

**PERFORMANCE EVALUATION OF SELECTED SMALL SCALE WATER
RESOURCES DEVELOPMENT SECTOR SUB PROJECTS OF LGED IN
SYLHET.**

by

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In partial fulfillment of the requirement for the degree

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MASTER OF ENGINEERING IN WATER RESOURCES

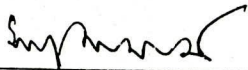


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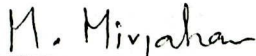
Certification of Project

The project work entitled "PERFORMANCE EVALUATION OF SELECTED SMALL SCALE WATER RESOURCES DEVELOPMENT SECTOR SUB PROJECTS OF LGED IN SYLHET" Submitted by Taposh Kanti Purkaystha, Roll No: 100616029(F), Session: October 2006, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Master of Engineering in Water Resources on September, 2009.



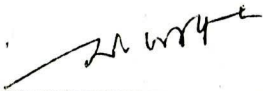
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It is hereby declared that this Project Report or any part of it has not been submitted elsewhere for the award of any degree or diploma.

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Abbreviations and Acronyms

BBS	Bangladesh Bureau of Statistics
BIDS	Bangladesh Institute of Development Studies
BMD	Bangladesh Meteorological Department
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
CADP	Command Area Development Project
CBN	Costs of Basic Needs
CEGIS	Center for Environmental and Geographic Information Services
cumec	cubic meter per second
DTWs	Deep Tube Wells
FEI	Food Energy Intake
GoB	Government of Bangladesh
GDP	Growth Domestic product
ha	Hectare
HIES	Household Income and expenditure Survey
HPI	Human Poverty Index
HYV	High Yield Variety
IFAD	International Fund Agricultural Development
IIMI	International Irrigation Management Institute
IMF	International Monetary Fund
IMP	Irrigation Management Program
IPRSP	Interim Poverty Reduction Strategy Paper
Kg	Kilogram
LLP	Low Lift Pump
M & E	Monitoring & Evaluation
MDGs	Millennium Development Goals
MDIP	Meghna-Dhonagoda Irrigation Project
Mha	Million Hectares
MP	Murate of Potash
MPO	Master Plan Organization
MS	Microsoft

NMIDP	National Minor Irrigation Development Project
NWPo	National Water Policy
O & M	Operation & Maintenance
PWD	Public Works Datum
PPRC	Power and Participation Research Centre
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
SA	Self-Assessment
SP	Sub Project
SPSS	Statistical Package for Social Science
STWs	Shallow Tube Well
Tk./ha	Taka per Hectare
USDA	United States Department of Agriculture
UNDP	United Nations Development programme
UNICEF	United Nations Children's Fund
WARPO	Water Resources Planning Organization
WB	World Bank
WMC	Water Management Corporation
WMCA	Water Management Cooperative Agency
WMG	Water Management Group
WOP	Without Project
WP	With Project

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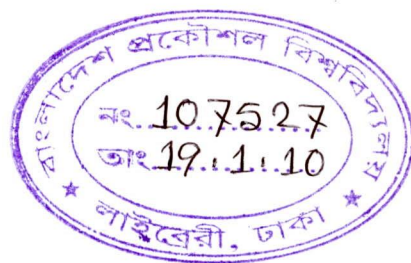
Abstract

The Small Scale Water Resources Development Sector Project (SSWRDSP) aims to ensure sustainable agricultural production in about 190,000 hectares of cultivated land and to alleviate poverty through income generation in the western half area of Bangladesh under Phase-I. Because of improving performances of Phase-I sub projects Phase-II of the SSWRDSP is being implemented in the eastern districts of Bangladesh. The project is under implementation by Local Government Engineering Department (LGED) and is jointly funded by the Asian Development Bank (ADB), International Fund for Agricultural Development (IFAD) and the Government of Netherlands (GON). These schemes are demand driven and are identified by the people based on local water related problem. The scheme planning, design and construction are done in consultation with stakeholders towards achieving sustainable agricultural growth. Beneficiary contribution amounting to 3% of earthworks (dykes and channel re-excavation) and 1.5% for water control structures of the investment costs has been made mandatory. This arrangement has developed sense of ownership among the beneficiary farmers and they are taking responsibility in maintenance for longer-term sustainability of the completed system. This study evaluates five selected SSWRDSP-II sub projects of LGED in the North-Eastern District of Sylhet. Two types of sub project were selected namely, Water Conservation type & Flood Management type. Agricultural, Participatory, Socioeconomic and Environmental performance indicators were used in this study. Irrigation area performance indicator showed 80%, 50% & 60% of target achievement in Boromchara, ChirChirChara & ShialiChara water conservation type sub projects respectively. While flood management performance indicator showed 55% & 46% of the targeted area protected from flash flood in BaghaBeel & DuliaSatbila flood management type sub projects respectively. Production performance indicator reveals considerable increase in production in post project condition(2008) compare to pre project condition(2005) and they are 45%, 193%, 147%, 140% & 40% increase in production for BaghaBeel, BoromChara, ChirChirChara, DuliaSatbila & ShialiChara sub projects respectively. On the other hand, participatory management performance showed poor performance regarding regularity in attendance for the members' of the WMCA. Even though Guideline for Participatory Water Management was followed regarding committee formation but activities of WMCA were not found satisfactory. There was no change

found in land holding pattern for the farmers in the selected sub project areas but moderate change in wage rate & crop land value was found in post project condition (2008). Environmental performance indicators did not showed adverse effect but it will be too early to comment regarding this. O & M responsibility of the sub project was not being handed over to the respective WMCA even though stipulated time has already been over and therefore the main objective of the SSWRDSP was not addressed so far. Eventually micro credit activities run by the WMCA become the main interest of the beneficiaries rather than sustainable O & M. So, long-term sustainability is still unproven, because not much time has elapsed for the O&M arrangement to be properly tested. Majority of the people of Sylhet region are expatriate and that is why they are not dependent on the agricultural production for their livelihood rather remittance plays important role in the local economy. Therefore the overall performance of the selected sub projects in this region is not impressive.

Chapter 1

Introduction



1.1 Background of the Study

Water management is the intervention of human in the manner in which surface and ground water are captured, conveyed, utilized and drained in a certain area. Moreover, it is a process of social interaction between different stakeholders, each employing different methods, resources and strategies, around the issues of water control. This management of water resources may be done through the development of water management systems where participation of all stakeholders is ensured. During the period from April 1996 to December 2002, Local Government Engineering Department (LGED) implemented the Phase-I of the small-scale water resources development project (SSWRDSP- I). The purpose was to rehabilitate and/or upgrade 280 small-scale water control systems, called sub projects, in western part of Bangladesh with much emphasis on people's participation. The sub projects comprised of flood control, drainage improvement, water conservation and command area development projects. The project was implemented with the aims of agricultural development, floodplain fisheries, environmental mitigation measures, stakeholder and beneficiaries' participation, poverty reduction and gender development as core elements. Based on its achievement, the second phase SSWRDSP-II has been under taken for implementation in the period from November 2001 to November 2009.

A large number of evaluations have concluded that the intended benefits from water management systems are not materializing, partly due to institutional weakness. People's participation at all stages of water resources development, is widely believed to be a key requirement, for tackling those institutional weakness. Mukharjee (2004) evaluated the performance of three-selected small-scale water resources development sector sub-project of LGED (Brazamul FCD, Agrani CAD and Gangarampur FCD sub projects) and one medium scale water sector development project (Narayanganj-Narsingdi Irrigation Project) of BWDB. The evaluation focused on hydraulic, agriculture, socio-economic and environmental aspects. The problems encountered in these schemes were: no clear operational instructions, which lead to conflicts between

the technicians and farmers; no equitable water distribution at field level; no cost recovery; no proper conflict handling etc. This study revealed that partial decentralization in LGED schemes helps in sustainable agricultural and overall financial development. Rana (2004) evaluated the participatory water management approach following guidelines for participatory water management (GPWM) systematically in Narayanganj-Narsingdi Irrigation Project (NNIP) and necessary modification was made to this approach with the help of BUET-DUT Project and BWDB as well as various aspects of the research were supervised and monitored. BUET, Bangladesh Institute of Development Studies (BIDS) and delft hydraulics (2003) evaluated the performance of thirty sub-projects of small-scale water resources development sector project Phase-I during the period from April 1996 to December 2002. The evaluation focused on the project framework ensuring sustainable operation & maintenance of small-scale water resources interventions. The study was performed on the basis of different criteria i.e., pre project condition, reconnaissance, appraisal and feasibility, planning and design, construction and quality, operation and maintenance, and general appreciation. The study revealed that, most of the sub projects performance was good and local communities were getting advantages of these projects.

1.2 Justification of the study

The preliminary report of Household Income and Expenditure Survey 2000 (BBS, 2001) expressed that about 44.3% people of Bangladesh live in below the poverty line. In order to eradicate this curse of poverty, Bangladesh prepared the Interim Poverty Reduction Strategy Papers (PRSP) and launched in March 2003 with the assistance of International Monetary Fund (IMF) and the World Bank (WB), which is targeted the national poverty reduction within 2015, accelerating the poverty reduction rate by 3.3% per annum. There is a strong inverse relationship between incidence of rural poverty and percentage of gross area irrigated. Bangladesh has a total land area of 14.39 million hectares (Mha) of which 8.42 Mha are under cultivation. Out of the total cultivable land, only 5.4 Mha (64%) is now under irrigation (Economic Review, 2007). Economy of Bangladesh is dependent on agriculture and it contributes to 16.38% of Gross Domestic Product (GDP), of which

crop sector contributes 72%. The Economic Review (2007) also expressed that the agriculture sector generates 51.69 % of total employment.

The National Strategy for Accelerated Poverty Reduction, drafted by the Planning Commission, stated the importance of effective use of surface water resources for multiple purposes including acquisition of adequate water for reliable irrigation in the dry season. Surface water inflows of the country vary from a maximum of about 140,000 cumec in August to a minimum of about 7,000 cumec in February (BANGLAPEDIA, 2003). Also, surface water is cheaper and easily irrigable and so farmers have definite priority of choice of surface water over ground water for irrigation.

Bangladesh has 3.5 million tons of rice grain shortage per annum in a normal year (BBS, 2005-2006). Aman (also Aus) cultivation in the country is very much vulnerable to damages due to floods, heavy rainfalls, droughts, cyclones, surges, insect attacks, etc. The thrust of the agriculture sector development plan is to accelerate the increase of rice and wheat production based on the dry season cropping aided by irrigation, thus reducing dependence on risk-prone monsoon cropping. Minor irrigation development is therefore seen as the main factor contributing to agricultural growth in the near future (BWDB, 1992). Hence a great deal of attention is needed to increase rice production to attain self-sufficiency in food grains. In this context LGED is implementing small scale water resources development sub projects in our country. In perspective of successful results in phase-I of the SSWRDSP, phase-II is under implementation. It is noteworthy that the phase-I was implemented at the western part of our country where as phase-II is being implemented in the eastern part of our country. Even though the nature of the sub projects is all the same but the geographical characteristics, topography and socio-economy are different in eastern part of the country. Especially north-eastern part of the country is comprised of hilly regions affected by flash floods and having less fertile soil as well. Again no study has been conducted to evaluate the performance of small scale water resources sub projects of phase-II in Sylhet so far. Therefore the performance of these sub projects is in need to be evaluated to measure success or failure of such sub-projects.

1.3 Objectives of the Study

The specific objectives of the present study are:

- I. To evaluate the performance of selected small scale water resources development sector project of Phase-II using selected indicators
- II. To evaluate participatory management of these selected sub projects
- III. To evaluate Operation & Maintenance (O&M) aspects

1.3 Organization of the Project Report

The project report contains six chapters. The organization of the chapters is as follows:

Chapter One: In this chapter, research objective is formulated on the basis of the condition of the study areas. It highlights the research objectives of the present research. Justification of the study is also included in this chapter.

Chapter Two: Chapter two provides an overview of small scale irrigation development in Bangladesh. It brings together various aspects of small scale water resources development sub projects implemented by LGED.

Chapter Three: It discusses in detail the methodology and analytical framework used in the study to identify the performance of selected small scale water resources development sub projects. The chapter also shows the reason behind the methodological considerations employed in the project, and describes the survey design and data collection methods used for the study.

Chapter Four: This chapter presents brief descriptions of the selected study areas. It also describes about the geographical characteristics of the study areas.

Chapter Five: Results and discussions regarding the performance evaluation of the selected sub projects have been discussed in this chapter.

Chapter Six: It concludes with the outcome of the study and also focuses on the recommendations came out of this project work.

2.1.2 National Water Policy (1999)

The goal of the National Water Policy (NWPo) formulated in 1999 is to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people and protection of the natural environment. The broad objectives of the NWPo are to:

- Address issues related to the harnessing and development of all forms of surface water and groundwater and management of these resources in an efficient and equitable manner.
- Ensure the availability of water to all elements of society including the poor and the underprivileged, and to take into account the particular needs of women and children.
- Bring institutional changes that will help decentralize the management of water resources and enhance the role of women in water management.
- Develop a legal and regulatory environment that will help the process of decentralization, and sound environmental management, and will improve the investment climate for the private sector in water development and management.
- Develop a state of knowledge and capability that will enable the country to design future water resources management plans by itself with economic efficiency, gender equality, social justice and environmental awareness to facilitate achievement of the water management objectives through broad public participation.

2.1.3 National Environment Policy (1992)

The National Environment Policy concerns in the water sector are broadly similar to those of the fisheries policy. The policy also highlights the need to maintain ecological balance and overall development through protection and improvement of the environment and protect the country against natural disasters. It seeks to identify and regulate activities that pollute and degrade the environment to ensure environmentally sound development in all sectors. The policy addresses 15 sectors in all, in addition to providing directives on the legal framework and institutional

Chapter 2

Literature Review

2.1 National Water Policies

The national policies of water sector are mainly the Fifth Five Year Plan (1996-97 to 2001-02), National Water Policy (1999) and other policies relevant to water environmental management are National Policy for Safe Water Supply and Sanitation (1998), National Agricultural Policy (1999), National Forestry Policy (1994), National Fisheries Policy (1998), National Environment Policy (1992), National Energy Policy (1996), Industrial Policy (1999), etc. The water environmental policies are summarized below.

2.1.1 Five Year Plan (1996-97 to 2001-02)

The Fifth Five Year Plan (1996-97 to 2001-02) encapsulates the Government's current policy, strategy and plan for the country's future development. The Plan has several general objectives, of which the following are most relevant to water resources and environmental planning and management:

- Improvement in the quality of life of the rural population through mobilization of the rural masses and resources at their command as well as channeling increased volume of invisible resources to rural economy so as to attain an accelerated growth in rural employment and income.
- Transformation of the rural socio-economic structure into a more equitable, just and productive one and empowerment of the rural poor by ensuring their increased access to resources.
- Protection and preservation of environment by putting in place adequate regulatory regimes and effective institutions, keeping in view the need for regeneration, recycling and optimum exploitation of natural resources consistent with sustainable development.

arrangements. Environmental audit of existing flood control and drainage projects on an emergency basis is advocated along with steps to modify these projects as necessary.

2.1.4 National Water Management Plan (NWMP)

The Water Resources Planning Organization (WARPO), which was formed in 1992. A National Water Policy (NWP) was prepared after extensive discussion and was approved in 1999 by National Water Resources Council (NWRC). WARPO prepared the National Water Management Plan (2001) and was adopted by the Government in March 2004. The NWMP has identified six main objectives for water sector planning: economic development, poverty alleviation, food security, public health and safety, improved standard of living for the people and protection of the natural environment. The NWMP is a framework, spanning 25 years through which various organizations related to water, will be implementing various programs and projects. The plan consists of 84 programs that are grouped into 8 sub-sectoral clusters, spatially distributed across 8 planning regions of the country. Implementations of the 84 programs are focused on pro-poor growth, food security and poverty reduction in line with national MDG.

2.1.5 Institutional Arrangements for Water Environmental Planning and Management

The institutional arrangement plays a key role for the water environmental planning and management. Table 2.1 shows the water sector activities and responsible institutions for water resources management.

Table 2.1: Water sector activities and responsible institutions (World Bank, 1998).

Activity	Institution	Responsibility
Producing national, sectoral, strategies and plans	WARPO	National water planning, regional planning, basin planning, inter-sectoral coordination, administration of water rights, regulation, monitoring
Review and approval of inter-sectoral schemes	WARPO	Coordinating plans developed by different water use agencies, inter-sectoral balancing and prioritizing needs.
Monitoring and regulating water regime	WARPO	Monitoring implementation of NWMP, monitoring changes in WRS
Project planning and feasibility studies	BWDB, LGED, DOF, MOA, BIWTA, DPHE, Municipalities	Developing projects within the context of the national water plan and of agricultural, industrial, municipal, and social demands, etc.
Operations and maintenance	BWDB, LGED, and farmer	BWDB responsible for operation and management of major structures; LGED and farmer
	organizations	organizations take over intermediate facilities
	BWDB	Flood control, drainage, and irrigation
	BIWTA	Maintaining river channels for navigation
	BWDB	Erosion control
	Ministry of Land	Leasing open- and closed – water fisheries, regulated use of subsoil resources
	WASA	Supplying drinking water to cities
	Municipalities	Supplying drinking water to small towns

2.1.6 Existing Water Environmental Regulations

The existing Bangladesh legislation of possible relevance to water use and regulation started from 1876 with the irrigation act by Bangladesh Water Development Board (BWDB) which concerns various aspects of irrigation development. This set of legislation does not provide for the comprehensive regulation of water use. The 1972 Bangladesh Water and Power Development Boards Order assign control of all surface water and groundwater to BWDB. In 1985, Ministry of Local Government and Rural Development Cooperative developed Ground Water Management Ordinance to assigns power to control irrigation tube well installation to the Thana Irrigation Committees. In 1995, Ministry of Environment and Forest (MoEF) issued Environment Conservation Act for development of a comprehensive legislative framework for protecting the environment. Dhaka Water Supply and Sewerage Authority adopted Water Supply and Sewerage Authority Act in 1996 for the construction, development, extension, preservation and guidance of water supply and sewerage system to facilitate healthy environment. In 1997 MoEF pass the ordinance on Environment Conservation Rules which contain wastewater effluent standards for industries and selected surface water uses. In 2000, Department of Environment (DoE) introduced Environment Court Act.

2.1.7 Directions of Change in Institutional Arrangements and Functions

The Government of Bangladesh, in the NWPo, has stated its intent to decentralize management and promote private sector participation in water environmental sectors planning and management. Most organizations in Bangladesh involved in the water environmental sectors will need to adapt to this policy. The new BWDB Act sets the scene to promote transparency and good governance within this major organization. Under the NWPo, WARPO has a responsibility to advise and assist other agencies. This function is expected to continue on a periodic basis.

In order to preserve the environment, DoE is charged with supporting environmental protection, restoration and enhancement measures consistent with the National Environmental Management Action Plan (NEMAP) and the NWMP and adhering to a formal EIA process, as set out in guidelines and manuals for water sector projects. DoE intends to have offices at District level and above.

2.1.8 Participatory Water Management & Gender Mainstreaming

Much effort has been expended over the last decade to establish water user groups. BWDB has experimented with those formed within FCD areas based on drainage blocks or chawks. LGED has also used the co-operative model in its small-scale water resources development project. DPHE has formed Water and Sanitation (WATSAN) committees as part of its rural water supply programme. The Barind Multipurpose Development Project, initially related to irrigation from deep tube wells, has also formed user groups. These models have met with mixed success and can all be characterized by being project-led rather than demand-driven. The WATSAN programmes for drinking water supply and sanitation represent an attempt to involve women in water supply and sanitation by providing technical skills training for women on sinking tube wells, low cost sanitary latrines and taking care of tubewells. Rural Development projects supported by the World Food Programme (WFP) have a special concern for involvement of women in activities related to the water sector. The Asian Development Bank (ADB) has similarly advocated the adoption of gender-balanced project design and impact assessment. To reduce gender disparities, ADB is stressing gender-sensitivity and gender analysis in a framework for impact assessment, planning and target setting. The ADB-funded LGED Small Scale Water Resources Development Project has recently adopted a Gender Action Plan which requires women to be present in separate but concurrent planning meetings, to be represented on managerial committees, and to receive wage equity on project works.

2.2 Small Scale Water Resources Development Projects in Bangladesh

In September 1995, a loan amounting to \$32 million was approved to finance the Small-Scale Water Resources Development Sector Project, whose expected outcome was a sustainable increase in agricultural production and income for smallholder farms in the subproject areas. These areas are located in western Bangladesh (where the standard of living was much lower than that in the eastern half).

This outcome was to be achieved through the Project's three components:

Part A: Beneficiary Participation and Water Management Association Development,

Part B: Development of Small-Scale Water Control Systems, and

Part C: Institutional Support for Small-Scale Water Resources Development.

An advisory technical assistance (TA) for Beneficiary Participation and Project Management provided by the Government of Netherlands was administered by ADB. The TA was expected to help the Local Government Engineering Department (LGED), the Executing Agency, implement the Project with beneficiary participation in the subprojects and to build the capacity of LGED staff and water management cooperative associations. In addition to the Government of Netherlands, the International Fund for Agricultural Development co-financed the Project.

The Project was rated successful. It was highly relevant at the time of appraisal and evaluation to the Government's and ADB's objectives and strategies, effective in achieving its objective of increasing agricultural production in the subproject areas, and efficient in terms of resource utilization.

An important result of the Project was the institutionalization of beneficiary participation in small-scale water projects. The process was successful, as it was able to assist LGED in completing 273 subprojects, 267 of which have been turned over to their respective water management cooperative associations. More importantly, the TA developed a process for beneficiary participation, which LGED has adopted as an integral part of the subproject cycle.

The National Water Policy has emphasized the establishment of stakeholders' participation for ensuring direct input from people at all levels. Lack of stakeholders' participation is considered as one of the most important factors for inefficient output. Hence, to improve the performance of Flood control, Drainage and Irrigation (FCDI) projects, beneficiaries should share the responsibilities of O&M and it is essential to have their direct participation right from the project planning and/or rehabilitation stage (World Bank, 1987). An assessment of past performances of water sector projects is presented in Table 2.2.

Table 2.2: Assessment of past performance of water sector projects and interventions

Project type	Performance/Impact (I)				Relative GoB	Ease of implementation and management
	Technical	Social	Environmental	Economic		
Rural FCD						
Inland embankments and polders	M	L	L	L	H	M
Coastal embankments and polders	M	M	L	M	H	
Compartmentalization Pilot Project	M	L	M	L	H	L
Small-scale FCD	H	M	L	H	L	M
River training and bank protection	M	H	M	M	H	M
Urban FCD	H	H	M	H	M	M
Small-scale Irrigation						
Barind DTWs	H	H	M	M	L	M
Rubber Dams	H	M	L	M	L	M
Khal Re-excavation	M	M	H	M	L	L
Large-scale Irrigation						
Primary pumping	L/M	M	M	L	H	M
Gravity supply	M	M	M	L	M	M
Flood Proofing						
Structural	H	H	H	H	L	M
Non-structural	H	-	-	-	M	M

(Source :NWMP,2001)

Note: (1) L = Low performance/Negative Impact, M= Medium Performance/Neutral Impact.

H = High Performance/Positive Impact Two letters together (e.g. M/I I indicates a high degree of variability in performance.

(2) Taking account of the degree of recovery of O & M costs from beneficiaries

(3) Net benefits are higher where there is little STW irrigation potential.

It is stated that large and medium scale FCD project performance varies from medium success to failure. It is due to poor economic returns, complexity of Operation and management and uncertainties regarding the beneficiaries' willingness to accept full responsibility for O&M. Moreover, they have several major negative impacts, such as the loss of fisheries, navigation and soil fertility, and the exacerbation of drainage problems.

While the small-scale projects of LGED appear to be more attractive and sustainable than large-scale projects. Apart from its low costs, it has the merit of being highly participatory, with beneficiaries' ability to take over the O&M fully. But long-term sustainability is still unproven,

because not much time has elapsed for the O&M arrangement to be properly tested.

As mentioned earlier that LGED is the authorized for implementing and maintenance the small-scale projects in Bangladesh. Currently, LGED develops water bodies/areas up to 1000 ha as subprojects under the 'Small Scale Water Resources Development Sector Project (SSWRDSP)'. The aims of this Project include sustainable agricultural growth and poverty alleviation by developing water resources, with main emphasis on people's participation.

The SSWRDS Project of the first phase commenced in 1995 -96 and originally it extended over the 37 districts of the western half of Bangladesh. 280 subprojects have been completed with a total benefited area of about 165,000 ha. In 2002 the Project extended, as a Second Small Scale Water Resources Development Sector Project (SSWRDSP-2), to include the eastern half of Bangladesh. About 300 subprojects improving agriculture over an aggregate 190,000 ha benefited area will be implemented under the SSWRDSP-2 (LGED, 2002).

2.2.1 Sub-project Development Process Components of SSWRDSP Sub-projects

The project activities are grouped into two components: Participatory Water Resources Development and Institutional Strengthening of the Small-Scale Water Resources Sector.

Participatory approach to Sub-project development:

In support of participatory development of the anticipated 300 subproject, the Project utilizes a process of selection, appraisal, and design involving area stakeholders throughout its implementation. To this effect, Water Management Cooperative Associations (WMCAs) are being established and provided with substantial institutional support for 3.5 years before and during construction. Extensive training is provided for mobilizing beneficiaries to participate in subproject selection, planning, implementation and O&M.

The following activities are carried out to ensure participation of the stakeholders in the subproject development process:

- Subprojects are identified by Union Parishads
- Social feasibility is checked by independent Participatory Rural Appraisal (PRA)
- Peoples' participation is institutionalized in Water Management Cooperative Associations (WMCAs)

- Close interaction between technical designers and WMCAs WMCA observes construction.
- WMCA is fully responsible for O&M of the subproject.
- WMCA monitors and evaluates activities which results in future developments.

Institutional strengthens for Small Scale Water Resources Development

Institutional strengthening is to enhance the capacity of concerned organizations to effectively participate in small-scale water resources development. This program includes (i) the advisory services of and international consulting firms in association with national firms, and (ii) training of organizations (other than WMCAs) involved in the Project's implementation.

Co-ordination with other agencies

SSWRDSP has mobilized several agencies, which provide support to subproject beneficiaries. These includes: Department of Agriculture Extension (DAE), Bangladesh Agricultural Development Corporation (BADC) under the Ministry of Agriculture, Department of Fisheries (DoF) under the Ministry of Livestock and Fishery, Department of Cooperative (DoC) under the Ministry of Local Government, Rural Development and Cooperatives, Forest Department (FD), Department of Environment (DoE), Bangladesh Rural Development Board (BRDB), Department of Livestock Services (DLS), Ministry of Land (MoL), Ministry of Women & Children Affairs (MoWCA), etc. The role of these agencies in relation to water sector interventions is to deliver services in their respective field of activity within the participatory framework set out in these guidelines. To legalize the support of these agencies, LGED entered into agreements with each agency through Memorandum of Understanding (MOU). In addition, it is recognized that there is need for close cooperation and coordination of the works with the Bangladesh Water Development Board (BWDB) since they are the major agency for implementing the water management interventions.

2.2.2 Subproject Development Cycle

Each subproject has three distinct stages:

- Identification and feasibility
- Design and Institutional establishment
- Construction and first year operation and maintenance

Identification and Feasibility

According with the LGED procedures, the local people first identify a potential subproject by recognizing water related problem(s) in their area. With identified possible solutions, they approach their elected representatives at grassroots level, the Union Parishad members with request for subproject. The Upazila Engineer (UE) would present the proposed subproject to the Upazila Development Coordination Committee (UDCC). Following the approval of UDCC, UE would cater the sub-project in the Upazila Plan Book and forward the same to the Executive Engineer (XEN). The XEN would review the proposal and forward it to Project Management Office (PMO).

All Union Parishads and many local NGOs have also been briefed on the Project and instructed to encourage their target groups to take the opportunity offered by the SSWRDSP. After it is proposed to LGED via the Union Parishad, and Upazila Engineer, LGED develops a technical and socio-economic information base and starts developing the subproject. As part of the subproject proposal processing, the LGED Project staff assesses/pre-screened the technical feasibilities of the proposed subproject undertaking reconnaissance visits. Where the outcome of the field reconnaissance was positive, the proposed sub-project was assigned to a Participatory Rural Appraisal (PRA) team. PRA methodology is used to determine its social and environmental feasibility with the following objectives:

- To determine if there is broad -based support for the proposed sub-project.
- To determine if there is opposition and, if so, to quantify the extent of opposition.
- To assess the willingness of potential beneficiaries to organize themselves into a Water Management Association and to take responsibility for O&M.

Proposed subprojects that pass all the feasibility tests are basically declared feasible and sent to the District Level Inter-Agency Project Evaluation Committee (DLIPEC) for discussion, approval and inclusion in District Work Plan.

Design and Institutional establishment

After the Project Management Office of LGED approves the proposed subproject, a parallel process of detailed designs and institutionalization of people's participation start. The infrastructure design by the feasibility consultant is preceded by field data collection and analysis. In both, the engineering analysis and detail design the consultants use the existing computer based software and the LGED Design Catalogue.

The subproject institutional development is accomplished through organizing various local stakeholders under a Water Management Cooperative Association (WMCA), within the legal framework of the Co-

operatives Act. The first step in this process is fielding the NGO facilitator. His involvement is for the duration of the subproject implementation cycle during which he works closely with the Upazila based LGED Community Organized (CO). The facilitator's main task is to assist the subproject population in all phases of the subproject. His brief is "to be on the side of the people".

At district level, the SSWRDSP employs a Socio-Economist, who assists the LGED staff in responding appropriately to the active involvement of all stakeholders. The Socio-Economist also assists the WMCA in getting registered with the Co-operative Department, and helps them to establish contacts with other Upazila level GOB staff (agriculture, fisheries, social welfare, women affairs etc.). A district level Assistant Engineer, a Surveyor and a Draftsman assists the regular LGED staff in all technical matters.

The facilitator's first task is to start a broad information campaign at village level. Following that he makes a total inventory of all households inside the subproject area and those living outside it, but project-affected. In the process he identifies existing stakeholders groups and respected local leaders. From among the latter, a small number of men and women are asked to form a "Bylaw drafting Committee". When they have completed the draft bylaws, they are transferred into a "First Management Committee" by adding representatives of farmers, fishermen, landless and women.

The First Managing Committee is involved in a variety of institutional activities such as:

- Formation of village or occupation based groups
- Membership enrolment
- Conflict mediation and resolution
- Formation of the Water Management Cooperative Association (WMCA)
- Applying for registration of the WMCA
- Preparing the WMCA's first annual general meeting

The main aim of these institutional activities is to create a strong and broad-based water management organization. It is the platform for all decisions on the management of water resources. This includes resolving the inevitable conflicts of interest between the various stakeholders.

Shortly after the first management committee is operational, the design engineers present a draft of the subproject concept and preliminary designs for review by the first management committee. Based on the outcome of the discussions with the stakeholders, the designer makes the necessary adjustments, if necessary, and includes possible mitigation measures in a "draft final design". The "draft final design" is presented for discussion and approval at the first annual general meeting of the WMCA.

It is at this general meeting that all the WMCA members have the final say in whether or not the subproject should go ahead as designed. To ensure sustainability a near unanimous acceptance of the design is needed. After the first Annual General meeting at which the WMCA has accepted the design, and when the first elected Managing Committee is in place, a formal agreement is signed between LGED and the WMCA for implementation of the subproject. This agreement includes the agreed design drawings as well as the responsibilities and rights of both parties.

In the first phase of the SSWRDSP the role of Local Government Institutions has been limited to subproject identification and conflict resolution. Since the start of the SSWRDSP-2, the government has issued new instructions to the Union Parishad on its role in development activities, including water. As a result, the

Union Parishad will be given an advisory status towards WMCAs. The project is now arranging trainings for Union Parishad members regarding participatory water management issues and their involvement in subprojects is likely to grow in the years to come.

Construction and First Year Operation and Maintenance

During the construction and first year's operation and maintenance stage, the parallel technical and institutional processes continue. ,

People's participation in this stage is mainly in three areas:

- (1) Contributing the required "beneficiary contribution"
- (2) Ensuring right of access of the contractor to all building sites, and
- (3) Observing the construction work.

The beneficiary contribution is a crucial part of the SSWRDSP methodology to ensure subproject sustainability. Therefore, after signing the Implementation Agreement and before tendering is started, the WMA has to collect the first year O&M contribution. This contribution is designed to test the commitment of the direct beneficiaries of the subproject, which in most cases are farmers and fishermen. It is calculated to be equivalent to the cost of operating and maintaining the infrastructure for a year (3% of earthwork and 1.5% of structures cost) (SSWRDSP, 1998).

The WMCA is involved in observing construction. The implementation Agreement includes detailed procedures, which allow only the Upazila Engineer to issue instruction to the contractor. The WMCA and Union Parishad members have the right to lodge written complaints to LGED. To ensure their independence, the WMCA managing committee members cannot work as contractors in any of the construction works under the subproject.

To channel project benefits to the landless, much of the earth moving work is done by Labor Contracting Societies (LCS). Their members are trained by the project retained NGOs. Destitute women and Widows are given preference in joining the LCS.

After the construction work is completed and the contractor's liability period is over, LGED assists the WMCA for at least one season and up to a full year in operating and maintaining subprojects. During this period LGED has to prove that the infrastructure delivers the promised results. After that year, the WMCA formally leases the subproject infrastructure from LGED.

During the first and subsequent years of operation the WMCA is likely to spend a considerable time resolving conflicts of interests between various stakeholders. If the WMA is not able to resolve a conflict it would invite others to mediate. Normally this would start with the Union Parishad Chairman, then the Upazila Engineer and in extreme cases the LGED District Executive Engineer.

Depending on the complexity of the subproject, the construction and first year O&M may last between two and three years. After taking over the subproject, all aspects of operation and maintenance become the sole responsibility of the WMCA.

The Sub project O&M includes

- Preparation and updating annually operation plan and budget “Preparation and updating maintenance plan and budget “Preparation and updating fund collection plan
- Establishing systems for monitoring, evaluation and follow-up action.

The beneficiaries are responsible for conducting operation and maintenance and for 100% of its cost. Normally, the necessary local resources will be collected from the direct beneficiaries in proportion to the benefit they receive. In addition joint activities such as tree plantation, fisheries activities and poultry farming may generate resources for the O&M. Destitute women are given preference when it comes to preventative maintenance work on embankments.

Once the subproject is operational the people in the area are likely to change their agricultural practices, fisheries and other production systems to make the most of the new environment. The project assists the people in linking up with other government and non-government resources that will facilitate these changes. For that reason a number of memorandums of understanding have been signed between LGED and other agencies.

2.2.3 Sub Project Management System

Water Management Co-operative Association Management

WMCAs have been formed in all 280 subprojects (SSWRDSP, 2002). These are legal bodies that are registered under the cooperative law and self managed through a Managing Committee that operates in accordance with a set of bylaws prepared by a Bylaw Drafting Committee and ratified by the WMCA General Membership. Sound management of the WMCA by the Management Committee is of critical importance to ensure the participation of the beneficiaries and ultimately to achieve the goals of the investment.

To promote sound management, each WMCA Management committee, through an initial orientation course, is instructed to undertake the following:

- Establish a physical location that will become the office where meetings can be held, where day-to-day cooperative business can be carried out, and where records and documents kept available for general access.
- Appoint at least one staff person as a manager to maintain records and undertake other tasks on behalf of the WMCA management committee. Usually this individual is paid a normal salary or allowance by the WMCA.
- Conduct weekly membership meetings, the primary focus of which is to increase membership and mobilize capital.
- Conduct monthly management committee meetings business of the cooperative.

- Conduct elections within the time frame stipulated by the cooperative law.
- Organize meaningful economic/business activities for the membership.

In addition, the management committees are systematically being provided with in-depth training by the cooperative department, which is designed to provide them with additional skills to assist them in fulfilling their roles.

2.2.4 The Cooperative Institutional Framework

The Cooperative Institutional Framework was selected during Project Appraisal to accommodate the perceived need to have a registered organization that could collect funds, operate bank accounts and be subject to external audit. In the course of implementing this, a number of concerns were raised. The most serious of these are (i) that the cooperative structure is unnecessarily complicated for a water management organization, and (ii) that the multipurpose cooperatives dilute the focus on operation and maintenance (LGED, 2000).

The project goals are to ensure sustainable agricultural growth as well as poverty reduction. With the inclusion of the poverty agenda, it becomes necessary to promote heterogeneous membership in the cooperative and, by extension the cooperatives need to address the needs of clientele beyond beneficiary farmers. Membership in a cooperative association is open to any adult member from within the geographical boundary of a subproject that wishes to join the association. The expenses of the SSWRDSP to large extent accepted the cooperative as a credible institution for water management and poverty alleviation together at the local stakeholder level.

2.2.5 Operation and Maintenance of Small-Scale Project

It is assumed that small-scale water resource programs are simple, so no major inputs are required for their implementation and O&M. Depending on foundation, hydrologic and hydraulic conditions, planning, design and implementation of even a very small structure may pose great difficulties. In addition, on the social side, in water resources projects there are conflicts among the users of lands at various elevations, between fishers and farmers, between navigation and water conservation, which make the assessment of surface water projects, complicated. Because of its complicated nature stakeholder participation is essential for developing and maintaining different type surface water subprojects. In-depth training and on-the-job experience is required to develop capability for planning, design, implementation and O&M of subprojects, which would be acceptable to the stakeholders. After implementation the subproject,

LGED transfers the ownership of the subproject to the WMCA, which, from now on, is responsible for the entire infrastructure within the subproject area. WMCA prepares O&M Plans, Agricultural Plans, Fisheries Plans, and Resource Mobilization Plan etc.

If the local stakeholders face any problem, first they would try to solve it by consulting their WMCA members. If WMCA members cannot solve the problem, they would inform the LGI associating with the Executive Committee members of WMCA and finally the LGED

2.2.6 Legal Framework of Water Management Co-operative Association

In SSWRDSP subproject, Water Management Co-operative Association (WMCA) means a co-operative society which is formed to accommodate the project goals and to improved the socio economic & institutional conditions of its member by way of providing various facilities and services and the members of which are beneficiaries of a subproject. Sound management of the WMCA by the management committee is of critical importance to ensure the participation of the beneficiaries and ultimately to achieve the goals.

Registration of water management organization is performed framework of the Cooperative Societies Ordinance, 2001 and the Cooperative Societies Rules, 2004 as amended from time to time. The registration of an organization gives them the power to hold property, to enter into contracts to institute and defend suits and other legal proceedings and to do all things necessary for the purposes for which it was constituted. So the organization registered will dictate them to form managing committee (already stated above) constituted in accordance with the Cooperative Societies Ordinance, Rules and the bye-laws to be framed there under. This system of registration will prevail till the government frame separate rules for registration of the water management organization for PWM. The terms and conditions of the sample agreements for ownership transfer, taking over of management, private management through leasing management contract under competitive bidding procedure or joint management for projects schemes of different sizes are also given in GPWM (2000).

There are some conditions which should be abided by the WMCA members. They are as follows,

- Regular weekly meeting should be arranged by the WMCA and spontaneous attendance should be ensured.
- Regular share and savings should be collected and receipt should be preserved.
- WMCA committee should be elected by the members through vote.
- WMCA member pass book should be up to date.
- Women's participation should be emphasized in WMCA activities.
- Borrowers should repay their loan in time.
- Trained member should convey his training to others.
- Operation & Maintenance fund should be comprised of all members' contribution.
- Every year the structure should be visited by the members' prior and post rainy season. They should also help the O&M sub committee to prepare maintenance budget.
- Members' should actively participate in operation & maintenance.

Some related literatures regarding performance evaluation of small and medium scale irrigation projects being studied under the department of Water Resources Engineering of Bangladesh University of Engineering & Technology (BUET) are reviewed in the following section.

Ahmed (1987) evaluated the performance of Chandpur Irrigation Project (CIP) of BWDB in the Chandpur district on agriculture sectors (cropping pattern, cropping intensity, crop yield and production, agriculture inputs use, population and food balance, impact on fisheries) and socio-environmental aspects (employment opportunities, transportation and navigation, water logging and drainage problem, water hyacinth problem, cooperatives and credits). The study revealed that radical positive change in cropping pattern has taken place in CIP. The cropping intensity has also jumped from 160-170% in pre-project stage to 225% after project implementation. Yields for individual crops have also increased (for T. Aman HYV, yield increased 64.6%). Consequently the total production of rice and others crops has increased significantly. Employment opportunity has increased in agricultural sector, but the project has also reduced the seasonal under-employment, which was a chronic problem in other flood prone areas. Direct benefits were also obvious in case of road transport. Fish production from the open water resources declined 35%. The impact of CIP on fisheries was a glaring example of the ecological consequences of water development projects in Bangladesh. But at the same time it showed how successfully the adverse impacts were overcome by taking proper remedial measures.

Azad (1990) performed a study on three small scale flood control, drainage and irrigation projects to evaluate their performance. Comparison to crop yield, cropped area, cropping intensity, land use pattern, income distribution and labor force by occupation in pre project and post project conditions. The technical and management problems in proper O & M of the projects were also identified through field observation and questionnaire survey. Study revealed problems in operation and maintenance aspects and proposed a better management system.

Das (1992) studied the impact of improved water distribution system of selected deep tube well irrigation schemes. A field study was conducted during the dry seasons of 1988-89 to 1992 to evaluate the impact of improved water distribution the result showed that the conveyance losses varied with the water charge method. The average area irrigated per unit of water supplied for deep tube wells with improved distribution system was found to be about eleven percent higher than that for deep tubewell with traditional distribution system.

Raquib (1999) studied the performance evaluation of rubber dam projects of Bangladesh. Igaon & Bakhali rubber dam projects of Cox's Bazar districts were selected as study area. Aspects of evaluation were engineering, agricultural, environmental and organizational. Engineering aspects involved identification of construction, operation and maintenance,. Agricultural aspects involved impacts on irrigated area, cropping intensity and yield. While environmental aspects involved impact on fisheries, drought, water logging, ground water table and boat communication. The study proposed better management in operation and maintenance and no adverse impact was found due to these projects.

BUET, BIDS and WL/delft hydraulics (2003) evaluated the performance of thirty sub-projects of Small-Scale Water Resources Development Sector Project Phase I (SSW-I) during the period from April 1996 to December 2002. The Local Government Engineering Department (LGED) implemented these projects. Selected 30 sub-projects (randomly) located in the western half of Bangladesh. The performance of these projects was evaluated from the viewpoints of technical, social-economic, institutional and environmental aspects. The evaluation focused on the project framework ensuring sustainable operation and maintenance (O&M) of small-scale water resources interventions, with special reference to the (i) institutional setup through Water Management Co-operative Associations (WMCAs) (ii) quality of the infrastructure and its social acceptability (iii) poverty reduction issues (iv) institutional strengthening of LGED and other agencies involved. Distinction was made between the number of projects scoring more than 70%, regarded as good, the number of projects score between 50% and 70%, requiring continuous supports and

attention, and the number of projects with a score below 50% considered as insufficient. It was found that about 47% of the sampled sub-projects showed a good score on technical issues and 17% score below the expected acceptable standard. For the remaining criteria only one out of the thirty projects reach a good score. The valuation of the socio-economic output was highly dependent on the perception of the respondents to the questionnaires in the field. The valuation of these sub-criteria therefore were made based on theoretical relations between the direct socio-economic outcomes such as agriculture, fisheries and employment and the expected distribution of such benefits between the poor and landless people and women. When considering the institutional criteria only one of the thirty sub-projects qualifies with a score above 70%, and about 20% of the sub-projects rank with a score above 60%. For the improvement of project performance the study recommended that (i) enhance involvement and participation of beneficiaries and stakeholders, (ii) focus on enhancement of the Water Management Unit's capacity and capability for identification, formulation, data: collection, appraisal preparation, design, construction and supervision of small-scale water resources schemes; (iii) more attention to the identification and determination of the expected socio-economic outcome of the sub-project, including a through baseline survey and study; (iv) specify measures should be taken to ensure that poor people, small fanners and destitute women get benefit from the sub-projects. Mukherjee (2004) evaluated the performance of three-selected small scale water resources development sector sub-project of LGED (Brazamul FCD, Agrani CAD and Gangarampur FCD sub-projects) and one medium scale water sector development project. (Narayanganj-Narsingdi Irrigation Project) of BWDB. The evaluation focused on hydraulic, agriculture, socio-economic and environmental aspects. The problems encountered in these schemes were no clear operational instruction, which lead to conflicts between the technicians and the farmers; No equitable water distribution at field level; no cost recovery; no proper conflict-handling etc. and improper system maintenance and lack of beneficiary participation was found, which was the main reason behind the lesser success of the water schemes.

This study also revealed that partial decentralization in LGED schemes helps in sustainable agricultural and overall financial development, but almost in every case the rate of farmer's involvement or beneficiary participation in system management was found not satisfactory. This study recommended that the performance of existing FCDI projects can be improved significantly by enabling increased people's participation in local level and by developing a suitable management approach that will have a strong institutional setting. In Bangladesh it is a prime need to develop water management system through participatory approach especially in case of

irrigation, drainage and flood control systems.

Rana (2004) evaluated the Participatory Water Management Approach (PWMA) following GPWM systematically in Narayanganj-Narsingdi Irrigation Project (NNIP) and necessary modification was made to this approach with the help of BUET-DUT Project and BWDB. For better performance of the PWM intervention work, various aspects of the research were supervised and monitored. Check list and questionnaires were prepared for systematic recording of the information. Coordination were maintained both for (i) functional activities of various institutions and (ii) various components of intervention work to ensure better performance through improve participatory water management. The impact of the applied PWM intervention work in NNIP was evaluated in terms of parameters chosen as indicators of the project's goals and achievement. Technical, Institutional, Agricultural, Socio-economic, Financial and economical all aspects were considered for performing the impact assessment. The evaluation involved comparison of the values of the indicators for pre and post intervention conditions. The intervention work in NNIP produced significant positive results in terms of crop productivity, agricultural returns, household income, supply and distribution of irrigation water and farmers willingness to participate in operation and maintenance of the project. Hydraulic I assessment shows that overall reliability of the canal systems has been improved and the average relative water supply at agricultural plot was higher compare pre intervention condition. Another most positive aspect of the intervention work in NNIP was that the coverage of irrigated area was increased significantly which was from 64.29% to 90.55% resulting irrigation systems performance better. But in institutional improvement, limited success has been achieved. Though all WMGs and one WMA were formed in NNIP area, their activities in all cases were not remarkable. Still lack of linkage with BWDB project level authority and also be late for service charge collection. Considering all those aspect, a modified PWM framework has been proposed for NNIP in this study which may result better system management and the beneficiaries could reach remarkable success from this project in future.

Rahman (2005) studied the impact evaluation of command area development in Meghna-Dhonagoda irrigation project. Field investigation was performed to evaluate the impact of command area development program in Meghna Dhongoda project considering the hydraulic, agricultural, socio-economic, environmental and institutional aspects. For the hydraulic, agricultural, socio-economic, environmental and institutional aspects, the impacts of CADP on MDIP were assessed comparing value

of selected indicators for pre and post CADP situations. The hydraulic indicators were used to compare the relative water supply (RWS) and water level for some selected canals with pre (1995) and post (2003) CADP situation. The agricultural indicator directly reflects irrigated agricultural system. Performance indicators of year wise irrigated area, cropping intensity, yield & production has been used as agricultural indicators. The socio economic indicator used in this study includes fee collection performance and financial self-sufficiency and this relates to long term impacts of agricultural strategies. Water quality, natural vegetation and fish have been considered as parameters for assessing the environmental impacts. The result of the evaluation study revealed that RWS to the field and water level in irrigation canals in post CADP situation was higher than pre CADP and the actual water level was very close to full supply level. This means that overall reliability of the canal system has been improved after CADP in MDIP. Yield of Boro (Hyv) increased due to the impact of the project. After the CADP in MDIP, irrigation fee collection was started from 2001-2002 and it was quite insignificant. Therefore depending on fee collection operation and maintenance was not possible to make it self sustaining. Environmental indicator showed no remarkable change in water quality and natural vegetation after CADP in MDIP, but fish production has increased by two times as compared to the bench mark year. From the institutional aspects, the result of the evaluation study revealed that though all selected water management groups were registered their activities are not satisfactory. Even all farmers of the command area are not member of water management groups.

Bhuiyan et al. (2006) evaluated the PWM application by the LGED in SSWRDSP and other BWDB in large-scale FCDI projects. As such an attempt has been made to I evaluate 4 small-scale projects of LGED and 3 large-scale projects of BWDB externally through a set of questionnaire survey, extensive field visit and group discussion. Subsequently this research is designed to evolve a suitable operation and maintenance (O&M) management practice for BWDB existing projects in particular and other similar existing projects in general, in line with government policy and guidelines. As such the findings obtained with pilot and external/field evaluations are in use to workout the above stated water management practice. At NNIP, a two-tier water management organization (WMO) comprising 40 Water Management Groups (WMGs) at the lowest tertiary canal level and one Water Management Association (WMA) as an apex body of the local stakeholders has been institutionalized since 2003-04 in order to assume the everyday water management of the project from the BWDB. Three aims have been identified for the establishment of PWM approach: to ensure beneficiaries' participation, self-control of the management, and O&M cost reduction and its effective use. As such, three seasons' data (pre-PWM: 2002-03, post-PWM: 2003-04 and 2004-05) have been collected in order to

evaluate the performances and suggest further modification that might be necessary for PWM practice. Under this research, a group of technical and extension staff of BWDB have been engaged, to work with the local beneficiaries in the field related to irrigation and O&M activities and at the same time to help in setting the local institution. The extension staff was involved in motivating the local beneficiaries for organizing meetings, decision-making, electing/selecting of the EC members, helping in preparation of irrigation plan and schedule, service charge collection and put in the bank account, training the beneficiaries (for technical, agricultural and institutional), etc. The research team was in touch with the field staff of the NNIP, to monitor their everyday activities. This deal was being arranged in consultation with higher BWDB officials to implement the PWM. At the same time the research team was involved in monitoring the impacts of the PWM approach at NNIP, so that it can be used as a lesson learning event and may eventually evolve a model for the future implementation of the management practice throughout the country. A number of performance evaluations are described based on pilot-scale PWM application at NNIP such as technical, agricultural, financial and economic, environmental and socio-institutional performance. In socio-institutional performance the following matters were considered: formation process of the institution, effectiveness, beneficiaries' involvement and sustainability of the institution. Based on the pilot-scale experience at NNIP and other external/field evaluations of LGED and BWDB water resources projects, a range of modifications of GPWM has been proposed for application under PWM in the existing water resources projects of Bangladesh.

Chapter 3

Methodology and Data Collection

3.1 Introduction

Impact assessment of any development intervention is a complex task. Difficulties arise not only in tracing all relevant impacts, but in attributing and linking them to relevant interventions, and importantly, in valuing and translating them in forms that could be used in decision-making processes (Hussain, 2004a). However, Irrigation water has multiple effects (Baker et al. 1998) and some of the irrigation induced impacts are desirable and beneficial to society and at the same time it could hasten the poverty alleviation processes while others are undesired and adverse in terms of their negative impacts on human and environment. Some of the impacts are significant, while the others may be insignificant. After identifying all the relevant impacts, the next step would be to quantify them in physical terms. There may be several different ways to quantify these impacts. Two commonly used approaches are: before and after and with and without comparisons. One of the problems with the 'before and after' comparison approach is that it fails to account for changes in production that would occur without the project and this could lead to erroneous estimates of the quantified impacts (Gittinger, 1982). Although the 'with and without' approach also suffers from similar limitations, it is commonly used in real world impact assessments. In this study "before and after" comparison approach is being followed to evaluate performance of selected sub projects.

3.2 Before and After comparison Approach

The impact of the water resources project can be evaluated comparing the before and after project situations. In this study, five sub projects were selected and the performances were evaluated on the basis of available and surveyed data regarding agricultural, participatory, socio economic and environmental aspects. Data were collected from various institutions and agencies namely LGED, DAE, BIDS. In addition to this a questionnaire survey was conducted among these selected sub projects for specific findings. Ten numbers of people out of the beneficiaries were selected at random in each sub project area for the questionnaire survey. Therefore,

the sample size for the survey is fifty in numbers. Among them 70% are male and 30% are female.

3.3 Performance Evaluation of an Irrigation System

The process of performance assessment or evaluation consists of exclusively measuring the extent to which goals are being met at the end of a given time, and thus requires that all relevant inputs and outputs are quantified or evaluated. Bos et al. (1993) have broadly classified performance indicators into three groups: hydraulic, agricultural and non-agricultural. Hydraulic indicators deal with the capture, allocation and conveyance of water from the source to the field. Agricultural indicators address the direct impact of the operational inputs (water) on outputs (irrigated area and crop production). Non-agricultural indicators deal with the impact of both operational and agricultural inputs on the viability and sustainability of the system. The international Irrigation Management Institute (IIMI) has also recommended similar indicators for the performance evaluation of irrigation systems (Molden et al., 1998).

The performance indicators used in the present study are briefly described in the following sections.

3.3.1 Indicators of Agricultural Performance

There are two types of sub projects among the selected sub projects in this study. They are namely Water Conservation type and Flood Management type sub projects. Therefore irrigation area performance indicator was used for the performance evaluation of Water Conservation type sub projects and flood management performance indicator was used for the performance evaluation of Flood Management type sub projects.

Irrigated Area performance: This is the direct indicator, originally proposed by Zhi (1989), for the assessment of agricultural performance in respect of area irrigated; where water is a limiting resource towards irrigation development. The indicator is expressed as:

$$\text{Irrigated Area Performance} = \frac{\text{Actual Irrigated Area}}{\text{Target Area}} \times 100$$

To evaluate the indicator, target command area is needed. In the present study, potential command area is taken as target command area. The potential command area for the selected sub projects are 506 for Boromchora Sub Project, 225 for Shiali chara Sub Project, 225 for Chirchirchara Sub Project respectively. (Source: LGED)

Flood Management performance: This indicator is used to evaluate actual protected area from flash floods in the selected flood management type sub projects. The indicator is expressed as:

$$\text{Flood Management Performance} = \frac{\text{Actual Protected Area}}{\text{Target Area}} \times 100$$

To evaluate the indicator, targeted protection area were taken as 675 ha for Baghabeel Sub Project and 507 ha for Dulia Satbila Sub Projects respectively. (Source: LGED)

Yield Performance: This is an important indicator where land is a limiting resource to irrigation development. The indicator is expressed as:

$$\text{Yield Performance} = \frac{\text{Yield After Project}}{\text{Yield Before Project}} \times 100 \%$$

Data were being collected from LGED to compare with the bench mark survey data of BIDS. A questionnaire survey was also conducted in this study to evaluate beneficiaries' perception regarding change in yield in the selected sub project areas.

Production Performance: This is the most useful agricultural indicator to evaluate irrigated agricultural systems in different countries like Bangladesh, where both water and land are limiting resources towards irrigation development.

$$\text{Production Performance} = \frac{\text{Production After Project}}{\text{Production Before Project}} \times 100 \%$$

Recorded data of LGED were collected to find the production performance in percentages for the selected sub project areas. Again Upazilla wise record for the annual production was also collected from the Department of Agricultural Extension Department for comparison.

3.3.2 Participatory Management

Participatory methods, developed in the context of Participatory Rural Appraisal, became the central tool for development agencies to embrace participation. Participatory approaches are not only contextual, but also emphasize poor people's creativity and ability to investigate and analyze their own reality (Chambers, 1994). The implementing agency of these sub projects is LGED and they have agreement with the relating Water Management Cooperative Association (WMCA) to hand over the sub project after construction and one year maintenance. Institutional performance of WMCA has been evaluated by collecting official records about the progress of the activities carried out by the association. In this assessment, increase in membership was calculated for the selected sub projects, meeting attendance of general members were also collected, a questionnaire survey was also conducted to find out reasons behind absence and micro credit activities of respective WMCA were also evaluated.

3.3.3 Socio-economic Aspects

Percentage change in wage rate and percentage change regarding the land value were used as indicators to evaluate socio-economic aspects for the selected sub project areas. Data regarding change in wage rate & crop land and home stead land values were collected through the questionnaire survey among the sub project areas. Change in land holding pattern was also taken as an indicator regarding this. Data were collected from LGED to evaluate change in land holding sizes in the selected sub project areas.

3.3.4 Environmental Aspects

Percentage change in Fisheries production was taken as an indicator regarding the evaluation of environmental aspects and relevant data were collected from LGED officials. A questionnaire survey was also conducted to find out the opinions of the beneficiaries regarding the open fisheries production in the post project situation, drainage condition, water logging and land use pattern of the selected sub project areas.

3.3.5 Operation & Maintenance (O & M) Aspects

As because the sub projects were not yet been transferred to the respective WMCA. The O & M activities and present status of the hydraulic structures were evaluated on the basis of questionnaire survey. Beneficiaries' perception regarding delay in handing over of the sub projects to WMCA was also evaluated through questionnaire survey.

3.4 Data Collection

Data was collected from two sources and they are as follows,

- Primary Sources
- Secondary Sources

Questionnaire survey was conducted among the beneficiaries in the selected sub project areas to collect the primary data regarding the performance evaluation. 10 numbers of beneficiaries from each sub project were selected at random for questionnaire survey. Among them 35 were male and 15 were female. Therefore the total sample size is 50.

Secondary data were collected from different governmental & non governmental organizations. They are namely Local Governmental Engineering Department (LGED), Fisheries Department, Department of Agricultural Extension (DAE) and Bangladesh Institute of Development Studies (BIDS).

Chapter 4

Study Area

4.1 Introduction

The Sylhet Division with its hills and basins constitute one of the most distinctive regions in Bangladesh. Situated to the north-east of the country the Division lies between 23°59' and 25°13' North latitude and 90°54' and 90 ° 30' East longitudes. The topography of Sylhet comprises mainly of hill soils, encompassing a few large depressions known locally as "Beels" which can be mainly classified as oxbow lakes, caused by tectonic subsidence primarily during the earthquake of 1762. It is flanked by the Indian states of the Meghalaya in the north, Assam in the east, Tripura in the south and the Bangladesh districts of Netrokona, Kishoregonj and Brahmanbaria in the west. The area covered by Sylhet Division is 12,569 km², which is about 8 percent of the total land area of Bangladesh.

Geologically, the region is complex having diverse sacrificial geomorphology; high topography of Plio-Miocene age (20 million years B.P) such as Khasi and Jaintia hills and small hillocks along the border. At the centre there is a vast low laying flood plain of recent origin with saucer shaped depressions, locally called Haors. Again most of the people of this district live in overseas countries and therefore considerable amount of remittance comes in this district. Eventually the land owners of the different Upazilla or Union Parisad are reluctant on cultivating lands and rely on the remittance. There fore landless people and farmers who are mostly migrant peoples from different parts of the country leads poor life even though there is scope of agricultural development.

4.2 Selection Criteria

Five number of sub projects have been selected from Sylhet districts. They are namely BaghaBeel sub project under Golapganj Upazila, BoromChara sub project under Companiganj Upazila, ChirchirChara sub project under Sadar Upazila, Duliasatbila sub project under Companiganj Upazila and Shialichara sub project under Goainghat Upazila.

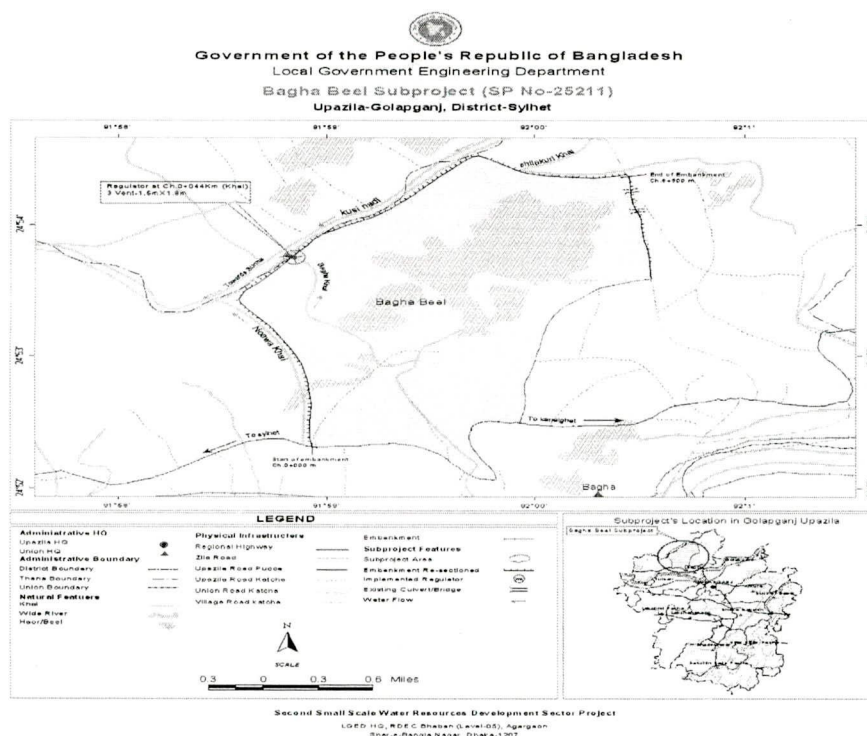
The major selection criteria regarding the selection of the subprojects are,

- Hydraulic structures and other related works of these five sub projects are completed and in operation
- Respective water management co operation associations are formulated and working

4.3 Bagha Beel Sub Project

4.3.1 Location and Map

Bagha Beel sub project is located in between the latitudes $24^{\circ}52.8' N$ and $24^{\circ}54.38' N$ and the longitudes $91^{\circ}58.32' E$ and $92^{\circ}0.22' E$. It is situated at about 4 km North West of Golapganj upazila H.Q. under Sylhet district. The map of the sub project is given below.



The sub project is under Bagha union and spread over part of Bagha, Hatimnagar and Kalakona mouzas. The villages which are in the sub project area are Majer Mahollah, Ansar Mohallah, Islamabad and Kalakona (part). The Kusi River passes in east west direction along the northern boundary and also the Surma River pass in east to west direction about 1.5 km away from the southern boundary of the subproject. The catchment of the subproject lies between Kusi River and Sylhet to Kanaighat LGED road.

4.3.2 Description

This is a Flood Management type sub project with a gross area of 675 ha and net area of 625 ha, intended to protect Boro crops from early flooding (up to mid-May).

The main problem was the early flooding (up to mid May) from the Kusi river, which damages matured Boro crops at harvesting stage. To overcome the problem the local people want to have a regulator at the outfall of Bagha Khal and flood embankment on the east and west side and along the left bank of the Kusi river of the SP area. The flush flood from the Kusi river overtops the bank of SP area goes under water during monsoon due to rainfall as well as flood from the Kusi river. It is to mention that Boro is the only crop in this Sub Project.

The following table represents the major cost components of the constructed small scale hydraulic structures in this sub project area.

Table 4.1: Major Cost Components

Major cost components		Sub Project name: Bagha Beel
Item	Size/length	Cost (tk)
Bagha Beel Regulator at Outfall of Bagha Khal	3Vent11.5mx1.8m	45,00,000
Re-sectioning of Submersible Embankment	6.5km	43,54,335
Construction of O&M Shed	9m x5m	2,60,000

Source: LGED

The following table shows the farmers category in this sub project areas according to land holding size. This data have been collected from the bench mark survey of BIDS.

Table 4.2: Farmers' category according to land holding size.

Name of the Sub Project	Landless	Marginal Farmer (0.01-0.49) (in acre)	Small Farmer (0.50-2.49) (in acre)	Medium Farmer (2.50-7.49) (in acre)	Large Farmer (7.50+) (in acre)
Bagha Beel	238 nos	23 nos	143 nos	178 nos	42 nos

The following table represents some general information about the Water Management Association of the Bagha Beel sub project.

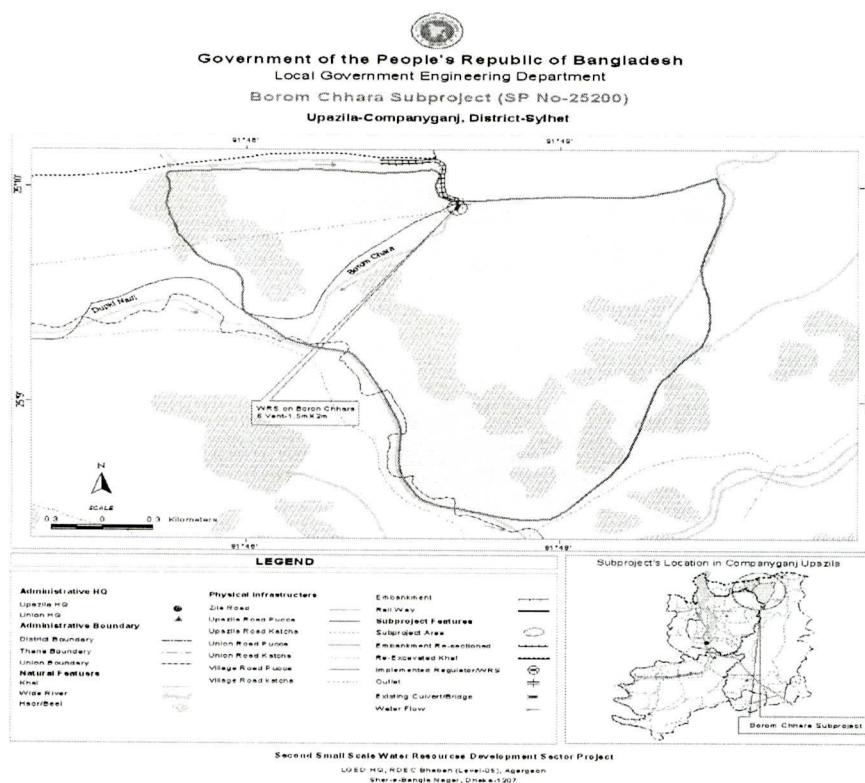
Table 4.3: WMCA Status

Name of WMCA	Date of Establishment	No. of Members		Avg. Value of Share(Tk)
		Male	Female	
Bagha Beel	08/11/06	364	79	384

4.4 Borom Chara Subproject

4.4.1 Location and Map

Borom Chhara sub project is located in between the latitudes 25°8.55' N and 25°10.56' N and longitudes 91°47.55' E to 91°49.7' E. it is about 10 km southeast of Companiganj upazila town and 25 km south of Sylhet district town. The subproject is located under Ranikhai union and spread over boom Siddhipur, Bijayparua, and Naogaon villages & mouzas. The map of the sub project is given below.



The Boromchhara sub project is located at the north end side of Companiganj upazila near Indian border in the villages-Borom Siddhipur, Bijayparua and Naogaon of north Ranikhai union under Companiganj upazila in the Sylhet district. The sub project is bounded by hills in India on the north, Duplir Bazaar and Kachli Beel areas on the south, Soilmari beel, Nazirgaon-Majertok areas on the west and Manu Khal (Kaiyachara) on the east.

4.4.2 Description

This is a Water Conservation type sub project with a gross area of 506 ha and net area of 435 ha, intended to irrigate Boro crops. The sub project area was suffering from scarcity of irrigation water during Boro season. Local people construct earthen cross dam across Borom Chara at two different locations during November December in every year to raise water level that comes from India to irrigate mainly Boro crops. After raising water level, gravity irrigation was provided. The cross dam is removed after harvesting of Boro crops at late May. Yield of Boro would be higher if people could make the cross dam in time and it can be retained up to end of May.

The following table represents the major cost components of the constructed small scale hydraulic structures in this sub project area.

Table 4.4: Major Cost Components

Major cost components		Sub Project Name: Borom Chara
item	Size/length	Cost(tk)
Khal Re-excavation	4.4km	10,86,280
Bank Raising	2km	1,86,800
WRS	5V-1.5m X 2m	45,00,000
O&M Shed for WMCA		2,60,000

Source: LGED

The following table shows the farmers category in this sub project areas according to land holding size. This data have been collected from the bench mark survey of BIDS.

Table 4.5: Farmers' category according to land holding size.

Name of the Sub Project	Landless	Marginal Farmer (0.01-0.49) (in acre)	Small Farmer (0.50-2.49) (in acre)	Medium Farmer (2.50-7.49) (in acre)	Large Farmer (7.50+) (in acre)
Borom Chara	290 nos	45 nos	97 nos	74 nos	15 nos

The following table represents some general information about the Water Management Association of the Borom Chara sub project.

Table 4.6: WMCA Status

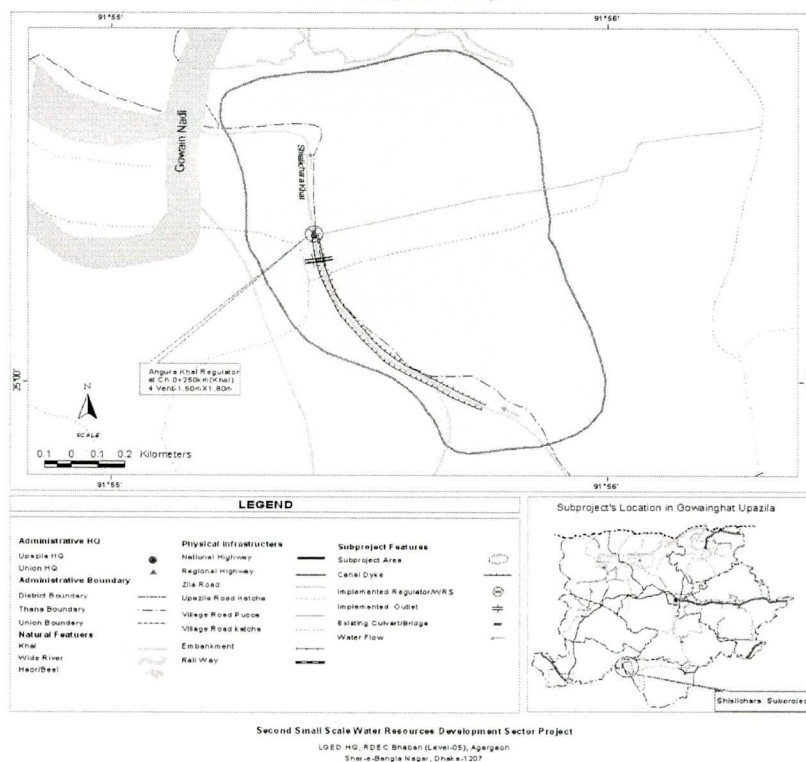
Name of WMCA	Date of Establishment	No. of Members		Avg. Value of Share(Tk)
		Male	Female	
Borom Chara	08/11/06	272	158	679

4.5 Shialichara Sub Project

4.5.1 Location and Map

Shialichara Water Conservation subproject is located in between the latitudes 24° 59.5' N and 25° 1.17' N and longitudes 91°55.05' E to 91°56.61' E. It is situated at about 12 km south of Gowainghat upazila town. The map of the sub project is given below. The subproject area covers in Gowainghat and Sylhet sadar upazila of Sylhet district under Fatehpur union and Khadimnagar union respectively and spread over Ratargal, Ramnagar, Deoangam, Bagabaria and Purba mahisher (partial) mouzas of Gowainghat upazila and Pirergaon mouzas of Sylhet Sadar upazila. There are two water level gauge stations of BWDB on Gowain nadi, one at Gowainghat (Station 252) which is 10.7 km u/s of the Sub Project and the other is at Salutikor (Station 252.1) which is 10.3 km d/s of the SP. The average flood level of the Sub Project area is 11.14 m PWD.

 Government of the People's Republic of Bangladesh
 Local Government Engineering Department
 Shailichara Subproject (SP No-23072)
 Upazila-Gowainghat, District-Sylhet



4.5.2 Description

This is a water conservation type subproject with a gross area of 250 ha and net benefited area of about 200 ha intended to conserve water for irrigation of Boro crops. The subproject is bounded by earthen hills on the south, Gowain nadi and Kai river on the north proposed Binnakandi-Gachpala subproject of SSWRDSP-2 on the east and Sylhet sadar boundary on the west. Binnakandi khal (length 7 km width 10 m depth 1.5 m) is receiving water from the hills of Sylhet sadar. In 1997-98, LGED under north east minor irrigation project(NEMP) constructed one 3 vent Water Retention Structure on the Bagerkhali khal under Jointapur upazila at about 12 km east of proposed sub project and is functioning well.

Local people used to construct a temporary cross dam on the proposed site every year by spending TK 10000 to Tk 5000 during early November to store water that comes from the hills at the south to irrigate mainly Boro crops. Khals are filled in about 3 days and gravity irrigation is provided. Moreover, sometimes (once in eight years), the cross dams are washed away due to onrushing water coming from hills during March-April and people could not rebuild it in just time.

The following table represents the major cost components of the constructed small scale hydraulic structures in this sub project area.

Table 4.7: Major Cost Components

Major cost components		Sub Project Name: Shiali Chara
item	Size/length	Cost(tk)
WRS	2 vent-1.5m x 1.5m	26,00,000
Supporting works		78,000
Physical contingencies		1,87,000

Source: LGED

The following table shows the farmers category in this sub project areas according to land holding size. This data have been collected from the bench mark survey of BIDS.

Table 4.8: Farmers' category according to land holding size.

Name of the Sub Project	Landless	Marginal Farmer (0.01-0.49) (in acre)	Small Farmer (0.50-2.49) (in acre)	Medium Farmer (2.50-7.49) (in acre)	Large Farmer (7.50+) (in acre)
Shiali Chara	84 nos	27 nos	54 nos	49 nos	28 nos

The following table represents some general information about the Water Management Association of the Shiali Chara sub project.

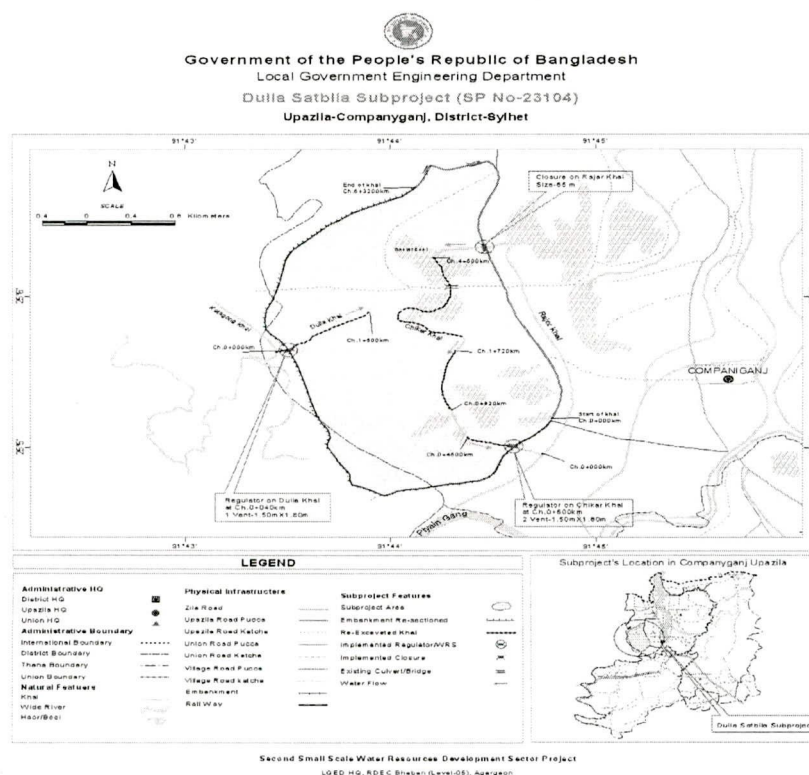
Table 4.9: WMCA Status

Name of WMCA	Date of Establishment	No. of Members		Avg. Value of Share(Tk)
		Male	Female	
Shiali Chara	23/09/04	194	104	528

4.6 Dulia Satbila Subproject

4.6.1 Location and map

Dulia Satbila sub project is located in between the latitudes $25^{\circ}9.76' N$ and $25^{\circ}11.96' N$ and longitudes $91^{\circ}43.55' E$ to $91^{\circ}44.72' E$. it is about 2 km southeast of Companiganj upazila town and 20 km south of Sylhet district town.



The subproject is located under Islampur union and spread over Tajmur nagar, Shamse nagar, Shimultola and Rajenrapur. The subproject is bounded on the south and east by Dauler bill to Katurbari road, on the north-east by an earthen road (0.75 km) and north-west and west by proposed earthen submergible embankment.

4.6.2 Description

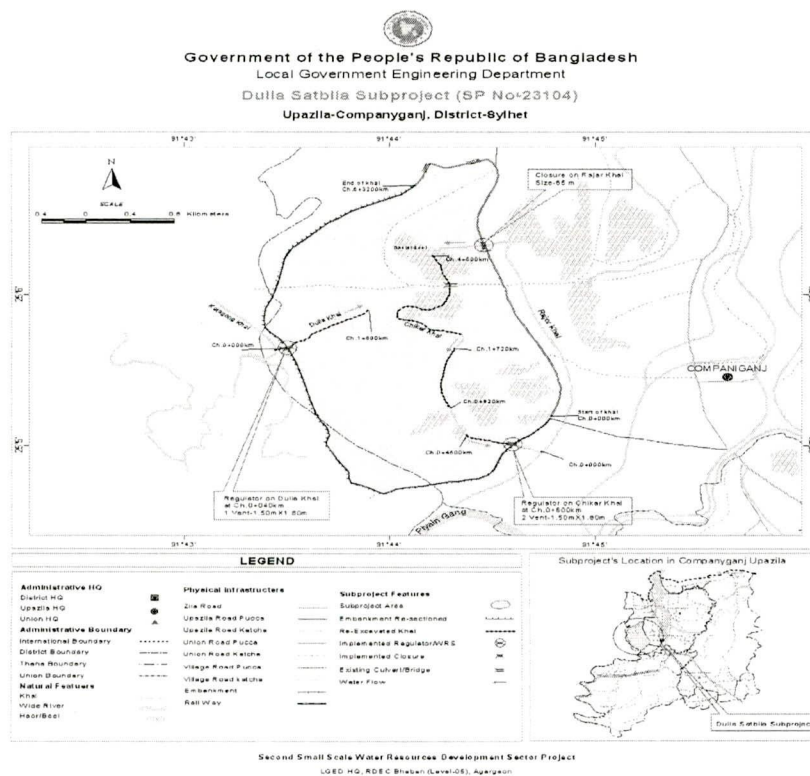
This is a Flood Management type sub project with a gross area of 760 ha and net area of 650 ha, intended to protect Boro crops from early flush flooding.

During early monsoon (April-May) flash floods enter in to the sub project area by Chiker khal(width 5m depth 2 m), Baiser Khal(width 3.5 mdepth 2.5 m) from the south, dhulia khal (width 4m depth 2m) and moragang(rajar khal width 3m depth 1m) from the north west from the Piyan river(south), Sona nadi-Bairang nadi(west), Dholai nadi(east) and overland flow from the north which receives water from India and damages Boro crops at the ripening stage. As reported by the beneficiaries, on an

4.6 Dulia Satbila Subproject

4.6.1 Location and map

Dulia Satbila sub project is located in between the latitudes $25^{\circ}9.76' N$ and $25^{\circ}11.96' N$ and longitudes $91^{\circ}43.55' E$ to $91^{\circ}44.72' E$. it is about 2 km southeast of Companiganj upazila town and 20 km south of Sylhet district town.



The subproject is located under Islampur union and spread over Tajmur nagar, Shamse nagar, Shimultola and Rajenrapur. The subproject is bounded on the south and east by Dauler bill to Katurbari road, on the north-east by an earthen road (0.75 km) and north-west and west by proposed earthen submergible embankment.

4.6.2 Description

This is a Flood Management type sub project with a gross area of 760 ha and net area of 650 ha, intended to protect Boro crops from early flush flooding.

During early monsoon (April-May) flash floods enter in to the sub project area by Chiker khal(width 5m depth 2 m), Baiser Khal(width 3.5 mdepth 2.5 m) from the south, dhulia khal (width 4m depth 2m) and moragang(rajara khal width 3m depth 1m) from the north west from the Piyan river(south), Sona nadi-Bairang nadi(west), Dholai nadi(east) and overland flow from the north which receives water from India and damages Boro crops at the ripening stage. As reported by the beneficiaries, on an

average about 60% of the Boro crops were damaged every year during the last 10 years and floods initially comes from the south and eastern part. This flash flood occurs 2-3 times and last about 8-10 days every time. To protect Boro crops from flooding and to conserve water local people construct earthen cross dams on the above mentioned Khal every year.

The following table represents the major cost components of the constructed small scale hydraulic structures in this sub project area.

Table 4.10: Major Cost Components

Major cost components		SP name: Dulia-Satbila
Item	Size/length	Cost(tk)
Re-excavation of Chikar and Dulia Khal	4.45km and 0.55km	2,66,737
Regulator	1 no:2v & 1 no 1v—1.5m x 1.8m each	56,00,000
Re-construction of road cum embankment	7.12km	10,93,648
Closure	one	91,038

Source: LGED

The following table shows the farmers category in this sub project areas according to land holding size. This data have been collected from the bench mark survey of BIDS.

Table 4.11: Farmers' category according to land holding size.

Name of the Sub Project	Landless	Marginal Farmer (0.01-0.49) (in acre)	Small Farmer (0.50-2.49) (in acre)	Medium Farmer (2.50-7.49) (in acre)	Large Farmer (7.50+) (in acre)
Dulia Satbila	157 nos	46 nos	165 nos	159 nos	12 nos

The following table represents some general information about the Water Management Association of the Dulia Satbila sub project.

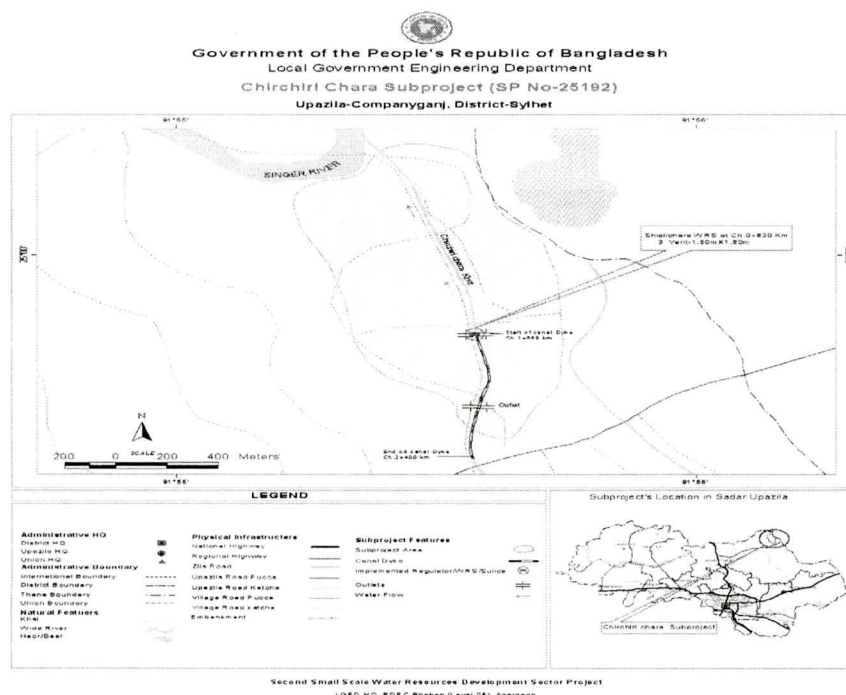
Table 4.12: WMCA Status

Name of WMCA	Date of Establishment	No. of Members		Avg. Value of Share(Tk)
		Male	Female	
Dulia Satbila	17/03/04	378	48	576

4.7 Chirchiri Chara sub project

4.7.1 Location and Map

Chirchirchara Water Conservation type subproject is located in-between the latitudes $24^{\circ}59.3'$ N and $25^{\circ}3.27'$ N and longitudes $91^{\circ}54.8'$ E to $91^{\circ}55.4'$ E. it is situated at about 12 km north east of Sylhet sadar upazila town.



The sub project area covers Sylhet sadar upazila of Sylhet district under Khadimnagar union and spread over Faringuara and Pirergaon mouzas.

4.7.2 Description

There is a Water Conservation type hydraulic structure in the sub project intended to conserve water for Boro crop. Local people constructs 2-3 temporary cross-dams on Chir Chiri Chara every year by spending Tk 20,000 to Tk 25, 000 during early November to store water that comes from the hills at the south to irrigate mainly Boro crops. The Khals are filled in about 3 days and gravity irrigation is provided. Yield of Boro would be higher if people could make the cross-dam in November. But they can not make the dam in time due to fund constraint. Moreover, sometimes (once in eight years), the cross dams are washed away due to onrushing water coming from hills during March-April and people can not rebuild it in just time.

The following table represents the major cost components of the constructed small scale hydraulic structures in this sub project area.

Table 4.13: Major Cost Components

Major cost components		Sub Project Name: Chirchir Chara
item	Size/length	Cost(tk)
WRS	4 vent-1.5 mx 2.0m	4,20,000
Supporting works		1,26,000
Physical contingencies		3,02,820

Source: LGED

The following table shows the farmers category in this sub project areas according to land holding size. This data have been collected from the bench mark survey of BIDS.

Table 4.14: Farmers' category according to land holding size.

Name of the Sub Project	Landless	Marginal Farmer (0.01-0.49) (in acre)	Small Farmer (0.50-2.49) (in acre)	Medium Farmer (2.50-7.49) (in acre)	Large Farmer (7.50+) (in acre)
Chirchir Chara	84 nos	27 nos	54 nos	49 nos	28 nos

The following table represents some general information about the Water Management Association of the Chirchir Chara sub project.

Table 4.15: WMCA Status

Name of WMCA	Date of Establishment	No. of Members		Avg. Value of Share(Tk)
		Male	Female	
Chirchir Chara	18/11/06	165	54	242

Chapter 5

Results and Discussions

5.1 Agricultural Aspect

In this study, five small scale water resources development sector sub projects were selected for performance evaluation. According to their nature and objective there were two types of sub project among these five selected sub projects. The following table represents the type of selected sub projects.

Sl No.	Types of Sub Project	
	Water Conservation	Flood Management
01	BoromChara SP	Baghabeel SP
02	ChirChiriChara SP	DuliaSatbila SP
03	ShialiChara SP	

5.1.1 Irrigation Area Performance

Three numbers of the selected sub projects were water conservation type sub projects and they are namely Borom Chara sub project, ChirChir Chara sub project and ShialiChara sub project. The objectives of the sub projects are to increase irrigation by means of water conservation. Table 5.1 represents the irrigated area performance in percentage. Data were collected from LGED and potential benefited area was taken as targeted irrigation area. Actual irrigated area was taken from the official records of LGED for the year of 2008.

Table 5.1 Irrigation area performance

Project area	January, 2008		
	Targeted Irrigation area (hactor)	Irrigated area (hactor)	Actual irrigated area/Target Area (%)
Borom Chara	506	400	80
ChirChir Chara	225	114	50
Shiali Chara	250	160	60

Source: LGED

Table 5.1 represents the irrigation area performance of these three selected sub projects. 80 percentage of the targeted irrigation area was achieved in Borom Chara

sub project. Where as 50% & 60% of the targeted irrigation were achieved in ChirChir Chara and Shiali Chara sub project respectively.

5.1.2 Flood Management Performance

Two number of sub projects of these selected sub projects are of flood management type. The objectives of these sub projects are to control early flooding in a way that beneficiaries can harvest their crop. Therefore the performances of these sub projects were determined in percentage of area that was possible to protect from flash flood and early flooding. Table 5.2 represents the flood management performance in percentage of this two selected sub project areas. Data were collected from LGED for the year of 2008 and potential benefited area was taken as targeted area.

Table 5.2 Flood Management Performance

Project area	January, 2008		
	Targeted area to be protected from flood(hactor)	Actual area protected from flood(hactor))	Actual protected area/Target Area (%)
Bagha Beel	675	373	55
Dulia Satbila	760	355	46

Source: LGED

Above table shows the flood management performance in percentage for the Bagha Beel and Dulia Satbila sub projects. The indicator shows that 55% of targeted area was protected in Bagha Beel sub project while 46% of targeted area was protected in Dulia Satbila sub project.

5.1.3 Yield Performance

Yield in these selected study areas were frequently disturbed by floods at the same time insufficient irrigation added more negative impact among the farmers to produce crop. From the SSWRDSP benchmark survey it was found that the average yield of the land is around 1200 kg per acre of cultivation. The following table represents the average yield of the crops in the study areas taken from the SSWRDSP benchmark survey by BIDS in 2005. Post project data were also collected from LGED for the year of 2007.

Table 5.3: Yield of Selected Major Rice Crops

Crop	Yield (Kg/acre)					
	Year	Bagha Beel	Borom Chara	ChirChir Chara	Dulia Satbila	Shiali Chara
HYV Boro	2005	800	1140	1330	950	1140
	2007	904	1800	1520	1520	1520
Change in %		13	57	14	60	33

Source: SSWRDSP Benchmark Survey (2005) & LGED (2007).

Table 5.3 represents the average yield (kg/acre) in the selected sub projects for Boro crop. From the table it is evident that the yield of hybrid variety of Boro crop is 800 kg/acre, 1140 kg/acre, 1330 kg/acre, 950 kg/acre and 1140 kg/acre for Bagha Beel, BoromChara, ChirChirChara, Dulia Satbila and ShialiChara sub projects respectively.

Beneficiaries' perception regarding yield performance:

A questionnaire survey was conducted regarding the beneficiaries perception about the change in yield performance. Table 5.4 represents the respondent's perception regarding the reason behind change in yield performance. Average fifty percent of the respondents of the selected sub project areas believe that high yielding variety of Boro was main reason behind better yield performance. Again, twenty percent of the respondents think better training from the WMCA also contributes to this phenomenon.

Table 5.4: Beneficiaries perception regarding yield performance

Reason behind yield performance	% of respondents				
	Bgha Beel	Borom Chara	ChirChir Chara	Dulia Satbila	Shiali Chara
High yielding variety	50	60	60	40	50
Better Irrigation	20	10	20	10	10
Protection from Flash Flood	10	10	10	30	-
Use of Pesticide	-	-	-	-	20
Better training from WMCA	20	20	10	20	20
Others	-	-	-	-	-

Source: Field survey

5.1.4 Production Performance

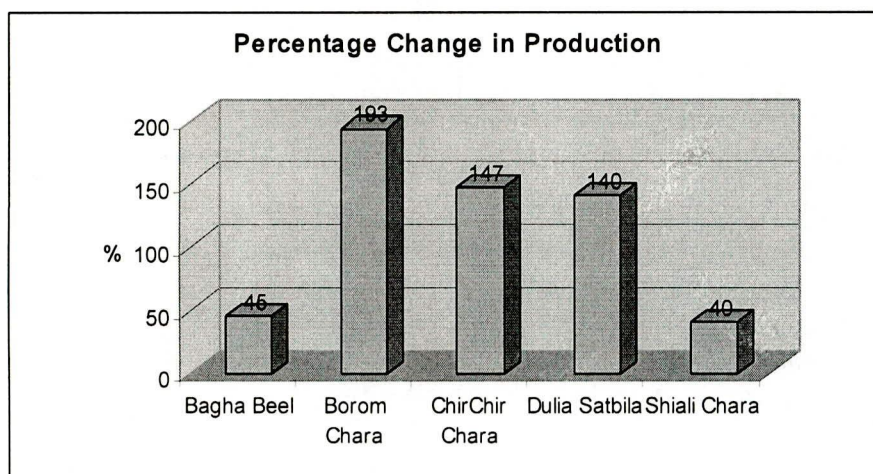
Agricultural production data for the year of 2005 (pre project) and 2007(post project) were collected from LGED to evaluate production performance Table 5.5 represents the change in yield performance regarding the selected sub project areas in post project condition. Highest 193 percent increase in production was found in Borom Chara sub project where as 147 percent and 140 percent increase in production were found in ChirChir Chara and Dulia Satbila sub projects respectively. Bagha Beel and ShialiChara sub project also conceded 45 percent and 40 percent respectively.

Table 5.5: Changes in Agricultural Production

Sub Project Name	Pre-Project, Year, 2005		Post-Project, Year, 2007		% Changed in Production
	Production (tons)	Financial (tk)	Production (tons)	Financial (tk)	
Baghabeel	2061	5,15,250	3000	90,000	45
Borom Chara	1395	3,48,750	4100	12,30,000	193
ChirChirchara	1412	3,53,000	3500	10,50,000	147
Duliasatbila	1227	3,06,750	3000	90,000	140
Shialichara	860	2,15,000	1200	3,60,000	40

Source: LGED

The following graph shows the graphical representation of percentage change in Boro crop Production in these selected sub project areas.



Annual agricultural crop production data were collected from the Department of Agricultural Extension for the year 2005-06, 2006-07 and 2007-08. Table 5.6 represents the change in crop production for last three years in the respective Upazillas which includes the selected SSWRDSP-II sub projects.

Table 5.6: Annual Crop Production of the selected Upazillas

Name of Upazila		Boro Season			Aman Season		Aus Season	
		2005-06	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Sylhet	Area (ha)	4095	4205	5205	-	9800	9450	3050
	Production (M. ton)	13239	13344	26802	-	18553	2.15	2.5
Goainghat	Area (ha)	5050	5585	4634	-	15500	4580	3800
	Production (M. ton)	11729	14347	27040	-	26341	2.15	2.5
Companiganj	Area (ha)	8115	7793	6850	-	9590	1300	570
	Production (M. ton)	20723	18345	31677	-	14590	2.15	2.5
Golapganj	Area (ha)	6450	5235	4750	-	15220	8400	5800
	Production (M. ton)	19745	14092	40603	-	28570	2.15	2.5

Source: Department of Agriculture Extension, Sylhet Division

5.2 Participatory Management

5.2.1 Membership Status of WMCA

Water Management Cooperative Association (WMCA) is the basic institution through which all the activities relating to the sub project have to be carried out. The following table shows change in membership for the selected sub projects' WMCA.

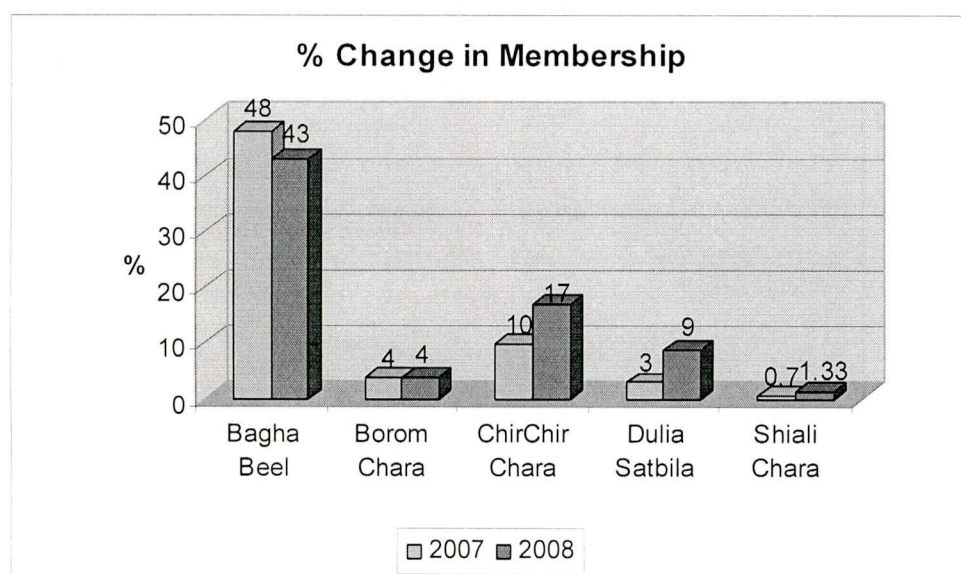
Table 5.7: Membership Status of WMCA

Name of WMCA	Year	Membership		
		Total	Male	Female
Bagha Beel	2006	299	270	29
	2007	443	364	79
	2008	632	473	159
Borom Chara	2006	430	272	158
	2007	451	286	165
	2008	473	292	181
ChirChirChara	2006	219	165	54
	2007	240	178	62
	2008	281	177	104
Duliasatbila	2006	426	378	48
	2007	439	386	53
	2008	481	405	76
Shialichara	2006	298	194	104
	2007	300	196	104
	2008	304	199	105

Source: LGED (2008)

From Table 5.7 it is found that increase in membership for the Bagha Beel sub project is considerable in amount but other sub project areas showed very few amount of

increase in membership. The following graph shows the graphical representation of percentage change in Membership for the year of 2007 & 2008.



5.2.2 Meeting attendance of WMCA general members

There is no alternative to regular attendance in WMCA meetings for sustainable development and for achieving maximum benefit from the sub project. In this regard, the following tables show the regularity of the members and cause behind their reluctances in attending the meeting as well.

Table 5.8: Regularity in Attendance

Meeting Attendance	Baghabeel	BoromChara	ChirChirChara	Dulia Satbila	Shialichara
Year,2007	55%	65%	30%	60%	35%

Source: LGED

Table 5.8 represents the percentage of regularity in attendance. Highest 60% attendance was found in Borom Chara sub project while lowest 30 % was found in Chir chir Chara sub project. Beneficiaries reason regarding absence in meeting attendance was surveyed and Table 5.9 represents the survey results.

Table 5.9: Reasons behind absence

Particulars	% of respondents expressing their opinions				
	Baghabeel	BoromChara	ChirChirChara	Dulia Satbila	Shialichara
Not informed	30	30	30	35	30
Busy					
Meeting were dominated by others	-	-	-	-	-
Meeting had no importance	30	35	50	35	40
Transportation problem	40	35	20	30	30
Gender issue	-	-	-	-	-

Source: Field survey

Table 5.9 represents the result of the questionnaire survey about the beneficiaries' perception regarding absence in the meetings organized by the WMCA. Average 30% of the respondents pointed out that they were not being informed about the schedule of meetings. Again average 40% of the respondents believed that meeting bears no importance while rest 30 % of the respondents thinks lack of transportation facilities as the reason behind their absence in the meeting.

5.2.3 Activities of WMCA

Questionnaire survey was conducted to find out beneficiaries perception regarding activities of WMCA. Table 5.10 represents the beneficiaries' perception regarding this. From the table it was found that average 50% of the respondents in the selected sub project areas believe that the guideline for participatory of water management (GPWM) was followed by the WMCA. But only 20 % of the respondents think that WMCA is involved in operation and maintenance of the sub projects. It can be noted that WMCA is being created for the sustainable O & M of the small scale water resources sub projects.

Table 5.10: Performance of WMCA

Activity of WMCA	% of respondents				
	Bgha Beel	Borom Chara	ChirChir Chara	Dulia Satbila	Shiali Chara
WMCA followed GPWM in its activities	50	50	40	50	50
WMCA is involved in O & M activities	20	20	30	20	20
Provide training for WMCA members	10	-	10	10	-
Provide micro-credit	20	30	30	20	30
Others	-	-	-	-	-

Source: Field survey (2008)

Micro Credit Activities

Micro credit activities are also run by the WMCA in respective sub project areas. The table below represents the detail of micro-credit activities of the selected sub projects.

Table 5.11: Micro-credit activities in selected sub-projects

Name	Loan information(tk)			Borrowers(nos.)			Borrowers (%)	
	Total Disbursed	Total Realized	% Realized	Male	Female	Total	Male	Female
Baghabeel	7,41,500	2,23,496	30	98	31	129	75	25
Borom Chara	3,48,000	1,72,250	49	43	27	70	61	39
ChirChirchara	42,000	42,000	100	96	33	129	74	26
Duliasatbila	8,42,000	5,43,153	64	174	9	183	95	5
Shialichara	3,18,000	2,73,752	86	68	31	89	76	24

Source: LGED (2008)

Table 5.11 represents the percentage of male and female members getting loan from the WMCA as well as the total amount of realization. Majority of the borrowers are male. Loan realization was found 100% in ChirchirChara sub project while highest amount of loan was disbursed in Dulia Satbila sub project.

5.3 Socio-Economic Analysis

Wage Rates and Land Values in Study Areas

Increase in wage rates and the land values indicate the improvement of the socio economic status of the local people. Table 5.12 & Table 5.13 shows the percentage changed in wage rate and land value respectively for the selected sub project areas. Average 25% increase in wage rate was found in the selected sub project areas in the peak season. No increase in average wage rate was found in Borom Chara sub project area.

Table 5.12: Wage rates in selected sub-project areas

Study areas	Avg. wage rate in slack season(tk/day)			Avg. wage rate in peak season(tk/day)		
	Pre project (Year 2005)	Post project (Year 2008)	% change	Pre project (Year 2005)	Post project (Year 2008)	% change
Baghabeel	120	130	10	150	200	25
Borom Chara	130	130	0	150	200	25
ChirChirchara	120	130	10	130	150	14
Duliasatbila	120	130	10	140	180	23
Shialichara	120	130	10	130	150	14

Source: Field survey (2008)

The following graph shows the graphical representation of percentage increase in wage rate for the peak season.

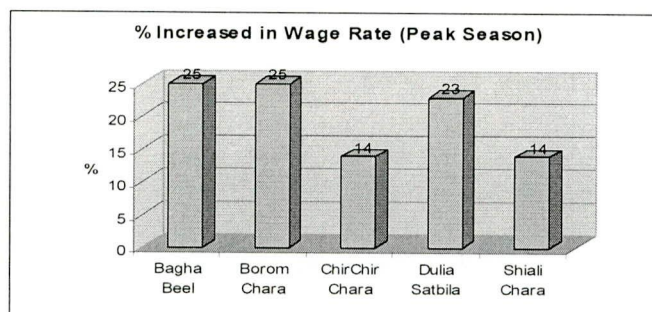
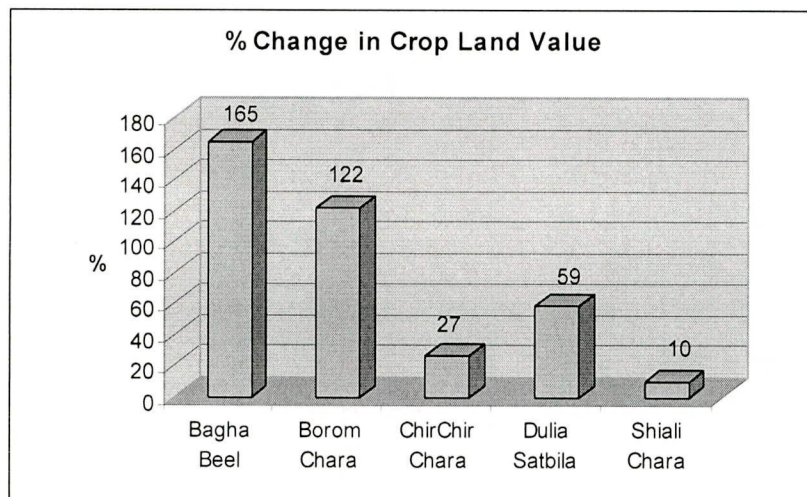


Table 5.13: Changes of Land Values in selected sub-project areas

Location	Pre project(Year, 2005)		Post project(Year,2008)	
	Crop land (per acre)	Homestead land (per acre)	Crop land (per acre)	Homestead land (per acre)
Bagha Beel	5,65,000	12,27,500	15,00,000	1227500
Borom Chara	4,50,000	5,50,000	10,00,000	6,00,000
ChirChir Chara	1,96,750	11,67,500	2,50,000	11,67,500
Dulia Satbila	2,20,000	3,00,000	3,50,000	3,00,000
Shiali Chara	2,00000	2,30,000	2,20,000	2,30,000

Source: Field survey (2008)

The following graph shows the graphical representation of percentage change in crop land value.



Change in Land Holding Pattern:

Data regarding farmers' category according to land holding size were also collected to evaluate the change in socio economic condition of the local farmers. Table 5.14 represents data regarding farmers' category in these selected sub project areas. But there were no change found in the farmers' category in any of the selected sub projects.

Table 5.14: Farmers Category according to Land Holding Size in Sub-Project Areas

HH category by landholding size	Bagha Beel		Borom Chara		ChirChir Chara		Dulia Satbila		Shiali Chara	
	2005	2008	2005	2008	2005	2008	2005	2008	2005	2008
Landless (LL)	238	238	290	290	84	84	157	157	179	179
Marginal farmer (0.01-0.49) (MRF)	23	23	45	45	27	27	46	46	35	35
Small farmer (0.50-2.49) (SF)	143	143	97	97	54	54	165	165	133	133
Medium farmer (2.50-7.49) (MF)	178	178	74	74	49	49	159	159	29	29
Large farmer (7.50 +) (LF)	42	42	15	15	28	28	12	12	6	6

Source: LGED, Sylhet.

5.4 Environmental Analysis

Environmental performance indicators used in this study are percentage change in fisheries production, drainage and water logging problems, impact on land use pattern and navigability. Questionnaire survey was conducted regarding the beneficiaries perception regarding these selected indicators.

5.4.1 Changes in Fisheries Production

Fisheries production can be divided in two types namely Open fish production and cultured fish production. Data were collected from LGED to evaluated cultured fish production in these selected sub project areas. But no records of data were found regarding open fish production in these selected sub project areas. Therefore a questionnaire survey was conducted regarding beneficiaries perception regarding open fish production in post project condition. Table 5.15 represents the surveyed data regarding beneficiaries' perception about open fish production.

Table 5.15: Beneficiaries Perception regarding Open Fish Culture in Post Project Condition

Description	% of respondents				
	Bgha Beel	Borom Chara	ChirChir Chara	Dulia Satbila	Shiali Chara
Open Fish Production Increased	50	40	60	50	40
Open Fish Production Decreased	50	60	40	50	60
Open Fish Production Unchanged	-	-	-	-	-

Source: Field survey (2008)

From the above table it can be states that about fifty percent of the respondents believe that open fish production decreased in the selected sub project areas.

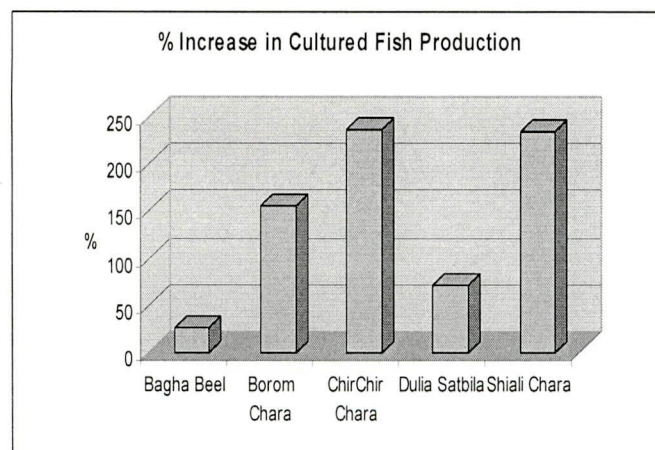
Again data were collected from LGED regarding cultured fish production of these selected sub project areas for the pre project (year 2005) and post project (year 2007) conditions. The following table represents the change regarding cultured fisheries productions among the sub project areas.

Table 5.16: Changes in Cultured Fisheries Production

Sub Project Name	Pre-Project (Year 2005)		Post-Project (Year 2007)		% Changed in production
	Yield(ton/yr)	Financial (tk)	Yield(ton/yr)	Financial (tk)	
Baghabeel	245	80,000	310	1,37,000	27
Borom Chara	36	88,000	92	1,60,000	155
ChirChirchara	12.5	45,000	42	1,50,000	236
Duliasatbila	35	1,00,000	60	2,80,000	71
Shialichara	15	45,000	50	1,50,000	233

Source: LGED, 2008

From Table 5.16 considerable changes in cultured fish production was found in almost every selected sub project areas. Chirchir Chara and Shiali Chara sub project showed 236 % and 233 % increase in cultured fish production. While 155 % increase was found in Borom Chara sub project. The following graph shows the graphical representation of percentage change in cultured fish production.



5.4.2 Drainage, Water Logging and Land Use Pattern in Post Project Condition

The following table represents respondent's opinion regarding drainage & water logging, impact on Land use pattern and increase in navigation in the post project condition. Here positive land use pattern means that land becomes cultivable and negative land use pattern means that the land became uncultivable.

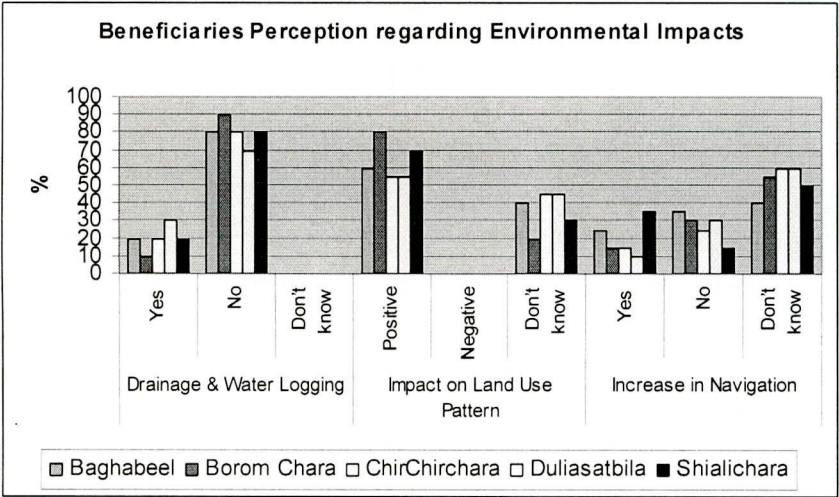
Table 5.17: Drainage, Water logging and Land Use Pattern

Sub Project Name	% of respondents expressing their opinion								
	Drainage & Water Logging			Impact on Land Use Pattern			Increase in Navigation		
	Yes	No	Don't know	Positive	Negative	Don't know	Yes	No	Don't know
Baghabeel	20	80	-	60	-	40	25	35	40
Borom Chara	10	90	-	80	-	20	15	30	55
ChirChirchara	20	80	-	55	-	45	15	25	60
Duliasatbila	30	70	-	55	-	45	10	30	60
Shialichara	20	80	-	70	-	30	35	15	50

Source: Field survey (2008)

From the above table it can be stated that majority of the respondents believe that there was no water logging or drainage problem in the post project condition. About 70% of the respondents believe that the sub project brought positive impacts in land use pattern.

The following graph shows the graphical representation of beneficiaries' perception regarding environmental impacts on Drainage & Water Logging, Impacts on Land Use Pattern and Navigation Status.



5.5 O & M Aspects

According to the agreement of LGED and WMCA, the first years' operation & maintenance cost of the completed sub projects would be financed by the local government. After successful completion of one year operation and maintenance the sub project's O & M should be handed over to the respective WMCA. Table 5.18 represents the age of the project and present status of the selected sub projects.

Table 5.18: Ages of the Projects and Present Status:

Name of Sub Projects	% of respondents expressing their opinion		
	Starting Date	Proposed Date of Hand Over to WMCA	Present Status
Bagha Beel	08/11/06	08/11/08	Yet to be Handed over
Borom Chara	08/11/06	08/11/08	Yet to be Handed over
ChirChirchara	18/11/06	18/11/08	Yet to be Handed over
Duliasatbila	17/03/04	17/03/06	Yet to be Handed over
Shialichara	23/09/04	23/09/06	Yet to be Handed over

Beneficiaries Perception Regarding the Delay of Handing Over:

A questionnaire survey was conducted regarding beneficiaries perception about delay of handing over of the sub projects. Following table represents the respondents' perception regarding this. About 60 % of the respondents believe that contractor's delay in completing the structural works of the sub project is responsible regarding delay of handing over of the sub projects to the respective WMCA.

Table 5.19: Beneficiaries Perception Regarding the Delay of Handing Over

Reasons	% of respondents expressing their opinion				
	Bagha Beel	Borom Chara	ChirChi Chara	Dulia Satbila	Shiali Chara
Contractor's Delay in physical work completion	70	60	70	60	70
WMCA is not efficient	-	-	-	-	-
LGED officials are responsible	20	30	30	20	20
Lack of co-ordination between LGED, WMCA and Local Administrative Departments.	10	10	-	20	10

Source: Field Survey (2008)

As the sub projects are yet to be handed over to the respective water management associations the O & M responsibilities are not performed by the WMCA. The following table shows the funds in O & M account for the selected sub projects.

Table 5.20: O & M Funds in Selected Sub Projects

Name of sub-projects	Fund in O & M account	GoB allocation	Expenditure by WMCA	GoB expenditure
BaghaBeel	2,42,000	-	-	-
BoromChara	1,31,510	-	-	-
ChirChirChara	77,050	-	-	-
DuliaSatbila	1,99,928	-	-	-
ShialiChara	57,129	-	-	-

Source: LGED

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A field survey was conducted to evaluate the present condition of the hydraulic structures of the selected sub project areas. Table 5.21 represents the present condition found in this study about the infrastructures constructed in the sub project areas.

Table 5.21: Present Condition of the infrastructure

Description	Bagha Beel	Borom Chara	Chirchiri Chara	Dulia Satbila	Shiali Chara
Siltation & sliding in canals	-	-	-	-	-
Seedbed, obstruction, water hyacinth and weeds in canals	-	medium	low	low	medium
Breach, public/rain cut, rat hole and erosion in embankments	-	-	-	2 Minor Cuts	-
Protection blocks and approach road damaged	-	-	-	low	low
Rusting grease and paint given in gates	yes	yes	yes	yes	yes
Damaging/ missing rubber seals	-	Water leaks	-	-	-
Gear box damage or stolen	Not found	Not found	Not found	Not found	Not found

Field Survey (2008)

From the field survey the condition of the hydraulic structures were found satisfactory except medium to low formulation of water hyacinth and weeds in canals. The gate operations were controlled by WMCA according to LGED officials' instructions.

Chapter 6

Conclusions and Recommendations

The salient objective of the study was to evaluate the performance of selected small scale water resources development sub projects of LGED in the district of Sylhet. Indicators used in this study are agricultural, socio-economic, participatory management and environmental indicators respectively. The following conclusions can be drawn from this study.

Agricultural performances

Irrigated area performance in percentage, Flood management performance in percentage, percentage change in yield and percentage change in production were used as indicators regarding the evaluation of agricultural performance. Irrigation area performance indicator was used for the water conservation type sub projects and flood management performance indicator was used for flood management type sub projects. Irrigation area performance indicator showed 80%, 50% & 60% target achievements in the BoromChara, ChirChirChara & ShialiChara sub projects respectively. While flood management performance showed 55% & 46% target achievements in Bagha Beel & Dulia Satbila sub projects respectively. Again, percentage increase in yield is 13%, 57%, 14%, 60% and 33% for Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively. According to questionnaire survey about 50% of the beneficiaries' believe that high yielding variety was the reason behind increase in yield. Production performance indicator showed 45%, 193%, 147%, 140% & 40% increase in Boro crop production in the BoromChara, ChirChirChara & ShialiChara sub projects respectively comparing pre (2005) and post (2007) project condition.

Participatory Approach

According to the agreement between LGED and WMCA, after completion of sub project construction and one year post operation & maintenance the sub project would be handed over to the WMCA for O & M. WMCA has been formed in every sub project area. The main purpose of the WMCA is the sustainable O & M of completed sub project. But these sub projects are yet to be handed over to the respective WMCA.

Therefore, percentage increase in membership, regularity in attendance, activities of WMCA and micro credit activities of the WMCA were taken as indicators for institutional performance evaluation. According to WMCA records, 48% increase in membership was found in Bagha Beel sub project. Percentage increase in membership in BoromChara, ChirchirChara, DuliaSatbila and ShialiChara are 4%, 10%, 3% & 0.7 % respectively. On the other hand, regularity in attendance was found 55%, 65%, 30%, 60% & 35% for Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively. Questionnaire survey reveal that majority of the beneficiaries' believe WMCA meeting bears almost no importance to them as well as they were not being informed about the meeting. Again about 50% of the respondents are aware that WMCA followed Guideline for Participatory Water Management Plan. Micro credit activities are included in to WMCA to make it operative round the year and for these selected sub projects the loan realization was found 30%, 49%, 100%, 64% and 86% for Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively.

Socio-economic performances

Percentage change in wage rate and percentage change regarding the land value were used as indicators to evaluate socio-economic aspects for the selected sub project areas. From the surveyed data, increase in crop land value was found 165%, 122%, 27%, 59% and 10% for Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively. Again, percentage increase in wage rate in peak season (harvesting season) was found 25%, 25%, 14%, 23% and 14% for Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively. But no change in Landholding pattern was found in the selected sub project areas according to LGED data.

Environmental performances

Percentage change in Fisheries production was taken as an indicator regarding the evaluation of environmental aspects and relevant data were collected from LGED officials. According to LGED, the production increased in case of cultured fish is 27%, 155%, 236%, 71% and 233% for the Bagha Beel, Borom Chara, ChirChir Chara, Dulia Satbila and ShialiChara sub projects respectively. According to the

questionnaire survey it was found that average 50% of the respondents believe that open fish culture have decreased in the post project condition.

Questionnaire survey was also conducted to find out the opinions of the beneficiaries regarding the drainage condition, water logging and land use pattern of the selected sub project areas. From the field survey it was found that average 80% of the respondents found no water logging or drainage congestion due to these sub projects. Again about 60% of the respondents believe in positive impact in land use pattern.

Operation & Maintenance Aspects

Even though the sub projects were supposed to be handed over to the respective WMCA after completion and one year post O & M by LGED, no sub projects was yet been handed over. Questionnaire survey revealed that average 60 % of the respondents believe that contractor's delay in completing the structural works of the sub project is responsible regarding delay of handing over of the sub projects to the respective WMCA. Hydraulic structures were found completed during the study but WMCA was not engaged in any kind of O & M of the selected sub projects. WMCA collected O & M funds and deposited the amount in saving accounts in the name of respective President & Secretary maintaining joint accounts with local banks.

Recommendations from the study

The following recommendations can be drawn from the study.

- Awareness should be created among the beneficiaries about the O & M of the sub projects.
- Training should be provided to the WMCA members regarding agricultural production and better O & M.
- Co-ordination between LGED and other local governmental organization should be improved for better performance of WMCA.
- Delay in handing over the sub projects created negative impacts on the WMCA, therefore sub projects should be handed over as early as possible to the respective WMCA.
- Monitoring should be strengthen regarding micro-credit activities that, beneficiaries taking loan from the WMCA invest it in the sub project area especially in agricultural production and fisheries production.
- Analysis of internal rate of return (IRR) for these selected sub projects were not being performed in this study, therefore a study can be taken to analyze IRR and hydraulic performances regarding these selected sub projects.

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ANNEX A

স্থানীয় সরকার প্রকৌশল অধিদপ্তর কর্তৃক বাস্তবায়িত দ্বিতীয় ক্ষুদ্রাকার পানি ব্যবস্থাপনা উপ প্রকল্প
সম্পর্কে স্থানীয় জনগনের মতামত ও মূল্যায়ন জরীপের নিমিত্তে প্রশ্নাবলী

নাম :

পেশা :

ঠিকানা :

উপ প্রকল্প সম্পর্কে কিছু সাধারণ প্রশ্নাবলী

১. আপনি কি জানেন কখন এবং কাদের দ্বারা এই উপ প্রকল্পটি শুরু হয়েছিল ?

২. কেন এই প্রকল্পটি নেয়া হয়েছিল ?

৩. প্রকল্পটি সম্পর্কে আপনার মূল্যায়ন কি

- খুবই উপকারী
- মোটামুটি উপকারী
- উপকারী নয়
- ক্ষতিকর
- জানি না

৪. উপ প্রকল্প এলাকায় কি ভূমি অধিগ্রহণ করা হয়েছিল এবং আপনার কি কোন পরিমাণ জমি অধিগ্রহণ হয়েছিল ?

৫. আপনি কি স্বতস্ফূর্ত ভাবে সকল কাজে অংশগ্রহণ করেছিলেন ?

৬. এখানকার অধিবাসীদের সাথে কি কোন কারণে প্রকল্প কর্তৃপক্ষের বিরোধ দেখা দিয়েছিল ?

কৃষি

১. আবাদী জমির পরিমাণ কি বেড়েছে ?

২. সেচের আওতায় কি আরও বেশী পরিমাণ জমি পাওয়া গেছে ?

৩. একর প্রতি উৎপাদন কি বেড়েছে ?

- উচ্চতর ফলনশীল প্রজাতি ব্যবহার করার ফলে
- উন্নত সেচের কারণে
- কীটনাশক ব্যবহার করার ফলে
- ভাল মানের প্রশিক্ষণ দেয়ার ফলে
- ফ্লাশ ফ্লাড থেকে রক্ষা পাওয়ার জন্যে
- অন্যান্য

৪. জমির উর্বরতা কি বেড়েছে বলে মনে হয় ?

সাংগঠনিক

১. এখানে কি পানি ব্যবস্থাপনা সমবায় সমিতি (পাবসস) রয়েছে ?

২. আপনি কি এর সদস্য ?

৩. যদি না হয়ে থাকেন তবে হওয়ার ইচ্ছা আছে কি ?

৪. আপনি কি সদস্যদের দায়দায়িত্ব সম্মুখে অবহিত আছেন ?

৫. পানি ব্যবস্থাপনা সমবায় সমিতির কার্যকারিতা কি ?

৬. সমিতির সাধারণ সদস্য এবং কমিটির সদস্যদের মধ্যে কোন বিরোধ আছে কি ?

৭. নিয়মিত কমিটির সভা হয় কি ?

৮. সময়মতো নির্বাচন হয় কি /

৯. আপনি কি সকল সভায় নিয়মিত অংশগ্রহণ করেন ?

১০. সভায় নিয়মিত অংশগ্রহণ না করার পিছনে কারণ কি ?

- মিটিং এর সময় জানি না
- ব্যস্ত ছিলাম
- মিটিং এ অন্যদের প্রাধান্য বেশী
- মিটিং এর কোন গুরুত্বই নেই
- পরিবহন সমস্যা
- জেডার ইস্যু

১১. সমিতিতে মহিলাদেও অংশ গ্রহণ কি আশানুরূপ ?

১২. না হলে এর পিছনে কারণ কি বলে আপনি মনে করেন ?

অবকাঠামো

১. অবকাঠামোগত কোন অভিযোগ আছে কি ?
২. অবকাঠামোর অবস্থান কি যথাযথ স্থানে হয়েছে বলে আপনি মনে করেন ?
৩. ভেন্ট সাইজ এবং গেইট সাইজ কি যথাযথ হয়েছে ?
৪. উচ্চতা কি সঠিক হয়েছে বলে আপনি মনে করেন ?
৫. আপনার কোন দিক নির্দেশনা আছে কি এই ব্যাপারে ?

পরিচালন এবং রক্ষণাবেক্ষন

১. কিসের ভিত্তিতে অবকাঠামো পরিচালিত হয়
 - যথাযথ নির্দেশন
 - প্রভাবশালীদেও ইচ্ছা
 - অপারেটরের খেয়ালখুশী
 - অন্যান্য
২. পরিচালনের ক্ষেত্রে কোন সম্মিলিত সিদ্ধান্ত রয়েছে কি ?
৩. সকলের স্বার্থ রক্ষা করা হয় কি ?
৪. আপনার মতামতের প্রাধান্য দেয়া হয়েছিল কি ?

প্রশিক্ষণ

১. পাবসস কি কোন প্রকার প্রশিক্ষণ দিয়ে থাকে ?
২. আপনি কি কোন প্রশিক্ষণ পেয়েছেন ?
৩. কারা প্রশিক্ষণ দিয়ে থাকেন ?
৪. প্রশিক্ষণ থেকে কি কোন প্রকার সম্মানী পাওয়া যায় ?
৫. আপনাদেও কি কোন টাকা দিতে হয় প্রশিক্ষণ নেওয়ার জন্যে ?
৬. প্রশিক্ষণ সম্মন্ধে আপনার মতামত
 - ধ. ভাল
 - ন. মোঠামুঠি
 - প. খারাপ
 - ফ. প্রয়োজন নয়

সামাজিক এবং অর্থনৈতিক

১. আপনি কি মনে করেন এই প্রকল্পের ফলে আপনার আয় পূর্বের থেকে বেড়েছে ?
 - বর্তমান দিন প্রতি মজুরী কত? (ফসল কাটা মৌসুম এবং অন্যান্য সময়)
 - ২০০৫ ইং সালে মজুরী কতছিল ?
২. আপনি কি মনে করেন মহিলাদের আয় উন্নতি হচ্ছে ?

৩. সামাজিক দারিদ্রতা কি একটু কমেছে ?
৪. আপনি কি মনে করেন উপকারভোগীর সংখ্যা আরও বেশী হওয়া উচিত ?
৫. আপনার এলাকায় জমির দাম কি আগের তুলনায় বেড়েছে ?
৬. যদি জমির দাম বেড়ে থাকে তবে তা কি পরিমাণ বেড়েছে ?
 - চাষাবাদের জমির বর্তমান মূল্য কত?
 - ২০০৫ ইং সালে কত ছিল ?
৭. গৃহস্থালী জমির দাম ২০০৫ ইং সালে কত ছিল ?
৮. বর্তমানে গৃহস্থালী জমির দাম কত ?

ক্ষুদ্র ঋণ

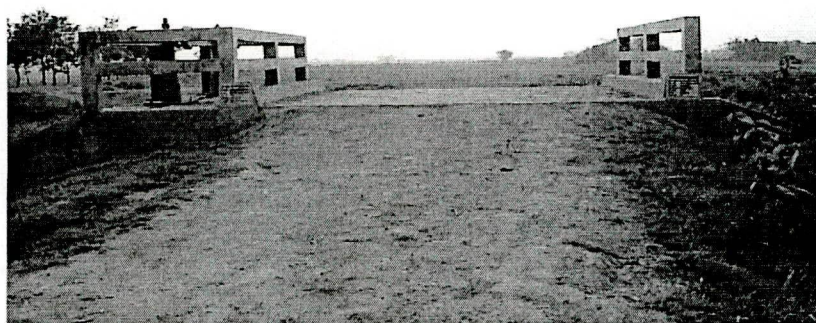
১. পাবসস কি ক্ষুদ্র ঋণ সুবিধা প্রদান করে থাকে ?
২. কারা এই ঋণ সুবিধা পায় ?
৩. আপনি কি কোন ঋণ নিয়েছিলেন ?
৪. নিয়ে থাকলে সময়মতো কিস্তি পরিশোধ করেন কি ?
৫. আপনার কি সমিতিতে কোন সঞ্চয় বা শেয়ার আছে ?
৬. মহিলাদেও কি এই ক্ষুদ্র ঋণ দেয়া হয় ?
৭. এই প্রকল্পের উদ্দেশ্য কি বলে আপনার মনে হয়
 - বন্যা নিয়ন্ত্রণ
 - কৃষি উৎপাদন
 - মৎস্য উৎপাদন
 - সামাজিক উন্নয়ন
 - ক্ষুদ্র ঋণ
 - পুঁজি উন্নয়ন
 - পরিচালন ও রক্ষণাবেক্ষন
 - জানি না

পরিবেশ

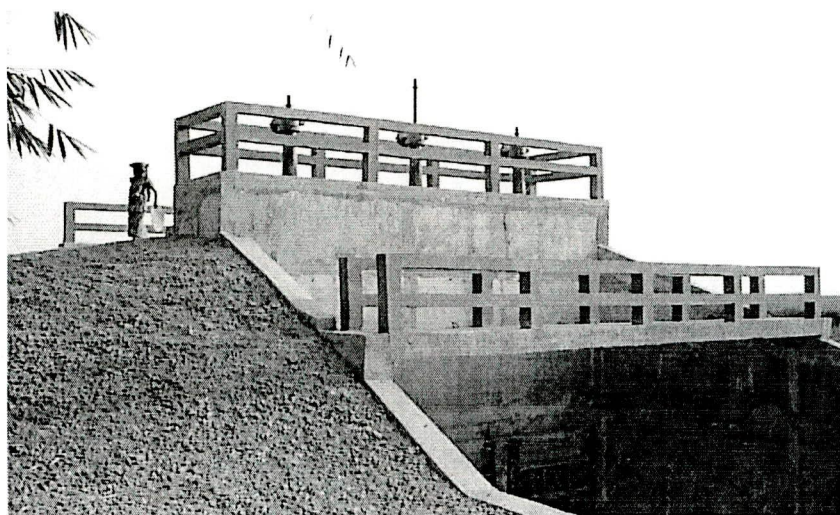
১. আপনি এই প্রকল্প বাস্তবায়িত হওয়ার পর পরিবেশগত কি কি পরিবর্তন লক্ষ্য করেছেন
 - ধ. জলাবদ্ধতা
 - ন. সেচের পানির অপ্রতুলতা/আধিক্য
 - প. পানি নিষ্কাশনে অসুবিধা
 - ফ. নাব্যতা বৃদ্ধি অথবা হ্রাস
 - ব. মৎস্য চাষে অসুবিধা
 - ভ. প্রাকৃতিক দূষণ বৃদ্ধি (যেমন : বন্যা, ঝড়, খরা, দাবদাহ ইত্যাদি)
 - ম. প্রাকৃতিক দূষণের তীব্রতা বৃদ্ধি
 - য. চাষাবাদ যোগ্য জমির পরিমাণ বেড়েছে
 - র. চাষাবাদ যোগ্য জমির পরিমাণ কমেছে



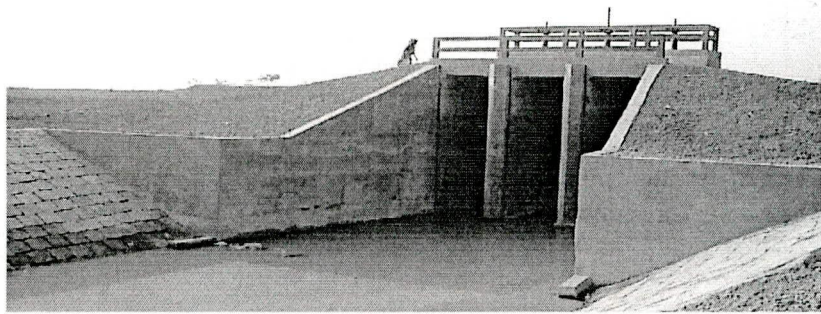
2 Vent Regulator, Dulia Satbila Sub Project



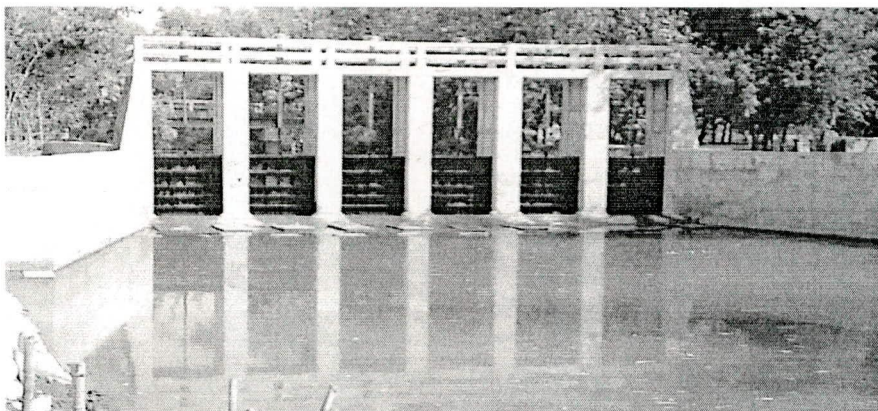
2 Vent Regulator, Dulia Satbila Sub Project



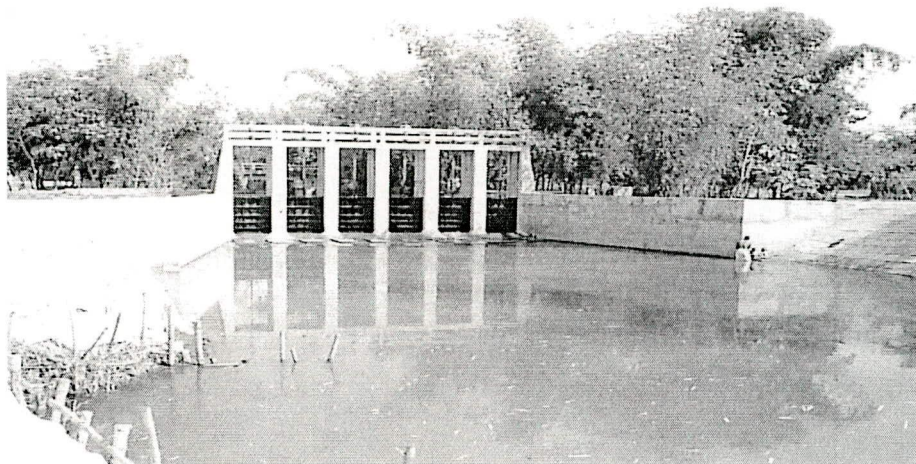
3 Vent Regulator, Bagha Beel Sub Project



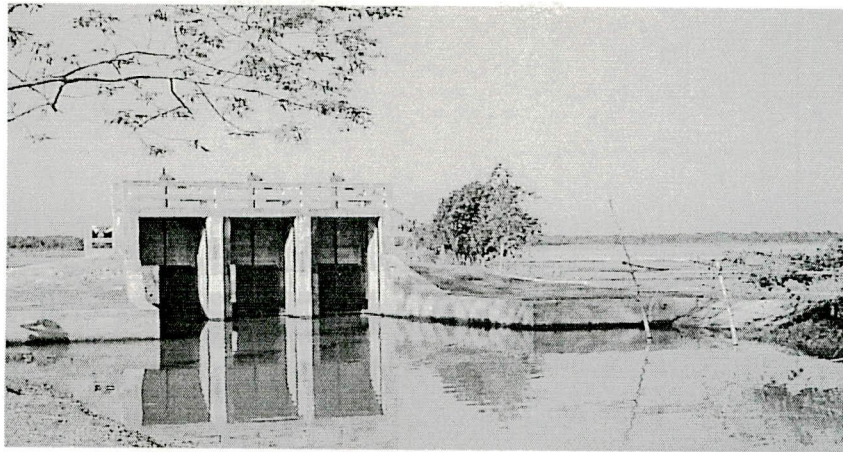
3 Vent regulator, Bagha Beel Sub Project



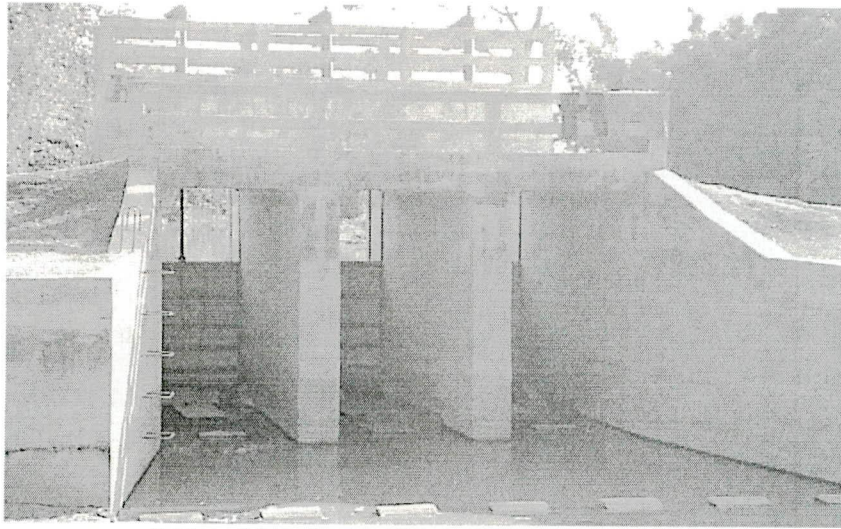
6 Vent Regulator, Borom Chara, Sub Project



6 Vent Regulator, Borom Chara, Sub Project



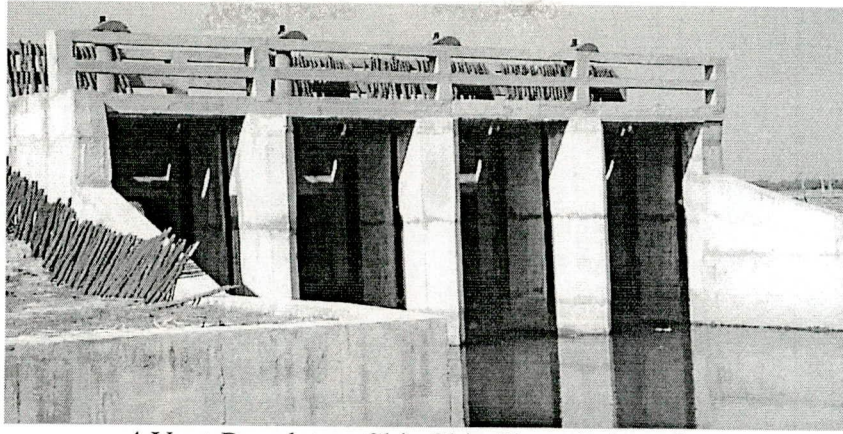
3 Vent Regulator, Shiali Chara Sub project



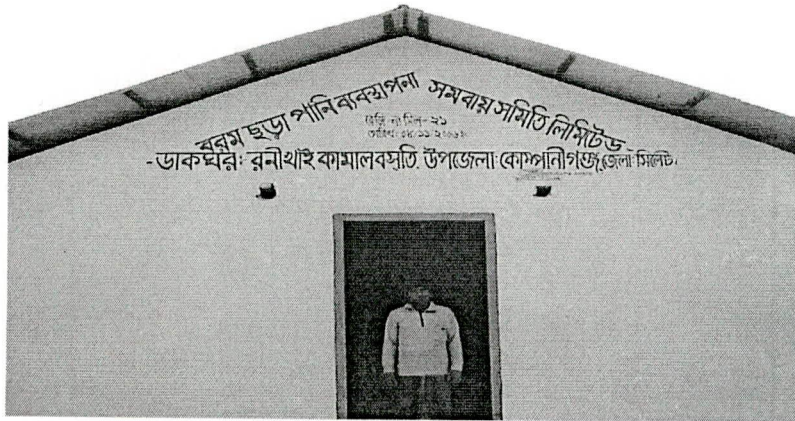
3 Vent Regulator, Shiali Chara Sub project



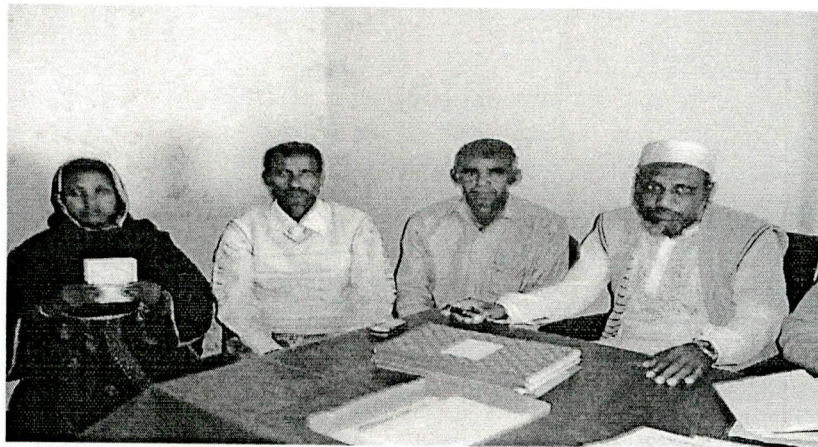
4 Vent Regulator, Chir Chir Chara Sub project



4 Vent Regulator, Chir Chir Chara Sub project



O & M Shed of Borom Chara Sub Project



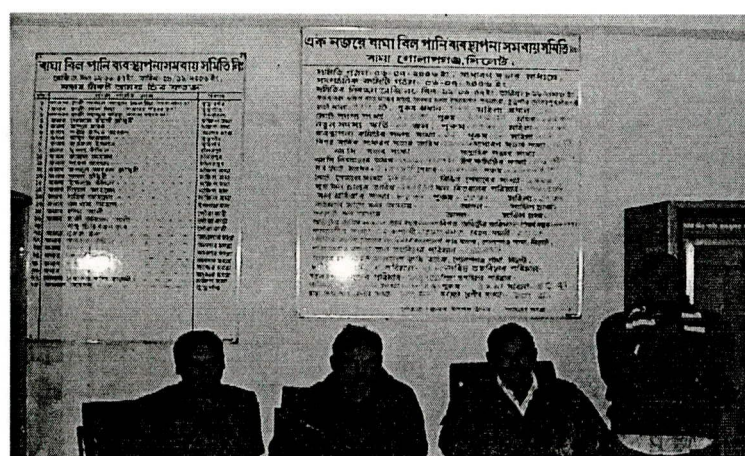
WMCA members in Chir Chiri Chara



Researcher with facilitator of LGED in Chirchiri Chara



WMCA president of BoromChara Sub Project



WMCA members in Bagha Beel Sub Project

ANNEX B

Tables

Source: LGED, SSWRDSP-2, LGED Bhaban, Agargaon, Dhaka.

Source: LGED, XEN Office, LGED Bhaban Sylhet.

Source: WMCA officials, SSWRDSP-II, Sylhet.

Financial & Economic Impacts on Subproject Agriculture

Pre-Subproject				Unit Value		Production	
Bagha Beel							
Crop	Area(ha)	Yield(t/ha)	Production(t)	Financial (tk)	Economic(tk)	Financial (tk)	Economic(tk)
F0	6						
It Aman(normal)	5.4	2.9	15.7	1952	9089	10541	49081
Vegetables	0.12	9.2	1.1	41169	43599	4940	5232
Oil seeds	0.3	1.2	0.4	11255	12566	3377	3770
Spices	0.18	4.8	0.9	83912	74404	15104	13393
Total	6		18			33962	71475
F1	79						
It Aman (normal)	19.75	2.9	57.3	1952	9089	38552	179508
Oilseeds	3.95	1.2	4.7	11255	12566	44457	49636
Total	23.7		62			83009.3	229143.5
F2	263						
Hyv boro(flooded)	105.2	2.9	305.1	-3391	5766	-356733	606583
Hyv boro	157.8	5.5	867.9	9737	25030	153649	394973
Total	263		1173			117976	455631
F3	277						
Hyv boro(flooded)	263.15	2.9	763.1	-3391	5766	-892342	151732
Hyv boro	0	5.5	0.0	9737	25030	0	0
1 boro	13.85	3.3	45.7	3704	12232	51300	169413
Total	277		808.8			-841041	168673

Post-Subproject Bagha Beel				Unit Value		Production		Net Increment	
Crop	Area (ha)	Yield (t/ha)	Production (t)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)
F0	6								
It Aman(normal)	5.4	2.9	15.7	1952	9089	10541	49081	0	0
Vegetables	0.12	9.2	1.1	41169	43599	4940	5232	0	0
Oil seeds	0.3	1.2	0.4	11255	12566	3377	3770	0	0
Spices	0.18	4.8	0.9	83912	74404	15104	13393	0	0
Total	6		18			33962	71475	0	0
F1	79								
It Aman (normal)	19.75	2.9	57.3	1952	9089	38552	179508	0	0
Oilseeds	3.95	1.2	4.7	11255	12566	44457	49636	0	0
Total	23.7		62.0			83009	229143	0	0
F2	263								
Hyv boro(flooded)	105.2	2.9	0.0	-3391	5766	0	0	356733	-606583
Hyv boro	157.8	5.5	1446.5	9737	25030	2560831	6582890	1024332	2633156
Total	263		1446.5			2560831	6582890	1381066	2026573
F3	277								
Hyv boro(flooded)	263.15	2.9	0.0	-3391	5766	0	0	892342	-1517323
Hyv boro	0	5.5	1447.3	9737	25030	2562292	6586645	2562292	6586645
1 boro	13.85	3.3	45.7	3704	12232	51300	169413	0	0
Total	277		1493.0			2613592	6756058	3454633	5069322

Financial & Economic Impacts on Subproject Agriculture

Pre-Subproject				Unit Value		Production	
Chirchir Chara							
Crop	Area(ha)	Yield(t/ha)	Production(t)	Financial(tk)	Economic(tk)	Financial(tk)	Economic(tk)
F0	146						
Vegetables	0	92	0	41169	43599	0	0
B Aus	37	1.9	70.3	1545	6024	57165	222888
Hyv t aus	73	4.2	306.6	7054	18397	514942	1342981
Hyv boro(drought)	51	5	255	6016	20306	306816	1035606
Hyv boro(normal)	22	5.5	121	9737	25030	214214	550660
Hyv t aman(normal)	37	4.2	155.4	7054	18397	260998	680689
It Aman (normal)	109	2.9	316.1	1952	9089	212768	990701
Total	329		1224.4			1566903	4823525
F1	12						
Hyv boro(drought)	7	5	35	6016	20306	42112	142142
Hyv boro(normal)	5	5.5	27.5	9737	25030	48685	125150
It Aman(normal)	12	2.9	34.8	1952	9089	23424	109068
Total	24		97.3			114221	376360
F2	17						
Hyv boro(drought)	5	5	25	6016	20306	30080	101530
Hyv boro(normal)	12	5.5	66	9737	25030	116844	300360
Total	17		91			146924	401890

Post-Subproject Chirchir Chara				Unit Value		Production		Net Increment	
Crop	Area (ha)	Yield (t/ha)	Production (t)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)
F0	146								
Vegetables	1	9.2	9.2	41169	43599	41169	43599	41169	43599
B Aus	37	1.9	70.3	1545	6024	57165	22288 8	0	0
Hyv t aus	73	4.2	306.6	7054	18397	514942	13429 81	0	0
Hyv boro(droug ht)	0	2.9	0	6016	20306	0	0	-306816	- 103560 6
Hyv boro(norma l)	131	5.5	720.5	9737	25030	1275547	32789 30	1061333	272827 0
Hyv t aman(norm al)	37	4.2	155.4	7054	18397	260998	68068 9	0	0
It Aman (normal)	109	2.9	316.1	1952	9089	212768	99070 1	0	0
Total	388		1578.1			2362589	65597 88	795686	173626 3
F1	12								
Hyv boro(droug ht)	0	2.9	0	6016	20306	0	0	-42112	- 142142
Hyv boro(norma l)	12	5.5	66	9737	25030	116844	30036 0	68159	175210
It Aman(norm al)	12	2.9	34.8	1952	9089	23424	10906 8	0	0
Total	24		100.8				40942 8	26047	33068
F2	17								
Hyv boro(droug ht)	0	2.9	0	6016	20306	0	0	-30080	- 101530
Hyv boro(norma l)	17	5.5	93.5	9737	25030	165529	42551 0	48685	125150
Total	17		93.5			165529	42551 0	18605	23620

Financial & Economic Impacts on Subproject Agriculture

Pre-Subproject				Unit Value		Production	
Shiali Chara							
Crop	Area(ha)	Yield(t/ha)	Production(t)	Financial(tk)	Economic(tk)	Financial(tk)	Economic(tk)
F0	2						
Vegetables	0.06	9.2	0.6	41169	43599	2470	2616
Hyv boro(drought)	1.4	5	7.0	6016	20306	8422	28428
Hyv boro(normal)	0	5.5	0	9737	25030	0	0
Hyv t aus	0.1	4.2	0.4	7054	18397	705	1840
It au	0.4	2.6	1.0	1518	8249	607	3300
Hyv t aman(normal)	0.6	4.2	2.5	7054	18397	4232	11038
It Aman (normal)	1.4	2.9	4.1	1952	9089	2733	12725
Total	4.0		15.6			19170.3	59946.4
F1	58						
Hyv boro(drought)	58	5	290	6016	20306	348928	1177748
Hyv boro(normal)	0	5.5	0	9737	25030	0	0
Hyv t aman(normal)	29	4.2	121.8	7054	18397	204.566	533513
It Aman(normal)	29	2.9	84.1	1952	9089	56.608	263581
Total	116					610102	1974842
F2	50						
I boro	2	3.3	6.6	3704	12232	7408	24464
Hyv boro(flooded)	10	2.9	29	-3391	5766	-33910	57660
Hyv boro(drought)	38	5	190	6016	20306	228608	771.628
Hyv boro(normal)	0	5.5	0	9737	25030	0	0
Total	50	225.6				202106	853752
F3	45						
Hyv boro(normal)	0	5.5	0	9737	25030	0	0
Hyv boro(drought)	15	5	75	6016	20306	90240	304590
Hyv boro(flooded)	15	2.9	43.5	-3391	5766	-50865	86490
I boro	15	3.3	49.5	3704	12232	55560	183480
Total	45		168			94935	574560

Post-Subproject				Unit Value		Production		Net Increment	
Shiali Chara									
Crop	Area (ha)	Yield (t/ha)	Production (t)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)
F0	2								
Vegetables	0.1	9.2	0.9	41169	43599	4117	4360	1647	1744
B Aus	0	5	0	6016	20306	0	0	-8422	-28428
Hyv t aus	1.9	5.5	10.5	9737	25030	18500	47557	18500	47557
Hyv boro(drought)	0.2	4.2	0.8	7054	18397	4232	11038	0	0
Hyv boro(normal)	0.3	2.6	0.8	1518	8249	455	2475	-152	-825
Hyv t aman(normal)	0.6	4.2	2.5	7054	18397	4232	11038	0	0
It Aman (normal)	1.4	2.9	4.1	1952	9089	2733	12725	0	0
Total	4.5		19.6			31448.6	81833.8	12278.3	21887.4
F1	58								
Hyv boro(drought)	0	5	0	6016	20306	0	0	-348928	-1177748
Hyv boro(normal)	58	5.5	319	9737	25030	567746	1451740	564746	1451740
Hyv t aman(normal)	29	4.2	121.8	7054	18397	204566	533513	0	0
It Aman(normal)	29	2.9	84.1	1952	9089	56608	263581	0	0
Total	116		524.9			825920	2248834	215818	273992
F2	50								
I boro	2	3.3	6.6	3704	12232	7408	24464	0	0
Hyv boro(flooded)	10	2.9	29	-3391	5766	-33910	57660	0	0
Hyv boro(drought)	0	5	0	6016	20306	0	0	-228.608	-771628
Hyv boro(normal)	38	5.5	209	9737	25030	370.006	951140	370.006	951140
Total	50		244.6			343504	1033264	141398	179512
F3	45								
Hyv boro(normal)	15	5.5	82.5	9737	25030	146055	375450	146055	375450
Hyv boro(drought)	0	5	0	6016	20306	0	0	-90240	-304590
Hyv boro(flooded)	15	2.9	43.5	-3391	5766	-50865	86490	0	0
I boro	15	3.3	49.5	3704	12232	55560	183480	0	0
Total	45					150750	645420	55815	70860

Financial & Economic Impacts on Subproject Agriculture

Pre-Subproject				Unit Value		Production	
Dulia Satbila							
Crop	Area(ha)	Yield(t/ha)	Production(t)	Financial(tk)	Economic(tk)	Financial(tk)	Economic(tk)
F2	135						
Hyv t aman(normal)	3.375	4.2	14.2	7054	18397	23807	62090
Hyv t aman(flooded)	3.375	2.8	9.5	-600	7871	-2025	26565
Hyv boro	40.5	5.5	222.8	9737	25030	394349	1013715
Hyv boro(flooded)	40.5	2.9	117.5	-3391	5766	-137336	233523
Wheat(drought)	1.35	1.9	2.6	2147	11091	2898	14973
Wheat(normal)	1.35	2.7	3.6	7115	19524	9605	26357
Hyv boro(drought)	33.75	5.0	168.8	6016	20306	203040	685328
Oilseeds	2.7	1.2	3.2	11255	12566	30389	33928
Total	126.9		542			524727.5	2096478.5
F3	245						
Hyv boro(flooded)	12.25	2.9	35.5	-3391	5766	-41540	70634
Hyv boro	12.25	5.5	67.4	9737	25030	119278	306618
Hyv boro(drought)	12.25	5	61.3	6016	20306	73696	248749
I boro	208.25	3.3	687.2	3704	12232	771358	2547314
Total	245		851.4			922793	3173314

Post-Subproject Dulia Satbila				Unit Value		Production		Net Increment	
Crop	Area (ha)	Yield (t/ha)	Production (t)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)
F2	135								
Hyv t aman(normal)	3.375	4.2	14.2	7054	18397	23807	62090	0	0
Hyv t aman(flooded)	3.375	2.8	9.5	-600	7871	-2025	26565	0	0
Hyv boro	128.25	5.5	705.4	9737	25030	1248770	3210098	854422	2196383
Hyv boro(flooded)	0	2.9	0.0	-3391	5766	0	0	137336	-233523
Wheat(drought)	0	1.9	0.0	2147	11091	0	0	-2898	-14973
Wheat(normal)	2.5	2.7	6.8	7115	19524	17788	48810	8182	22453
Hyv boro(drought)	0	5	0.0	6016	20306	0	0	-203040	-685328
oilseeds	2.7	1.2	3.2	11255	12566	30389	33928	0	0
Total	140.2		739.0			1318728.5	3381490.2	794001	1285012
F3	245								
Hyv boro(flooded)	0	2.9	0	-3391	5766	0	0	41540	-70634
Hyv boro	171.5	5.5	943.3	9737	25030	1669896	4292645	1550617	3986028
Hyv boro(drought)	0	5	0	6016	20306	0	0	-73696	-248749
I boro	73.5	3.3	242.6	3704	12232	272244	899052	-499114	-1648262
Total	245		1185.8			1942140	5191697	1019347	2018384

Pre-Subproject				Unit Value		Production	
Borom Chara							
Crop	Area(ha)	Yield(t/ha)	Production(t)	Financial(tk)	Economic(tk)	Financial(tk)	Economic(tk)
F0	147						
Baus	88	1.9	167.6	1545	6024	136269	531317
Itaman(normal)	140	2.9	405	1952	9089	272596.8	1269279
Hyvtaman(normal)	7	4.2	30.9	7054	18397	51846.9	135218
Hyv boro	0	5.5	0	9737	25030	0	0
Total	235		603.4			460713	1935814
F1	123						
Itaman(normal)	61.5	2.9	178.4	1952	9089	120048	558974
dwaman(broadcast)	61.5	2.1	129.2	2557	7409	157255.5	455654
Hyv boro	0	5.5	0	9737	25030	0	0
Total	123		307.5			277304	1014627
F2	147						
Hyv boro	58.8	5.5	323.4	9737	25030	572536	1471.764
Hyv boro(drought)	14.7	5	73.5	6016	20306	88435	298498
Total	74		396.9			660971	1770262
F3	18						
Hyv boro	13.5	5.5	74.3	9737	25030	131450	337905
l boro	4.5	3.3	14.9	3704	12232	16668	55044
Total	18		89.1			148118	392949

Post-Subproject Borom Chara				Unit Value		Production		Net Increment	
Crop	Area (ha)	Yield (t/ha)	Production (t)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)	Financial (tk)	Economic (tk)
F0	147								
B aus	0	1.9	0	1545	6024	0	0	-136269	-531317
It aman(normal)	58.8	2.9	170.5	1952	9089	114778	534433	-157819	-734846
Hyv t aman(normal)	7.4	4.2	30.9	7054	18397	51847	135218	0	0
Hyv boro	102.9	5.5	566	9737	25030	1001937	2575587	1001937	2575587
Total	169		767.3			1168562	3245238	707849	1309425
F1	123								
It aman(normal)	61.5	2.9	178.35	1952	9089	120048	558974	0	0
dw aman(broadcast)	61.5	2.1	129.15	2557	7409	1572555.5	455654	0	0
Hyv boro	123	5.5	676.5	9737	25030	1197651	3078690	1197651	3078690
Total	246		984			1474955	4093317	1197651	3078690
F2	147								
Hyv boro	147	5.5	808.5	9737	25030	1431339	3679410	858803	2207646
Hyv boro(drought)	0	5	0	6016	20306	0	0	-88435	-298498
Total	147		808.5			1431339		770368	1909148
F3	18								
Hyv boro	13.5	5.5	74	9737	25030	131450	337905	0	0
l boro	4.5	3.3	14.9	3704	12232	16668	55044	0	0
Total	18		89			148118	392949	0	0

Sub project No: 25192
 Sub project Name: Shiri ShiriChara
 Type of project: Water Conservation
 Area benefited: 175 Hecter
 No. of families benefited:166, total 232.

Infrastructure:

- a) WRS : 1 no.
- b) O & M Shed :1 no.
- c) Canal Dyke : 0.830 km.
- d) Outlet : 4 nos.

Total Cost: 53,44,743/=

Collected O & M Fund:77,050/=

Classification of families:

Landless (0-0.49 acre)	: 84
Marginal Farmer (0.50-0.99 acre)	:27
Small Farmer (1-2.49 acre)	:54
Medium Farmer (2.5-7.49 acre)	:49
Large Farmer (7.50 +)	:28

Information of Shirishirichara WMCA (up to April'08):

Reg. No: Syl-23/06-07 Dated : 18-11-06

Total Member : 219

Male : 165 Female : 54

Own capital: 53,080/=

Share: 19,050/= & Savings: 34,030/=

Distributed Micro-credit: 42,000/= Collected Micro-credit: 40,480/=

Collected Service Charge: 520/=

No. of borrower: 14 Male 12 Female :02

Date of Last AGM: 28-06-07

Date of Last Election: 28=06-07

Last Audit Report : 20-08-07 Profit : 5,853/=

Sub project No: 25211

Sub project Name: Bagha Beel

Type of project: Flood Management

Area benefited: 625 Hector

No. of families benefited: 355, total 624.

Infrastructure:

a) Regulator : 1 no.

b) O & M Shed : 1

no.

c) Flood Protection embankment : 6.5

km.

Total Cost: 1,09,66,696/=

Collected O & M Fund: 2,42,000/=

Classification of families:

Landless (0-0.49 acre) : 238

Marginal Farmer (0.50-0.99 acre) : 23

Small Farmer (1-2.49 acre) : 143

Medium Farmer (2.5-7.49 acre) : 178

Large Farmer (7.50 +) : 42

Information of Bagha Beel WMCA (up to Dec'07):

Reg. No: Syl-19/06-07 Dated : 8-11-06

Total Member : 443

Male : 364 Female : 79

Own capital: 1,70,250/=

Share: 1,03,600/= & Savings: 66,650/=

Distributed Micro-credit: 1,75,000/= Collected Micro-credit: 41820/=

Collected Service Charge: 9,275/=

No. of borrower: 35 Male 28 Female : 7

Date of Last AGM: 28-06-07

Date of Last Election: 30-10-07

Last Audit Report : 23-10-07 Profit : 9,551/=

Sub project No: 23104

Sub project Name: Dhulia Satbila, Companiganj

Type of project: Flood Management

Area benefited: 407 Hector

No. of families benefited: 437, total 539.

Infrastructure:

a) Regulator : 2 no. (1 vent & 2 vent)

b) O & M Shed : 1 no.

c) Flood Control embankment : 5.920
km.

d) Canal Re-excavation : 5.750
km.

e) Closure : 1 no.

Total Cost: 1, 05, 93,390/=

Collected O & M Fund: 1.99.928/=

Classification of families:

Landless (0-0.49 acre) : 157

Marginal Farmer (0.50-0.99 acre) : 46

Small Farmer (1-2.49 acre) : 165

Medium Farmer (2.5-7.49 acre) : 159

Large Farmer (7.50 +) : 12

Information of Dhulia Satbila WMCA (up to April'08):

Reg. No: Syl-94/03-04 Dated : 17-03-04

Total Member : 426

Male : 378 Female : 48

Own capital: 2,45,620/=

Share: 17,040/= & Savings: 2,28,580/=

Distributed Micro-credit: 6,09,600/= Collected Micro-credit:
3,92,685/=

Collected Service Charge: 77,910/=

No. of borrower: 137 Male 133 Female : 04

Date of Last AGM: 10-09-07

Date of Last Election: 30-09-07

Last Audit Report : 16-09-07 Profit : 10.917/=

Sub project No: 23072

Sub project Name: ShialiChara

Type of project: Water Conservation

Area benefited: 155 Hector

No. of families benefited: 178, total 382.

Infrastructure:

- a) WRS : 1 no.(3 vent)
- b) O & M Shed : 1 no.
- c) Canal Dyke : 4.096 km.
- d) Outlet : 2 nos.

Total Cost: 38,33,036/=

Collected O & M Fund: 57,129/=

Classification of families:

Landless (0-0.49 acre) : 179

Marginal Farmer (0.50-0.99 acre) : 35

Small Farmer (1-2.49 acre) : 133

Medium Farmer (2.5-7.49 acre) : 29

Large Farmer (7.50 +) : 06

Information of ShialiChara WMCA (up to April'08):

Reg. No: Syl-17/04-05 Dated : 23-09-04

Total Member : 298

Male : 194 Female : 104

Own capital: 1,57,500/=

Share: 22,200/= & Savings: 1,13,360/=

Distributed Micro-credit: 3,99,000/= Collected Micro-credit: 2,63,120/=

Collected Service Charge: 35,880/=

No. of borrower: 107 Male 80 Female : 27

Date of Last AGM: 21-06-07

Date of Last Election: 23-08-05

Last Audit Report : 08-10-07 Profit : 12,398/=

Sub project No: 25200

Sub project Name: Boromchara

Type of project: Water Conservation

Area benefited: 155 Hector

No. of families benefited: 178, total 382.

Infrastructure:

- a) WRS : 1 no.(6 vent)
- b) O & M Shed : 1 no.
- c) Canal re-excavation : 2.80 km.
- d) Outlet : 2 nos.

Total Cost: 7401234/=

Collected O & M Fund: 131510/=

Classification of families:

Landless (0-0.49 acre) : 290

Marginal Farmer (0.50-0.99 acre) : 45

Small Farmer (1-2.49 acre) : 97

Medium Farmer (2.5-7.49 acre) : 74

Large Farmer (7.50 +) : 15

Information of Boromchara WMCA (up to April'08):

Reg. No: Syl-21/06-07 Dated : 08-11-06

Total Member : 430

Male : 272 Female : 158

Own capital: 292020/=

Share: 115900/= & Savings: 176120/=

Distributed Micro-credit: 458000/= Collected Micro-credit:
2,36,600/=

Collected Service Charge: 47320/=

No. of borrower: 92 Male 48 Female : 44

Date of Last AGM: 18-06-07

Date of Last Election: 25-10-07

Last Audit Report : 25-10-07 Profit : 5261/=

Chirchirchara January, 2008.

Committee Formation: 18/11/06

Registration No: Syl-23/06-07

Total Family: 207

Male: 161

Female: 46

Total Amount of Capital: 63570/=

Share: 18450

Savings: 30570/=

Others: 14550/=

Micro credit info:

Total nos. of Borrowers: 129

Total disbursement: 42000/=

Male: 12

Female: 02

Loan realization: 30624/=

Uncollected: 11376 /=-

O&M fund: 77050/=

Chirchirchara December, 2008.

Committee Formation: 18/11/06

Registration No: Syl-23/06-07

Total Family: 281

Total Amount of Capital: 95540/=

Male: 177

Female: 104

Share: 22300

Savings: 55090/=

Others: 18150/=

Micro credit info:

Total nos. of Borrowers: 129

Total disbursement: 42000/=

Male: 96

Female: 33

Loan realization: 42000/=

Uncollected:

O&M fund: 77050/=

Dulia satbila December, 2008.

Committee Formation: 17/03/04

Registration No: Syl-94/03-04

Total Family: 481

Total Amount of Capital: 278820/=

Male: 405

Female: 76

Share: 21320

Savings: 228580/=

Others: 25015/=

Micro credit info:

Total nos. of Borrowers: 183

Total disbursement: 842000/=

Male: 174

Female: 09

Loan realization: 543153/=

Uncollected: 298847/=

O&M fund: 200000/=

Dulia satbila January, 2008.

Committee Formation: 17/03/04

Registration No: Syl-94/03-04

Total Family: 426

Total Amount of Capital: 278820/=

Male: 378

Female: 48

Share: 17040

Savings: 221880/=

Others: 20175/=

Total disbursement: 449000/=

Micro credit info:

Total nos. of Borrowers: 129

Male: 101

Female: 04

Loan realization: 324823/=

Uncollected: 124177/=

O&M fund: 200000/=

Baghabeel January, 2008.

Committee Formation: 08/11/06

Registration No: Syl-19/06-07

Total Family: 453

Male: 372

Female: 81

Total Amount of Capital: 595940

Share: 113900

Savings: 70650/=

Others: 70150/=

Micro credit info:

Total nos. of Borrowers: 129

Total disbursement: 190000/=

Male: 58

Female: 31

Loan realization: 45320/=

Uncollected: 144680/=

O&M fund: 241400/=

Baghabeel December, 2008.

Committee Formation: 08/11/06

Registration No: Syl-19/06-07

Total Family: 632

Male: 473

Female: 159

Total Amount of Capital: 595940

Share: 345300

Savings: 141370/=

Others: 192070/=

Micro credit info:

Total nos. of Borrowers: 129

Total disbursement: 744500/=

Male: 58

Female: 31

Loan realization: 223496/=

Uncollected: 521004/=

O&M fund: 77000/=

Boromchara December, 2008.

Committee Formation: 08/11/06
Registration No: Syl-06-07
Total Family: 473
Total Amount of Capital: 414160 /=

Micro credit info:
Total nos. of Borrowers: 117

O&M fund: 131510/=

Male: 292
Share: 152750
Savings: 261410/= Others: 157592/=
Total disbursement: 648000/=
Male: 60 Female: 57
Loan realization: 376375/=
Uncollected: 271625/=

Boromchara January, 2008.

Committee Formation: 08/11/06
Registration No: Syl-06-07
Total Family: 422
Total Amount of Capital: 95540/=

Micro credit info:
Total nos. of Borrowers: 70

O&M fund: 131510/=

Male: 271 Female: 151
Share: 107750
Savings: 157350/= Others: 83588/=
Total disbursement: 348000/=
Male: 43 Female: 27
Loan realization: 172250/=
Uncollected: 175750/=

Shialichara December, 2008.

Committee Formation: 23/09/04
Registration No: Syl-17/04-05
Total Family: 304
Total Amount of Capital: 185820/=
Share: 27300

Micro credit info:
Total nos. of Borrowers: 129

O&M fund: 57129/=

Male: 199 Female: 105
Savings: 132200/=
Others: 25320/=
Total disbursement: 513000/=
Male: 96 Female: 33
Loan realization: 373472/=
Uncollected: 125848/=

Shialichara January, 2008.

Committee Formation: 23/09/04
Registration No: Syl-17/04-05
Total Family: 292
Total Amount of Capital: 140770/=
Share: 20550

Micro credit info:
Total nos. of Debtor: 29

O&M fund: 57129/=

Male: 191 Female: 101
Savings: 101160/=
Others: 19060/=
Total:
Total disbursement: 318000/=
Male: 68 Female: 21
Loan realization: 273752/=
Uncollected: 104248/=

