivated in the project area in the rabi season. However, the cultivation of boro paddy has not expanded in the area. Similarly, a shift from local to HYVs has not been observed in other seasons. Irrigation coverage has also not been expanded. The present cropping patterns in both project and control areas are almost the same with local aus, local aman and pulses being the major crops.

10.8.2 Impact on Input Use

Since the project implementation, cultivation of some crops e.g. pulses, oilseeds, sweet potato, chillies, peanuts etc. have expanded in the project area. However, area under these crops are still low with local aus and local aman being the major crops. Without any expansion of HYVs of rice, the intensity of use of chemical fertilizer and pesticides has not increased to a level to cause any serious leaching of these chemicals, resulting in environmental degradation through surface and groundwater pollution, increase in fish disease and

mortality. The biological food chain is unlikely to be disrupted in the near future if some major shift from local to HYVs does not occur.

10.8.3 Livestock

Post-project changes in livestock and other non-crop resources are presented in Table 10.10. This table shows a major change in the number of cattle in the project area. This change is due to increased pasture and grazing land and feed supply. Flood control has decreased risk of flooding and has reclaimed lands. Cattle graze in these lands and feed on green grasses. Enhanced supply of animal feed and the agricultural wastes also have facilitated increase in cattle population. Increase in the number of cattle has replaced buffaloe population. For keeping buffaloes, adequate waterbodies are needed. Moreover, buffaloes eat more feed than cattle. Therefore, in a circumstance where waterbodies are decreasing as an impact of the project, most of the farmers are encouraged to keep cattle than buffaloes. Goat population has also increased in the project area. Goats are scrap feeders. Cultivation of more vegetables, grains and availability of green grasses have facilitated goat raising. There has also been an increase in the poultry population.

10.8.4 Impact on Fuel Use

The use of fire-wood as fuel in the project area is less than that in the control area (Table 10.11). However, fire-wood tree plantation is higher in the project area than in the control area due to higher security against flood risk.

Table 10.10

Post-Project Changes in Livestock, and Other Non-Crop Resources in the Project Area

Indicators	Percentage of Village Reporting		
	Increase	No Change	Decrease
No. of Cattle	89.7	10.3	0.0
No. of Buffaloes	0.0	0.0	100.0
No. of Goats	86.2	13.8	0.0
No. of Ducks	0.0	3.4	96.6
No. of Chicken	79.3	20.7	0.0
Pasture/Grazing area	75.9	13.8	10.3
Supply of Animal Feed	69.0	24.1	6.9
Area of Water bodies	0.0	13.8	86.2
Opportunities for capture Fishery	0.0	0.0	100.0

Source: BIDS/SSISP Village Level Survey 1992.

Table 10.11

Number of Fire-Wood Plants Per Household Chopped and Planted

Area	Average number of fire-wood per household	
	Chopped	Planted
Project	0.24	2.37
Control	0.26	1.23

Source: BIDS/SSISP Household Level Survey, 1992.

Use of cowdung as fuel has decreased the burden on fuel-wood in the project area. Therefore, a positive impact of the project may be considered on the fuel-wood production.

10.8.5 Domestic Water Supply

People in the project area mostly use tubewell water for drinking and pond water for other purposes. Extension of tubewells did not affect the groundwater level. Lesser availability of surface water and increasing population as well as government programmes in this respect have facilitated the extensive use of tubewell water for domestic purposes.

10.9 Adverse Impacts of Project Structures

The incidence of adverse impacts associated with project structures are reported in Table 10.12. It is observed from the table that most of the villages within the project area experienced adverse effect due to project structures. The least effect was observed in case of irrigation canals. The nature of problems are shown in Table 10.13. From the table it can be observed that maximum adverse effects have been on fishing, boating, soils and surface run-offs which, however, were expected at the planning stage of the project.

Table 10.12

Incidence of Adverse Effects Associated with Project Structures

Type of Structure	Percentage of villages where problems experienced
Irrigation canal	31.0
Flood control embankment	100.0
Drainage canal and regulator	96.6
Salinity control embankment	100.0

Source: BIDS/SSISP Village Level Survey, 1992.

Table 10.13

Problems Reported with Specific Project Structures

Structure		
Irrigation Canal Problems	Flood Control Embankment Problems	Drainage canal and regulators Problems
	Reduced soil fertility	Boating problems
Fishing problems	Decreased fishing opportunities	fishing problems
Boating problems	Adverse impact on aquatic plants/animals	Conflict among the villages
	Water-logging after severe floods	
	Adverse environmental impact through reduced surface run-off	

Source: BIDS/SSISP Village Level Survey, 1992.

10.10 Conclusion

The impact of the project on the environment and livelihood security has been positive, though in many cases some adverse impacts have been reported. The major impact has been the security of the project area from tidal inundation and salinity intrusion. The area under water-logging has been substantially reduced as an impact of the project. However, in certain areas, particularly in the control village, water-logging has been observed to be increased as an adverse impact of the project and/or due to improper drainage.

The project interventions have created opportunities for increased crop production at least partially through realization of the full flood protection

measures in the project area. However, lack of irrigation and absence of extension and other services have restricted the realization of the potentials. Due to flood protection and other measures of the project, cultivation of rabi crops and availability of grazing land have brought some positive impact on the livestock sector. There has been strong negative impact of the project on wet lands and waterbodies leading to the substantial reduction of fish culture and fish capture opportunitiess. Afforestation in the polder area has not taken place to any significant extent.

The project area has not been observed to be associated with any decline in ground water level, increase in salinity or decline in water quality. The biological environment, both in terms of fauna and flora has remained mostly static, though some harmful life forms have flourished in the project area due to available shelter and food.

CHAPTER 11

CONCLUSIONS AND POLICY RECOMMENDATIONS

The final chapter brings forth the major conclusions of the study which have implications for adoption of general policy measures and/or specific policy recommendations. The major findings and points of arguments are presented below.

The primary objective of the Patuakhali Polder 43/2B Sub-Project is to provide full flood protection and extended use of irrigation by low lift pumps and gravity means to increase production of both winter and summer rice crops. The expected benefit is thus to be derived through reduced flood damage and risk of crop failure (as a result of full flood protection measures) and conversion of local aman to HYV aman and expansion of HYV boro areas (as a result of irrigation). In addition to direct benefits on crop production, the project is also expected to provide some protection to dwellings and livestock from periodic high flooding. Accordingly the physical structures of the project mainly consist of embankments for flood control with regulators equipped with flap gates for drainage and irrigation.

The evaluation study points out that there have emerged a number of problems with respect to the achievement of the project objectives. While the project has been largely successful in providing protection against flood damages and tidal inundation thereby reducing risks to crops, dwellings and other properties, there have been problems relating to water-logging in particular. The construction of the embankment without providing adequate measures to drain out the accumulated water inside the project has been observed to cause acute drainage congestion in certain parts of the project area. More importantly, complementary measures to increase irrigated area and provision of modern inputs and extension services have been totally neglected during implementation. As a result, no expansion of irrigation has been reported from the project area particularly through the use of minor irrigation equipments.

The evidence shows that the operation and the maintence of the structures are not satisfactory. The embankment is subjected to breaches and has encountered

the problem of erosion. The design top width and side slopes do not exist any longer throughout the entire length of the embankment. Some of the canals have already been silted up and remain ineffective for irrigation and drainage of excess water. The budget for O & M activities is inadequate to properly complete the required and rountine works.

In respect of proper management of the project, one important shortcoming has been the lack of local participation and cooperation among various government agencies in planning and implementation of the project, though these institutional aspects have been considered to be of prime importance in the feasibility study. The local people have rarely been consulted during the planning and implementation phases of the project. In absence of any effective local (project) committee of the beneficiaries of the project, the concerned departments of the government do not have the opportunity to interact with the people through local committes. Thus the project could not go much beyond the improvement of the physical environment of area and fails to generate the needed enthusiasm amongst the beneficiaries to bring desired economic benefits through adoption of irrigation and related new technological inputs.

We have evaluated the socio-economic impacts of the project through a comparison of cross-section data on the selected socio-economic variables (e.g. production, employment, income, education, etc.) in the project and control areas, assuming that the control area would be comparable to the without project situation. For the purpose of this assessment, we have also considered the situations prevailing in the pre and post-project periods in both the project and control areas.

It has been observed that cropping pattern, cropping intensity and yield rates of various crops have significantly changed/increased due to the realization of the provision of full flood protection under the project. In absence of any complementary measures for use of pumped irrigation and other related inputs including extension services, the benefits of embankment for protecting floods could not be combined with the benefit of irrigation for adoption of HYVs. Thus the major objective of the project for transforming the cropping system through shift of cropping from local to HYVs to inhance the overall production performance remains largely unrealized.

The projet area, compared to the control area, has been able to attain a significant improvement in the performance of crop agriculture in respect of cropping pattern, cropping intensity and yield rates of various crops. It has been observed that gross returns, net returns and value-added of all crops taken together and most of the individual crops are significantly higher in the project area than in the control area. This indicates that the project provides a significant positive impact on the performance of crop-agriculture. If the flood protection measures could be combined with irrigation measures for expansion of HYV adoption, the direct impact of the project on crop-production would have been enhanced and stimulated. In respect of non-crop agriculture, the project area has been observed to have higher employment and income which, however, can be not fully be attributed to the impact of the project.

In spite of the positive direct impact of the project on the performance of crop-agriculture, the indirect impacts of the project on land, labour and credit markets appear to be far-fetched, probably due to the partial fulfillment of the objectives of the project. Through a comparative assessment, it has been observed that the distribution pattern of owned and operated land is very much skewed in both the project and control areas and this unequalising pattern appears to have been evolved overtime in a similar fashion as well in the both the areas. However, as an impact of the project, the land prices in the project area have increased significantly indicating that the project intervention improved the quality of land and its productive uses. Labour market, in terms of employment situation and wage rates, appears to be more developed in the project area than in the control area. This is very likely since the production performance particularly in the agricultural sector is much better in the project area than in the control area. No systemetic and significant variations in respect of the percentage of households taking loan (both institutional and non-institutional) and average borrowing per household have been observed in project and control areas. For productive purposes of loan, households concentrate on farming activities in the project area and on non-agricultural activities in the control area. The project does not appear to have a significant impact on credit market.

A comparison of cross-section data in project and control areas along with the assessment of pre and post-project situations manifests that the project area

has been able to attain a better off position than the control area in respect of the welfare indicators (e.g. household income, employment, occupational pattern, asset formation etc.) used in this study. Thus, in respect of overall situations in maintaining the livelihood through meeting their subsistence and basic needs, the project area appears to be better off than the control area.

The occupation pattern has been observed to be dissimilar in the project and control areas. The project area concentrates on the agricultural activities, but the control on the non-agricultural activities. A small percentage of earning members have changed their occupation after the completion of the project. This change, however, can not be considered as the impact of the project, though this change has been observed to be somewhat higher in the project area than in the control area.

We have analysed educational characteristics, health, food and nutritional conditions prevailing in the project and control areas in order to provide some indications of indirect impacts of the project on these socio-economic variables. No significant and systematic variations in the average rates of literacy have been observed in the project and control areas. But the enrollment rate of the children has been higher in the control area than in the project area. This higher achievement in enrollment by the control area may be explained by the fact that the control area has better accessibility to the urban centre in the district head quarters of Patuakhali. The overall health conditions have not significantly improved, rather static situations in health conditions have mostly been cropped up in both the project and control areas.

The households in the project and control areas do not have sufficient food intake and protein - the condition being somewhat better in the project area than in the control area. For most of the food items, the level of consumption of the majority of households remains unchanged. But for fish consumption, the level has much deteriorated, more in the project area than in the control area. The distress condition of small farms in respect of acute food shortage has been observed to coincide with the pre-harvest periods (Ashar and Sravan; Ashwin and Kartic) of Aus and Aman paddy, the main crops in the study area. The seasonal pattern of food shortage has, however, been more acute in the control area than in the project area. If the project objectives could have been fully realized,

the acute food shortage would have been reduced through the enhancement of food production as a direct and stimulated impact of the project.

The project does not appear to have any significant impact on the lives of women. Women are not observed to bear a larger work-load in crop processing activities, even though the project has a significant impact on agricultural productivity. Women's access to food and their roles in decision making process do not show any large difference between the project and control areas. The lack of impact of the project on women's situation may be explained by the fact that the project has been only recently constructed, while the change in the life pattern of women involves a long term social process.

The impact of the project on the environment and livelihood security has been positive, though in many cases adverse impacts have been reported. The major impact has been the security of the area from tidal inundation and salinity intrusion. The area under water-logging has been substantially reduced as an impact of the project. However, in certain areas, particularly in the control village, water-logging has substantially increased as an adverse impact of the project and/or due to improper drainage. The project has some positive impacts on livestock sector through making available of grazing land. But there has been strong negative impact on wet lands and waterbodies leading to substantial reduction of fish culture and fish capture opportunities. Afforestation has not taken place to any significant extent. The biological environment, both in terms of fauna and flora has remained mostly static, though some harmful life forms have flourished in the project area due to available shelter and food.

Recommendations

In the light of the above findings, the following recommendations are made for fulfillment of the unrealized objectives and better functioning of the project:

- The Sluice Committees should be provided with the responsibility of operating the gate lifting chain pulleys and spare chain pulleys. For smooth handling, the gate lifting chain pulleys should be long enough. In order to stop unneccessary wastage of water, the sides and bottom of the gates should be provided with rubber seal.

- Installation of more flushing inlets at appropriate places as requested by the beneficiaries appears to be reasonable for deriving the benefits of the project.

- The interior channels and drainage channels should be maintained through reexcavation, resectioning and realignment.

- Many problems, e.g. raised water level outside the embankment, cuts and breaches, internal flooding and drainage congestion etc. result in continual damage to embankment and limit the effectiveness of the regulators. The O & M activities should concentrate on these problems by raising adequate fund and involving local people for ensuring tangible benefits to them.

- It is essential to pursue serious efforts of demonstrating the benefits of irrigation particularly in the rabi season through provisions of credit and other facilities for installation of irrigation equipments like low lift pumps. One of the positive contribution of the project has been the expansion of rabi crops like pulses, oilseeds, vegetables etc. in the project area. Thus, it may be useful to support the initiative of the farmers for crop diversification and its further stimulation through provisions of extension, credit and other services needed by them.

- Appropriate measures may be taken for the development of livestock and poultry in order to supplement income and contribute to nutritional improvements. There has been a substantial negative impact on open water capture fisheries due to the project. This calls for measures to increase fish farming in the area to derive the benefits of improved flood-free environment. Similarly, massive and effective afforestation programmes in the project area as well as along the embankment can go a long way in improving the ecology, protecting the embankment and reducing the damages of cyclones and other natural disasters.

The successful achievement of the objectives of the project - as the evaluation study points out - is contingent upon the efficient planning

and implementation requiring both 'top down' and 'bottom up' approaches. This calls for resorting to a policy pertaining to strong inter departmental cooperation and people's participation in the project management activities. Since the project has some specific regional characteristics and the structure in question is simple, we emphasize on the reformulation of the project outlined above through consultation with local people. A well designed rehabilitation scheme of the project involving structural changes in respect of internal drainage network, provisions of irrigation and extension services needs to be implemented so that the project can improve not only the physical environment in the area, but also can provide perceived economic benefits to the people

Summary Characteristics of Sub-Projects of SSISP

Serial Number & Cycle		Name of the Sub-project or Scheme	Objectives	Status[1] of the Project	Area (ha) Gross 00,000	Net 33,333	Flood Control 00,000	Irrigation	Drainage
1	01	Baranai River Sub-Project	D/FC/I	c	5,080	3,811	2,430	1,251	810
	02	Barkati Beel Sub-Project	I/FC	c	445	365	365	-	122
	03	Hanger Khal Irrigation Scheme	I	c	765	367	-	367	-
	04	Pakuria Beel Sub-Project	D	c	2,590	2,228	-	-	2,228
		Cycle 1: Total			8,880	6,771	2,795	1,618	3,160
2	05	Haijda Embankment Project	FC/I	o	9,717	8,097	5,830	3,240	810
	06	Tirnai River Sub-Project	I	c	328	316	-	316	316
	07	Ramchandi River Sub-Project	I/D	c	380	364	-	364	364
	08	Versa River Sub-Project	I	c	433	417	-	417	417
	09	Tangon Sub-Project	I	o	4,632	4,454	-	4,453	4,453
	10	Tulshia Beel Sub-Project	I	c	202	202	-	202	-
	11	Mathabhanga-Upper Bhairab	I	a	Feasibility Stuty Only				
		Cycle 2: Total			15,692	13,850	5,830	8,992	6,360
3	12	Aglar Chak Irrigation Project	FC/I	c	7,935	4,656	2,996	2,632	405
	13	Keraniganj Irrigation Project	FC/I	o	10,931	6,883	4,453	3,240	810
	14	Boalkhali Irrigation Project	I or FC/I	o	12,550	7,287	4,858	4,858	3,644
	15	Balali Padamaree Irrig. Project	FC/I	o	2,389	2,024	1,620	405	-
	16	Gugrajola Irrigation Project	FC/I	o	8,705	4,656	3,240	4,292	-
	17	Sachar Bazar Irrigation Project	FC/I or I	a	5,668	Feasibility Study Only			
	18	Gurmar Haor Irrigation Project	FC/I	c	7,247	5,263	4,858	4,312	810
	19	Sonamoral Haor	FC/I	c	3,725	3,158	2,429	1,620	405
		Cycle 3: Total			59,150	33,927	24,454	21,359	6,074

Annexure I Contd.

Serial Number & Cycle		Name of the Sub-project or Scheme	Objectives	Status of the Project	Area (ha) Gross 00,000	Net 33,333	Flood control 00,000	Irrigation	Drainage
4	20	Raisari-Saidkhati Sub-Project	FC/I	a	5,223	Feasibility Study only			
	21	**Patuakhali Polder 43/2B (S.P.)**	**FC/I**	**c**	**5,466**	**5,247**	**5,247**	**3,036**	**2,024**
	22	Patuakhali Polder 55/2C (S.P.)	FC/I	c	6,275	6,024	3,563	2,429	
	23	Tarail Pachuria Polder-2 (S.P.)	FC/I	o	8,300	5,810	5,810	2,753	1,619
	24	Madhukhali-Baliakandi Irr. Proj.	D/FC/I	o	9,448	8,048	6,480	1,000	1,000
	25	Patuakhali Polder 55/3	FC	o	9,845	7,403	7,403	-	7,403
	26	Patuakhali Polder 55/4	FC	c	5,142	4,288	4,288	-	4,288
	27	Kamarnogaon F.C.D. Project	D/FC	c	5,652	4,409	4,000	-	2,000
	28	Pangsa Irrigation Project	I	o	12,400	8,097	-	8,097	-
	29	Makash Reel Development Scheme	D	a	2,753	Feasibility & Design Only			
	30	Munshiganj-Tongibari	FC/I	a	-	Preliminary Study Only			
	31	Updakhali	FC/D/I	a	8,500	Feasibility & Design Only			
			Cycle 4: Total		99,004	49,326	36,791	17,315	18,334
D-Drainage, FC-Flood Control, I-Irrigation			Project Total		182,726	103,874	69,870	49,284	33,928

Source: Consultancy Completion Report (1990) and BWDB Report (1991).

Note : [1]Status of the project: c = completed
o = ongoing
a = abandoned

Since the undertaking of this status in March 1992, four on-going sub-projects (e.g. Haijda Embankment, Keraniganj Irrigation, Gugrajala Irrigation and Pangsa Irrigation Project) have been completed and thus the number of completed projects has gone up from 15 to 19. At the time of undertaking of the study, Boalkhali Irrigation Sub-project was an on-going one which has recently been discontinued so as to increase the number of discontinued sub-projects from 6 to 7. The remaining 5 sub-projects (e.g. Tangon, Balali Padamsree, Modhukhali-Baliakandi, Patuakhali Polder 55/3 and Tarail Pachuria Polder 2) are now treated as on going.

Location of the Villages Selected for Household Survey and Their Links with Thana Headquarter

Village	Union	Thana	Location and distance of Union Parishad Office from Village (km)	Distance of Thana from Village (km)	Means of Communication of Thana headquater
Project Area					
Moshurikathi	Aukhola	Golachipa	2.4	8.0	A kutcha road of 8.0 km (for walking on foot) connecting the Thana. Communication by engine boat and launch in the river Lohalia.
Boloikathi	Auliapur	Patuakhali	0.8	8.0	Pucca road of 5.0 km connecting the thana/district by rickshaw. communication by engine boat and launch in the river Lohalia.
Uttar Aukhola	Aukhola	Galachipa	4.0	15.2	Communication by engine boat and launch in the river Lohalia.
Control Area					
Purba Auliapur	Auliapur	Patuakhali	0.8	8.85	Pucca road of 5.0 km connecting the thana/district by rickshaw. Communication by engine boat and launch in the river Lohalia.

Source: BIDS/SSISP Village Level Survey, 1992.

Social Infrastructural Facilities Available in the Selected Project Villages and the Control Village

Name of Village	Distance of Primary School (km)	Distance of High School (km)	Distance of College (km)	Distance of the nearest branch of Commercial Bank (km)	Distance of Market (haat) (km)
Project Area					
Moshuri Kathi	0.8	1.6	8.0	8.0	2.4
Boloikathi	0.4	0.4	8.0	3.2	0.8
Uttar Amkhola	within village	4.8	12.8	12.8	1.6
Control Area					
Purba Auliapur	within village	1.6	8.0	8.0	0.5

Source: BIDS/SSISP Village Level Survey, 1992.

Members of Evaluation Study Team for Patuakhali Polder 43/2B Sub-Project

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