PERFORMANCE EVALUATION OF SELECTED COMMAND AREA DEVELOPMENT (CAD) SUBPROJECTS

MD. SOHEL RANA

DEPARTMENT OF WATER RESOURCES ENGINEERING
BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY (BUET)
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PERFORMANCE EVALUATION OF SELECTED COMMAND AREA DEVELOPMENT (CAD) SUBPROJECTS

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Md. Sohel Rana
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Certification of Project

The project work entitled 'PERFORMANCE EVALUATION OF SELECTED COMMAND AREA DEVELOPMENT (CAD) SUBPROJECTS' submitted by Md. Sohel Rana, Roll No: 100616006 (P), Session: October 2006 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of **Master of Engineering in Water Resources Engineering** on 28 September, 2011.

Professor Dr. Md. Sabbir Mostafa Khan — Chairman of the Committee
Department of Water Resources Engineering — (Supervisor)
BUET, Dhaka.

Professor Dr. M. Fazlul Bari — Member
Department of Water Resources Engineering
BUET, Dhaka.

Professor Dr. M. Mirjahan — Member
Department of Water Resources Engineering
BUET, Dhaka.

Declaration

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

Signature of the Supervisor

_____

Professor Dr. Md. Sabbir Mostafa Khan
Department of Water Resources Engineering
BUET, Dhaka.

Signature of the Candidate

_____

Md. Sohel Rana

Table of Contents

List of Tables

List of Figures

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
CEGIS	Center for Environmental and Geographic Information Services
cumec	cubic meter per second
DTWs	Deep Tube Wells
GoB	Government of Bangladesh
GDP	Gross Domestic Product
ha	Hectare
HYV	High Yield Variety
IFAD	International Fund For Agricultural Development
IIMI	International Irrigation Management Institute
IMP	Interim Management Program
IPRSP	Interim Poverty Reduction Strategy Paper
JBIC	Japan Bank for International Cooperation
Kg	Kilogram
LLP	Low Lift Pump
M&E	Monitoring & Evaluation
MDIP	Meghna-Dhonagoda Irrigation Project
MPO	Master Plan Organization
NMIDP	National Minor Irrigation Development Project
NWPo	National Water Policy
O&M	Operation & Maintenance
PWD	Public Works Datum
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
SP	Subproject
STW	Shallow Tube-Well
Tk./ha	Taka per Hectare
USDA	United States Department of Agriculture
WARPO	Water Resources Planning Organization
WMC	Water Management Corporation
WMCA	Water Management Corporative Association
WMG	Water Management Group

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Md. Sohel Rana
Author

Abstract

Most of the people of Bangladesh are directly involved in agricultural work which has a great impact on the economy. Without the development of agriculture it will not be possible to develop the country. In root level, LGED undertook Small Scale Water Resource Development Sector Project phase-1 (SSWRDSP-1) in 1995 jointly funded by Asian Development Bank (ADB), International Fund for Agricultural Development (IFAD) and the Government of Netherlands (GON). The main purpose was to alleviate poverty through agricultural and fisheries development and environmental mitigation measures. With the successful completion of phase-1, LGED undertook the phase-2 (SSWRDSP-2) in 2002 for the same purpose and funded by the same donors. After completion of SSWRDSP-2 in 2007, the third phase is going on in the name of "Participatory Small Scale Water Resources Sector Project (PSSWRSP)" from January-2010. On the other hand, JBIC funded Small Scale Water Resources Development Projects (SSWRDP) is going on in 15 Districts in greater Mymensingh, Sylhet and Faridpur areas of Bangladesh in the period from July-2007 to June-2013. In SSWRDSP, the beneficiaries are directly involved with the subproject activities, by investing 3% for earth work and 1.5% for structural work entirely for O&M through membership of WMCA committee.

The present study evaluates the performance of selected five CAD subprojects in Chapainawabganj district. Command Area Development (CAD) Subproject is the project in which on-farm development works like field leveling, sump, field channels, field drain, siphon, aqueduct, turnout etc are constructed for delivering the water to the farmers' field. The approach used for this evaluation is "pre and post project approach". The indicators which have been used for this evaluation are hydraulic, agricultural and non-agricultural. The hydraulic indicator i.e. the water supply performance increased by 181%, 200%, 30%, 125% and 289% for Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP respectively. Among agricultural indicators, the Irrigation area performance increased 260%, 283%, 78%, 176% and 525% and yield of boro crop increased by 52%, 53%, 40%, 33% and 43%, for the above subprojects respectively. Among non-agricultural indicators, the member enrollment status of WMCA is satisfactory of each subproject. The increment of member enrollment in each year is not significant; because maximum beneficiaries initially became members in concern WMCA. On the other hand, the meeting occurrence number in each subproject is more than the proposed number during 2008-2010. In conflict resolution, water management and infrastructure maintenance the performance of WMCA is more than 70%. In microcredit activities, the WMCA are doing well in credit disburse and credit recovery. The loan recovery percentages of Mohammadkhani SP are 70.06%, 75.60% and 52.60%, in Nayagola-Mohananda SP are 92.90%, 93% and 76%, in Dariapur SP are 59.95%, 55.01% and 58.54%, in Palsha Mahespur SP are 100%, 100% and 100%, in Agrani Irrigation SP are 100%, 100% and 100% in 2008, 2009 and 2010 respectively. The socio-economic performance, such as the wage rates and land value of the subproject areas increased significantly. There was no remarkable change of environmental conditions in after CAD condition compare to before CAD condition regarding. Regarding O&M performance, it is seen that the subprojects are financially self sufficient. The

percentage of fund collection efficiency of Mohammadkhani SP are 99.98%, 100% and 99.00%, of Nayagola-Mohananda SP are 99.99%, 99.89% and 99.96%, of Dariapur SP are 98.31%, 82.35% and 95.11%, of Palsha Mahespur SP are 99.99&, 100% and 70.75% and of Agrani CAD SP are 95.61%, 91.96% and 92.93% in 2008, 2009 and 2010 respectively. The main source of income of the people of this area is agricultural production. From the beneficiaries opinion it is known, farmers get one crop per year. In dry season the area become dry and farmers do not get water easily for irrigation. By the implementation of these subprojects, the farmers get surface water to irrigate their land. Now they cultivate three crops per year.

Chapter 1

Introduction

1.1 General

Bangladesh is an agricultural country. Most of the people are directly involved in agricultural activities. The economy of Bangladesh depends extensively on agricultural development. Agricultural development depends on the irrigation for production of crops. In Bangladesh, about 65% of economy depends on agricultural production, and 53% of the irrigable area is under irrigation and rest of the irrigable area depends on rain water (Bari et al. 1999). Bangladesh is an overpopulated country and as the population increasing so demand for food is also increasing day by day. It has limited land and water. So, sustainable water management and economic use of water is needed for agricultural sector. Bangladesh government has taken up necessary steps to increase agricultural production to meet food demand for increasing population with the limited irrigation water and land. Water management is necessary for efficient use of water. The management of water resources may be done through the participation of all stakeholders. Local Government Engineering Department (LGED) implemented Small Scale Water Resources Development Project Phase-1 during 1995 to 2002 and Second Small Scale Water Resources Development Sector Project Phase-2 (SSWRDSP-2) during 2002 to 2007. These were subprojects of area upto 1000 ha. The purpose was to increase agricultural production through water management system in small scale with much emphasis on people's participation. These subprojects contain flood control, flood management, drainage improvement, water conservation and command area development (CAD) projects. They were implemented for poverty reduction through agricultural production, fisheries development and environmental mitigation measures. Based on the achievement of phase-1 & 2, the phase-3 started in the name "Participatory Small Scale Water Resources Sector Project (PSSWRSP)" from January-2010 for implementation. In the mean time another project has been going on funded by JBIC for implementation of Small Scale Water Resources Development Projects (SSWRDP) in 15 Districts in greater Mymensingh, Sylhet and Faridpur Areas in Bangladesh for the period from July-2007 to June-2013.

In this sector, large number of studies & evaluations were done. Most of these subprojects could not achieve its original goals due to several reasons. The functions of different structures in the subprojects are deteriorating and in some cases these are totally inoperative. Thus the aim of the subprojects has not been fulfilled. BUET, Bangladesh Institute of Development Studies (BIDS) and Delft hydraulics (2003) evaluated the performance of thirty subprojects of Small scale Water Resources Development Sector Project phase-1 during the period from April 1996 to December 2002 titled 'External Evaluation Small Scale Water Resources Development Sector Project-1'. The above study found that, performance of most of the subprojects was good and local community were getting benefit out of these subprojects. Another benefit monitoring & evaluation (BME) study completed by BIDS (December 2008) for Second small Scale Water Resources Development Sector Project. This

study concluded that the sustainability of the subprojects is largely dependent on the performance of the WMCAs via satisfactory operation and maintenance. Despite these situations, the study found good performance of the subprojects and development of the project area.

1.2 Justification of the Study

During the period from 1995 to 2002 and 2002 to 2007 the Local Government Engineering Department (LGED) implemented the Small-Scale Water Resources Development Sector Project (SSWRDSP) Phase-1 and Phase-2 (Subproject area <1000 ha) respectively. The project was to rehabilitate or implement small scale water control system, called Subprojects all over the country. The type of schemes varied depending on local geographical and hydrological conditions and includes flood control, drainage improvement, water conservation and command area development (CAD). Command Area Development (CAD) Subproject is the project in which on-farm development works like field leveling, sump, field channels, field drain, siphon, aqueduct, turnout etc are constructed for delivering the water to the farmers' field. The CAD subprojects mainly focused on the improvement of on-firm water management, participation of the beneficiaries to the scheme, O&M and construction or rehabilitation of some physical infrastructure. In Chaipanawabganj district, LGED implemented subprojects whose major types are CAD subprojects. The entire project was financed through a loan to Government of Bangladesh (GoB) from the Asian Development Bank (ADB) and an International Fund for Agricultural Development (IFAD). Furthermore, the GoB and subproject beneficiaries financed the project. Also the Government of the Netherlands (GON) provided a Technical Assistance (TA) grant. Although there are lots of performance evaluations, no performance evaluation about the five CAD subprojects selected for this study. That is why a comprehensive evaluation of the five selected CAD subprojects is deemed necessary.

1.3 Objectives of the Study

The specific objectives are:

i. To evaluate the performance of CAD Subprojects in Chapainawabganj district by selected indicators.
ii. To evaluate participatory management.
iii. To evaluate Operation & Maintenance (O&M) aspects.

Chapter 2

Literature Review

2.1 General

Bangladesh has a limited agricultural land. Every year the agricultural land converted to residential area due to fulfill the demand of homestead for the increasing people. Also some agricultural lands are decreased due to erosion of river bank. As a result the production of agriculture is decreasing badly day by day. The agricultural production cost is increasing due to limited resources in our country. So the performance evaluation of water resources development project is prime need in order to take necessary steps to gain maximum possible benefits and also for future efficient planning and development of water resources projects. The performance of a system is represented by its measured levels of achievement in terms of one or several parameters which are named as indicators. It is the measure of effectiveness with respect to the achievement of the desired objectives of the project. The performance of irrigation projects depends on several factors like engineering, agricultural, socio-economic and institutional.

2.2 Previous Evaluation of Water Resources Projects

Some research works were conducted regarding performance evaluation of small and medium scale irrigation projects. Few of them are cited here:

Ahmed (1987) evaluated the performance of Chandpur Irrigation Project (CIP) of BWDB in 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, co-operatives 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% post-project implementation. Yields for individual crops have also increased (for T. Aman HYV, yield increased to 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 sources declined to 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 (FCDI) projects to evaluate their performance comparing 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 cost for irrigation of unit area by deep tube-wells with improved distribution system was found to be about eleven percent higher than that for deep tube-well 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 district 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 implementation of 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 subprojects. Selected (randomly) 30 subprojects are located in the western half of Bangladesh. The performance of these subprojects 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 (i) institutional setup through Water Management Cooperative Associations (WMCAs), (ii) quality of infrastructure and its social acceptability, (iii) poverty reduction issues and (iv) institutional strengthening of LGED and other agencies involved. Distinction was made between the number of subprojects scoring more than 70%, regarded as good, the number of subprojects scored between 50% and 70%, required continuous supports and attention and the number of subprojects with a score below 50% considered as insufficient. It was found that about 47% of the sampled subprojects showed a good score on technical issues and 17% scored below the expected acceptable standard. For the remaining criteria only one out of thirty subprojects reached a good score. The valuation of the socio-economic output was highly dependent on the perception of the respondents on the questionnaires in the field. The valuation of these sub-criteria therefore was made based on theoretical relations between the direct socio-economic outcomes such as agriculture, fisheries and employment, the expected distribution of such benefits between the poor, landless people and women. When considering the institutional criteria, only one of the thirty subprojects 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 (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 subproject including a through baseline survey and study and (iv) specify measures to be taken to ensure that poor people, small farmers and destitute women get benefit from the subprojects.

Mukherjee (2004) evaluated the performance of three selected small scale water resources development sector subprojects of LGED (Brazamul FCD, Agrani CAD and Gangarampur FCD subprojects) 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 had no clear operational instruction that led to conflicts between the technicians and the farmers; no equitable water distribution at field level; no cost recovery; no proper conflict-handling and maintenance system, and lack of beneficiary participation was found. These were the main reasons behind the lower success of the water schemes.

The above study also revealed that partial decentralization of LGED schemes helps in sustainable agricultural and overall financial development, but almost in all cases 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 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 management system.

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 lists and questionnaires were prepared for systematic recording of the information. Coordination was maintained for both (i) functional activities of various institutions and (ii) various components of intervention work to ensure better performance through improved 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 aspects were considered for performing the impact assessment. The evaluation involved comparison of the values of the indicators for pre & 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

assessment shows that overall reliability of the canal systems has been improved and the average relative water supply at agricultural plot was higher compared to pre intervention condition. Another most positive aspect of the intervention work in NNIP was that the coverage of irrigable area increased significantly which was from 64.29% to 90.55% resulting better irrigation systems performance. But in institutional improvement, limited success was achieved. Though all WMGs and one WMA were formed in NNIP area, their activities in all cases were not remarkable. Still there is lack of linkage between BWDB project level authority and farmers for service charge collection. Considering all those aspects, a modified PWM framework has been proposed for NNIP in this study which may result better system management so that 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 (MDIP). Field investigation was conducted to evaluate the impact of command area development program in Meghna Dhongoda Irrigation 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 were used as agricultural indicators. The socio-economic indicators used in this study include fee collection performance & 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 beneficial impact of the project. After the CADP in MDIP, irrigation fee collection was started from 2001-2002 and it was quite insignificant. Therefore, depending only on fee collection operation & maintenance was not possible to make itself sustaining. Environmental indicator showed no remarkable change in water quality and natural vegetation after CADP in MDIP, but fish production has increased by two fold 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 members 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 evaluate 4 small scale subprojects 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 work out 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 day to day 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 were 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 day to day activities. This deal was 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 were 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.

BIDS (2008) evaluated performance of 40 subprojects known as “Benefit Monitoring & Evaluation (BME) Study of Second Small Scale Water Resources Development Sector Project (SSWRDSP-II). These subprojects were implemented by Local Government Engineering Department (LGED). Out of 40 subprojects 10 are from SSWRDSP-I and 30 are from SSWRDSP-II. Benefit Monitoring & Evaluation of these subprojects were conducted from the viewpoints of socio-economic, agricultural, water management, fisheries and women & development. The methodology adopted in this study was collection of data through household survey for aforesaid five modules. The data were collected from a “Project area” (two villages having intervention) and a “Control area” (one village having no intervention). In this study, from the socio-economic point of view, it was found that the average household income and value of assets in the Project area is respectively 22.3% & 30.60% higher than the Control area. In agricultural point of view, it was found under HYV crop area increased 13% over

the time and the crop production increases by 78% in the Project area compared to only by 25% in the Control area in pre-subproject production. On average, the households in the Project area had higher farm income of Tk. 65,943, recording an increase of 76% in pre-subproject situation with marginal difference among the various size of farms (67% to 93%). It was found that the subproject helped substantial increase in farm income. The WMCA formed there should, however, need to be more careful about the maintenance of the infrastructures built there.

The above study found the major reasons for construction of subprojects. In most cases, they have been perceived by local people due to the incidence of crop losses (73.60%), drainage congestion, flooding (52.60%), water logging (56.20%) and lack of irrigation facilities (38.00%). There was a questionnaire to the local people in subproject area whether the problems were resolved satisfactorily. In only a few cases (3.30%), the respondents mentioned that the problems have been slightly solved or not solved at all, while over half of them (52.40%) mentioned that the problems were only partially solved. However, around 44.30% thought that the problems were largely solved or were solved as expected. In the post-project periods, the situation in respect of inundation and land levels considerably improved. On the whole, about 27.60% of the cultivated lands were flood free in the pre-project situation, which increased to about 57.50%. Overall, the flood-free lands has increased to the extent of as high as 178% while flooded area has decreased to the extent of 49%.

Most subprojects encountered some maintenance problems, most of which were not difficult to be addressed. Some common problems in relation to the maintenance of the subprojects were identified. Over two fifths of the perceived problems (42.80%) were related to either O&M fund inadequacy or O&M group being non-functioning, while over one third (35.30%) were related to lack of dynamism on the part of the WMCAs or lack of unity/common interest on the part of the beneficiaries. Some of the problems (9.40%), however, were perceived to be related to subproject design or its defective construction.

This study found that important changes happened in the reference period in terms of cultivable landholding per household, irrigation pattern and flood inundation inside the project area. Such changes resulted in positive impacts on cropping intensity, use of HYV rice variety and in overall paddy production. But on the other hand, some negative impacts were apparent in terms of development of aquaculture and fisheries in the project areas. The study also found reductions in the percentage of household involvement in pond aquaculture and open water fishing but there was considerable increase in average pond size and little increase in average fish production from the pond aquaculture.

Analysis of this study found that except in few cases, there was no big difference between the occupation of the women in the Project areas and those in the Control areas. However, a big difference between the project and control areas' women was found in the amount of income they earned from different activities. Overall, the average annual income earned by the surveyed women is estimated at Tk. 4,534 in the Project area as against Tk. 3563 in the Control area. Findings show that

from almost all occupations, the women in the Project area earned significantly higher income than their counterparts in the Control area.

This study mentioned, one should not rely too much on the absolute figures relating to the performance of the subprojects and WMCAS. Nevertheless, subject to limitations of the survey and survey data, It can be concluded that the SSWRDSP-I subprojects have had substantial positive impacts on income and asset for the beneficiary households, although the non-poor households have been benefited more. This study finally concluded that the performance of the subprojects is highly dependent on the performance of the WMCAs. Hence, efforts should be made to improve the performance of the WMCAs in terms of improved operation and maintenance in order to ensure the sustainability of the subprojects and avoid their costly rehabilitation in the future.

Mizanur Rahman (2008) evaluated performance of the participatory water management of some selected small scale water resources projects of LGED. It was conducted on three selected sub-projects of SSWRDSP of LGED. Of the selected sub-projects two are from phase-1 and one from phase-2. The objectives of the study were to analyze pre & post project condition of project area and assess the performance of WMCAs through questionnaire survey. It was found that, crop production and cropping intensity have increased remarkably in two subprojects than one subproject of phase-2. Due to lack of beneficiaries' participation and O&M of the intervention structure by WMCA one subproject was not functioning well. Lack of beneficiaries' participation and proper infrastructure maintenance by WMCA were found to be the main reasons behind lesser success of those water schemes. This can be improved by increasing beneficiaries' involvement in the local level and improved linkage between WMCA members and LGED project authority.

Tapos Kanti (2009) performed a study on selected small scale water resources development sector subproject in sylhet district to evaluate their performance. Comparison was made on crop yield, cropped area, cropping intensity and flood management performance 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. This study found: irrigation area performances are 80%, 50% and 60% of targeted of selected three water conservation subprojects. While, flood management performances are 55% & 46% of the targeted area of two subprojects. On the other hand, production is considerably increased comparing pre and post project area. Participatory management showed poor performance regarding regularity in attendance for the members of the WMCA. As majority of the people of Sylhet region are expatriate they are not dependent on the agricultural production for their livelihood rather than remittance plays an importance role in the local economy. This study recommend awareness about O&M, training for WMCA, coordination between LGED and other government organization and monitoring of micro credit activities.

Chapter 3

Methodology

3.1 General

Performance is one of the key factors that's need to be taken into account to further planning and design for sustainability of same type of projects. Hence, quantitative evaluation of the project performance is required during project life time. There are lots of ways to quantify the performance of the projects. In this study "before and after" comparison approach is being followed to evaluate performance of selected CAD subprojects. The process of performance evaluation consists of measuring the extent to which targets are being met at the end of a given time and thus requires that all relevant inputs and outputs are quantified or evaluated.

3.2 Subproject Selection Criteria

The performance of the water resources projects can be evaluated comparing pre project condition, i.e. before the CAD situation and post project condition which mean after CAD situation. In this study, five subprojects (one subproject is from SSWRDSP-1 and four subprojects are from SSWRDSP-2) of LGED in Chapainawabganj district were selected for performance evaluation on the basis of available and surveyed data regarding cultivated area, agricultural, socio economic, environmental and participatory aspect. Data were collected from LGED and DAE. For field data collection a questionnaire survey was conducted among the selected five CAD subprojects area. The names of five subprojects are:

1. Mohammadkhani subproject
2. Nayagola-Mohananda subproject
3. Dariapur subproject
4. Palsha Mahespur subproject.
5. Agrani Irrigation CAD subproject

Ten numbers of people out of the beneficiaries were randomly selected in each subproject area for questionnaires survey. Therefore, the sample size for the survey is fifty in numbers of which 70% are male and 30% are female.

3.3 Selection of performance Indicators

Performance evaluation has vital importance in water resources projects. It is necessary to determine the performance of the implemented subprojects for problem in future planning. So, it is necessary to choose efficient set indicators that satisfy certain standards. It must be quantifiable at acceptable level

of accuracy, easily perceivable and cost of measurements related to the indicator must not be very high. Bos et al. (1993) have broadly classified performance indicators into three groups.

1. Hydraulic
2. Agricultural and
3. Non-agricultural

Hydraulic Indicator deals with the capture, allocation and conveyance of water from the source to the field. Agriculture indicators address the direct impact of the operational inputs (water) on outputs (irrigated area and crop production). A non-agricultural indicator deals 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 (modern et al., 1998). The indicators which are used in the study are briefly described below.

3.3.1 Hydraulic Indicators

Hydraulic Indicators deals with the conveyance of irrigation water from the source to the farmer's field by present irrigation facilities within the subproject area. The simplest and yet probably the most important hydraulic performance indicator used in this study is increase in water supply.

$$Increase\ in\ Water\ Supply\ (\%) = \frac{Disch\arg e\ \Pr e\ CAD\ Condition - Disch\arg e\ Post\ CAD\ Condition}{Disch\arg e\ \Pr e\ CAD\ Cocdition} x100$$

3.3.2 Agricultural Indicators

Agricultural indicators measure the contribution of the irrigation activity to the economy in relation to consumption of the increasingly scarce of water resources. These indicators provide the basis for comparison of agricultural performance. The agricultural indicators used in the performance evaluation are 'area indicator' and 'production indicator'.

3.3.2.1 Area Indicator

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

$$Irrigated\ Area\ Performance(\%) = \frac{Acual\ Irrigated\ Area}{T\arg et\ Area} x100$$

To evaluate the performance, target area is taken as subproject command area or subproject benefited area. Actual irrigated area is the area that the farmers can irrigate within subproject area which is taken from field survey data.

3.3.2.2 Production Indicator

Production Performance: This is most useful agricultural indicator to evaluate irrigated agricultural systems in country like Bangladesh, where both water and land are limited for agricultural production. The indicator is expressed as:

$$Increase\ in\ \mathrm{Pr}oduction\ (\%) = \frac{(\mathrm{Pr}oduction\ After\ CAD\ Condition - \mathrm{Pr}oduction\ Before\ CAD\ Condition)}{\mathrm{Pr}oduction\ Before\ CAD\ Condition} x100$$

Data are collected from LGED and field through questionnaire survey within the subprojects area.

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

$$Increase\ in\ Yield\ \ (\%) = \frac{Yield\ \ After\ CAD\ Condition - Yield\ \ Before\ CAD\ Condition}{Yield\ \ Before\ CAD\ Condition} x100$$

Data are collected from LGED and field through questionnaire survey within the subprojects area.

3.3.3 Non-agricultural Indicators

3.3.3.1 Participatory Management

Participatory management is the practice of empowering employees to participate in organizational decision making. This practice grew out of the human relations movement in the 1920s. This method developed in the context of Participatory Rural Appraisal, became the central tool for development agencies to embrace participation. The beneficiaries are directly or indirectly affecting or being affected by a management decision (Glicken 2000) and extending the range of people and organizations involved in management to those who would not normally be involved. An organization required for this method must be socially responsible and be aware of its role within the concept of sustainable development. The Local Government Engineering Department (LGED) forms an organization in each subproject which known as WMCA. After implementation and O&M for one year, LGED hands over the subproject for O&M to this WMCA. Institutional performance of WMCA has been evaluated by collecting official records about the progress of the activities carried out by the organization. In this evaluation, conflict resolution, water supply management, O&M of infrastructure, enrollment of members and meeting attendance percentage of general members in each year were collected. A questionnaire survey was done for various data collection.

3.3.3.2 Socio-economic Aspects

The main concern of this article is to assess the indirect impact of the subprojects on the welfare of the people within subproject area. The welfare of people in its turn is likely to be reflected in larger household income, employment, occupation pattern, asset formation etc. The subproject will improve agricultural and fisheries production through participatory and sustainable small-scale water resource management. That will benefit entire communities under the subprojects. Percentage change in wage rate and regarding land value were used as indicators to evaluate socio-economic aspects for the selected subproject areas. Data were collected through questionnaire survey in the subprojects area. Data were also collected from LGED to evaluate change in land holding sizes in the selected subproject areas.

3.3.3.3 Environmental Aspects

Environmental impact is a sensitive issue to implement any type and size of project for the present world. Now it is mandatory to assess the impact on environment for any type of project, whatever it may be large or small. There is an ever increasing thread of environmental degradation and subsequent ecological imbalance. So, for this study few selected environmental parameters have been considered to indicate the pre and post project environmental status.

The selected parameters are given below:

a. Impact on land use pattern
b. Decrease in land fertility
c. Effect on public health
d. Effect of pesticides and fertilizers.

Percentage change in land fertility was taken as an indicator regarding the evaluation of environmental aspect. Relevant data were collected from LGED office. A questionnaire survey was also conducted for field data (bench mark) collection.

3.3.3.4 Operation & Maintenance (O&M) Aspects

A few years ago, the irrigation water was distributed to the farmers land without any cost from irrigation project. Government borne all the expenditure for those projects. As a result after few years the project became sick due to lack of proper O&M in time. Conceiving this problem the government has engaged beneficiaries for O&M of that project through an organization. This organization collect O&M cost from beneficiaries was maintain the project. An evaluation of the system based on financial and economic principles, will give the benefit-cost ratio in order to understand the system performance. The indicator which will be used for the impact assessment is fund collection efficiency of the subproject.

$$Fund\ Collection\ Efficiency\ (\%) = \frac{Fee\ collection}{Fee\ targeted\ \ for\ collection} x100$$

3.4 Data Collection

The data which are required for performance evaluation of selected CAD subproject in Chapainawabganj district have been collected from two sources. One is primary source and other is secondary source. For primary data collection, a questionnaire survey was conducted among the beneficiaries in the selected subproject area. From each subproject area 10 beneficiaries were questioned among this 70% are man and 30% are women. For primary data collection the following points were given emphasis:

- Collection of agricultural data (cropped area, cropping intensity, total production, yield etc) for pre & post project condition.
- For O&M data collection, data were taken from those people who are directly involved for O&M of that subproject.
- Adequacy of agricultural support services.
- Role of beneficiaries for O&M.
- Yearly & monthly meeting details.
- Status of WMCA, etc.

The secondary data were collected from different government and non-government organizations like, Local Government Engineering Department (LGED), Department of Agricultural Extension (DAE) and Bangladesh Institute of Development Studies (BIDS).

Chapter 4

Project Description and Study Area

4.1 General

Bangladesh is a highly populated country of 150million inhabitants and consists largely of a low, flat topographical area. Of the land, 80% is constituted of major rivers floodplains of the Brahmaputra, Ganges and Meghna rivers. Of the country, 60% is lower than 6 m above sea level. The population density is one of the biggest in the world. Mainly due to its geographic condition, the main problems in water management arise from the flat topography where no potential storage of water is possible because of the marked distinction between wet and dry seasons. Flood events occur frequently during the wet season which is able to inundate about 65% of the country, while droughts are a general cause of water scarcity during the dry season. Besides, the country suffers from flash floods, rise of river beds, saltwater intrusion etc. The water resources management thus identifies, among others, the major issues of concern like floods, drainage congestion, drought, arsenic contamination, salinity intrusion etc. Only 7% of the country's surface water flow has a source within the country. The other 93% comes from Transboundary Rivers shared with India, Myanmar, Nepal, Butan and China.

4.2 Water Management Practices in Bangladesh

In our country water management practices has been implemented with the guideline of National Water Management Plan (NWMP) and The National Water Policy (NWPo). In line with the provisions of the NWPo, the NWMP provides a framework at the national and regional level within which the line agencies, Bangladesh Water Development Board (BWDB), the Local Government Engineering Department (LGED) and other stakeholders will plan and implement their activities and projects in a coordinated manner to achieve the national objectives. The NWMP strongly advocates for development of sustainable institutions at the local level, which proposes separation of planning and regulatory functions from implementation and operational functions.

4.3 Water Resource Sector Framework

Within the NWMP guideline, LGED implemented lot of subprojects with the participation of the local stakeholders this is a continuous process in the pursuit of sustainable development. Stakeholders within each subproject area formed Water Management Co-operative Association (WMCA) for the O&M of the subproject and poverty reduction.

4.4 Project Description

4.4.1 Small Scale Water Resources Development Sector Project

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. 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). The Small Scale Water Resources Development Sector Project (SSWRDSP) is spread all over the country of Bangladesh **(Figure 4.1)**. The subproject development takes place in three distinct stages. The process involves best utilization of the available water resources linking people's participation in planning, design, construction and post project operation and maintenance (O&M).

4.4.2 Subproject Development Cycle (LGED, 2000)

Three basic principles underlie the SSWRDSP approach to water resource management:

>> Schemes must be identified by local people, and initially processed through their elected representatives in the Union Parishad.

>> Local people, beneficiaries as well as project affected persons, must be involved in all stages of subproject development.

>> The overall approach is a combination of two parallel but inter-related processes, one dealing with “Institutional” and the other with “Technical” matters.

Each small scheme has three distinct stages in the development process:

Stage 1: Identification and feasibility

Stage 2: Design and Institutional establishment

Stage 3: Construction and first year operation and maintenance

In the first stage, local people identify a potential schemes based on local water problem of flooding and/or shortage of water. After it is proposed to LGED via the Union Parishad (the lowest level of the local government) LGED develops a technical and socio-economic information base and starts developing the subproject. The proposed scheme is then presented to the Upazila Development Coordination Committee (UDCC) for approval. As part of its own responsibility, LGED Project staff initially assesses the technical feasibility of the proposed scheme. A Participatory Rapid Appraisal

methodology is used to determine the social and environmental feasibility. Proposed subprojects that pass all the feasibility tests are basically declared feasible and sent to the District Level Inter-Agency Project Evaluation Committee (DLIAPEC) for discussion and approval.

In the second stage the subproject detail design is done while people's participation is institutionalized by forming and registering a Water Management Co-operative Association (WMCA). Simultaneously design engineers prepare preliminary design for discussion with the WMCA managing committee and general members. The observations made by the beneficiaries are noted and detail designs are amended where needed and construction drawings are finalized. Compensation for land acquisition is also looked at in detail. The final output of this stage is a comprehensive design in line with what the WMCA members want. This acceptance is formalized in an Implementation Agreement between the WMCA and LGED to precede with the construction activities.

In the third stage, the "technical" process includes everything related to construction as well as the first year's operation and maintenance (O&M). The parallel "institutional" process concentrates on strengthening the WMCA and making plans for O&M and for improved agricultural & fisheries production. The final output of this stage is LGED and the WMCA signing a Lease Agreement allowing the latter to use the scheme's infrastructure on the condition that the WMCA will maintains it.

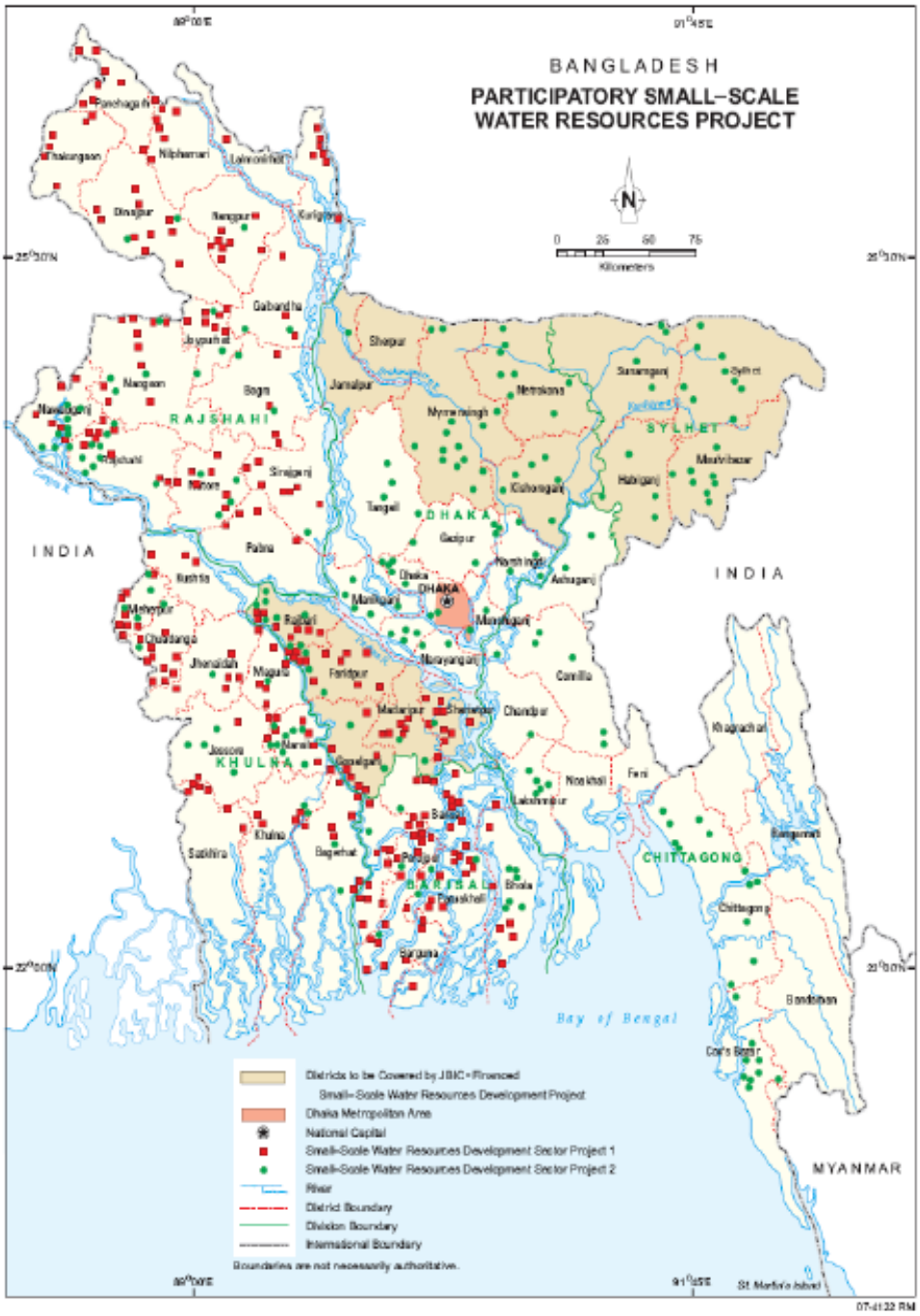


Figure 4.1: Subproject Location Map of SSWRDSP

4.4.3 Subproject Identification and Feasibility

In line with the overall LGED approach, a potential scheme is generally first identified by local people. When they have identified a possible solution to a water-based problem in their area, they approach their elected representatives at the lower level of the local government, the Union Parishad members. The Union Parishad members discuss the problems and tentative solutions, and then formulate a scheme proposal for submission to the LGED Upazila Engineer for assistance. The Upazila Engineer visits the proposed scheme area to assess the problems and possible solutions. The LGED Upazila

level staff meets with people of different classes, both inside and outside the scheme area to find out what they think about the proposed scheme. They specifically try to meet people who might be negatively affected.

When the LGED field staffs are convinced that the proposed scheme has both technical and social potential, they collect more technical and socio-economic data and prepare a scheme proforma together with the Union Parishad members. The full documentation of the proposed scheme is then discussed in a meeting of the Upazila Development Co-ordination Committee (UDCC). This meeting includes all Union Parishads under the concerned Upazila and any adjacent Union Parishads that might be negatively impacted by the proposed scheme interventions. After necessary amendments, if any, the proposed scheme is approved and forwarded to the district level Executive Engineer of the LGED. He checks to see whether the information is complete and sound, and whether the proposal fits in with other infrastructure development planned for the area. If the Executive Engineer agrees that the proposal seems feasible, he forwards it to the Project Management Office (PMO) in Dhaka. The PMO pre-screens the proposal to see whether it fits in the project selection criteria and whether it makes sense from a regional, technical, environmental and economic point of view. Using a pre-screening format, maps and boundaries are checked and updated and the scheme concept is checked to confirm criteria. The scheme area is then checked with existing projects with Bangladesh Water Development Board (BWDB) to avoid overlapping and its compliance with water resources development regional plans. This is followed by a reconnaissance site visit by PMO engineers to verify the information supplied. If the outcome of this review is positive, two parallel processes are initiated; the detailed hydrological survey data is collected to allow a preliminary design to be made, and an independent Participatory Rapid Assessment team is sent to review the social and environmental feasibility of the proposal. The main task of the assessment team is to receive answers to four questions:

- Is there broad, popular support for the proposed subproject?
- Is there any opposition to the proposed subproject, and if so, by whom, why and how many people are against it?
- What are the likely environmental impacts and what possible mitigation measures can be taken?
- Are the beneficiaries willing to pay part of the investment cost and assist with land acquisition?

All data and information collected is passed on to a consulting engineering firm to prepare a comprehensive scheme feasibility study as well as a conceptual design. Hydrological studies, using data from BWDB hydrological stations, are carried out to determine the pre- and post-project water levels for flood management and drainage schemes and water availability for irrigation schemes. Area-elevation curves are prepared and pre- and post-project water levels superimposed on these. The basis for the land level data is the 4"-1 mile (1:15840) irrigation planning maps. Pre and post-project land classification are then abstracted from the area-elevation curves. Based on land

classification, agriculture impact analysis is undertaken. As a general rule, post-project crop patterns and yields on a given land type are considered to be the same as pre-project crop patterns and yields. Thus, agriculture impacts mainly resulted from changes in the areas of the various land types.

Many water sector schemes completed earlier had negative impacts on open-water fisheries. In the schemes feasibility studies these negative impacts on fisheries, i.e. the “worst case” scenario, in terms of habitat extent, duration, and quality, are assumed to get an indication of changes in fish production, employment in fishing, and subsistence fishers nutrition. At the same time potential positive impacts inherent in the basic subproject design such as improvements in habitat quality related to re-excavation of drainage khals, increased (compensatory) employment of landless laborers in agriculture are calculated. Potential mitigating and compensating measures such as modifying structure designs to fish friendliness and operating practices to minimize damage to open water fisheries and measures to promote aqua-culture are looked into.

Part of the appraisal process is preparing the Summary Appraisal and Summary Initial Environmental Examination Report consists mainly of assembling the appropriate information resulting from the analytical process described above into a concise document. The most important step at this stage is to assimilate the outcome of the screening analysis with that of the PRRA into a complete and consistent report. If the feasibility study shows that the proposed scheme is technically, economically, socially and environmentally feasible, it is sent to the District Level Committee (DLIAPEC) for approval. Proposed scheme with major problems are referred back to the Upazila Engineer and the Union Parishad for reformulation. The identification and feasibility study stage would normally take between 3 and 6 months.

4.4.4 Design and Institutional Establishment

Once a proposed scheme is approved, the parallel processes of detailed design of the scheme infrastructure and institutionalizing people’s participation start. After the approval of scheme, the Upazila Engineer and his staffs gather more technical data. This is used as input for the scheme detailed design. This design includes information on the necessary land acquisition. In preparing the detailed engineering design, extensive use is made of various computer-based analytical tools consisting of spreadsheets designed for flood routing, hydraulic design, structural design (section and reinforcement), bill of quantities and cost estimates. Hydraulic Engineering Center (HEC) software is available and used where called for. In addition, a design catalogue prepared by the SSWRDSP is made available to designers in both digital and hard copy. This has expedited the design process.

The institutional development is done by bringing the various local stakeholders together in a Water Management Co-operative Association (WMCA), under the legal framework of the co-operatives Act. The first step in this process is fielding the NGO facilitator who mobilizes local people in scheme development process. He works closely with the Upazila-based LGED Community Organizer (CO). The main task of CO is to assist the beneficiaries in all phases of the scheme development. He is

trained “to be on the side of the people”. At district level, the project 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 the WMCA to relate to the other Upazila level GoB staff (agriculture, fisheries, social welfare, women affairs etc.). A district level Assistant Engineer, a Surveyor and a Draftsman assist the regular LGED staff in all technical matters. The first task of CO 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 stakeholder groups and local elites. From among the latter, a small number of men and women are asked to form a “Bye-law drafting Committee”. When they have completed the draft bye-laws, they are transformed into the “First Managing 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 Co-operative Association (WMCA)
- applying for registration of the WMCA, and
- preparing for the WMCA’s first annual general meeting

The main aim of these institutional development activities is to create a strong and broad-based water management organization. It is the platform for all decisions on the management of the water resources. This includes resolving the inevitable conflicts of interest among the various stakeholders. Shortly after the first management committee is operational, the design engineers present the drafts of the scheme concept paper and preliminary design at meeting of the first management committee. After discussing the drafts, the detail designs are adjusted where needed including possible mitigation measures for project-affected-people, and a land acquisition plan. To ensure sustainability, efforts are made to achieve a near unanimous approval of the design. The direct beneficiaries are listed along with their amount of contribution. This follows signing of an implementation agreement between LGED and the WMCA. This agreement is to proceed with implementing the scheme which includes the agreed design drawings as well as the responsibilities and rights of both parties.

To date the role of Local Government Institutions in the SSWRDSP has been limited to scheme identification and conflict resolution. Since the commencement of the Small Scale Water Sector Project, the government has issued new instructions to the Union Parishad on its role in development activities, including water resources. As a result the Union Parishad will be given an advisory status towards WMCAs. The Project started training for Union Parishad members regarding participatory water management issues and their involvement in water resources development schemes which is likely to grow in the years to come.

4.4.5 Construction and First Year O&M

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 needed in the following three areas:

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

The beneficiary contribution is a crucial part of the SSWRDSP methodology to ensure people's participation. Therefore, after signing the Implementation Agreement and before tendering is started, the WMCA has to collect the contribution from the scheme beneficiaries towards the investment cost. This contribution is designed to test the commitment of direct beneficiaries, who are in most cases the farmers and in some cases they are fishermen. The beneficiary contribution is calculated to be equivalent to the cost of operating and maintaining the infrastructure for one year. For Command Area Development (CAD, surface water irrigation distribution) type of schemes, a beneficiary contribution of 10% of the investment cost is required, and for other types of schemes, 3 % of earthwork and 1.5% of the cost of structures.

The Project Management Office (PMO) sends the Bill of Quantities (BOQ) and estimates to the District Executive Engineer to collect the contribution and to float the tender for the structures. After receiving bids, the Executive Engineer prepares a comparative statement and makes recommendation to the PMO for selection of the contractor. Normally the lowest bidder is recommended for selection as per procurement guidelines set by Asian Development Bank. As soon as full beneficiary contribution and the WMCA membership criteria are fulfilled, the PMO approves the bids and releases funds for the work. Upgrading embankments and channel re-excavation often involves disputes over land. It is the responsibility of WMCAs to ensure that these disputes are resolved and that the scheme infrastructure can be built as planned. If necessary, the Union Parishad members and/or Chairman can be invited to help solve such disputes. Finally the WMCA is involved in observing construction. The Implementation Agreement includes detailed procedures for this, allowing only the Upazila Engineer to issue instructions to the contractor, while giving the WMCA and Union Parishad members 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, earthmoving work is done through Labor Contracting Societies (LCSs). Their members are trained to carryout earthworks as per technical specifications. Destitute women are given preference in joining these Labour Contracting Societies. 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 the scheme. During this

period LGED has to prove that the infrastructure delivers the promised results. After that year, the WMCA formally takes over the infrastructure from LGED. During the first and subsequent years of operation, the WMCA is likely to spend considerable time resolving conflicts of interests between the various stakeholders. If the WMCA are unable 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.

After taking over the subproject, all aspects of operation and maintenance become the sole responsibility of the WMCA. This includes making and implementing:

>> an operation plan and budget

>> a maintenance plan and budget

>> a plan to collect the necessary local resources

>> a system for monitoring, evaluation and follow-up action.

The beneficiaries are responsible for operation and maintenance and 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 activities such as tree plantation and fisheries activities may generate resources for O&M. Destitute women are given preference when it comes to preventative maintenance work on embankments.

Once the scheme is operational, the people in the area are likely to change their agricultural, 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.

4.4.6 Subproject Management System

After taking the responsibilities of subproject for management, it is a duty of WMCA management committee to run the Subproject properly. Good management of WMCA is prime needs for development of the project area and achievement of main goal of SSWRDSP. 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.

The management system of small scale subprojects of LGED is given in **figure 4.2**

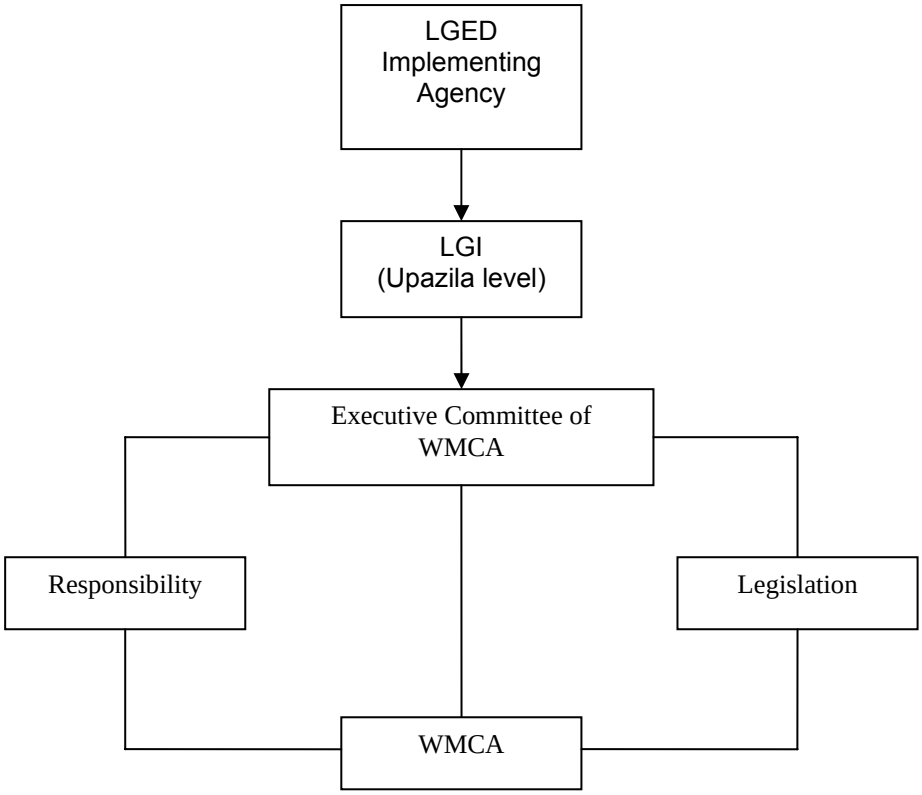


Figure 4.2 The management system of small scale subprojects of LGED

Initially LGED make an orientation for WMAC management committee to train them how to run an organization in good manner. They instruct to establish the following responsibilities.

- Find out a location for WMCA office, where meeting can be held, co-operative activities can be carried out.
- Appoint at least one person as manager to maintain records and official works of WMCA.
- Conduct weekly membership meeting for discussing WMCA activities and capital mobilization.
- Conduct monthly management committee meeting.
- Conduct election in time described in the co-operative law.
- Organize meaningful economic/business activities for the membership.

In addition, the management committee is trained by the concern co-operative department, which is designed to provide them with additional skill to good management of WMCA. These trainings are on

- O&M planning
- Technical and financial management and
- Maintenance cost sharing & fund utilization.

4.4.7 Framework of Water Management Co-operative Association

Water Management Co-operative Association (WMCA) is a society which is formed to manage O&M of the subproject with the participation of beneficiaries for achieving the subproject goal. It helps to increase the socioeconomic condition, agricultural production and reduce the poverty of the people within the subproject area. So, good management of WMCA has to ensure the development of the country.

WMCA is registered within the framework of the Cooperative Society Ordinance, 2001 and Cooperative Society rule, 2004 as amended from time to time. The registration of the WMCA achieve to hold property and other activities to do all necessary works to fulfill its constitute. The system of registration will prevail till the government frame separate rules for registration of the WMCA for PWM. The terms and conditions of the sample agreement 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).

The member of the WMCA should follow the following rules:

- Regular weekly meeting should be arranged by the WMCA and spontaneous attendance should be ensured.
- Regular share and saving should be collected and receipt should be preserved.
- WMCA committee should be elected by the members by voting.
- 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 and maintenance fund should be comprised of all members' contribution.
- Every year during pre & post rainy season the structure should be visited by the members. They should also help the O&M sub-committee to prepare maintenance budget.
- Members should actively participate in operation & maintenance.

Adopting the procedure described above, the LGED implemented 580 no. of subproject within the guide line of NWMP through 1st and 2nd phase of SSWRDSP. The lists of different types of subprojects which are completed in 1st & 2nd phase are given below:

Table no. 4.1: List of completed Subproject in 1st phase of SSWRDSP

Serial Number	Subproject Type	No. of Subproject completed in 1st phase	Benefited Area (ha)
1	Drainage and Water Conservation (DR&WC)	24	14505
2	Flood Control and Drainage (FCD)	126	79720
3	Flood Control (FC)	12	6282
4	Drainage and Irrigation (DR&Irri)	2	1600
5	Flood Control and Drainage & Water Conservation (FMD&WC)	23	15590
6	Drainage (DR)	47	26800
7	Water Conservation (WC)	45	19680
8	Command Area Development (CAD)	1	577
	Total =	**280**	**164734**

Source: LGED

Table no. 4.2: List of completed Subproject in 2nd phase of SSWRDSP

Serial Number	Subproject Type	No. of Subproject completed in 2nd phase	Benefited Area (ha)
1	Drainage and Water Conservation (DR&WC)	62	34893
2	Flood Management and Drainage (FMD)	64	34119
3	Flood Management (FM)	6	2427
4	Drainage and Irrigation (DR&Irri)	18	10313
5	Flood Management and Drainage & Water Conservation (FMD&WC)	40	22871
6	Drainage (DR)	11	6905
7	Irrigation (I)	3	1938
8	Water Conservation (WC)	64	35284
9	Command Area Development (CAD)	29	11146
10	Command Area Development & Irrigation (CAD&Irrigation)	3	1402
	Total =	**300**	**161298**

Source: LGED

4.5 Study Area

4.5.1 General Features

The study area of this evaluation is Chapainawabganj district. This district is the north western-most district of Bangladesh. It is a part of the Rajshahi Division and lies between latitudes 24°43′48”N and 24.73°N and longitudes 88°12′0”E and 88.20°E. The district consists of five Upazilas. The Upazilas are Bholahat, Gomastapur, Nachole, Nawabganj Sadar and Shibganj Upazila. Most of the people depend on farming of this area for their daily bread. However, a good number of people are well educated and well of here. This is also known as barindh area. The Barind Tract, which is the largest pleistocene terrace of the country, is made up of the Pleistocene alluvium, also known as older alluvium. The Barind unit is comparatively at a higher elevation than the adjoining floodplains. The contours of the Tract suggest that there are two terrace levels - one at 40m datumn and the other between 19.8m and 22.9m. Therefore, when the floodplains inundated during the monsoon the Barind Tract remains free from flooding and is drained by a few small streams. The Barind is floored by the characteristic Pleistocene sediments known as the Madhupur (Barind) Clay. The Madhupur clay is reddish brown in colour, oxidised, sticky and rather compact. The Barind almost became an arid region due to massive deforestation. Also, due to its extreme dry nature and relatively low rainfall, the vegetation cover decreased distinctively and the area could be picked up in satellite images as a hot and dry land. As the area was considered a low potential area for groundwater development, agriculture used to depend on monsoon rainwater. In the dry season ground water is the main source of irrigation. But it is costly and contain different typed of minerals and salts which are harmful for the land in long term. To avoid this problem, surface water irrigation has developed in small scale through CAD projects. The main source of surface water is river. There are four rivers in Chapai Nawabganj. They are Padma, Pagla, Mahananda and Punarbhaba. In dry season the rivers flow become less. Farmers take water from river for irrigation which is available in the river through pumping. Most of the subprojects in this area which are implemented by LGED are CAD subproject.

4.5.2 Selection Criteria

Most of the subprojects in Chapainawabganj district are Command Area Development (CAD) subproject. Five number of CAD subprojects are selected for this performance evaluation. They are Mohammad Khani Subproject, Nayagola-Mohananda Subproject, Dariapur Subproject, Palsha Mahespur Subproject and Agrani Irrigation CAD Subproject all are Chapainawabganj sadar upazila.

The major selection criteria of the subproject are;

- These subprojects are completed and in operation
- Respective Water Management Cooperative Association (WMCA) are formulated and working.

4.5.3 Mohammad Khani Subproject

4.5.3.1 Location and Map

Mohammad Khani Subproject is located in between longitudes $88^0$17.8'E and $88^0$18.2'E and latitudes $24^0$37.74'N to $24^0$38.22'N about 3km north of Nawabganj Town, on the left bank of Mohananda river **(Figure 4.3**). The subproject is under Baliadangi Union and Mohammad Khani, Taherpur, Uttar Bhabanipur, Rasulpur, Manpur, Kuchlapur, Amarat, Dilalpur, Rundra and Boreia Mouzas.

4.5.3.2 Subproject Description

Mohammad Khani Subproject is a Command area Development (CAD) subproject. The main objective of the subproject is for increased agriculture production, specifically an overall increase of HYV Boro and HYV T.Aman for the whole subproject. There will be decrease in yields of B.Aus, pulses and oilseed for the whole subproject. The gross area is 596 ha and net benefited area 563ha. Poor irrigation facilities and shortage of irrigation water is the main problem in the subproject area (PRA, 2003). Mohananda River is the main source of water for the subproject. The subproject has 1st and 2nd stage lifting arrangement. In first stage, water is withdrawn from Mohananda River up to FSL 23.20 mPWD and stored in a pond. This pond is used as the source of water for 2nd stage lifting. From 2nd stage lifting water is supplied through PVC pipe to a sump at FSL 38.11 mPWD. Water from the sump, is distributed to the field through canal by gravity flow. The land type classification of the project area is given in Table 4.3

Table 4.3: Land Type Classification of Mohammad Khani Subproject

Land Type	Area (ha)
Non-cultivated highland	33
F0 (d<0.3m)	480
F1 (0.3m<d<0.9m)	46
F2 (0.9m<d<1.8m)	34
F3 (d>1.8m)	3
Non-cultivated lowland	0
Net area (F0+F1+F2+F3)	**563**
Gross Area	**596**

Source : LGED

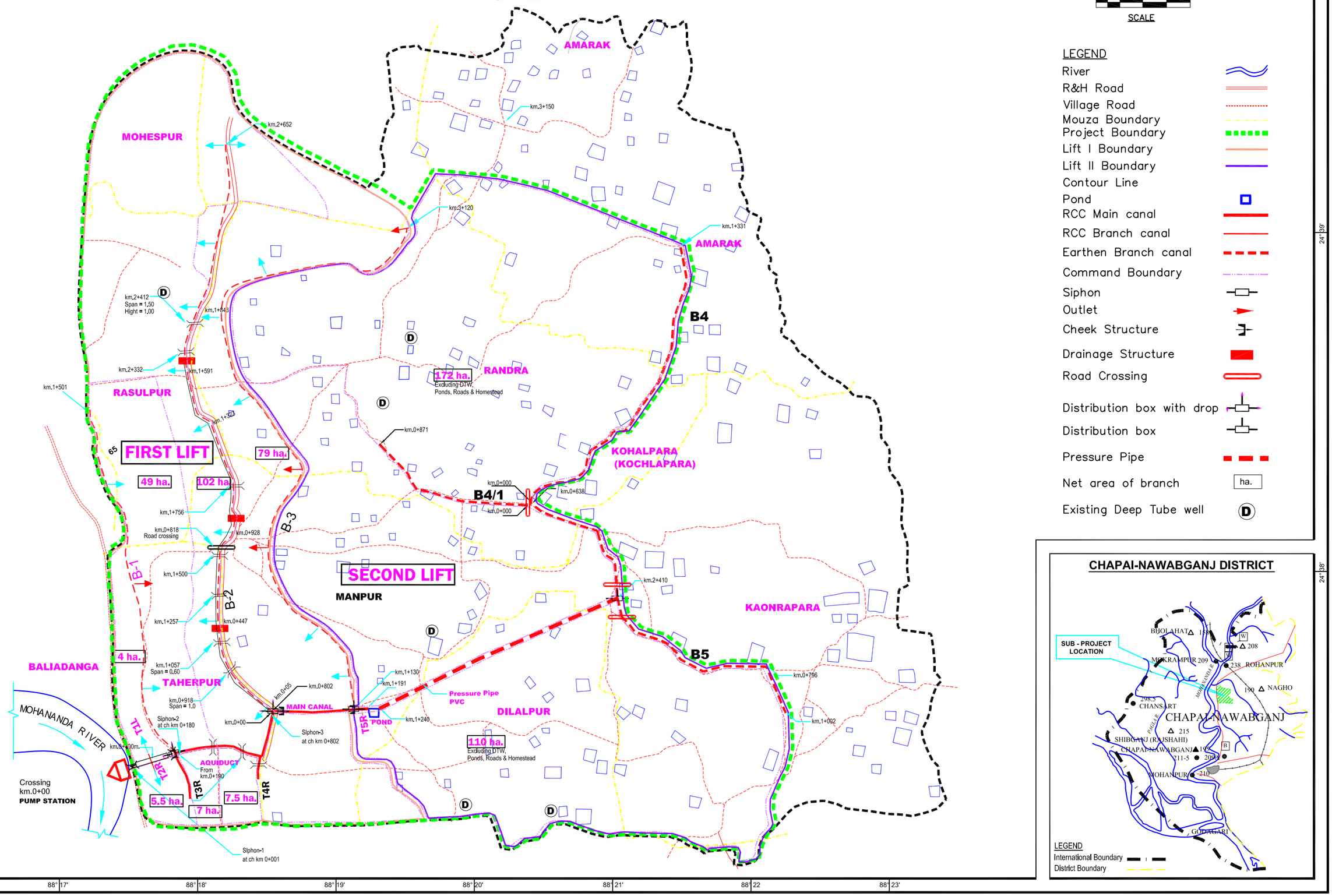
Before the implementation of the subproject by LGED, there was an existing irrigation system which was formed through the local farmers. This was not sufficient to cover the total irrigable areas. Also the supplied water was lost due to seepage and failure of earthen canal. Due to excessive loss of irrigation water through earthen canals and damaged brick canal lining it was hardly possible to command 75 ha of irrigable land by using 4 nos. of 2 cusec pumps. The irrigation cost before the implementation of this CAD project was 6000 tk./ha.

LOCAL GOVERNMENT ENGINEERING DEPARTMENT

MOHAMMADKHANI CAD SUB-PROJECT

UPAZILA: NAWABGONJ SADAR, DISTRICT: NAWABGONJ

INDEX MAP



100 0 100 200 300

SCALE

LEGEND

- River
- R&H Road
- Village Road
- Mouza Boundary
- Project Boundary
- Lift I Boundary
- Lift II Boundary
- Contour Line
- Pond
- RCC Main canal
- RCC Branch canal
- Earthen Branch canal
- Command Boundary
- Siphon
- Outlet
- Cheek Structure
- Drainage Structure
- Road Crossing
- Distribution box with drop
- Distribution box
- Pressure Pipe
- Net area of branch (ha.)
- Existing Deep Tube well (D)

Figure 4.3: Index Map of Mohammadkhani Irrigation CAD Subproject.

Details of the existing system (before implementation of this subproject) are listed below:

- Damaged brick main canal (about 650m)
- Damaged brick branch canal (about 600m)
- Damaged Earthen Canal (about 1500m) ;
- Sump and Pump Shed
- Road Crossings

LGED implemented this present irrigation system through the SSWRDSP-2 and constructed the components described in the following table with cost components of the subproject.

Table 4.4: Major cost components of Mohammad Khani Subproject

SI No	Component Name	Size/ Length	Cost(Tk)
1	Part A: Mohammad Khani Subproject Irrigation System		19,369,778
	- Siphon	210 m	
	- Aqueduct	989 m	
	- RCC Canal on the ground	95 m	
	- Pressure pipe conveyance system	1218 m	
	- Branch Canal B1,B2, B3, B4 and B5	10241 m	
2	Part B:O&M Shed	12.00m x 6.00m	273,631
		Total Taka =	19,643,409

Source: LGED

The general information about the Water Management Co-operative Association (WMCA) of Mohammad Khani Subproject is given in the following table:

Table 4.5: WMCA Status of Mohammad Khani Subproject

Name of WMCA	Date of Establishment	No. of Members		Total Members
		Male	Female	
Mohammad Khani Irrigation Subproject WMCA Ltd.	10-02-2003	844	320	1164

Source : LGED

4.5.4 Nayagola-Mohananda Subproject

4.5.4.1 Location and Map

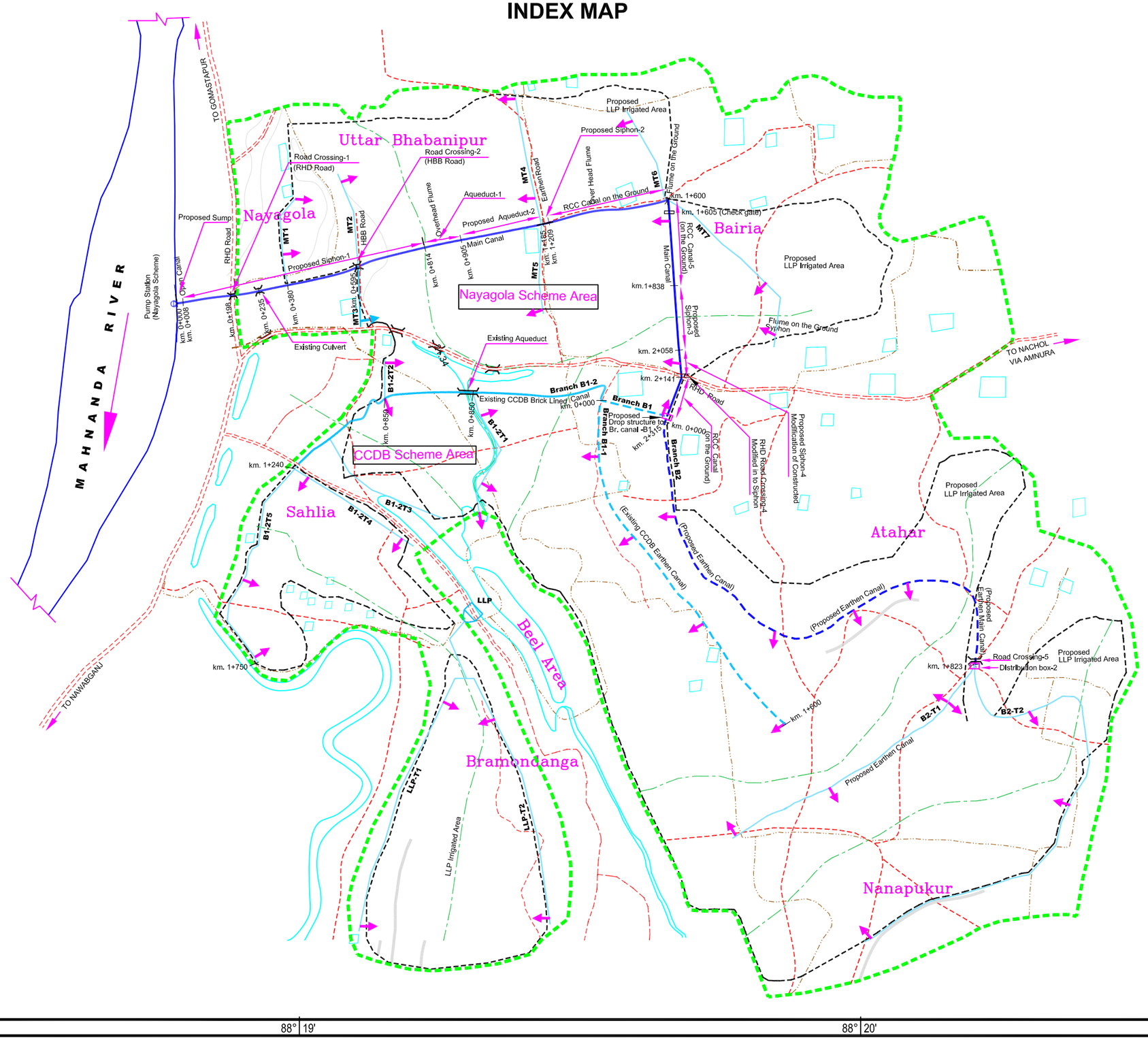
Nayagola-Mohananda Subproject is located in the Sadar Thana of Chapainowabganj district. The Nayagola CAD Subproject is located between longitudes 88°-17.5'E and 88°-19.5'E and latitudes 24°-34.8'N and 24°-36.5'N and at about 3.8km north of Nawabganj town **(Figure 4.4)**.

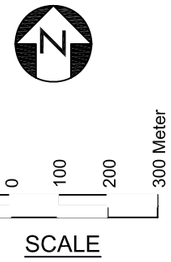
LOCAL GOVERNMENT ENGINEERING DEPARTMENT

NAYAGOLA -MOHANANDA CAD SUB - PROJECT

UPAZILA: SADAR, DISTRICT: CHAPAINAWABGANJ

INDEX MAP





LEGEND

- Depression Line
- Irrigable Area Boundary
- Turn Out
- Distribution box
- Aqueduct
- Culvert/Bridge
- River
- R&H Road
- Village Road
- Mouza Boundary
- Project Boundary
- Contour Line (EL in m PWD)
- Pond
- RCC Main Irrigation Canal
- Proposed Branch Canal(Earthen)
- Brick Lined Branch Canal(Existing)
- Branch Canal Earthen (Existing)
- Tertiary Canal

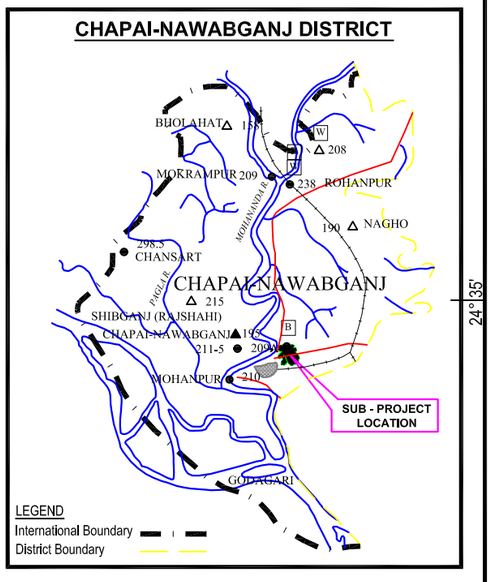


Figure 4.4: Index Map of Nayagola-Mohananda Subproject.

The subproject area lies on the left bank of Mohananda River and includes Nayagola, Uttar Bhabanipur, Bairai, Atahar, Nonapukur and Hosendanga mouzas under the Jhilim, Islampur and Baliadanga unions of Nawabganj Upazila.

4.5.4.2 Subproject Description

Nayagola-Mohananda Subproject is a Command area Development (CAD) subproject. The main objective of the subproject is for increased agriculture production, specifically an overall increase of cereals, oilseeds, vegetable,HYV Boro and HYV T.Aman for the whole subproject. The gross area is 490ha and net benefited area 342 ha. Shortage of irrigation water with lack of water delivery system is the main problem in the subproject area (PRA, 2003). River Mohananda is the main source of water for the subproject. The land type classification of the project area is given in Table 4.6

Table 4.6: Land Type Classification of Nayagola-Mohananda Subproject

Land Type	Area (ha)
Non-cultivated highland	148
F0 (d<0.3m)	197
F1 (0.3m<d<0.9m)	85
F2 (0.9m<d<1.8m)	46
F3 (d>1.8m)	14
Non-cultivated lowland	0
Net area (F0+F1+F2+F3)	**342**
Gross Area	**490**

Source : LGED

Before the implementation of the subproject by LGED, the Nayagola irrigation scheme started initially in 1964 with three diesel engines and pumps collected from BADC on rental basis. The beneficiaries have been practicing irrigation management since 1965 with an informal association. In 1985, under the privatization policy of BADC, the pumps were purchased by the beneficiaries and the prime movers were changed to electric motors. About 50 ha of land were irrigated with 2-LLPs (Capacity 57 l/s each) at initial stage. This system was not sufficient to cover the total irrigable areas. Also the supplied water was lost due to seepage and failure of earthen canal. Due to excessive loss of irrigation water through earthen canals and for damaged to the brick canal lining it was hardly possible to command 70 ha by using 4 nos. of 2 cusec pumps. The irrigation cost before the implementation of this CAD project was 4482 tk/ha.

Details of the existing system (before implementation this subproject) are listed below:

- Damaged brick main canal
- Damaged brick branch canal
- Damaged Earthen Canal
- Sump and Pump Shed

- Road Crossings

LGED implemented this present irrigation system through the SSWRDSP-2 and constructed the components described in the following table with cost components of the subproject.

Table 4.7: Major cost components of Nayagola-Mohananda Subproject

SI No	Component Name	Size/ Length	Cost(Tk)
1	Part A: Nayagola-Mohananda Subproject Irrigation System		17,136,040
	- Siphon	443 m	
	- Aqueduct	686 m	
	- RCC Canal on the ground	1395 m	
	- Branch Canal B2	1820 m	
2	Part B:O&M Shed	12.00m x 6.00m	298,579
		Total Taka =	17,434,619

Source: LGED

The general information about the Water Management Co-operative Association (WMCA) of Nayagola-Mohananda Subproject is given in the following table:

Table 4.8: WMCA Status of Nayagola-Mohananda Subproject

Name of WMCA	Date of Establishment	No. of Members		Total Members
		Male	Female	
Nayagola-Mohananda WMCA Ltd.	19-05-2003	443	229	663

Source : LGED

4.5.5 Dariapur Subproject

4.5.5.1 Location and Map

Dariapur Subproject **(Figure 4.5)** is located in between longitudes 88^0 18' 00"E and 88^0 19' 40"E and latitudes 24^0 33' 55"N and 24^0 34' 46"N and. It is situated at 5km south-east of Chapai Nawabganj district H.Q at Jhilim Union of Chapai Nawabganj Sadar Upazila. The subproject area spreads over mouza Thakurpalsa 1 & 2, part of Dariapur, Jhikra and Kalupur of Jhilim union. The subproject is located on the left bank of Mahananda River.

LOCAL GOVERNMENT ENGINEERING DEPARTMENT

DARIAPUR CAD SUB - PROJECT

UPAZILA: SADAR, DISTRICT: CHAPAINAWABGANJ

INDEX MAP

88°|18' 88°|19' 24° 35' 24° 34'

To Chapai Nawabganj
Dariapur Khal
To Chapainawabganj
Haripur
Beel
Dariapur
Rajarampur Beel
Rajarampur
Existing Bridge
Mosque
Ch. 0+025
Ch. 0+200
Ch. 0+350
Ch. 0+600
Ch. 0+800
Ch. 1+420
Ch. 1+850
Ch. 2+800
Ch. 3+200
Ch. 0+200
Ch. 0+550
Thakur Palsa
Sihrampur
Jhikra
To Godagari
Godagari Upazila
Mahananda River
A
B
C
D
E
F
G
H
I
J
K
L
Length = 1395m (A-B) Dia=750mm RCC Pipe
Length = 430m (B-C) Dia=600mm RCC Pipe
Length = 950m (C-D) Dia=450mm RCC Pipe
Length = 90m (D-E) Dia=300mm RCC Pipe
Length = 310m (E-F) Dia=300mm RCC Pipe
Length = 350m (B-G) Dia=450mm RCC Pipe
Length = 600m (H'-H) Dia=300mm RCC Pipe
Length = 200m (B-H') Dia=450mm RCC Pipe
Length = 750m (C-I) Dia=300mm RCC Pipe
Length = 600m (D-K) Dia=300mm RCC Pipe
Length = 200m (D-J) Dia=300mm RCC Pipe
Length = 550m (E-L) Dia=300mm RCC Pipe

The River bank is protected by CC Block

Header Tank at ch. 0+025 km

Existing Aqueduct at ch.1+127 km

Existing road crossing one no. 750mmØ RCC pipe joint with newly 750mmØ RCC buried pipe with RCC collar.

TBM Value 21.401 mPWD has been kept on PL top (out side) of Haripur Dabpara Waktia Mosque on the bank of Mohananda river (Southern corner), which was carried from another TBM value 21.950 (of BWDB gauge station no. 211.5) kept on North east corner electric pole bottom of power house campus, Chapai Nawabganj.

N

200 0 200 400 600 M.

SCALE

LEGEND

- Gross Benefited Area Boundary
- River
- National Highway/Feeder Road
- Unmetaled Road
- Rural Road R1,R2,R3 (Earthen)
- Beel/Hour/Water body
- Pond
- Homestead Area
- Existing Bridge / Culvert
- Existing Embankment
- Contour Line (mPWD) 6.0
- BM / TBM Location
- Proposed Header Tank (HT-1)
- Buried Pipe Line (750 mm dia)
- Buried Pipe Line (600 mm dia)
- Buried Pipe Line (450 mm dia)
- Buried Pipe Line (300 mm dia)
- Riser

Charts of Burried Pipe Line

Sl	Points	Length (m)	Dia
1	A-B	1395	750
2	B-C	430	600
3	C-D	950	450
4	D-E	90	300
5	E-F	310	300
6	B-G	350	450
7	B-H'	200	450
8	H'-H	600	300
9	C-I	600	300
10	D-J	200	300
11	E-K	500	300
12	F-L	550	300
Total Length =		6175 m	

CHAPAI-NAWABGANJ DISTRICT

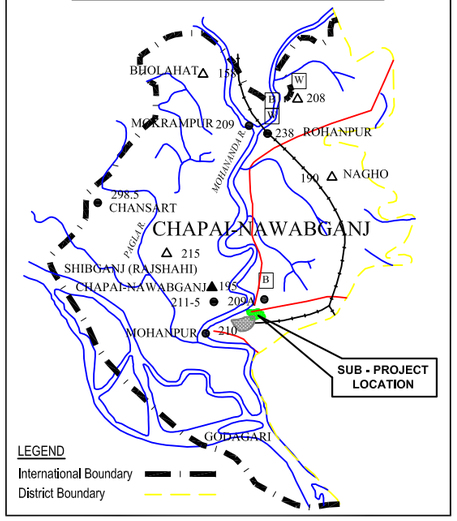


Figure 4.5: Index Map of Dariapur Subproject.

4.5.5.2 Subproject Description

Dariapur Subproject is a Command Area Development (CAD) Subproject through buried pipe irrigation network system. The main objective of the project is to increase agricultural production, specifically an overall increase of cereal crops. The cereal production will include mainly HYV Boro. Shortage of irrigation water is the main problem in the subproject area, which reduces coverage and yield of HYV Boro. Construction of RCC main burried pipe with branches and outlets reduced drought damages to HYV Boro in F0, F1 and F2 lands and fallow lands was brought under irrigation. Reduction of irrigation cost and additional production of HYV Boro encouraged the farmers to pay O&M cost. The gross area is 310ha and net benefited area 290ha. Shortage of irrigation water with lack of water delivery system is the main problem in the subproject area. Mohananda river is the main source of water for the subproject. The land type classification of the project area is given in Table 4.9

Table 4.9: Land Type Classification of Dariapur Subproject

Land Type	Area (ha)
Non-cultivated highland	10
F0 (d<0.3m)	198
F1 (0.3m<d<0.9m)	75
F2 (0.9m<d<1.8m)	17
F3 (d>1.8m)	0
Non-cultivated lowland	10
Net area (F0+F1+F2+F3)	**290**
Gross Area	**310**

Source : LGED

The farmers of this area developed an irrigation system before the present irrigation system by forming a co-operative society named “Dariapur Sech Prokolpo” in the year of 1973, and they developed an irrigation system for their agricultural land. This system received water from Mahananda River by using 4 no. of electrically operated pumps total discharge capacity is 11.5 cusec (engine capacity 15HP-30HP). The existing irrigation system consisted of rectangular canal with 125 mm brick wall 1280 m, earthen canal 4450 m, underground pipe canal 550 m, 4 nos. aqueduct of total length 85 m, 6 nos. road crossings of total length 60 m and 2nd lifting arrangement to irrigate about 50 ha of land. Water was lifted from Mohananda River to the sump on its bank and supplied to the field using the existing canal system which was mostly damaged and unworkable due to old age of the infrastructures and lack of proper maintenance. An existing pond is used as reservoir for second lift. Surface water is available in Mohananda River for irrigation throughout the year. The total irrigation coverage, before the implementation of this subproject, was about 90 ha as reported by the local people. The irrigation cost before the implementation of this CAD project was 3000 tk/ha.

Details of the existing system (before implementation this subproject) are listed below:

- Damaged brick Irrigation Canal (about 1280m) ;

- Earthen Canal (about 4450m) ;
- RCC aqueducts 4 nos (one no. of length 55m constructed in 1973, 10m, 10m and 10m);
- Sump and Pump Shed (1 No. for 4 Nos. of pumps with total HP 75) ;
- Road Crossings 60m (6 nos, 8m, 3m, 23m, 10m, 8m, 8m);
- Buried pipe line dia 300mm (550m).

LGED implemented this present irrigation system through the SSWRDSP-2 and constructed the components described in the following table with cost components of the subproject.

Table 4.10: Major cost components of Dariapur Subproject

SI No	Component Name	Size/ Length	Cost(Tk)
1	Part A: Hearder Tank	Size: 6.10m x 2.60m	401,072
2	Part-B: Burried Pipe Irrigation Network System		13,578,419
	-750mm dia Pipe	1398.10 m	
	-600mm dia Pipe	430 m	
	- 450mm dia Pipe	1500 m	
	- 300mm dia Pipe	2850m	
	-300mm Dia Alfa Alfa Valve	29 nos.	
	-250mm Dia Air vent pipe	29 nos.	
	-Pacca Nacca	29 nos.	
3	Part C:O&M Shed	12.00m x 6.00m	490,880
		Total Taka =	14,470,371

Source: LGED

The general information about the Water Management Co-operative Association (WMCA) of Dariapur Subproject is given in the following table:

Table 4.11: WMCA Status of Dariapur Subproject

Name of WMCA	Date of Establishment	No. of Members		Total Members
		Male	Female	
Dariapur Irrigation Subproject WMCA Ltd.	04-12-2007	672	425	1097

Source : LGED

4.5.6 Palsha Mahespur Subproject

4.5.6.1 Location and Map

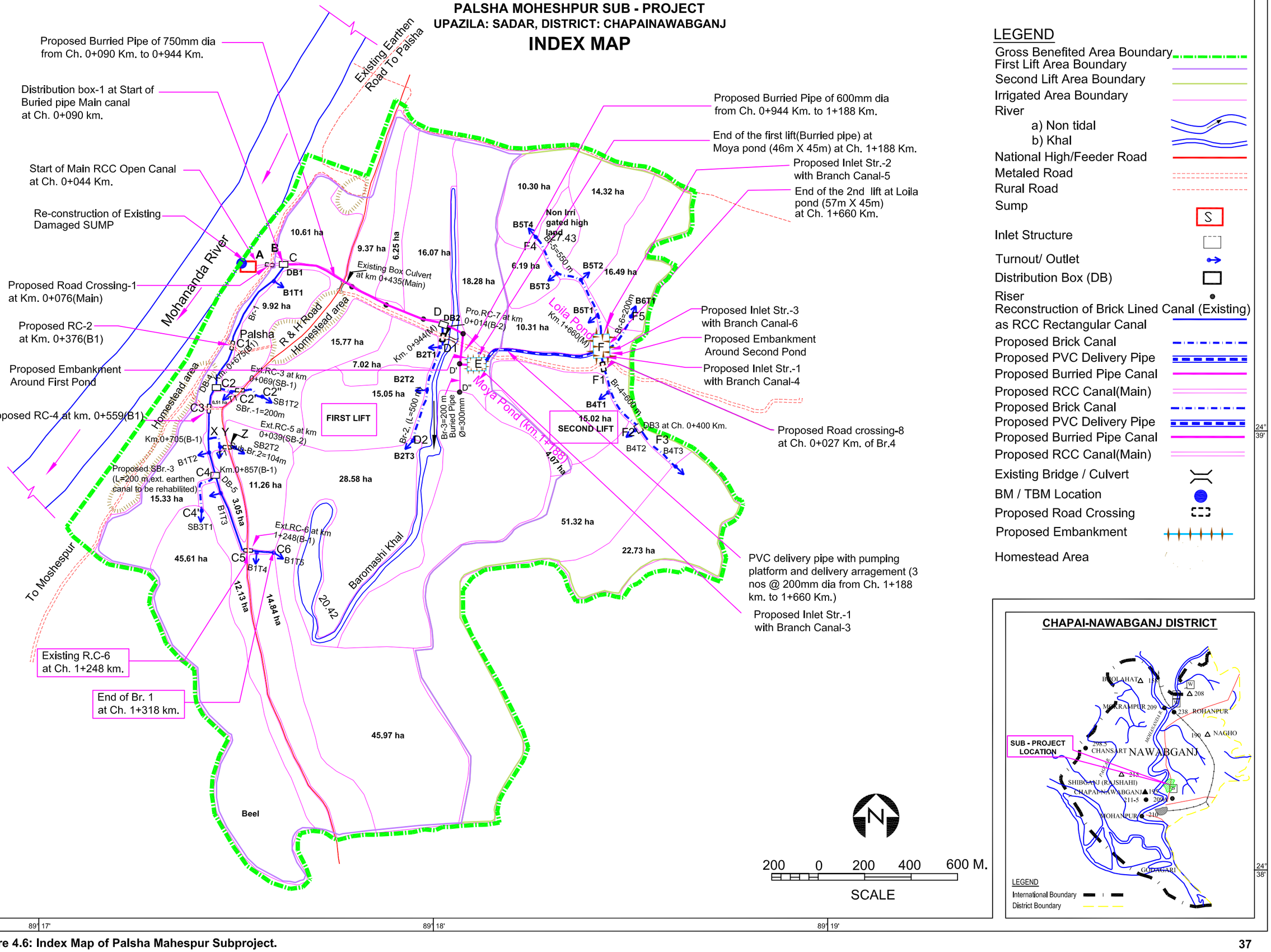
Palsha Mahespur Subproject (**Figure 4.6**) is located in between latitudes 24^0 37.90'N and 24^0 39.85'N and longitudes 89^0 17.07'E and 89^0 18.77'E. It is situated at about 8km North of Chapainawabganj

LOCAL GOVERNMENT ENGINEERING DEPARTMENT

PALSHA MOHESHPUR SUB - PROJECT

UPAZILA: SADAR, DISTRICT: CHAPAINAWABGANJ

INDEX MAP



LEGEND

- Gross Benefited Area Boundary
- First Lift Area Boundary
- Second Lift Area Boundary
- Irrigated Area Boundary
- River
  - a) Non tidal
  - b) Khal
- National High/Feeder Road
- Metaled Road
- Rural Road
- Sump (S)
- Inlet Structure
- Turnout/ Outlet
- Distribution Box (DB)
- Riser
- Reconstruction of Brick Lined Canal (Existing) as RCC Rectangular Canal
- Proposed Brick Canal
- Proposed PVC Delivery Pipe
- Proposed Burried Pipe Canal
- Proposed RCC Canal(Main)
- Proposed Brick Canal
- Proposed PVC Delivery Pipe
- Proposed Burried Pipe Canal
- Proposed RCC Canal(Main)
- Existing Bridge / Culvert
- BM / TBM Location
- Proposed Road Crossing
- Proposed Embankment
- Homestead Area

CHAPAI-NAWABGANJ DISTRICT

Figure 4.6: Index Map of Palsha Mahespur Subproject.

district H.Q in Baliadanga & Gobratala Union of Chapai Nowabgonj Sadar Upazila and spreads over the villages Palsha, Mohesour,Srirampur, Rasulpur, Damdanga and Amarak.The Subproject is located on the left bank of the Mahananda river.

4.5.6.2 Subproject Description

Palsha Mahespur Subproject is a Command Area Development (CAD) subproject. The main objective is to reduce loss of irrigation water, improve the irrigation facilities and increase the command area and extends irrigation to lands with higher elevations. By providing all facilities the production of the subproject area would be increased, specifically an overall increase of cereal crops. Shortage of irrigation water is the main problem in the subproject area, which reduces coverage and yield of HYV Boro. Construction of RCC buride pipe and open canal with branches would increase yield of HYV Boro in F0, F1and F2 lands. On the other hand, reduction of irrigation cost and additional production of HYV Boro encouraged the farmers to pay O&M cost. The gross area is 533 ha and net benefited area 473 ha. Shortage of irrigation water with lack of water delivery system is the main problem in the subproject area. The Mohananda river is situated on the west side of subproject area and this river is the main source of irrigation water. Before the implementation of this subproject, existing irrigation practice supplied water from the Mohananda river and its covers only 46 ha and through a society (unregistered) named “Palsha Somobay Halka Shech Prokalpa”. Most of the cultivable lands in the subproject area are under F0 and F1. The land elevation varies from 19.66 mPWD to 27.59 mPWD within the subproject. The land type classification of the project area is given in Table 4.12

Table 4.12: Land Type Classification of Palsha Mahespur Subproject

Land Type	Area (ha)
Non-cultivated highland	59
F0 (d<0.3m)	381
F1 (0.3m<d<0.9m)	92
F2 (0.9m<d<1.8m)	0
F3 (d>1.8m)	0
Non-cultivated lowland	1
Net area (F0+F1+F2+F3)	**473**
Gross Area	**533**

Source : LGED

The old irrigation system used 4 nos. of LLP (total Pump Capacity: 8 cusecs, 20 hp Motor each) for irrigation of 46 ha of land. All LLPs are electrically operated. The old system consists of open brick canal of 1300m long and earthen canal about 300m long in north-south direction. There was no canal in east-west direction. In old system the cost of irrigation is around Tk. 4,400 per ha as reported by local people. By this system with the aforesaid structure, farmers could irrigate partially 46 ha of land.

Details of the existing old system (before implementation this subproject) are listed below:

- Damaged brick Canal (about 1300m)
- Earthen Canal (about 300m)
- Sump and Pump Shed

LGED implemented this present irrigation system through the SSWRDSP-2 and constructed the components described in the following table with cost components of the subproject.

Table 4.13: Major cost components of Palsha Mahespur Subproject

Sl No	Component Name	Size/ Length	Cost(Tk)
1	Part A: Palsha Moheshpur Irrigation Canal System -		8,918,000
	-Construction of Sump	1 no.	
	-Distribution Box	5 nos.	
	-Turnout/Outlets	20 nos.	
	-Road Crossing	5 no.	
	-Intake Box	1 no.	
	-Riser	6 nos.	
	-Second Lifting Arrangement	1 no.	
	- Irrigation Canal (Main Open/Buried, Branch Open/Buried & Sub Branch)	4662m	
2	Part B:O&M Shed	12.00m x 6.00m	490,880
		Total Taka =	**9,408,880**

Source: LGED

The general information about the Water Management Co-operative Association (WMCA) of Palsha Mahespur CAD Subproject is given in the following table:

Table 4.14: WMCA Status of Palsha Mahespur Subproject

Name of WMCA	Date of Establishment	No. of Members		Total Members
		Male	Female	
Palsha Mahespur Irrigation Subproject WMCA Ltd.	23-10-2006	262	155	417

Source: LGED

4.5.7 Agrani Irrigation CAD Subproject

4.5.7.1 Location and Map

Agrani Irrigation CAD Subproject (**Figure 4.7**) is located in between latitudes 24^0 35.18'N and 24^0 36.5'N and longitudes $88^0$17.30'E and $88^0$19.00'E. It is situated at 10km north-east of Chapainawabgonj district H.Q in Zhilim Union of Chapai Nowabgonj Sadar Upazila and in the villages Milki, Bidirpur, Gonka, Kalupur, Kallaynpur, Durgapur, Sheyala, Uppor Razarampur, Chohodditola and Gabtola. The subproject is bounded by Mohananda river to the north-west, by a water body (Beel) to the south-west and by the Mohadanga and Modhya Gopinathpur Mouza to the east.

4.5.7.2 Subproject Description

Agrani Subproject is a Command Area Development (CAD) subproject. The main objective is to reduce loss of irrigation water, improve the irrigation facilities and increase the command area. By providing all facilities the production of the subproject area would be increased, specifically an overall increase of cereal crops. Scarcity of irrigation water is the main problem in the subproject area, which reduced coverage and yield of HYV Boro. Construction of RCC main and branch canal with turnout will increase yield of HYV Boro in F0, F1, F2 and F3 lands. On the other hand, reduction of irrigation cost and additional production of HYV Boro encouraged the farmers to pay O&M cost. The gross area is 685 ha and net benefited area 557 ha. Shortage of irrigation water with lack of water delivery system is the main problem in the subproject area. The surface water of the Mohananda River is the main source of irrigation water in the subproject area. The land type classification of the project area is given in Table 4.15

Table 4.15: Land Type Classification of Agrani Irrigation CAD Subproject

Land Type	Area (ha)
Non-cultivated highland	50
F0 (d<0.3m)	325
F1 (0.3m<d<0.9m)	135
F2 (0.9m<d<1.8m)	60
F3 (d>1.8m)	37
Non-cultivated lowland	78
Net area (F0+F1+F2+F3)	**557**
Gross Area	**685**

Source : LGED

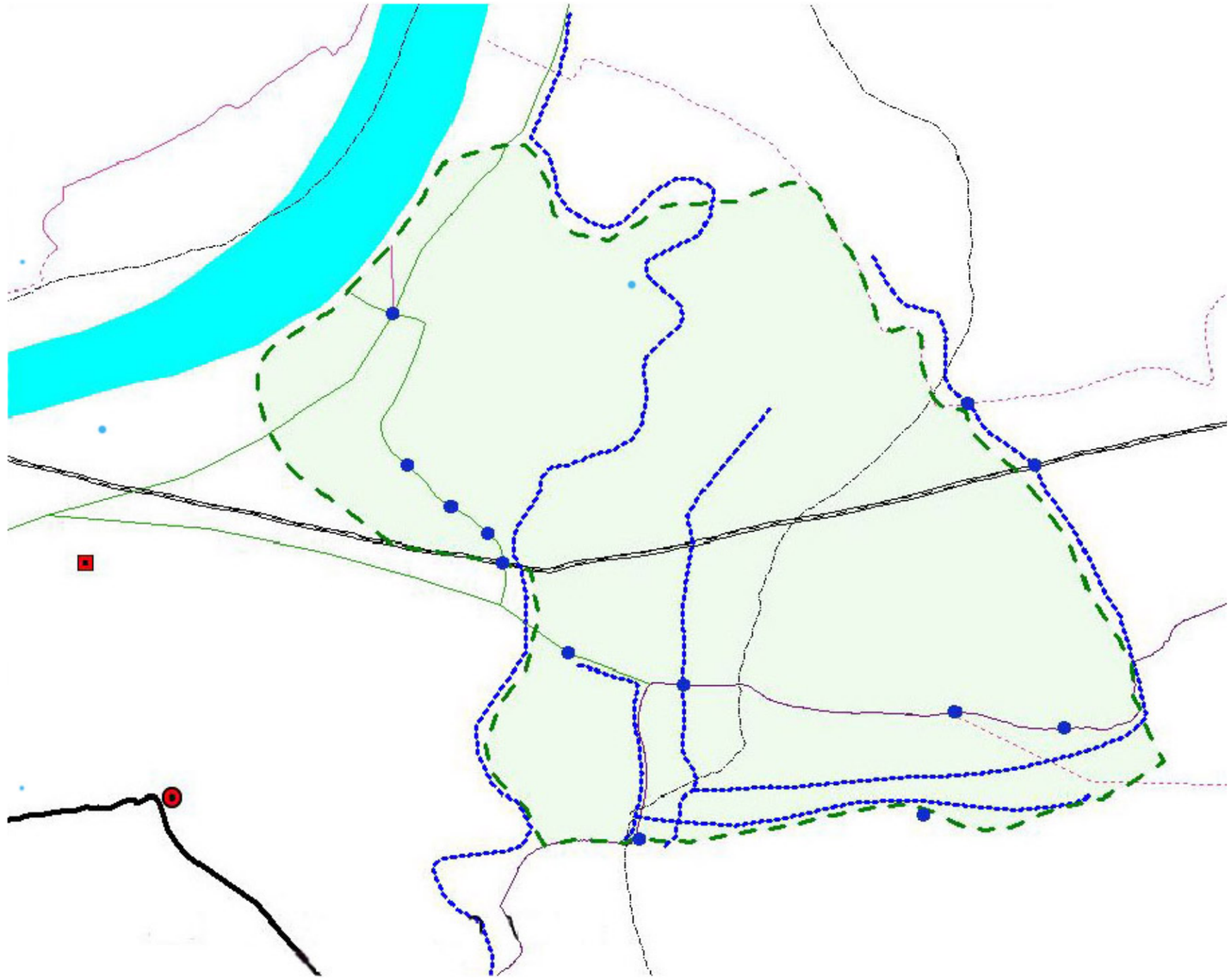
The farmers of this area developed an irrigation system before the present irrigation system. The farmers used 3 Nos. of LLPs (Capacity is 2.0 cusec each) to collect water from Mohananda River and the collected water was delivered to the main (brick lined) and branch (earthen) canal. Then the local farmers of the subproject area irrigated their lands by this surface water. The old system was

LOCAL GOVERNMENT ENGINEERING DEPARTMENT

AGRANI IRRIGATION CAD SUB - PROJECT

UPAZILA: SADAR, DISTRICT: CHAPAINAWABGANJ

INDEX MAP



500 0 500 Meters

SCALE

LEGEND

Administrative HQ
- District HQ
- Upazila HQ
- Union HQ

Administrative Boundary
- International Boundary
- District Boundary
- Thana Boundary
- Union Boundary

Natural Featuers
- Khal
- Wide River
- Haor/Beel

Physical Infrastructers
- National Highway
- Regional Highway
- Zila Road
- Upazila Road Pucca
- Upazila Road Katcha
- Union Road Pucca
- Union Road Katcha
- Village Road Pucca
- Village Road katcha
- Embankment
- Rail Way

Subproject Features
- Subproject Area
- Embankment Re-sectioned
- Re-Excaveted Khal
- Implemented Regulator/WRS/Sulice
- Existing Regulator/Sulice/WRS
- Existing Culvert/Bridge
- Water Flow

CHAPAI-NAWABGANJ DISTRICT

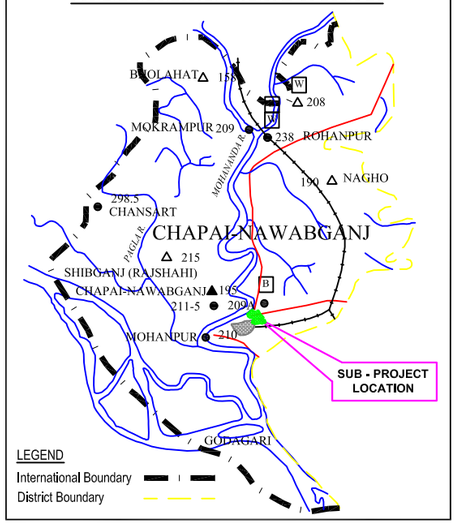


Figure 4.7: Index Map of Agrani Irrigation CAD Subproject.

maintained by the Agrani Co-operative Society. The condition of this old system was poor and canal capacities were inadequate. By this old systen the total irrigation coverage was 30 ha of lsnd.

Details of the existing system (before implementation this subproject) are listed below:

- Damaged brick lined canal (about 1200m)
- Poor condition earthen canal (about 1000m)
- Road Crossing
- Sump and Pump Shed

LGED implemented this present irrigation system through the SSWRDSP-1 and developed the irrigation facilities from 30 ha to 557 ha by constructing the components described in the following table with cost components of the subproject. The following table represents the major cost component of the subproject.

Table 4.16: Major cost components of Agrani Irrigation CAD Subproject

SI No	Component Name	Size/ Length	Cost(Tk)
1	Agrani Irrigation Canal System		18,222,821
	-Sump	1 no.	
	-RCC Main Canal	3120 m	
	- RCC Branch Canal	5275 m	
	-Syphon	1 no.	
	-Culverts	3 nos.	
	-Aquiduct	1 no.	
	-Bridge cum Aquiduct	1 no.	
	-Box sluice	1 no.	
2	Part C:O&M Shed	12.00m x 6.00m	298,579
		Total Taka =	18,521,400

Source: LGED

The general information about the Water Management Co-operative Association (WMCA) of Agrani Irrigation CAD Subproject is given in the following table:

Table 4.17: WMCA Status of Agrani Irrigation CAD Subproject

Name of WMCA	Date of Establishment	No. of Members		Total Members
		Male	Female	
Agrani Irrigation Subproject WMCA Ltd.	09-05-1996	1240	644	1884

Source: LGED

Chapter 5

Result and Discussion

In this study the performance evaluation of selected Command Area Development (CAD) subprojects in Chapainawabganj district have been evaluated in terms of aspects such as hydraulic, agricultural and non agricultural such as participatory management, socioeconomic and environmental. The hydraulic aspect deals with the performance of water delivery system. Agricultural aspect deals with irrigated area, production and yield performance etc.

5.1 Water Supply Performance

Hydraulic Indicators deal with the conveyance of irrigation water from the source to the farmer's field with the help of irrigation facilities within the subproject area. The data for this calculation were collected from field survey and the design flow data were collected from LGED.

Table 5.1: Water Supply Performance

Subproject Name	Discharge before CAD Condition (m^3/s)	Discharge after CAD Condition (m^3/s)	% Increase
Mohammadkhani	0.227	0.637	181
Nayagola -Mohananda	0.227	0.680	200
Dariapur	0.326	0.425	30
Palsha Mahespur	0.227	0.510	125
Agrani	0.227	0.878	289

Source: Field Survey

Table 5.1 shows the water supply performance of the selected subprojects. The Increase water supply in Mohammadkhani, Nayagola-Mohananda and Agrani are abruptly increases because before the CAD condition area under irrigation is much less than after CAD condition in aforesaid subprojects.

Table 5.2: Area Irrigated per cumec discharge before and after CAD Condition.

Subproject Name	Before CAD Condition (ha/cumec)	After CAD Condition (ha/cumec)
Mohammadkhani	331	424
Nayagola -Mohananda	309	394
Dariapur	276	377
Palsha Mahespur	203	249
Agrani	353	570

Source: Field Survey

Table 5.2 shows the area irrigated per cumec before and after CAD condition of the selected subprojects. It is seen that per cumec discharge irrigated area increased after CAD condition compare to before CAD condition. This is due to the improvement of irrigation canal system and also for properly water management.

Table 5.3: Pump Operation Hour per day in Boro and Aman season.

Subproject Name	Boro Season Average (hour/day)	Aman Season Average (hour/day)
Mohammadkhani	18~20	7~10
Nayagola -Mohananda	18~20	7~10
Dariapur	18~20	7~10
Palsha Mahespur	18~20	7~10
Agrani	18~20	7~10

Source: Field Survey

Table 5.3 It is seen that pump operation hour for all the subprojects ate 18 to 20 hour/day in Boro season. In Aman season it is 7 to 10 hour/day depend on the availability of rainfall. Pump operation hour per day is same in before and after CAD condition. In Boro season pump operation hour depends on the availability of electricity. If electricity supply is continuous then pumps run 22 to 23 hour/day.

Table 5.4: Irrigation Cost per Hector before and after CAD condition.

Subproject Name	Before CAD Condition (tk./ha)	After CAD Condition (tk./ha)
Mohammadkhani	6000	3000
Nayagola -Mohananda	4500	3361
Dariapur	3000	2500
Palsha Mahespur	4400	3000
Agrani	7450	3360

Source: Field Survey

Table 5.4 It is seen that irrigation cost before the CAD condition is more than after CAD condition. That means irrigation cost per hector reduces after CAD implementation. This is due to the improvement of irrigation canal system and also for properly water management. So, these subprojects have a good impact.

5.2 Irrigation Area Performance

This is the direct indicator of performance calculation in respect of area irrigated. The main objective of these subprojects is to ensure the irrigation water whenever required for agricultural production.

Data were collected from field survey and LGED. The target area taken from subproject feasibility study report and actual irrigation area taken from respective WMCA office.

Table 5.5(a): Irrigation Area Performance

Subproject Name	CAD Condition Targeted Irrigation Area (ha)	CAD Condition Actual Irrigation Area (ha)	Performance (%)
Mohammadkhani	563	270	46
Nayagola -Mohananda	342	268	78
Dariapur	290	160	55
Palsha Mahespur	473	127	32
Agrani	557	500	90

Source: Field Survey & LGED

Table 5.5(a) shows the irrigation area performance of the selected subprojects. The maximum performance achieved in the subproject of Agrani and Nayagola-Mohananda Subprojects. The Agrani CAD subproject is the oldest among them. Its water management system is better than others.

Table 5.5(b): Irrigation Area Performance

Subproject Name	Before CAD Condition Irrigation Area (ha)	After CAD Condition Actual Irrigation Area (ha)	% Increase
Mohammadkhani	75	270	260
Nayagola -Mohananda	70	268	283
Dariapur	90	160	78
Palsha Mahespur	46	127	176
Agrani	80	500	525

Source: Field Survey & LGED

Table 5.5(b) shows the actual increment of irrigation area of the selected subprojects with respect to pre project irrigation area. The maximum Increment occurred in Agrani and Nayagola-Mohananda Subprojects. Initially when local people started this subproject irrigated only 80 ha. After CAD condition its facilities improved and irrigate 500 ha.

5.3 Production Performance

This performance is calculated on the basis of pre project (year 2000) and post project data (year 2011). These data were collected from LGED.

Table 5.6: Production Performance

Subproject Name	Before CAD Condition Production (tons)	After CAD Condition Production (tons)	% Change in Production
Mohammadkhani	354	1472	316
Nayagola - Mohananda	350	1635	367
Dariapur	405	976	141
Palsha Mahespur	216	699	223
Agrani	248	2075	737

Source: Field Survey & LGED

Table 5.6 shows the production performance of the selected subprojects. The maximum production increased in Agrani CAD subproject because the initial command area of this subproject is less than other subprojects and also its command area increase after CAD condition.

5.4 Yield Performance

In the dry area the yield of Boro mainly depends on the availability of irrigation water. It is decreased due to scarcity of water. For the Yield performance calculation the before and after CAD condition data were collected from WMCAs of each subprojects.

Table 5.7: Yield Performance for Boro Crops

Subproject Name	Boro Crop Yield (ton/ha)		% Increase
	Before CAD Condition	After CAD Condition	
Mohammadkhani	4.05	6.14	52
Nayagola - Mohananda	4.19	6.42	53
Dariapur	4.19	5.86	40
Palsha Mahespur	4.19	5.58	33
Agrani	3.91	5.58	43

Source: Field Survey & LGED

From the table 5.7 it is seen that the yield of Bora crop, after CAD condition of subproject increased considerably with respect to before CAD condition in each subproject. The maximum Boro crop production increased in Mohammadkhani Subproject while minimum production in Palsha Mahespur Subproject. This production increase is due to the timely irrigation of the subprojects.

5.5 Participatory Management

5.5.1 Membership Status of WMCAs

Water Management Cooperative Association (WMCA) is the organization which is registered by the government. All the activities related to subproject O&M within the subproject area are carried out by WMCA. The following table shows the change of membership for WMCA of the selected subprojects.

Table 5.8: Membership Status of WMCAs

Name of WMCA	Year	Membership		
		Male	Female	Total
Mohammadkhani Irrigation Subproject WMCA Ltd.	2008	844	320	1164
	2009	840	315	1155
	2010	835	310	1145
Nayagola -Mohananda WMCA Ltd.	2008	341	161	502
	2009	445	207	652
	2010	435	234	669
Dariapur Irrigation Subproject WMCA Ltd.	2008	547	273	820
	2009	626	313	939
	2010	674	336	1010
Palsha Mahespur Irrigation Subproject WMCA Ltd.	2008	262	130	392
	2009	282	140	422
	2010	283	173	456
Agrani Irrigation Subproject WMCA Ltd.	2008	623	304	927
	2009	782	388	1170
	2010	1258	644	1902

Source: Field Survey

From the Table 5.8 it is seen that the total members of each subproject is increasing except Mohammadkhani Subproject. The decrease of member no. in Mohammadkhani WMCA is due to death of few members and not taken of new member in last three years.

5.5.2 Meeting Attendance of WMCA General Members

Regular meeting of the Water Management Cooperative Association (WMCA) is a prime need for proper running of WMCA. In each meeting attendance of the general members is important for

planning of subproject activities and also for O&M activities. The following table shows the regularity of the members and cause behind their absence in attending the meeting as well.

Table 5.9: Meeting Occurrence Number and Attendance Percentage

Name of Subproject	year	Proposed No. of meeting in a year	No. of meeting occurred in a year	Meeting Attendance (%)
Mohammadkhani	2008	12	15	85
	2009	12	14	90
	2010	12	14	95
Nayagola - Mohananda	2008	13	13	75
	2009	13	13	85
	2010	13	13	90
Dariapur	2008	12	15	80
	2009	12	14	90
	2010	12	17	95
Palsha Mahespur	2008	13	17	75
	2009	13	15	80
	2010	13	15	85
Agrani	2008	13	21	85
	2009	13	21	90
	2010	13	16	95

Source: Field Survey & LGED

The number of meeting for a subproject is fixed. But it is seen that the occurrence number of meeting for a particular subproject in a year is more than the target number. This is due to the requirement of the WMCA management for smoothly running of WMCA.

Table 5.10: Beneficiaries reasons for not attending the meeting

Name of Subproject	% of respondents expressing their opinions					
	Not important	Transportation problem	Busy	Timely not informed	Dominated by others	Gender Issue
Mohammadkhani	-	30	60	10	-	-
Nayagola - Mohananda	-	20	70	10	-	-
Dariapur	-	30	60	-	10	-
Palsha Mahespur	-	40	50	10	-	-
Agrani	-	30	60	10	-	-

Source: Field Survey

All the members of the WMCA could not attend the meeting due the different reasons. The maximum answers are that, they could not attend the meeting because they were busy at their own works.

5.5.3 Conflict Resolution

The responses from questionnaire survey on conflict resolution by WMCA whether the WMCA can solve it easily or not.

Table 5.11: Beneficiaries perception for conflict resolution

Name of Subproject	% of respondents expressing their opinions	
	Easily solved	Unsolved or delayed
Mohammadkhani	80	20
Nayagola -Mohananda	70	30
Dariapur	80	20
Palsha Mahespur	70	30
Agrani	90	10

Source: Field Survey

From the table 5.11 it is seen that 70% to 80% conflicts were solved easily by the WMCA management committee easily. Only 20% to 30% conflicts were unsolved or delayed due to the technical, financial matter. The beneficiaries informed were informed that the WMCA are trying to solve these problems.

5.5.4 Water management

The responses from questionnaire survey on water management for cultivation by WMCA whether the WMCA can supply water in time or delay.

Table 5.12: Beneficiaries perception for water management

Name of Subproject	% of respondents expressing their opinions	
	Water Supply in time	Water Supply is delayed
Mohammadkhani	60	40
Nayagola -Mohananda	70	30
Dariapur	70	30
Palsha Mahespur	60	40
Agrani	70	30

Source: Field Survey

From the table 5.12 it is seen that 60% to 70% beneficiaries answered they got water in their field in time. On the other hand 30% to 40% beneficiaries answered water supply was delayed. The water supply is delayed due to electricity supply is not continuous for pump operation and infrastructure maintenance problem.

5.5.5 Infrastructure Maintenance

The responses from questionnaire survey on maintenance of infrastructure within the subproject by WMCA whether the WMCA can properly maintain the infrastructure in time or delayed.

Table 5.13: Beneficiaries perception for Infrastructure maintenance

Name of Subproject	% of respondents expressing their opinions	
	Infrastructure Maintenance in time	Infrastructure Maintenance delayed
Mohammadkhani	60	40
Nayagola -Mohananda	70	30
Dariapur	70	30
Palsha Mahespur	60	40
Agrani	70	30

Source: Field Survey

From the table 5.13 it is seen that 60% to 70% beneficiaries answered the infrastructures are maintained in time. On the other hand 30% to 40% beneficiaries answered maintenance of the infrastructures is delayed due to technical and financial maters.

5.5.6 Micro Credit Activities

Poverty alleviation is another main objective of the SSWRDSP-2 and it achieves through micro credit distribution among the beneficiaries. The beneficiaries take loan from WMCA without any deposit. Any beneficiaries can take loan easily from WMCA. The following table shows loan distribution and recovery amount and loan taking male female percentage for the year of 2010.

Table 5.14(a): Micro Credit Activities of WMCA of Selected Subprojects in 2008 year

Name of Subproject	Amount Disburse	Amount Recovery	Loan Recovery	Borrowers (nos.)			Borrowers Percentage	
	(Tk.)	(Tk.)	(%)	Male	Female	Total	Male	Female
Mohammadkhani	324000	227000	70.06	250	74	324	77.16	22.84
Nayagola - Mohananda	1212000	1126000	92.90	134	90	224	59.82	40.18
Dariapur	1091000	654000	59.95	143	76	219	65.30	34.70
Palsha Mahespur	326000	326000	100.00	96	41	137	70.07	29.93
Agrani	3250000	3250000	100.00	408	114	522	78.16	21.84

Source: Field Survey & LGED

Table 5.14(b): Micro Credit Activities of WMCA of Selected Subprojects in 2009 year

Name of Subproject	Amount Disburse	Amount Recovery	Loan Recovery	Borrowers (nos.)			Borrowers Percentage	
	(Tk.)	(Tk.)	(%)	Male	Female	Total	Male	Female
Mohammadkhani	225000	170000	75.56	157	68	225	69.78	30.22
Nayagola - Mohananda	1570000	1461000	93.06	165	117	282	58.51	41.49
Dariapur	3450000	1898000	55.01	313	170	483	64.80	35.20
Palsha Mahespur	708500	708500	100.00	153	95	248	61.69	38.31
Agrani	6157000	6157000	100.00	456	150	606	75.25	24.75

Source: Field Survey & LGED

Table 5.14(c): Micro Credit Activities of WMCA of Selected Subprojects in 2010 year

Name of Subproject	Amount Disburse	Amount Recovery	Loan Recovery	Borrowers (nos.)			Borrowers Percentage	
	(Tk.)	(Tk.)	(%)	Male	Female	Total	Male	Female
Mohammadkhani	190000	100000	52.63	100	85	185	54.05	45.95
Nayagola - Mohananda	1495000	1136000	75.99	85	76	161	52.80	47.20
Dariapur	8836000	5173000	58.54	534	273	807	66.17	33.83
Palsha Mahespur	746000	746000	100.00	149	86	235	63.40	36.60
Agrani	8000000	8000000	100.00	1038	214	1252	82.91	17.09

Source: Field Survey & LGED

From the Tables 5.14(a), 5.14(b) and 5.14(c) it is seen that the WMCA of all the subprojects are doing well in micro credit activities. WMCA of Palsha Mahespur and Agrani WMCA are ahead of other WMCA in loan recovery activities.

5.6 Socio Economic Analysis

5.6.1 Wage Rate Analysis

Effect of subproject in socio economic sector depends on the economic condition of the beneficiaries within the subproject area. As the beneficiaries are mainly farmers and day labourers so change of wage rate is main indicator for socio economic analysis. The table shows the percentage change of wages rate.

Table 5.15: Wage Rates in Selected Subproject Areas

Name of Subproject	Avg. wage rate in normal season (Tk./day)			Avg. wage rate in peak season (Tk./day)		
	Before CAD condition	After CAD condition	Change (%)	Before CAD condition	After CAD condition	Change (%)
Mohammadkhani	60	200	333.33	80	250	312.50
Nayagola - Mohananda	120	200	166.67	150	250	166.67
Dariapur	100	150	150.00	120	200	166.67
Palsha Mahespur	130	180	138.46	150	200	133.33
Agrani	60	175	291.67	70	250	357.14

Source: Field Survey

From the Table 5.15 it is seen that the wage rates increase abruptly after implementation of the subprojects. The reason of increasing the wage rates is not unique. There is lot of factors like, increasing of price of necessary commodities, increasing of working opportunities for labourers etc.

5.6.2 Land Value Analysis

Change of land value for agricultural land as well as homestead land is another indicator of socio economic analysis. Positive value indicates the improvement of social status of the beneficiaries. The table below shows the percentage change of land value for agricultural and homestead land of the year 2010.

Table 5.16: Changes of Land value in Selected Subproject Areas (2010)

Name of Subproject	Agricultural land value (Tk./ha)			Homestead land value (Tk./ha)		
	Before CAD condition	After CAD condition	Change (%)	Before CAD condition	After CAD condition	Change (%)
Mohammadkhani	40,000	600,000	1500	60,000	300,000	500
Nayagola - Mohananda	85,000	400,000	470	40,000	500,000	1250
Dariapur	250,000	400,000	160	100,000	300,000	300
Palsha Mahespur	450,000	800,000	178	50,000	100,000	200
Agrani	10,000	550,000	5500	20,000	300,000	1500

Source: Field Survey

From the Table 5.16 it is seen that the land value for both agricultural and homestead increased abruptly after implementation of the subprojects. The reason of increasing the land value is not unique. There is lot of factors like, increasing the economical status of people, increasing the population and none increasing the land area and availability of irrigation water in agricultural land etc.

5.7 O&M Aspect

After successfully completion of subproject construction, LGED is responsible for O&M for 1st year. After one year maintenance the LGED authority hands over the O&M responsibility to respective WMCA. Sustainability of O&M is an important factor for smooth running of water resources subprojects. Sustainability can be calculated on the basis of O&M fund collection. Tables below show the financial viability of subprojects. Performance of O&M aspect and participatory management are related each other.

Table 5.17(a): Financial viability of the subprojects on the basis of fund collection for O&M purpose (year 2008)

Name of Subproject	O&M Fund Collection (Tk.)		Fund Collection Efficiency (%)	Actual Expenditure for O&M (Tk.)	Expenditure as a % of Budget Estimated (Tk.)	Expenditure as a % of Fund Collected (Tk.)
	Budget estimated	Fund Collected				
Mohammadkhani	3,612,860	3,612,000	99.98	1,250,000	78	78
Nayagola - Mohananda	1,037,103	1,037,000	99.99	1,010,000	97	97
Dariapur	295,000	290,000	98.31	270,000	92	93
Palsha Mahespur	887,110	887,000	99.99	350,000	79	79
Agrani	3,097,722	2,961,592	95.61	1,427,500	68	73

Source: Field Survey

Table 5.17(b): Financial viability of the subprojects on the basis of fund collection for O&M purpose (year 2009)

Name of Subproject	O&M Fund Collection (Tk.)		Fund Collection Efficiency (%)	Actual Expenditure for O&M (Tk.)	Expenditure as a % of Budget Estimated (Tk.)	Expenditure as a % of Fund Collected (Tk.)
	Budget estimated	Fund Collected				
Mohammadkhani	3,823,200	3,823,200	100	1,300,000	71	71
Nayagola - Mohananda	1,250,300	1,250,000	99.98	1,240,000	99	99
Dariapur	340,000	280,000	82.35	320,000	94	114
Palsha Mahespur	746,000	746,000	100	380,000	78	78
Agrani	2,461,320	2,263,322	91.96	1,334,800	91	106

Source: Field Survey

Table 5.17(c): Financial viability of the subprojects on the basis of fund collection for O&M purpose (year 2010)

Name of Subproject	O&M Fund Collection (Tk.)		Fund Collection Efficiency (%)	Actual Expenditure for O&M (Tk.)	Expenditure as a % of Budget Estimated (Tk.)	Expenditure as a % of Fund Collected (Tk.)
	Budget estimated	Fund Collected				
Mohammadkhani	4,413,300	4,413,000	99.99	1,800,000	75	75
Nayagola - Mohananda	1,352,500	1,352,000	99.96	1,310,000	97	97
Dariapur	736,000	700,000	95.11	500,000	68	71
Palsha Mahespur	3,251,000	2,300,000	70.75	450,000	64	62
Agrani	2,445,838	2,272,829	92.93	1,923,700	79	85

Source: Field Survey

From Tables 5.17(a), 5.17(b) and 5.17(c) it is seen that all the WMCA are financially solvent for O&M purpose. It is also seen that the collection amount is more than O&M expenditure amount. Out of five numbers of WMCA committee, three WMCA committees told that after O&M expenditure the rest amount was deposited to their O&M bank account. The rest two number of WMCA committee told that the rest amount was invested to microcredit. Expenditure for O&M includes electricity's bill for pumps operation, earthen canal maintenance, pump repair, buy new pump, pipes, pump operation platform construction, office maintenance, salaries etc.

5.8 Environmental Analysis

Environmental performance indicator depends on the change of land type, fish production, water quality, change of land fertility and natural vegetation characteristic. Maximum lands of selected subprojects are F0 and F1. Small portion are F2 and F3. In this study all the subprojects are CAD type. No changes occur in respect of drainage facilities before and after the CAD condition. So the water body which was before the CAD condition remains same after the CAD condition. As these subproject use surface water, so the soil fertility increased, this is helpful for agricultural production. In CAD project system, it improves the irrigation facilities within the project areas. From the beneficiary's perception, no remarkable change of environment occurs within the subproject areas after implementation of each CAD project.

Chapter 6

Conclusions and Recommendations

6.1 General

The main objective of this study was to evaluate the performance of selected command area development (CAD) subprojects of LGED in Chapainawabganj district. Indicators used in this study are hydraulic, agricultural, participatory management, socio-economic, environmental and operation & maintenance etc. The following conclusion can be drawn from this study.

6.1.1 Hydraulic Performance

Water supply performance is calculated between before CAD condition and after CAD condition water supply data. In after CAD condition the water supply increased to 181%, 200%, 30%, 125% and 289% for Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP respectively. As pump numbers and pump capacity increased, so the water supply also increased. As a result more agricultural land could be irrigated through the implementation of the subproject. Water supply is always higher in after CAD condition than the before CAD condition, so the subprojects are satisfactorily irrigated in the after CAD condition.

6.1.2 Agricultural Performance

In these CAD subprojects the indicators like irrigation area performance, production performance and yield performance have significant positive results. Irrigation area performance of Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP respectively showed 260%, 283%, 78%, 176% and 525% area increase in after CAD condition compared to before CAD condition. For production performance of Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP and Palsha Mahespur SP the percentage of production increase are 316%, 367%, 141%, 223% and 737% respectively in after CAD condition compared to before CAD condition. For yield performance of Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP for Boro crop production, the percentage increase are 82%, 53%, 40%, 33% and 43% respectively in after CAD condition compared to before CAD condition. Resulting agricultural performance was found satisfactory.

6.1.3 Participatory Management Performance

This performance depends upon the activities of the management committee. Percentage of member enrolment and number of meetings occurred and microcredit disburse & collection each year etc. People in the project areas know the effect of the subproject better, so most of them become

members of respective WMCA. So the increment of member enrollment is not significant in the year 2009 and 2010. It is shown that the number of meeting occurred is more than the proposed number each year in a subproject. That has a positive significance for better management. On the other hand, in the meeting the participant attendance percentage is more than 80% each year a subproject. 10 to 20% participants do not attend the meeting due to business of their own. In conflict resolution WMCAs performance are between 70 to 90%. The outstanding of conflict remains unsolved or delayed due to technical and financial matter. On the other hand water management and infrastructure maintenance performance are between 60 to 70% which is an indication of good performance of WMCA. In microcredit activities, the WMCAs are doing well in credit disbursement and credit recovery. The loan recovery percentage of Mohammadkhani SP is 70.06%, 75.56% & 52.63%; in Nayagola-Mohananda SP is 92.90%, 93% & 76%; in Dariapur SP is 59.95%, 55.01% & 58.54%; in Palsha Mahespur SP is 100%, 100% & 100% and in Agrani Irrigation SP is 100%, 100% & 100% in the year 2008, 2009 and 2010 respectively.

6.1.4 Socio-Economic Performance

Percentage changes of wage rates and land value in after CAD condition compared to before CAD condition are used to evaluate socio-economic performance for the selected CAD subprojects. Percentage change of wage rate in normal season is 333%, 167%, 150%, 138% and 291% while in peak season is 313%, 167%, 167%, 133% and 357% for Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP respectively. On the other hands the percentage change of agricultural land value is 1500%, 470%, 160%, 178% and 5500%; for homestead land 500%, 1250%, 300%, 200% and 1500% for Mohammadkhani SP, Nayagola-Mohananda SP, Dariapur SP, Palsha Mahespur SP and Agrani CAD SP respectively. It is seen that the wage rate and land value within subprojects area change abruptly in after CAD condition. The changes occurred not only due to the implementation of the subproject but there are a lot of factors for this change. But it is a fact that the socio-economic condition of the inhabitants living in SP area increased in after CAD condition compared to before CAD condition.

6.1.5 Environmental Performance

There is no appreciable environmental changes occur in after CAD condition compared to before CAD condition. But beneficiaries' perceptions are that the fertility of land increase due to surface water irrigation through the CAD subproject.

6.1.6 Operation & Maintenance (O&M) Performance

Performance of WMCA is related to O&M. Performance is estimated through the percentage of fund collection efficiency of WMCA in different years. The fund collection efficiency of Mohammadkhani SP is 99.98%, 100% & 99.00%; that of Nayagola-Mohananda SP is 99.99%, 99.98% & 99.96%; of

Dariapur SP is 98.31%, 82.35% & 95.11%; of Palsha Mahespur SP is 99.99%, 100% & 70.75% and of Agrani CAD SP is 95.61%, 91.96% & 92.93% for the year 2008, 2009 and 2010 respectively. It is seen that all the SPs are financially solvent for O&M activities.

6.2 Recommendations

Based on the study, the following recommendations are suggested for improvement of further evaluation of CAD subprojects.

- This study could not measure the discharge at outlet point of each canal because of the absence of discharge measuring device in the field level.
- Over irrigation loss and conveyance loss could not be measured; to find water delivery efficiency it should be measured.
- This study could not measure the water quality and land fertility (whether increase or decrease) after implementation of the CAD subprojects.

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ANNEX-A

স্হানীয় সরকার প্রকৌশল অধিদপ্তর কর্তৃক বাস্তবায়িত দ্বিতীয় ক্ষুদ্রকার পানি ব্যস্হাপনা উপ প্রকল্প (CAD Project) সম্পর্কে স্হানীয় জনগনের মতামত ও মূল্যায়ন জরীপের নিমিত্তে প্রশ্নাবলী :

উত্তর দাতার নামঃ

পেশাঃ

ঠিকানাঃ

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 হযেছিল?
৫. আপনি কি স্বর্তস্ফূর্ত 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 পরিমান জমি পাওয়া গেছে?
৩. প্রকল্পের আগে কত পরিমান জমি সেচ সুবিধা ছিল।
৪. প্রকল্পের পরে (২০১০ সালে) কত পরিমান জমি সেচ সুবিধা পাচ্ছে।
৫. একর প্রতি উৎপাদন কি বেড়েছে?
৬. যদি উৎপাদন বাড়ে তবে বাড়ার কারন কি?
   - উচ্চতর ফলনশীল প্রজাতি ব্যবহার করার ফলে
   - উন্নত সেচের কারনে
   - কীটনাশক ব্যবহার করার ফলে
   - ভাল মানের প্রশিক্ষণ দেয়ার ফলে
   - ফ্লাশ ফ্লাড থেকে রক্ষা পাওয়ার জন্য
   - অন্যান্য
৭. জমির উর্বরতা কি বেড়েছে বলে মনে হয়?
৮. প্রকল্পের আগে একর প্রতি উৎপাদন কত ছিল ।
৯. প্রকল্পের পরে (২০১০ সালে) একর প্রতি উৎপাদন কত হল।

সাংগাঠনিক

১. এখানে কি পানি ব্যবস্হাপনা সমবায় সমিতি (পাবসস) রয়েছে?
২. আপনি কি এর সদস্য?
৩. যদি না হয়ে থাকেন তবে হওয়ার ইচ্ছা আছে কি?

৪. আপনি কি সদস্যদের দায়দায়িত্ব সন্মন্ধে অবহিত আছেন?
৫. পানি ব্যবস্হাপনা সমবায় সমিতির কার্যকারিতা কি?
৬. সমিতির সাধারণ সদস্য এবং কমিটির সদস্যদের মধ্যে কোন বিরোধ আছে কি?
৭. বিরোধ থাকলে কি নিয়ে?
৮. নিয়মিত কমিটির সভা হয় কি?
৯. সময়মত নির্বাচন হয় কি? কতবার নির্বচান হয়েছে?
১০. প্রতি বছর কয়টি সভা অনুষ্ঠিত হওয়ার কথা।
১১. ২০০৮, ২০০৯ এবং ২০১০ সালে কয়টি সভা অনুষ্ঠিত হয়েছে।
১২. আপনি কি সকল সভায় নিয়মিত অংশগ্রহণ করেন?
১৩. সভায় নিয়মিত অংশগ্রহন না করার পিছনে কারণ কি?
- মিটিং এর সময় জানি না
- ব্যস্ড় ছিলাম
- মিটিং এ অন্যদের প্রধান্য বেশী
- মিটিং এর কোন গুরুত্বই নেই
- পরিবহন সমস্যা
- জেন্ডার ইস্যু

১৪. সমিতিতে মহিলাদের অংশ গ্রহণ কি আশানুরুপ?
১৫. না হলে এর পিছনে কারণ কি বলে আপনি মনে করেন?
১৬. সমিতিতে সদস্য সংখ্যা:

সাল	পুরুষ সদস্য	মহিলা সদস্য	মোট সদস্য
২০০৮			
২০০৯			
২০১০			

অবকাঠামো
১. প্রজেক্টের আগে পানি সরবরাহ কত ছিল?
২. প্রজেক্টের পরে ২০১০ সালে পানি সরবরাহ কত?
৩. অবকাঠামোগত কোন অভিযোগ আছে কি?
৪. অবকাঠামোর অবস্হান কি যথাযথ স্হানে হয়েছে বলে আপনি মনে করেন?
৫. পানির আউটলেট কি সঠিক স্হানে আছে ?
৬. সাম্প এর উচ্চতা কি সঠিক হয়েছে বলে আপনি মনে করেন?
৭. আপনার কোন দিক নির্দেশনা আছে কি এই ব্যাপারে?
৮. প্রকল্পের সম্পূর্ণ এলাকায় পানি যায় কিনা? না গেলে কারণ কি?
৯. প্রকল্পের পানি সরবরাহ লাইন বারিড পাইপ না ওপেন ক্যানেল
১০. বারিড পাইপ হলে এর সুবিধা কি?

পরিচালন এবং রক্ষণাবেক্ষন
১. কিসের ভিত্তিতে অবকাঠামো পরিচালিত হয়
- যথাযথ নির্দেশন
- প্রভাবশালীদের ইচ্ছা
- অপারেটরের খেয়ালখুশী
- অন্যান্য

২. পরিচালনের ক্ষেত্রে কোন সম্মিলিত সিদ্ধান্ত রয়েছে কি?
৩. সকলের স্বার্থ রক্ষা করা হয় কি?

৪. আপনার মতামতের প্রধান্য দেয়া হয়েছিল কি?
৫. ২০১০ সালে পরিচালনা ও রক্ষণাবেক্ষনের জন্য কত টাকা বাজেট করা হয়েছিল? কত টাকা আদায় করা হয়েছে?

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. আপনাদের কি কোন টাকা দিতে হয় প্রশিক্ষণ নেওয়ার জন্য?
   ধ. ভাল
   ন. মোটামুটি
   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)
   - এই প্রকল্পের বাস্তবায়ন হওয়ার আগে মজুরী কত ছিল
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?
   - চাষবাদের জমির বর্তমান মূল্য কত?
   - এই প্রকল্পের বাস্তবায়ন হওয়ার আগে কত ছিল?

৭. গৃহস্হলী জমির দাম এই প্রকল্পের বাস্তবায়ন হওয়ার আগে কত ছিল?
৮. বর্তমানে গৃহস্হলী জমির দাম কত?

ক্ষুদ্র ঋণ

১. পাবসস কি ক্ষুদ্র ঋণ সুবিধা করে থাকে?
২. কারা এই ঋণ সুবিধা পায়?
৩. আপনি কি কোন ঋণ নিয়েছিলেন?
৪. নিয়ে থাকলে সময়মতো কিস্ড়ি পরিশোধ করেন কি?
৫. আপনার কি সমিতিতে কোন সঞ্চয় বা শেয়ার আছে?
৬. মহিলাদের 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
   - পূজি উন্নয়ন
   - পরিচালনা ও রক্ষনাবেক্ষণ
   - জানি না

৮. ২০১০ সালে কত টাকা ঋণ প্রদান করা হয়েছে? কত টাকা ঋণ আদায় হয়েছে।

৯. এই ঋণ কত জন নিয়েছে? তাদের মধ্যে কত জন পুরুষ এবং কত জন মহিলা রয়েছে।

পরিবেশ

১. আপনি এই প্রকল্প বাস্তবায়িত হওয়ার পর পরিবেশগত কি কি পরিবর্তন লক্ষ্য করেছেন

- ক. জলাবদ্ধতা
- খ. সেচের পানির অপ্রতুলতা/আধিক্য
- গ. পানি নিষ্কাশনে অসুবিধা
- ঘ. নাব্যতা বৃদ্ধি অথবা হ্রাস
- ঙ. মৎস্য চাষে অসুবিধা
- চ. প্রাকৃতিক দূর্যোগ বৃদ্ধি (যেমনঃ বন্যা, ঝড়, খরা, দাবাদাহ ইত্যাদি)
- ছ. প্রাকৃতিক দুর্যোগের তীব্রতা বৃদ্ধি
- জ. চাষবাদ যোগ্য জমির পরিমাণ বেড়েছে
- ঝ. চাষবাদ যোগ্য জমির পরিমান কমেছে

Some Pictures of Subproject Areas.

Office room of Mohammadkhani Subproject

RCC Canal of Mohammadkhani Subproject

RCC Canal of Mohammadkhani Subproject

2nd lifting arrangement from pond
of Mohammadkhani Subproject

Sump of 2nd lifting arrangement
of Mohammadkhani Subproject

RCC Canal start from Sump of 2nd lifting arrangement
of Mohammadkhani Subproject

Sump of Nayagola-Mohananda Irrigation Subproject

Researcher with WMCA Chairman and Secretary
of Nayagola-Mohananda Irrigation Subproject

Siphon and RCC Canal on Ground
of Nayagola-Mohananda Irrigation Subproject

WMCA office and RCC Branch Canal
of Nayagola-Mohananda Irrigation Subproject

Earthen Branch Canal
of Nayagola-Mohananda Irrigation Subproject

Researcher and WMCA member in Office Room
of Dariapur Subproject

Header Tank of Buried Pipe Irrigation system
of Dariapur Subproject

Outlet and field canal of Buried Pipe Irrigation system
of Dariapur Subproject

Researcher, WMCA member and Office Room
of Palsha Mahespur Subproject

Sump and RCC Canal of Palsha Mahespur Subproject

Paddy tree in field of Palsha Mahespur Subproject

Researcher and WMCA member in Office Room of Agrani Irrigation CAD Subproject

Sump of Agrani Irrigation CAD Subproject

Road Side RCC Canal of Agrani Irrigation CAD Subproject

ANNEX-B

Information about subprojects

Subproject - 1

Subproject Name : Mohammadkhani Subproject.
Sub project No : 22021
District : Chapai Nawabgonj
Upazila : Sadar
Type of project : Command Area Development (CAD)
Gross Area : 596 ha.
Net benefited Area : 563 ha
Total no. of households within subproject area : 1225 nos.
Total no. of beneficiary households within subproject area : 810 nos.
Infrastructure:

- Sump 1no.
- Siphon 210 m
- Aqueduct 989 m
- RCC Canal on Ground 95 m
- Pressure pipe conveyance system 1218 m
- Branch Canal B1, B2, B3, B4 and B5 10241 m
- O & M Shed 12.00m x 6.00m

Total Cost (Tk.) : 19,643,409

Information of Mohammadkhani Irrigation Subproject WMCA (in 2010)

Registration No : 04, Chapai Nawabganj, Dated: 10-02-2003
Total Member : 1164 nos. (Male: 844, Female: 320)
No. of Shear : 1520 nos.
Shaving : 334,975.00
Distributed Micro-credit : 190,000.00
Collected Micro-credit : 190,000.00
No. of borrower : 185 nos. (Male: 100, Female: 85)
Date of Last AGM : 25-07-2010
Date of Last Election : 25-08-2010
Last Audit Report : 18-07-2010
Profit : 48,000.00

Subproject - 2

Subproject Name : Nayagola-Mohananda CAD Subproject.
Sub project No : 22023
District : Chapai Nawabgonj
Upazila : Sadar

Type of project : Command Area Development (CAD)
Gross Area : 490 ha.
Net benefited Area : 342 ha
Total no. of households within subproject area : 580 nos.
Total no. of beneficiary households within subproject area : 331 nos.
Infrastructure:

- Sump 1no.
- Siphon 443 m
- Aqueduct 686 m
- RCC Canal on Ground 1395 m
- Branch Canal B2 1820 m
- O & M Shed 12.00m x 6.00m

Total Cost (Tk.) : 17,434,619

Information of Nayagola-Mohananda WMCA (in 2010)

Registration No : 12, Chapai Nawabganj, Dated: 19-05-2003
Total Member : 663 nos. (Male: 443, Female: 229)
No. of Shear : 13280 nos.
Shaving : 1,050,000
Distributed Micro-credit : 1,495,000
Collected Micro-credit : 1,495,000
No. of borrower : 161 nos. (Male: 85, Female: 76)
Date of Last AGM : 12-07-2010
Date of Last Election : 22-06-2009
Last Audit Report : 30-06-2010
Profit : 212,000

Subproject - 3

Subproject Name : Dariapur Subproject.
Sub project No : 25288
District : Chapai Nawabgonj
Upazila : Sadar
Type of project : Command Area Development (CAD)
Gross Area : 310 ha.
Net benefited Area : 290 ha
Total no. of households within subproject area : 927 nos.
Total no. of beneficiary households within subproject area : 585 nos.
Infrastructure:

- Header Tank 1no. (Size: 6.10m x 2.60m)
- Burried Pipe Irrigation Network System 6178.10 m

- O & M Shed 12.00m x 6.00m

Total Cost (Tk.) : 14,470,371

Information of Dariapur Irrigation Subproject WMCA (in 2010)

Registration No	: 09, Chapai Nawabganj, Dated: 04-12-2007
Total Member	: 1010 nos. (Male: 674, Female: 336)
No. of Shear	: 5566 nos.
Shaving	: 3,273,000
Distributed Micro-credit	: 8,836,000
Collected Micro-credit	: 5,173,000
No. of borrower	: 807 nos. (Male: 534, Female: 273)
Date of Last AGM	: 28-12-2010
Date of Last Election	: 29-11-2008
Last Audit Report	: 11-11-2010
Profit	: 100,000

Subproject - 4

Subproject Name : Palsha-Mahespur Subproject.

Sub project No : 25241

District : Chapai Nawabgonj

Upazila : Sadar

Type of project : Command Area Development (CAD)

Gross Area : 533 ha.

Net benefited Area : 473 ha

Total no. of households within subproject area : 1021 nos.

Total no. of beneficiary households within subproject area : 353 nos.

Infrastructure:

- Sump 1no.
- Irrigation Canal (Main, Branch and Sub Branch Open/Buried) 4662 m
- O & M Shed 12.00m x 6.00m

Total Cost (Tk.) : 9,408,880

Information of Palsha-Mahespur Irrigation Subproject WMCA (in 2010)

Registration No	: 08, Chapai Nawabganj, Dated: 23-10-2006
Total Member	: 456 nos. (Male: 283, Female: 173)
No. of Shear	: 1505 nos.
Shaving	: 329,598
Distributed Micro-credit	: 746,000
Collected Micro-credit	: 746,000
No. of borrower	: 235 nos. (Male: 149, Female: 86)

Date of Last AGM	: 18-10-2010
Date of Last Election	: 18-10-2010
Last Audit Report	: 27-07-2010
Profit	: 71,000

Subproject - 5

Subproject Name	: Agrani Irrigation CAD Subproject.
Sub project No	: 11004
District	: Chapai Nawabgonj
Upazila	: Sadar
Type of project	: Command Area Development (CAD)
Gross Area	: 685 ha.
Net benefited Area	: 557 ha
Total no. of households within subproject area	: 2000 nos.
Total no. of beneficiary households within subproject area	: 1379 nos.

Infrastructure:

- Sump 1no.
- Siphon
- Aqueduct
- RCC Canal on Ground
- RCC Branch
- O & M Shed 12.00m x 6.00m

Total Cost (Tk.) : 18,521,400

Information of Agrani Irrigation Subproject WMCA (in 2010)

Registration No	: 01, Chapai Nawabganj, Dated: 09-05-1996
Total Member	: 1902 nos. (Male: 1258, Female: 644)
No. of Shear	: 9559 nos.
Shaving	: 3,768,297
Distributed Micro-credit	: 8,000,000
Collected Micro-credit	: 8,000,000
No. of borrower	: 1252 nos. (Male: 1038, Female: 214)
Date of Last AGM	: 25-12-2010
Date of Last Election	: 25-12-2010
Last Audit Report	: 08-11-2010
Profit	: 119,320