

## **ANNEX 13**

### **MASTER PLAN ON SSWRD IN MYMENSINGH DISTRICT**

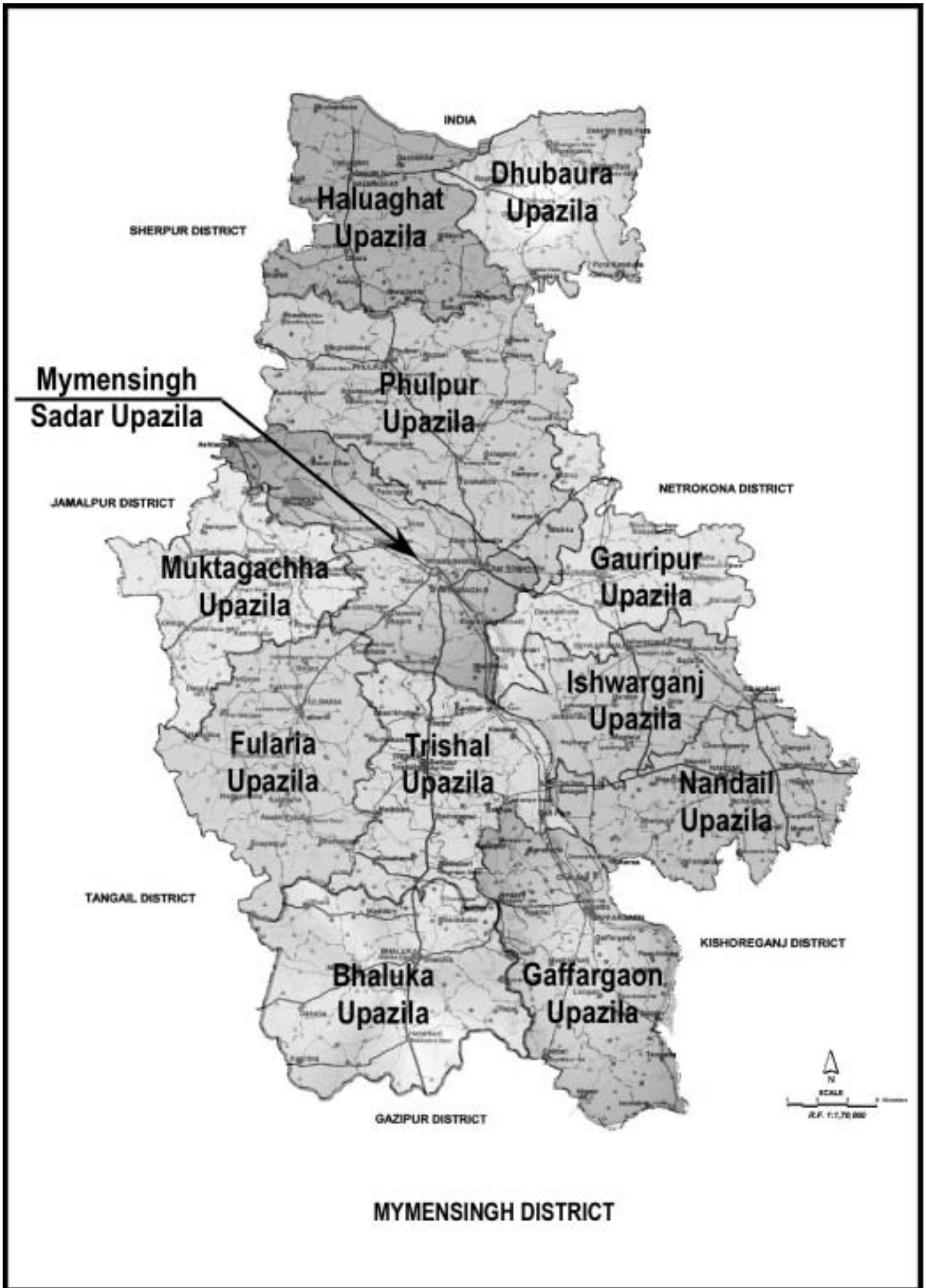
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**MASTER PLAN STUDY  
ON  
SMALL SCALE WATER RESOURCES DEVELOPMENT  
FOR  
POVERTY ALLEVIATION THROUGH EFFECTIVE USE OF SURFACE WATER  
IN GREATER MYMENSINGH**

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**NOVEMBER 2005**

**PACIFIC CONSULTANTS INTERNATIONAL (PCI), JAPAN**



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Map of Mymensingh District

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### **Abbreviations**

ADB	Asian Development Bank
BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BMD	Bangladesh Meteorological Department
BRDB	Bangladesh Rural Development Board
BWDB	Bangladesh Water Development Board
CAD	Command Area Development
DAE	Department of Agricultural Extension
DFID	Department for International Development of UK
DI	Drainage Improvement
DIWC	Drainage Improvement and Water Conservation
DOC	Department of Cooperatives
DOE	Department of Environment
DoF	Department of Fisheries
DPHE	Department of Public Health Engineering
DTW	Deep Tubewell
EIRR	Economic Internal Rate of Return
FAP	Flood Action Plan
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation
FD	Forestry Department
FM	Flood Management
FMDI	Flood Management and Drainage Improvement

GDP	Gross Domestic Product
GIS	Geographical Information System
HQ	Headquarter
HTW	Hand Tubewell
HYV	High Yield Variety
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
IMCC	Inter-ministerial Coordination Committee set under the TAPP
JICA	Japan International Cooperation Agency
LCS	Labour Contracting Society
LGED	Local Government Engineering Department
LGI	Local Government Institutions
LLP	Low Lift Pump
M&E	Monitoring and Evaluation
MIS	Management Information System
MLGRD&C	Ministry of Local Government, Rural Development and Co-operatives
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forest
MoFL	Ministry of Fisheries and Livestock
MoL	Ministry of Land
MoWR	Ministry of Water Resources
NGO	Non-Governmental Organization
NWMP	National Water Management Plan
NWPo	National Water Policy
NWRD	National Water Resources Database
O&M	Operation and Maintenance
PMO	Project Management Office
PRA	Participatory Rural Appraisal
PWD	Public Works Datum (0.0 m PWD = 0.457 m of SOB datum)
SOB datum	Survey of Bangladesh datum (identifiable with mean sea level)
SP	Subproject
SSWRDSP	Small-Scale Water Resources Development Sector Project
STW	Shallow Tubewell
TIP	Thana Irrigation Program
TK.	Taka, US\$ 1.00= Tk 57.4 as of October 2004
UDCC	Upazila Development Coordination Committee
UP	Union <i>Parishad</i> (Council)
UE	Upazila Engineer
WARPO	Water Resources Planning Organization
WC	Water Conservation
WMA(WMCA)	Water Management (Cooperative) Association

## Chapter 1 Outline of the Master Plan Study

### 1.1 Background

The provisions of the National Water Policy (NWPo) of 1999 states that the local government and relevant agencies are responsible for planning and execution of water management based on the National Water Management Plan (NWMP) approved by the National Water Resources Council (NWRC) on 31<sup>st</sup> March 2004, and in regard to the regional features of local water resources<sup>1</sup>.

The Government of Bangladesh (hereinafter referred to as “GOB”), with the support from ADB, IFAD and the Government of the Netherlands, has carried out the Small Scale Water Resources Development Sector Project (SSWRDSP-1) aiming at the rehabilitation and improvement of small-scale water resource management systems. The project was carried out from 1995 covering 37 districts of the western part of Bangladesh. Following the same concept, the second phase of this project (SSWRDSP-2), covering 61 districts throughout the country commenced in 2003 with the planned period of 7 years. However, from lessons learned from SSWRDSP-1, the preparation of district level small scale water resources development plans are recognized to have significant importance for further implementation of SSWRDSP.

Under such circumstances, the GOB requested the Government of Japan (hereinafter referred to as “GOJ”) for technical assistance regarding the preparation of district level plans for small scale water resources development (SSWRD), which will be considered as the basic development plans at district levels. In response to the GOB’s request, the GOJ dispatched a Preparatory Study Team from February to March, 2004, and signed the Scope of Work for *the Master Study on Small Scale Water Resources Development for Poverty Alleviation through Effective Use of Surface Water in Greater Mymensingh of Bangladesh* (hereafter referred as “the Study”) on February 25, 2004.

Based on the Scope of Works, the JICA Study Team, carried out the Study in Bangladesh from July 18, 2004 to July 23, 2005.

### 1.2 Objectives and Scope of the Study

#### (1) Objectives

The overall goal of the Study is **to secure safe and sustainable water resources management and to increase farmers’ income**, and objectives of the Study are;

- 1) to formulate Plan for SSWRD in Greater Mymensingh comprising program of priority programs, and the scope for the follow-on investment projects which include effective use of surface water, and
- 2) to enhance and strengthen the capacity of the counterpart in preparation of the SSWRD Plan

#### (2) Scope of the Study

The Study is conducted in the following 2 phases:

- Phase I: Field Survey in wet season, Identification of problems on SSWRD in the Study Area (July 2004 to November 2004)
- Phase II: Field survey and Formulation of Small Scale Water Resources Development Plans (January 2005 to July 2005)

The Study will consist of the following study items.

#### 1) Data Collection and Analysis

- (a) Collect and review the existing data and information on physical, socio-economical and institutional settings, including hydrology, water availability and quality, land use, population, poverty and other human development indices, income, gender issues and occupational patterns; and collate the same with project objectives and outputs.

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<sup>1</sup> Outline of the NWPo (1999) is shown in Table 1.1.

- (b) Assess the performance and issues of the economic activities of the Sub-districts (Upazila), including agriculture, fishery, forestry, and other natural resources, roads and road transport, water supply and sanitation.
  - (c) Collect information on the ongoing and proposed interventions in the Upazila in water and other relevant sectors
- 2) Inventory Survey and Participatory Rural Appraisal (PRA)
- (a) Carry out the inventory survey of existing infrastructure related to water resources, along with their status and location maps
  - (b) Select potential areas for SSWRD
  - (c) Undertake PRA at representative Unions and Upazilas that includes the potential area and assess the following: i) development status, needs and priorities; ii) water-related problems, their causes and proposed solutions; iii) stakeholders' views on the ongoing and proposed initiatives; and iv) stakeholders' willingness to contribute to the construction, operation and maintenance (O&M).
- 3) Preparation of Master Plan for SSWRD with the Target Year of 2015
- (a) Strategies and priority programs which could include flood management, irrigation and drainage, agriculture and fishery extension, rural water supply, arsenic mitigation, and institutional strengthening.
  - (b) Preparing guidelines for project assessment
  - (c) Preparing prioritized list of sub-projects
  - (d) Preparing Action Plans
- 4) Technology transfer to counterpart personnel
- (a) On-the-job training in the process of preparing the Master Plan
  - (b) Conduct workshops

### **1.3 The Study Area**

The Study Area, as indicated in the location map, covers the six districts (Mymensingh, Tangail, Sherpur, Jamalpur, Netrakona and Kishoreganj) of the Greater Mymensingh area. The Study Area is located in the north-central part of the country bordered by the Meghna River in the east, Gazipur District and Dhaka City in the south, the Jamuna River in the west, and the Indian state of Meghalaya in the north. The Old Brahmaputra River runs through the Area flowing from the northwest to the southeast. In the southern part of the Study Area, the Madhupur terrace with an elevation of about 15 m lies in the 3 m-lowlands. The Study Area occupies 11.3 % of the country with a land area of 16,672 km<sup>2</sup>, and has a population of 12.6 % (15.5 million people) of the total population (BBS, 2001). The local administration in the Study Area comprises of 6 Districts, 58 Upazilas (sub-districts) and 562 Unions.

### **1.4 Counterparts of the Study**

As stated in S/W, the GOB counterpart institution is Integrated Water Resources Management Units (IWRMU) of Local Government Engineering Department (LGED) under the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C).

The counterparts of the Study are consisting of the staff of LGED headquarters and Executive Engineers and Upazila Engineers at the local government institution in the Study Area.



## 1.5 Surveys and Workshops conducted in the Study

The Study designed as participatory plan formulation with several workshops and meetings, and several surveys at each level of the administration. They are summarized as follows:

Stages	Workshops/Surveys	IMCC	National	District	Upazila	Union	Community
Phase I: Problem Identification	W/S on the Inception Report and PCM Problem Analysis						
	Socio-economic Interview Survey						
	Farm Household Interview Survey						
	Union Questionnaire Survey(UQS)						
	W/S on Phase I Survey Results						
	W/S on Interim Report						
Phase II: Development Potential and Master Plan Formulation	W/S on Planned Field Survey & Questionnaire Survey to Upazila Engineers						
	Participatory Workshops (PRA)						
	Inventory Survey						
	UQS Verification Survey						
	CM of UDCC/DSSWRDC on Master Plan Concepts and verification of potential subproject						
	Explanation on Master Plan Concepts and verified of Potential Subproject						
	W/S on Draft Master Plan Explanation and Discussion						

Notes: W/S= Workshop(s), PCM=Project Cycle Management, UQS= Union Questionnaire Survey, PRA= Participatory Rural Appraisal, CM= Consultation Meeting(s), UDCC= Upazila Development Coordination Committee(s), DSSWRDC= District Small Scale Water Resources Development Committee, IMCC= Inter-ministerial Coordination Committee, = main targeted group, =secondary targeted group

## Chapter 2 Mymensingh District

### 2.1 General Conditions

Mymensingh district (the District) is situated between 24°15' and 25°12' north latitudes and 90°13' and 90°49' east longitudes. The District with an area of 4,363.48 km<sup>2</sup>, is bounded by Meghalaya State of India and Garo Hills on the north, Gazipur district on the south, Netrokona and Kishoreganj districts on the east and Sherpur, Jamalpur and Tangail districts on the west.

Mymensingh district was established in 1787. Later on it was divided into six districts viz. Tangail, Jamalpur, Mymensingh, Kishoreganj, Sherpur and Netrokona. The district consists of 8 municipalities with 84 wards, 12 upazilas, 146 union parishads, 2,201 mouzas and 2,709 villages. The 12 upazilas and their areas are given in the table below.

Upazila-wise Area in km<sup>2</sup>

Name of Upazila	Effective Area	Riverine Area	Forest Area	Total Area	% over District
<b>District Total</b>	<b>4,109.77</b>	<b>106.71</b>	<b>147.00</b>	<b>4,363.48</b>	<b>100.00</b>
Bhaluka	350.11	1.19	92.75	444.05	10.18
Dhobaura	248.28	-	2.77	251.05	5.75
Fulbaria	378.17	9.48	14.76	402.41	9.22
Gaffargaon	394.68	6.48	-	401.16	9.19
Gauripur	272.98	1.09	-	274.07	6.28
Haluaghat	348.74	2.05	5.28	356.07	8.16
Ishwarganj	281.38	4.81	-	286.19	6.56
Mymensingh Sadar	372.65	15.80	-	388.45	8.90
Muktagachha	282.36	1.40	30.95	314.71	7.21
Nandail	324.86	1.27	-	326.13	7.48
Phulpur	519.53	60.68	-	580.21	13.30
Trishal	336.03	2.46	0.49	338.98	7.77

Source: Census of Agriculture 1996

### 2.2 Natural Conditions

In the District, both the summer and winter are relatively mild. The maximum and minimum temperatures as observed in April and January range between 33.4°C and 12°C. Summer season continues from April to June and winter lasts from December to February. Rainfall starts in May and continues upto September. Annual average rainfall at Mymensingh is 2,365 mm, 66% of it concentrated in monsoon season (June - September) and only 3% of the annual rainfall in dry season (December - March).

The District belongs to the Northeast (NE) and North Central (NC) Hydrological Zone. The main rivers flowing through the District are the Brahmaputra, Kangaha, Bhagai, Mogra, Benar, Sutai and Mahuri rivers. In addition to these rivers, there are many small rivers, beels and haors, which are scattered over the District (Fig. 2.2). Among them, the Ghumira, the Darsa, Dholai, Kharia, Rangra, Jalgabha and Raijan beels are important. The Old Brahmaputra River is navigable throughout the year. All other rivers are navigable during monsoon and they provide cheap transportation facilities to the people of the District by traditional country boats. Total length of the rivers in the District is about 450 km covering an area of 106.71 km<sup>2</sup>. It occupies about 2.45% of total area of the District.

The soils in the District, except for a minor area of hill soil in the northern border, are formed with recent and sub-recent alluvial sediments. Most of the soil has silty clay texture and low contents of organic matter. The Modhupur Tract upland soil associations in the form of deeply dissected terrace with brown clay loam are present in the western part of the District. The soil in the northern part contains mixed grey silty clay of the oldest piedmont alluvium plain which has been changing southwards into the Brahmaputra floodplain ridges and basins. In the central and southern parts, the

soil is therefore, dominated mostly by the old Brahmaputra floodplain complex in the form of grayish silty clay loam.

### 2.3 Socio-economic Conditions

Population of the district is 4,439,017; male 50.62%, female 49.38%; Muslim 94.73%, Hindu 4.25%, Christian 0.75%, Buddhist 0.06% and others 0.21%. Ethnic nationals (0.89% of total population) are Garo, Hajong, Koch and Hadi. Main occupations are; agriculture 57.67%, commerce 8.15%, transport 15.66%, construction 2.13%, service 1.21%, others 15.18%.

Average literacy rate of the District is 30.7%, male and 20% female. Educational institutions are; agricultural university 1, medical college 2, homeo medical college 1, polytechnic institute 1, vocational institute 1, veterinary training institute 1, primary teacher's training institute 1, teacher's training institute 2, national institute of primary education 1, government college 5, non-government college 57, government high school 9, non-government high school 368, secondary school 129, madrasa 1212, government primary school 1249, non-government 794, kindergarten 33, NGO operated school 1065, art school 1.

GDP of the District at current market prices in 1999-2000 is estimated at Tk. 73,117 million with growth rate at 5.58 %, and per capita GDP is Tk.15,430 (US\$ 307) which ranked the 33<sup>rd</sup> among 64 districts in Bangladesh. Sectorial shares of GDP are; 18.0 % by crops & horticulture, 13.4 % by Fishing, 11.3 % by wholesale & retail trade .

According to “Local Estimate of Poverty and Malnutrition in Bangladesh (BBS & WFP, 2004), the population ratio below the lower poverty line in the District is mostly very high at 37% to 55% except Mymensingh Sadar, Bhaluka and Gaffargaon upazilas. Percentage of population with calories intake lower than 1,805 Kcal/capita/day is very high (more than 30%) in Mymensingh Sadar, Muktagaccha, Ishwarganj, Nandail and Dhobaura upazilas.

Communication facilities are; pucca roads 770 km, semi pucca roads 4,062 km; waterways 365 nautical mile (676km); railways 147 km. Total number of hats and bazars are 322.

Health centers are; Hospital 2, upazila health complex 11, missionary hospital 1, homeo hospital 1, school health clinic 1, police hospital 1 and leprosy hospital 1.

### 2.4 Agriculture in the District

According to the DAE annual report 200002001, the total agriculture land is 344,633 ha; cultivable waste land 14,181 ha, cultivable fallow land at 15,237 ha, seasonal fallow land 15,013 ha. Major cropping pattern is Boro – Fallow - T.Aman (60%) and Boro – Aus - T.Aman (10%).

The cropping pattern and land holding in the District are as follows:

Land holding and use	No. of holding		Operated area	
	No.	%	ha	%
Total	776,727	100.0	828,128	100.0
Non farm holding	258,592	33.3	18,602	2.2
Small holding	423,140	54.5	379,074	45.8
Medium holding	86,008	11.1	33,0080	39.9
Large holding	8,987	1.2	100,372	12.1

Source: Census of Agriculture, 1996

Cropping pattern	Area (ha)	Share of Total Area
Single cropped area	39,746	12.0%
Double cropped area	219,885	66.5%
Triple cropped area	70,821	21.4%
Net cropped area	330,452	100%
Cropping Intensity %	209 %	

Source: 2000-2001 Annual Report of DAE

As shown the above table, 54.5% of farm house holdings belong to the small farm holdings with an area of less than 1 ha. The medium and the large farm holdings were 11.1% and 1.2% respectively in the District.

The gross cropped area and the percentage of distribution of crops in the District and average of the Study Area are shown below.

Distribution of Crops in the District and Study Area (%)

District	Gross Cropped Area (1,000 acre)	Aus	Aman	Boro	Rice Total	Wheat/maize	Potato	Vegetables	Spices	Pulses	Oil Seeds	Jute	Sugar Cane
Mymensingh	1,322	22.2	39.2	25.0	86.4	3.3	1.1	1.1	1.9	1.3	1.6	2.0	0.0
Study Area Average		12.9	31.7	32.6	77.3	4.2	1.4	1.2	2.5	1.3	5.4	5.5	0.8

Source: Census of Agriculture - 1996 (BBS)

Gross value-added of major crops in the District compared to the Study Area and country is shown below.

Gross value-added of agriculture in the District at Constant Prices (2000-01)

(Unit: million Taka)

	Crops	Animal farming	Forestry	Fishing	Total
Mymensingh	12,183	2,478	1,567	8,667	24,895
Bangladesh	287,664	59,470	36,996	120,020	504,150
<Share (%) in Agriculture>					
Mymensingh	48.9	10.0	6.3	34.8	100.0
Study Area Average	59.0	11.6	7.7	20.4	100.0
Bangladesh	57.1	11.8	7.3	23.8	100.0

Source: Statistical Yearbook of Bangladesh (2001)

Share of crops in the District was low, but fishing was highest share in comparing with other district.

## 2.5 Fisheries in the District

### (1) Production of Fishery in Greater Mymensingh Area

Inland water fisheries of Bangladesh are divided into two types. One is inland open-water (river & estuary, Sundarban, Beel, Kaptai Lake, flood land), and the other is inland close-water (pond & ditch, baor, shrimp (freshwater shrimp) & fish farm). However in Greater Mymensingh area, there is no estuary and Baor.

In the rainy season, a lot of young and old men and women in rural areas catch fish in the floodplain, public canal, river etc. In addition, backyard pond culture using the hole that has been dug when soil is taken for the construction of house, road etc., becomes active every year. Freshwater fish is an important source of animal protein accounting for around 60% of the total animal protein intake. Moreover, freshwater fish, both caught in public water and cultured, is also an important source of cash income. The share of fishery industry in GDP was 11% in 1999-2000.

The table below shows annual fisheries production from inland waters in six districts in 2002. Pond and shrimp farm are culture fisheries and others are capture fisheries..

Total Catch of Inland Water, 2002

(Unit: MT)

No.	District	River	Beel	Floodland	Pond	Shrimp farm	Total
1	Mymensingh	2,607	5,332	25,270	23,314		56,523
2	Kishoreganji	1,284	5,584	19,191	9,237	15.82	35,312
3	Netrakona	1,344	8,013	8,867	15,682		33,906
4	Tangail	1,032	1,456	9,341	5,605		17,434
5	Jamalpur	755	2,287	6,746	3,241		13,029
6	Sherpur	85	2,330	3,830	2,486		8,731
	Total	7,107	25,002	73,245	59,565	15.82	164,935

Source, Fisheries Statistical Yearbook of Bangladesh (2002), Department of Fisheries

### (2) Fisheries in Mymensingh District

Annual catches from various inland waters are shown in the table below. In the table, the catch of beel in 2002 shows a drastic decrease. This is due to the change in the statistical system made in 2002. Catches from beel in other districts excluding that in Tangail District had been brought together in one

Beel catch in the Study Area and was put in the table until 2001, but they were put separately by each district from 2002. The production from the ponds slightly dropped in 1999 due to damage caused by the flood in 1998. However, it quickly recovered and recorded a higher level in 2002 than in 1998. The catch from the flood land tended to decrease and dropped in 2002 to the level much lower than that in 1998.

Annual Catches from inland waters in the Mymensingh District (MT)

Location	1998	1999	2000	2001	2002
River	3,753	2,818	3,444	2,587	2,607
Beel*	(18,300)	(18,878)	(20,143)	(20,437)	5,332
Floodland	44,190	30,649	33,946	29,697	25,270
Pond	21,473	18,617	21,052	22,819	23,314
Total					56,523

Note: \* old statistic system from 1998 to 2001 of which district data in ( ) of Mymensingh are total of the Old Mymensingh District, including Jamalpur, Kishoreganj, Netrakona and Sherpur districts.

Source: Fisheries Statistical Yearbook of Bangladesh 2002, DoF

## 2.6 Livestock in the District

Climatic and topographic conditions, especially the high temperature and high humidity and frequent flooding, are not suitable to domestic animals. Pasture lands are not abundantly available for cattle and goats. Recently water shortages and development of agricultural machinery have caused unfavorable conditions to water buffalos. Due to the low feed efficiency, it has been difficult to enhance livestock farming in Bangladesh under the low food self-sufficiency. From these reasons, livestock farming has not been a priority area in the past. However, livestock is necessary to be developed in the future as an important income source of farmers. Livestock can be a demand-driven product. As the national economy develops, consumption of livestock will be increased. Number of livestock in the District and Study Area according to the size of holdings is shown below.

Number of livestock in the District and Study Area (1996)

Number in 1000s

	Districts	Holdings		Farm Holdings			
		All	Non-farm	Total	Small	Medium	
Cattle	Mymensingh	833	53	780	488	247	45
	Study Area	2,526	156	2,370	1,493	724	152
Goats	Mymensingh	528	95	433	313	103	16
	Study Area	1,351	260	1,091	805	244	42
Fowls	Mymensingh	3,360	620	2,740	1,981	657	102
	Study Area	10,346	2,070	8,311	6,088	1,896	328

Source: Census of Agriculture - 1996 (BBS)

Percentages of households which raise animals are generally high in all the size of farm holdings. It indicates that the farming is closely related with animal husbandry, and recycling and scavenging of livestock are well functioned. Difference in the number of livestock in the District was not large in cattle. The high water level during rainy seasons is suitable for water animals and brings about high value. In the scavenging livestock, farming area of the farm lands has large effects on number of animals.

Land limitation causes a shortage of feed supply in Bangladesh. Various chars along large rivers such as the Jamuna River and the old Brahmaputra River are expected to be good pasturing areas. For that purpose, the water management of the rivers is important.

In Bangladesh, veterinary services are key issues for the development of livestock farming. According to the officers in Ministry of Livestock and Fisheries, the veterinary services in the Greater Mymensingh are not much different among the districts. Vaccination to poultry is already well organized. However, vaccination services to cattle and ducks are not well managed. Veterinary services in Kishoreganj and Netrakona, where duck farming is widely extended, need to be improved.

## 2.7 Zoning of the District

Based on the Agroecological Zone (AEZ) and inundation land type, upazilas in the District is mainly classified as 1) medium highland of Old Brahmaputra Floodplain, 2) medium highland of Young Brahmaputra Floodplain, and 3) highland of Madhupur Tract (Fig. 2.3). The shares of zones in the Upazila-wise classifications are shown in the table below:

(unit in ha)

Upazila	Item	Young Brahmaputra Floodplain (802)	Old Brahmaputra Floodplain (901, 902, 903)		North-eastern Plains & Basins (2202)	Northern and Eastern Piedmont (2201)	Madhupur Tract (2801)
		F1	F1	F2	F1	F0	F0
Bhaluka	Total (ha)	0	2,572	0	0	0	41,823
	Share	0.0%	5.8%	0.0%	0.0%	0.0%	94.2%
Dhobaura	Total (ha)	0	4,560	0	8,166	12,476	0
	Share	0.0%	18.1%	0.0%	32.4%	49.5%	0.0%
Fulbaria	Total (ha)	0	25,329	0	0	0	15,066
	Share	0.0%	62.7%	0.0%	0.0%	0.0%	37.3%
Gaffargaon	Total (ha)	11,115	18,648	0	0	0	8,215
	Share	29.3%	49.1%	0.0%	0.0%	0.0%	21.6%
Gauripur	Total (ha)	13,758	13,790	10	0	0	0
	Share	49.9%	50.0%	0.0%	0.0%	0.0%	0.0%
Haluaghat	Total (ha)	0	12,696	0	13,724	6,141	0
	Share	0.0%	35.8%	0.0%	38.7%	17.3%	0.0%
Ishwarganj	Total (ha)	16,035	0	9,949	0	0	0
	Share	61.7%	0.0%	38.3%	0.0%	0.0%	0.0%
Muktagachha	Total (ha)	5,978	23,401	0	0	0	2,337
	Share	18.8%	73.8%	0.0%	0.0%	0.0%	7.4%
Mymensingh Sadar	Total (ha)	14,956	14,673	0	0	0	0
	Share	41.5%	40.7%	0.0%	0.0%	0.0%	0.0%
Nandail	Total (ha)	9,806	0	23,650	0	0	0
	Share	29.3%	0.0%	70.6%	0.0%	0.0%	0.0%
Phulpur	Total (ha)	2,063	47,896	0	0	0	0
	Share	3.6%	84.5%	0.0%	0.0%	0.0%	0.0%
Trishal	Total (ha)	4,862	24,868	0	0	0	3,947
	Share	14.4%	73.8%	0.0%	0.0%	0.0%	11.7%
District Total (ha)		78,574	188,433	33,608	21,890	18,618	71,388
Share		18.3%	44.0%	7.8%	5.1%	4.3%	16.7%

## 2.8 Water Resources Development

### (1) Hydrological Region and NWMP

The District is covered by North East and North Central Hydrological Regions. Mostly, the left bank of the Brahmaputra River is under the North East Hydrological Region, and the right bank of the Brahmaputra River belongs to North Central Hydrological Zone in the District. According to the National Water Management Plan, there is no specific regional water resources program except national level program for the Study Area.

The FAP study in relation to the District is FAP 3: North Central Regional Study (NCRS). The FAP 3 study area was 12,000 km<sup>2</sup> lying between Jamuna, Padma, Meghna, old Brahmaputra and Lakhya rivers. The objective of the Study was to formulate a Regional Water Resources Development Plan (RWRDP) with emphasis on flood control and drainage. In the Development Plan, the region was divided into 13 Planning Units (PUs) based on hydrology, soils, land use, population density and socio-economic characteristics. After considering the main physical development constraints, PUs 1, 2, 4, 6, 7 and 10 were selected as priority development areas. Six pre-Feasibility Studies were carried out. Among them, the District concerned study is Muktagacha-Bhaluka Development Scheme (RS5), covering an area of 172,000 ha of PU 3.

## (2) Large Scale Water Resources Development Projects in the District

According to the NWRD of WARPO, there are 13 large scale water resources development projects in the District which were constructed by BWDB (Fig. 2.2). Its outline is summarized as follows:

Name of Project	Length of Embankment (km)	Length of canal (km)	No. of Regulator/Sluice Gate	Type of System	Project Area (ha)	Irrigable Area (ha)	Starting Year	Completion Year	Status
Rouha Bakchori & Other Beel System	17.50	4.45	1	FCD	810	0	1983	1987	Complete
Shilla River Sub-Project	38.00	0.00	9	FCDI	12,024	2,885	1986	1994	Complete
Re-Excavation Baralia Khal	0.00	12.00	0	DR	2,000	0	1977	1978	Complete
Ujanpara Komarbhangra Sub- Project	18.57	8.50	1	FCDI	1,556	464	1990	1992	Complete
Laihi River Sub-Project	0.00	11.90	2	FCDI	2,000	400	1989	1990	Complete
Bannyar Khal Sub-Project	6.00	6.00	1	FCDI	1,542	346	1990	1992	Complete
Dublakuri Kala Khal Project	0.00	8.00	3	FCDI	11,141	3,565	1979	1985	Complete
Suktajuri Project	20.00	0.00	7	FCDI	3,650	1,180	1986	1992	Complete
Boka Beel Sub-Project	5.93	0.60	1	FCDI	1,893	793	1994	1995	Complete
Garamara Sluice Project	0.00	6.00	1	FCDI	813	200	1959	1959	Complete
Khiro River Sub-Project	0.00	12.00	3	FCD	3,040	0	1988	1992	Complete
Upper Shilla River Sub-Project	18.00	7.62	3	FCDI	6,770	2,708	1986	1994	Complete
Sukajjuri Bathai Sub-Project	29.00	24.00	5	FCD	6,778	0	1990	1992	Complete

Source: National Water Resources GIS Data Base (NWRD)

## (3) Minor Irrigation Development in the District

Minor irrigation equipment and irrigated area during Boro 2003 in the Upazila is show as follows:

Upazila	DTW		STW		LLP		Total Irrigated Area
	No.	Area(ha)	No.	Area(ha)	No.	Area(ha)	
Bhaluka	288	4,719	3,190	4,599	699	1,523	10,841
Dhubaura	32	613	933	3,768	77	671	5,052
Fulbaria	411	9,196	596	921	107	222	10,634
Gaffargaon	342	6,253	2,132	5,480	1,011	3,446	15,179
Gouripur	60	698	4,607	13,890	17	70	14,658
Haluaghat	165	2,655	2,140	6,637	100	443	9,736
Ishwarganj	148	3,763	3,341	5,147	30	51	8,960
Muktagaccha	401	11,605	800	1,666	37	50	13,321
M. Sadar.	257	6,058	4,197	9,323	47	227	15,608
Naddail	234	5,223	2,263	5,677	62	172	11,073
Phulpur	76	860	11,151	24,702	71	141	25,703
Trisal	343	8,476	390	2,109	100	1,139	11,763
Total	2,757	60,120	35,740	83,918	2,358	8,154	152,527

Sources: Survey Report on irrigation Equipment and irrigated Area 2003, BADC, Total irrigated area including the area irrigated by other traditional equipment

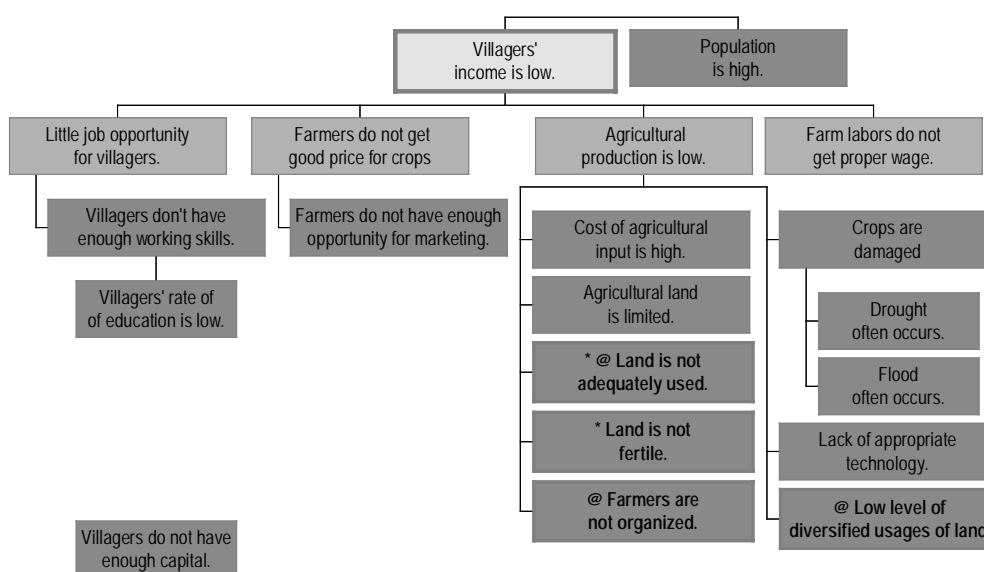
## Chapter 3 Problem Analysis and Participatory Workshops in the District

### 3.1 Problem Identified through Workshops in the District

To clarify the main issues concerning water resources management and livelihood in the Study, three (3) workshops were held at district, Iswanganj and Jatia unions in the District,. Problem analyses were carried out in each workshop.

#### (1) Problem Identification Workshops of District Officials

Workshops targeting government officials were held at district levels. Participants were LGED officials/officers, government district agencies and representative of Union *Parishads*. Results are shown in the following problem trees.



**Note:** "Villagers are lazy." was not qualified after discussion.

\*: Priority causes selected by the participants. @: Priority causes selected by Chairman of Jatia Union.

#### (2) Problem Identification Workshops of Villagers in Subproject Areas

Workshops at Iswanganj and Jatia unions were held at 2 unions 16 and 17 Sep 2004. Selection of the workshop sites was done based on the zoning of the Upazilas. Problem trees are shown in Fig. 3.1.

#### (3) Summary of the Problem Analysis Workshops

Problem analyses were undertaken at each workshop with the core problem defined as "villager's income is low". Direct causes in each workshop are shown below.

	Mymensingh District	Iswanganj Union, swanganj Upazila	Jatia Union Iswanganj Upazila
Cause 1	Villagers can't find jobs / work in the area.	1. Villagers can't find jobs / work in the area.	1. Agricultural production is low.
Cause 2	Farmers can't get good price of products.	2. Agricultural production is low.	1. Villagers can't find jobs / work in the area.
Cause 3	Agricultural production is low.	Family expenditure is large.	Women can't earn.
Cause 4	Villagers' wage is low.	Per capita cultivable land is small.	Family expenditure is large.
Cause 5		Women can't earn.	

The direct causes identified as the least common multiplier of all the problems identified together with workshops in the Study Area are: 1) Low agricultural production, 2) Limited work opportunity, 3) Low profit from products, 4) Low fish production, 5) Large family expenditure, and 6) Women cannot earn, low livestock production, etc. (Fig. 3.2).



### 3.2 Problems and Issues Identified

#### (1) Problems identified in the District

Problems for small scale water resources development identified in the District are summarized in the following table

Problems related to Natural conditions:		
- Flat low lying terrain	- Strong Seasonal Bias of Rainfall	
Problems related to Socio-economic Conditions:		
- Poverty/Vulnerability of Farmers	- Gender Issues	- Local Conflicts
- Illegal Land Occupation	- Fragmented Agricultural Area and Small Landholdings	
- Communication Gap between Local Government and Villagers		
Problems related to agriculture, livestock and fisheries:		
(Agriculture)		
- Land development	- Water Related Problems	- Rice Monoculture
- Problems of deficit farmers	- Seed Production and Supply	- Traditional Farming
- Malnutrition by poor protein supply		
(Fisheries)		
- Flood damages	- Shortage of water during dry season	- Lack of freezing storage
- Insufficient fishery extension services	- No management of indigenous fish and conservation area	
- Hard to access for water bodies leasing by poor fishermen		
(Livestock)		
- Feed shortages in dry seasons	- Integrated forestry-livestock farming	- Veterinary services
(Marketing)		
- Poor marketing environment		
Rural Infrastructure Conditions:		
- Damages to roads	- Rural Community Water Supply	- Poor road network

#### (2) Findings of Farm Household Interview Survey and Union Questionnaire Survey

The survey was conducted to understand/identify profitable farming style. According to the results of farmers' interview survey, farmers expressing their request to the Union Parishads are summarized in the table. As far as water resources concerned, irrigation and drainage problems are expressed by farmers.

Priority of Farmers Requests to Union

Requests	Mymensingh	Average
Transportation (Marketing)	2	1.2
Sanitary facilities	1	1.7
Irrigation	3	3.0
Seed supply	4	4.5
Drainage	6	4.8
Health services	7	5.2
Fertilizer supply	4	5.5
Training for new technologies	7	7.2
Credit services	7	8.7
Information services	10	9.5
Cooperative services	11	9.8

Source: JICA Farm household survey (2004)

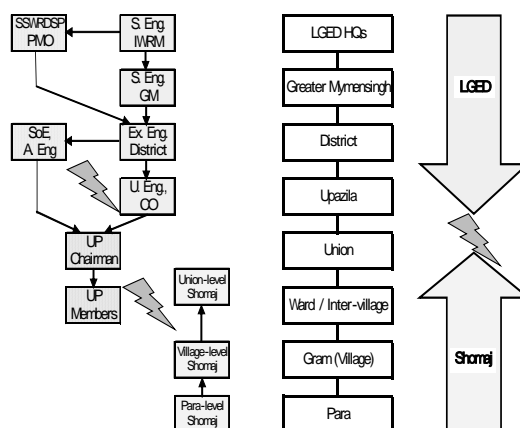
#### (3) Other Issues

##### 1) PRA used in SSWRDSP-2

The PRA used in SSWRDSP-2 is a step of a project appraisal process by SSWRDSP-2. Therefore, PRA starts from the proposed project, not from the needs of the villagers or their future image. However, PRA workshops become the venue to talk about the development of the area, to get better consensus among stakeholders and improve subproject design.

##### 2) Communication Gap

There found two major communication gaps in subproject planning, one between Union level and village/para level, and the other between project employee and LGED employee line. The former gap hinders getting the consensus of the people and establishing participation and ownership of the people. The latter gap hinders identifying and designing a good subproject. In this context, more participation of Upazila Engineer and Community Organizer to design-discussion meeting seems to be necessary. Also, consensus of *shomaj* elders at village-level and *para*-level should be reached before finalizing the proposal of subproject.



Communication Gap

### 3.3 Participatory Workshop (PRA) for Sustainable Water Resources Management

#### (1) Methodology

##### 1) Issues:

Two communication gaps; one between union level and *gram* (village) / *para* level, and the other between project employee and LGED employee line.

##### 2) Assumptions

Organizing several participatory workshops (PRA) at *gram* level beside sub-project level, with active participation of villagers, local leaders, UEs, AEs (SP-2), SoEs (SP-2), SAEs (SP-2) and other local LGED staff, can conquer these communication gaps and promote better project design and better consensus among all the actors.

The Team requested AE (SP-2) and/or SoE (SP-2) of each district to choose one promising sub-project area to organize participatory workshops.

##### ➤ Benefits for the Study Team / LGED

To collect more grass-roots information especially on decision-making and collaboration in the community-base projects and activities.

To clarify the needs of the community

To verify a participatory planning and decision making process for small-scale water resources development including involvement of UEs, AEs (SP-2), SoEs (SP-2), SAEs (SP-2) and other local LGED Staff.

##### ➤ Expected benefits for the local communities as a by-product

To share the ideas and opinions at intra-*gram*, inter-*gram* and sub-project levels.

To start some collaborative actions for consensus and for the future.

Capacity building of the individuals and the communities.

#### (2) Process of Participatory Workshops (PRA)

##### 1) Arrangement of workshops with local leaders

Preparation of about four *gram* level workshops to strategically cover all the study area.

Preparation of one integrated workshop at sub-project level for summary and some consensus building.

Miking by UP Chairpersons, UP Members, *matabbors* and other local leaders for participation.

##### 2) *Gram* level interviews and workshops

Interviews focused on poor villagers.

Mapping, rich-poor profile and other RRA tools if necessary.

*Appreciative Inquiry* : a) Discovery Stage by sharing success stories of community- based projects and activities, b) Dream Stage by sharing the future image of individuals and the community where they can repeat more success stories, c) Design Stage by sharing what actions they can take today, tomorrow and next week.

##### 3) Integrated workshops

Presentation of the results of the *gram* level workshops.

Presentation of observation and analysis by the Team: identification of intra-*gram* / inter-*gram* issues, and sub-project / *upazila* / district level issues if any.

Discussion especially on inter-*gram* and sub-project level issues, and on immediate actions.

### Interviews and Participatory Workshops Schedule at Each Subproject Area

<u>1<sup>st</sup> – 3<sup>rd</sup> day:</u>	Meeting with key persons and arrangement of workshops by the Study Team, transect of the study area and interviews of villagers by the PRA Contractor.
<u>4<sup>th</sup> – 7<sup>th</sup> day:</u>	Four <i>gram</i> level workshops (three <i>para</i> level workshops at the sub-project area in <i>Sherpur</i> District) using mapping, rich-poor profile and <i>Appreciative Inquiry</i> .
<u>8<sup>th</sup> day:</u>	An integrated workshop at sub-project level: <ul style="list-style-type: none"> <li>- Presentation of the results of the four <i>gram</i> level workshops by villagers</li> <li>- Presentation of the observation and analysis by the Study Team and the PRA Contractor</li> <li>- Technical issues of the proposed sub-project by UE and/or AE (SP-2) or SA (SP-2)</li> <li>- Social issues and WMCA by SoE (SP-2)</li> <li>- Question &amp; answer, and free discussion</li> </ul>
<u>9<sup>th</sup> – 10<sup>th</sup> day:</u>	Reporting by the PRA Contractor.

### (3) Records of Participatory Workshops (PRA) in Mymensingh District

<u>Sub-project Name:</u> Not known yet. <u>District:</u> <i>Mymensingh</i> <u>Upazila:</u> <i>Trishal</i> <u>Union:</u> <i>Rampur</i>	<u>Grams:</u> 1) <i>Namapara-Charpara</i> , 2) <i>Vatipara</i> , 3) <i>Kakchar-Noyapara</i> , 4) <i>Kakchar</i> , 5) <i>Darilla</i> , 6) <i>Khbiapara</i> , and 7) <i>Uzanpara</i>	<u>Appraisal Status:</u> Under preparation.
<u>Type / Project Area (Benefited Area):</u> Catchment area development / Area not known yet.		
<u>Major Proposed Activities / Facilities:</u> Canal re-excavation.		
<u>Necessary Modification:</u> Outlet canals need to be included in the project area.		
<p>An NGO lead by the wife of a high government officer tried to take a 99-year lease on a <i>beel</i> and many villagers are very sensitive about the <i>beel</i> issue.</p> <p>There is a social conflict especially between two <i>grams</i>. They built a village elementary school at the backyard of <i>matabbor's</i> house to avoid sending their children to go to the government elementary school in the other <i>gram</i>.</p> <p>The villagers of that <i>gram</i>, however, came to the integrated workshop by a large group. They said they want to discuss with the villagers of the other <i>grams</i>, and waited for other villagers to come.</p>		

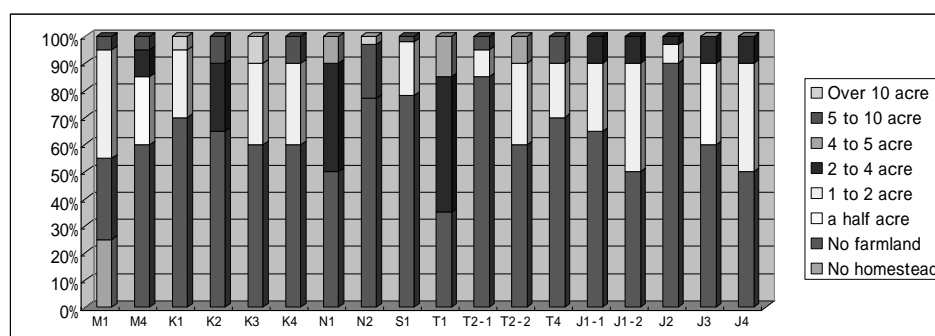
### (4) Some Cross Sectional Analysis

#### 1) Rich-poor profiles at the *gram* level workshop

18 Rich-poor profiles conducted at the *gram* level workshops show that villagers define landless farmers as poor and the ratio of the poor ranges from 50% to 85%.

**Rich-Poor Profile at *Gram* Level Workshops**

	M1	M4	K1	K2	K3	K4	N1	N2	S1	T1	T2-1	T2-2	T4	J1-1	J1-2	J2	J3	J4
No homestead	25%																	
No farmland	30%	60%	70%	65%	60%	60%	50%	77%	78%	35%	85%	60%	70%	65%	50%	90%	60%	50%
a half acre		25%																
1 to 2 acre	40%		25%		30%	30%			20%		10%	30%	20%	25%	40%	7%	30%	40%
2 to 4 acre		10%		25%			40%			50%				10%	10%	3%	10%	10%
4 to 5 acre							10%		15%			10%						
5 to 10 acre	5%	5%		10%		10%		20%	2%		5%		10%					
Over 10 acre			5%		10%			3%										



Note: Mymensingh (M1, M4), Kishoreganj (K1 to 4), Netorakona (N1, N2), Sherpur (S1), Tangail (T1, T2-1, T2-2, T4), Jamalpur (J1-1, J1-2, J2 to 4)

## 2) Cash income of relatively poor villagers

The PRA Consultant Team made 92 interviews in total, 15 or 16 interviews at each sub-project site. They did a purposeful sampling of interviewees by visiting rather small and shabby huts. 26 out of 92 interviewees or 28.3% are women, and strikingly, 14 out of 26 or 53.8% of the women are single (13 widows and one divorcee). At the sub-project area in *Kishoreganj*, all the four women interviewed are widows.

8 out of 26 female interviewees or 30.8% said they are doing maid and earn something like three meals and Tk. 30/day or 0.5 kg of rice per day to 1 *mond* (40kg) per month. 6 out of 26 or 23.1% are day laborer earning Tk. 30 to 100 and they are all in *Sherpur*. 5 out of 26, or 19.2% said they are hawkers of fishes, vegetables and household goods, and earn Tk. 25 to 60/day. Also another 5 said they are housewives.

32 out of 92 interviewees or 34.8% said their major income source is day labor and the daily wages range from Tk. 30 to 100/day. At the sub-project area in *Sherpur*, 14 out of 15 interviewees or 93.3% are engaged in day labor of farming, forestry and earthen work etc. One villager said he is a farmer with 50 decimal (0.5 acre) of farmland.

The daily wages and availability of farming labor vary from month to month. For example in *Jamalpur*, the wage is about Tk. 50/day in July-September, about Tk. 60/day in January-March, about Tk. 80/day in November-December, and about Tk. 100 in April-June. Usually one meal and 0.5 kg of rice are provided by the landowners in planting and weeding seasons, and two meals and 1 kg of rice in harvesting season.

9 out of 92 interviewees or 9.8% said they are share-croppers but their land sizes are something like one or two *bigha* (0.33 or 0.66 acre) and they do day labor substantially. 8 out of 92 interviewees or 8.7% are rickshaw/van pullers and earn Tk. 50 to 200/day. Some are working in Dhaka. 7 out of 92 interviewees or 7.6% are hawkers of fishes, vegetables, ice cream and household goods and earn Tk. 25 to 100 (Tk. 25 to 60 for women)/day.

In conclusion, options of day labor for women are less and wages are lower than men. Men can choose fishery or farm labor in high season, and rickshaw/van pullers, earthen work or hawkers in low season. Many of them can still make Tk. 50-70 per day all year round. Maximum wages women can make, however, is Tk. 60/day if earthen work is available. Only some women are lucky enough to find wood cutting / planting jobs or to be able to work in the field. Otherwise, to work as a maid might be the best regular occupation.

The majority of poor farmers (55 out of 92 interviewees or 59.8%, the cases with no interest are excluded) are borrowing money at very high interest (8% to 20% per month or 100% to 240% per year). 57.9% are the loans for food, agriculture, business etc. and the average amount is Tk. 1,873. 34.2% are for health problems and the average amount is Tk. 3,431. Others are for land and houses (Tk. 20,000 and Tk. 14,000 from NGOs), and for wedding (Tk. 7,800)

## (5) Participatory Planning and Decision Making Process

COMMON ISSUES	POSSIBLE IMMEDIATE ACTION
<b>On Project Designing</b>	<b>For Project Designing</b>
1. All of the six sub-projects where the Team had workshops go beyond union borders. If the benefited area is close to 1,000 ha and the area of each union is something like 2,000-3,000 ha, the sub-project most likely is a multi-union project.	1. Assuming all the sub-projects are multi-union, UE, AE (SP-2), SoE (SP-2) and other local LGED Staff need to check all the sub-project proposals and rewrite them accordingly.
2. Negative impacts tend to occur near the border of the project area, especially beside the facilities such as embankment, sluice gates and culverts. They are not paid attention so that no mitigation measures can be taken, if appraisal teams only study inside of the project area.	2. The study area for the appraisal teams need to include potentially affected areas such as outside of embankment, outlets or inlets of sluice gates and culverts, and upstream of dams. The study area must be significantly wider than the project area.
3. Project purpose, major project facilities and activities are not so clear in the sub-project proposals, and they are being refined through "appraisal" process by the appraisal teams.	3. UEs, AEs (SP-2), SoE (SP-2) and other local LGED staff must refine the sub-project proposals so that the project purpose, major project facilities and activities are clear.
4. UEs, AEs (SP-2) and other local LGED staff are not involved in substantial project designing because it is considered as "appraisal" process.	4. Full and active participation of UEs, AEs (SP-2), SoE (SP-2) and other local LGED staff in project designing is a must. Participation does not only mean participation of the villagers, but of all the actors.
5 Phasing of the projects and priority in <i>upazila</i> / district development (plans) are not so clear.	5. UEs, AEs (SP-2) and other LGED staff at <i>Upazila</i> and District levels need to add comments to the sub-project proposals on phasing and priority in the <i>upazila</i> and the district.

On Consensus Building	For Consensus Building
1. Few districts or <i>upazilas</i> have full appraisal reports, so that local LGED staff cannot explain the results, either the proposals pass or fail, fully to UP Chairpersons and villagers.	1. For transparency and accountability to UP Chairpersons, UP members, local leaders and villagers, copies of all the appraisal reports must be sent to each district and the <i>upazila</i> (s) so that AEs (SP-2), SoE (SP-2), UEs and other local LGED staff can explain the results of appraisals to them.
2. Few UP Chairpersons consult <i>gram</i> level leaders, sometimes not even UP members, before submitting subproject proposals.	2. Accountability to the villagers and consensus of <i>gram</i> level leaders such as <i>matabbors</i> need to be the pre-requisites for UP Chairpersons to submit sub-project proposals
3. One transect walk and one workshop in a sub-project area are not enough for consultation. Important negative impacts and social conflicts can be unrecognized by the appraisal teams, and many questions of the villagers will be unanswered.	3. Two-day interviews and three to five <i>gram</i> level workshops need to be conducted in addition to one transect walk and one workshop by the PRA team. A workshop for more than three <i>grams</i> usually cannot attract so many ordinary villagers from all the grams. A workshop for every one or two <i>grams</i> is recommended.
4. Neighboring villagers of a sub-project do not have opportunities to be consulted by the appraisal teams	4. The villagers of neighboring <i>grams</i> and unions must be included to the interviews and workshops by the PRA team. They could be affected negatively by the proposed sub-project. The primary purpose of impact assessment is not to show there are little negative impacts, but to show how many mitigation measures are identified and how much project design has improved from the original one.
5. Many villagers do not have opportunities to get information on WMCA so that they do not know what WMCA is even after they have agreed to join WMA.	5. Full explanation to the villagers on major activities, pre-requisites and benefits of WMCA is necessary before asking about their promises to join WMA.

## (6) WMA or WMCA

### 1) WMAs in SSWRDSP-1

There are 280 subprojects in SSWRDSP-1 and the average members of WMA are 413, of which 100 or 24.2% in average are female members. The members are largest at 833 (an average of four WMCAs) in Pabna District and smallest at 110 (an average of four WMCAs) in Bogra District.

The target amount of beneficiary contribution is Tk. 128,417 in average per WMA. The amount is highest at Tk. 363,342 (an average of six WMCAs) in Chapai Nawabganj District and lowest at Tk. 27,259 (an average of seven WMCAs) in Thakurgaon District.

The collected amount of beneficiary contribution is Tk. 290 per member in average. It is highest at Tk. 1,247 per member in Bogra District and lowest at Tk. 104 per member in Jhenaidah District.

### 2) Community-Based Projects

From the success stories of community-based projects, the Team has found that about 20 villagers invested for a gram level earthen dam project in *Sherpur* District about Tk. 240,000 every season for nine years. In case of a gram level DTW project in *Mymensingh*, 35 villagers invested Tk. 350,000. The amount is almost as much as the target amount of beneficiary contribution in *Chapai Nawabganj* District.

The water fee of the earthen dam project in *Sherpur* District is Tk. 800 per acre, and that of the DTW project in *Mymensingh* District is Tk. 140/Katha (Tk. 1,750 per acre). The investment, water fee, construction wages and who work as day laborer etc. were decided by *shomaj* of *matabbors* and villagers have had no serious problems of investment nor collecting water fees.

The interviews showed that more than 20% of the poorer households in the villages could be female-headed. Also more than half of the population is usually landless and poor. The figure could be as high as 90% in some grams.

Women have much less options and opportunities for cash income in the villages. If they are not lucky enough to be able to work in the forest or in the paddy field, the best they can do is to find temporary earthen work, work as a maid (usually 40kg of rice per month plus three meals) or as a hawker (could be Tk. 30-40/day).

### 3) RECOMMENDATION

It seems to be very difficult for poor families, especially female-headed families, to contribute Tk. 300, sometimes more than Tk.1,000 in cash to join WMCA. They might not be the direct beneficiaries of the subprojects either if they are landless. On the other hand, it is not difficult for villagers to invest Tk. 300,000 at gram level if they are community-based projects, the decision was made through *shomaj*, and landowners, who are more likely the real direct beneficiaries of subprojects, invest and pay the water fee. Therefore:

To exempt poor landless farmers, especially female-headed households, from cash contribution to join WMA.

To introduce progressive cash contribution system based on gram level decision.

To charge operation and maintenance fee solely on landowners' accounts.

To include community-based water resources development projects into WMAs under SSWRDSP-2 even if they are not selected as subprojects.

## Chapter 4 Small Scale Water Resources Development Potentials

### 4.1 Surface Water Resources in the District

#### (1) Perennial/seasonal Waterbodies

According to NWRD of WARPO, there are about 635 perennial waterbodies, with a total area of about 4,943 ha which cover 1.2% of the District. Among them, beels are counted as 154 with an area of 2,361 ha in the District, and 59% of union with beel(s) as shown in the following table.

District	Total Number		Number. With Beel		No. of Beel*	Beel Area (ha)
	Upazila	Union	Upazila	Union		
Mymensingh	12	146	10	60	154	2,361
Total	58	565	52	250	664	15,033

Source: NWRD, WARPO

Notes: \* because a beel locates in the several unions

In regard to the water scarcity in dry season, it may be said that all waterbodies especially beels with considerable scale have some development potential for SSWRD. Installation of supplemental water retention facilities or dredging may improve its utilization.

#### (2) Flood Water

While floods are the major constraint for livelihood in the District, it is also a fact that it is a source of water, and with an excessive amount. Retention and utilization of flood water for supplementary irrigation may enhance agricultural production particularly in areas with relatively high altitude.

#### (3) Flood water

While floods are the major constraints for livelihood in the Study Area, it is also a fact that it is a source of water, and with an excessive amount. Retention and utilization of flood water for supplementary irrigation may enhance agricultural production particularly in areas with relatively high altitude.

### 4.2 Small Scale Water Resources Development in the District

#### (1) Previous SSWRD Program

There was not significant project operated in the District except Thana Irrigation Program (TIP) in 1960s and Canal Digging Program (CDP) since 1979 up to 1996, Also the SSWRDSP, started 1995, was implemented in the western part of Bangladesh. Since July 2002, the SSWRDSP-2 has started covering the District.

#### (2) Progress of SSWRDSP-2

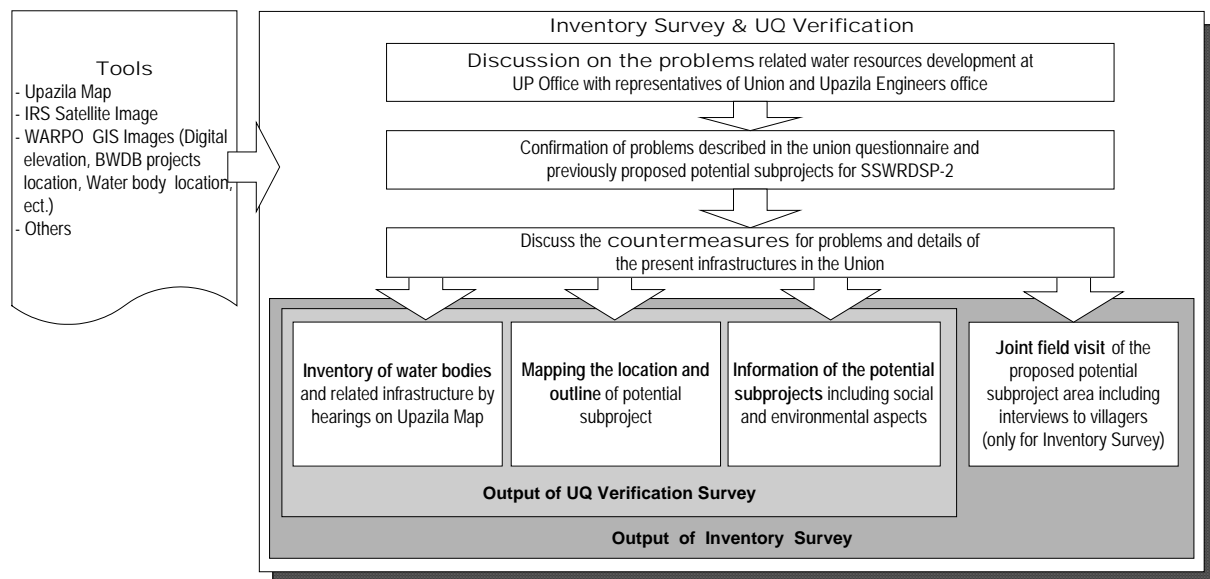
There are 146 subprojects proposed from 58 unions of the District as shown in the subproject list of PMO office of SSWRDSP-2 as shown in Table 4.1. The subprojects proposals were screened by the following procedures: 1) prescreening at district level, 2) reconnaissance by PMO, 3) PRA/Pre-feasibility survey by local consultants, 4) Feasibility Study by consultant. Up to the reporting period, 14 subprojects were granted approval for implementation. Most of reasons for failure at prescreening stage are incomplete format.

### 4.3 Identification of Potential Subprojects

#### (1) Methodology

Identification of potential SSWRD subproject was conducted by the inventory and union questionnaire verification surveys. Both surveys conducted firstly, discussion and clarification of the answer of union questionnaires on the water related problems in the Union among UP chairman and members, representative of villagers and staff of Upazila engineer's office at Union office. Then the locations, necessary countermeasures for the problems faced by people in the Union were confirmed. These scopes of works for the potential subprojects not only the technical aspects but also environmental and

social aspects were discussed and recorded by surveyor and enumerator of the Study Team. In case of the inventory survey, the proposed potential subprojects were visited to confirm the present conditions and conduct the preliminary technical assessment including interviewing the potential beneficiaries by members discussed in the Union office. Processes of both surveys are shown below:



### (3) Inventory Survey

#### 1) Objectives

To examine the situation of water resources related infrastructure, confirm the contents of the collected Union Questionnaires and to identify the potential subprojects for SSWRD in selected 61 Unions of the District

#### 2) Selection of Unions to be surveyed

Selection of unions to conduct the inventory survey was done based on the submission of subproject proposals for SSWRDSP-2. Unions, which were previously selected, based on the understanding that information on present water bodies and related infrastructure is required.

#### 3) Survey Procedures

The survey was conducted by dispatching consultants to each Union and by conducting interviews to relevant government officers, UP chairmen and members, village heads, Upazila Engineers and other local stakeholders and actual field survey to the water resources infrastructures and potential subproject sites. The survey process for each union was as follows:

- a) Explanation of survey to relevant officers at Union complex
- b) Identification of water bodies / infrastructure location and access route
- c) Survey on water bodies / infrastructure
- d) Verification of information indicated in the Union Questionnaires
- e) Discussion with relevant officers at Union complex for identification of potential subproject areas and possible intervention plans based on identified water bodies/ infrastructure

### (3) Union Questionnaire Verification Survey

#### 1) Objective

To verify the contents of the collected Union Questionnaires and to identify/collect information relevant to potential subprojects for SSWRD in the 85 unions of the District, which were not selected for the Inventory Survey.

#### 2) Survey Procedures

The Survey was done through interviews to local stakeholders including UP chairmen, members,

village heads, Upazila Engineers and other local representatives.

#### (4) Identified Potential Subprojects

##### 1) Results of Potential Subproject Identification Survey

In preparation of the list of potential subprojects for SSWRD in the District, the results of field surveys were carefully examined and necessary modification were made. Accordingly, the Study Team identified 159 ungrouped potential subprojects in the District. The identified potential subprojects were categorized into four types; 1) Flood Management: FM, 2) Drainage Improvement: DI, 3) Command Area Development: CAD and 4) Surface Water Conservation: WC, accordingly to their contents. The type, scale of gross area and relation with BWDB projects in the district are summarized in the following tables, while the locations of these subprojects are indicated in Fig. 4.1. The preliminary list of potential subprojects has further been screened to clarify whether they should be implemented under small-scale water resources development schemes, and then has been prioritized in order to select those for further implementation arrangements.

Identified Potential Subprojects by Type

District	FM	DI	CAD	WC	FM&DI	FM & WC	DI&WC	FM, WC&DI	Total
Mymensingh	18	40	1	7	22	3	47	21	159
Study Area Total	118	145	2	67	83	25	185	69	694
% within total	17.0	20.9	0.3	9.7	12.0	3.6	26.7	9.9	100

Identified Potential Subprojects by Scale of Area

Upazila	Gross Subproject Area (ha)					Total	BWDB Related
	1,000	1,000 < 1,500	1,500 < 2,000	> 2,000			
Mymensingh	124	19	10	6		159	49
Study Area Total	572	57	18	47		694	176

##### 2) Verification of Identified Potential Subprojects

After discussion in the UDCC, DSSWRC and IMCC, the identified subprojects were reviewed in the light of the comments received in these meetings. The hydrological features and contents of the identified subprojects were also examined to verify its adequacy as a single subproject. Consequently, a total of 130 potential subprojects were verified. About 5 to 20% of the potential subprojects were grouped in each district. This was mainly due to: 1) multiple upstream-downstream subprojects with contents of re-excavation continuously located on the same river/*khal* and 2) multiple subprojects with continuous contents of embankment rehabilitation/construction.

Out of the 130 verified subprojects, 91 had gross areas of 1,000 ha or below. This counts up to some 70% of the total verified subprojects.

Verified Potential Subprojects by type

District	FM	DI	CAD	WC	FM&DI	FM & WC	DI&WC	FM,WC &DI	Total	Total before verification
Mymensingh	13	26	1	6	20	3	42	20	130	159
Study Area Total	91	101	2	57	80	23	157	82	593	694
% within total	15.3	17.0	0.3	9.6	13.5	3.9	26.5	13.8	100.0	-

Verified Potential Subprojects by Scale of Area

District	Gross Subproject Area (ha)					Total	BWDB Related
	1,000	1,000 < 1,500	1,500 < 2,000	> 2,000			
Mymensingh	91	20	9	10		130	36
Study Area Total	572	57	18	47		694	176



#### 4.4 Prioritization of Potential Subprojects

##### (1) Necessity of Prioritization

In order to effectively utilize limited inputs, development activities of the Master Plan should be implemented at the right place for the right purposes, contributing at the maximum extent to its overall goals. Prioritization of subprojects should be done with necessary criteria to select the most important interventions. Before prioritization, the verified subprojects which were obviously unqualified for SSWRDSP were screened out, and then the qualified potential subprojects were scored and categorized into four categories (A, B, C and D) depending on their scores and maturity in planning.

##### (2) Method of Prioritization

Identification of potential subprojects was done by first identifying the needs of the local villagers and then by formulating a package of measures to cope with these problems. This was done so that the measures to cope with the most important problems were not forced to take the form of SSWRD, neglecting the possibilities of other forms such as medium and large-scale interventions, which may be more suitable in certain cases. In this context, the verified subprojects were not necessarily designed as SSWRD subprojects from the beginning.

Among prioritization, the verified potential subprojects were pre-screened to exclude subprojects that clearly do not fit into the SSWRD scheme. For this process, the gross area and location of the verified subprojects were applied, where medium and large-scale subprojects as well as small-scale subprojects lying in areas protected for the purpose of environmental conservation were excluded.

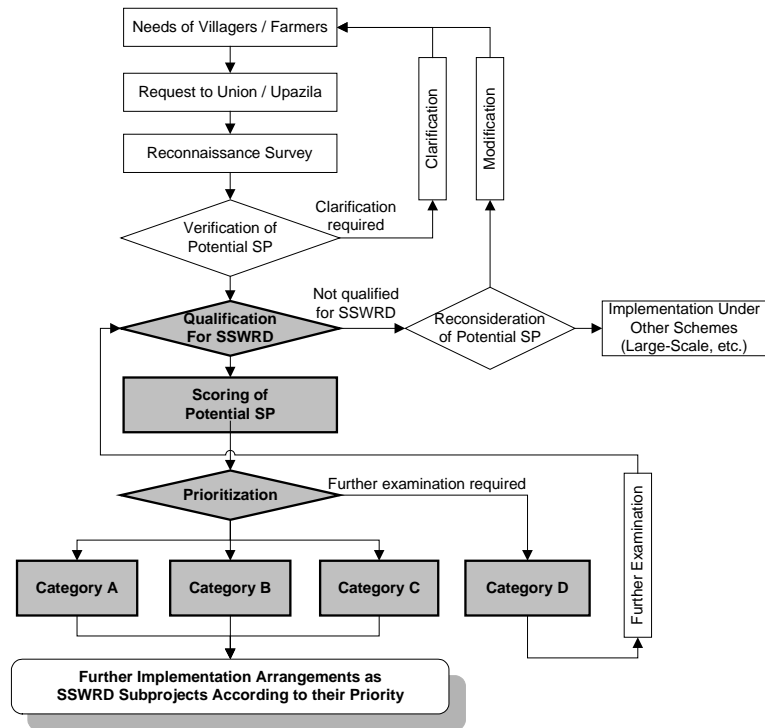
After pre-screening, the qualified subprojects were scored by applying a method for multi-criteria analysis. The criteria and weight of the scores were carefully examined based on available information, and each qualified subproject was scored accordingly. The main items regarded in the criteria were: 1) Impact on Poverty Alleviation, 2) Significance of Benefit, 3) Hydrological and Environmental Considerations, and 4) Easiness of Implementation of the Subproject and O&M by Local Beneficiaries in the Subproject Area

Subsequently, the maturity of the qualified subprojects was checked based on the criteria developed under the SSWRDSP-2, which is the current scheme for implementation of SSWRD subprojects. Those found to require further examination for implementation as SSWRD subprojects were categorized as Priority D, while others were categorized into A, B and C according to their scores.

##### (3) Qualification of Verified Subprojects

###### 1) Criteria for Qualification of Verified Subprojects

Under the NWPo, water resources development interventions with the benefiting are of 1,000 ha or less are categorized as “Small-Scale”. In this regard, all such interventions can be referred to as potential SSWRD subprojects. However, LGED has developed a set of selection criteria under the SSWRDSP-1 and 2 to qualify subprojects that are expected to be effective and efficient. This criterion covers a wide range of issues from economic viability / technical feasibility to social acceptability and



Flow of Prioritization

environmental soundness.

In regard that the potential subprojects that are identified and prioritized under this study are to be implemented by LGED, and that the SSWRDSP-2 following its first phase is currently the only scheme under LGED to implement SSWRD subprojects, these criteria (or modified according to future needs) would be most appropriate in qualifying such potential subprojects.

However, in order to give concrete decisions on whether the potential subproject is fully qualified or not, analysis must be done in detail for each individual criteria. In regard that the Master Plan Study has not stepped in to the very details of the individual subprojects, but rather concentrated in collecting general but overall information to provide the directionality for SSWRD, it is not favorable to completely judge the potential subprojects at this stage, where those judged unqualified will be excluded from further examinations. In this regard, two fundamental criteria were applied for qualification (pre-screening) of the verified potential subprojects, while the remaining selection-criteria were considered later on for the prioritization of qualified subprojects.

The criteria applied were:

Gross subproject area: Based on the definition of SSWRD subprojects, the benefiting area of each subproject must be 1,000 ha or less. At this stage, detailed analysis of topography and hydrology is not done for individual subprojects, therefore, accurate figures of benefiting areas are not presented. Taking into regard that based on GIS analysis of the layout of verified subprojects, some 20% of the subprojects area is expected to be settlements, roads etc., qualification of the subprojects were done by adding 20% margin to the current frame. Also taking into regard that the range of benefiting area as defined in SSWRDSP-2 is 50 to 1,000 ha, verified subprojects with the gross area falling outside of the range of 60 to 1,200 ha were excluded.

Overlapping with protected areas: In order to prevent the obviously negative-impact on the environment, the implementation of subprojects in protected areas should be avoided. In this regard, verified subprojects located in Madhupur National Park and its buffer zone as defined by the Department of Forestry was excluded.

## 2) Qualified potential subprojects

Through the process of pre-screening in regard to the criteria set above, some 16% of the verified subprojects were considered to be of large scale. As a result, 99 subprojects out of the 130 verified subprojects were found qualified. These qualified subprojects will be prioritized for further implementation arrangements. The average area of a single qualified subproject is 623.6 ha in the District.

### District-wise Number and Area of Qualified Subprojects

District	Number of verified subprojects	Number of qualified subprojects	Total gross area of subprojects (ha)	Average gross area of subproject (ha)	Total area in the District (ha)	% of Total gross area within the District
Mymensingh	130	99	61,738	623.6	436,300	14.2
Study Area Total	593	496	266,743	537.8	1,667,200	16.0

### Type-wise Number of Qualifies Subprojects

District	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI & WC	District Total
Mymensingh	10	23	1	5	16	1	31	12	99
Study Area Total by Type	81	89	2	52	70	21	118	63	496

## (4) Prioritization of Qualified Potential Subprojects

### 1) Prioritization Method

After qualification, the potential subprojects were prioritized and categorized into four categories (A, B, C and D) according to their priority. This was done by two approaches. One to screen out and lower the priority of potential subprojects that are qualified but yet require additional information to confirm

if they satisfy certain criteria for SSWRDSP-2. The other is to score the qualified subprojects by using a multi-criteria analysis method, and selecting those with higher priority based on a set of criteria. The potential subprojects selected in the former process was categorized into category D, while the remaining were categorized in to A, B, and C.

#### a) Screening of Category D Subprojects

Out of the set of selection criteria developed under SSWRDSP-2, two were applied in the process of qualifying the potential subprojects. The remaining criteria were not applied in consideration that the potential subprojects should not be completely screened at Master Plan level. However, based on the information collected in the study, preliminary judgment for the criteria concerning subproject construction cost can be made, where potential subprojects not satisfying the criteria at this point should be bound for further examination. In regard that such examination will require more time and resources, they should have lower priority among implementation. The potential subprojects not satisfying the criteria were categorized into “Category D”, which require further examination to clarify whether they can (with or without modification) satisfy the set of selected criteria.

#### SSWRDSP-2 Selection Criteria and its Application for Screening “D Category” Subprojects

SSWRDSP-2 Selection Criteria	Application	Reason
The SP must be in line with district strategies and guidelines for SSWR and approved by DIAPEC	Applied for qualification	The Master Plan itself is positioned as the district strategy for SSWRD. Approval of DIAPEC will be done at the stage of implementation
More than 40 % of the SP benefited area will be operated by landless share croppers, marginal farmers	Not applied	Examination should be done based on reliable information obtained at the stage of feasibility study
No more than 30 % of the households depend on subsistence capture fisheries.	Not applied	Examination should be done based on reliable information obtained at the stage of feasibility study
Each SP will entail rehabilitation / upgrading of an existing water control system	Not applied	Examination will be done at field reconnaissance
SP cost must not exceed \$ 1000/ha for CAD and \$ 500 for other schemes without ADB's prior approval.	Applied	Examination will be done by checking the contents of the potential SPs
Benefited area served by the SP must be more than 50 ha and not exceed 1000 ha.	Applied for qualification	Already applied for qualification of verified subprojects
Each subproject must be technically feasible; economically viable (EIRR > 12 %)	Not applied	Detailed study should be examined at the stage of feasibility study.
Capacity of beneficiaries in ensuring the sustainability of submersible embankments must be shown for Interventions in the deeply flooded part of the Northeast Region	Not applied	Detailed study should be examined at the stage of feasibility study
The SP shall be environmentally sound and IEE/EIA study has to be undertaken and appropriately approved after consulting the beneficiaries and project affected people	Partially applied for qualification	SP areas in environmentally sensitive areas have been taken into consideration
The SP shall be socially sound and require no or minimal displacement of people and land acquisition, and not involving sensitive areas	Not applied	Detailed study should be examined at the stage of PRA
Enrollment of 70 % of the direct beneficiary households as member of the WMA.	Not applied	Detailed study should be examined at the stage of PRA – WMA formulation
Recurrent cost of subproject O&M shall be covered by beneficiaries through formulated WMA	Not applied	Detailed study should be examined at the stage of PRA – WMA formulation

#### b) Scoring Method of Qualified Subprojects

Scoring of subprojects was done by applying *Analytical Hierarchy Process* (AHP) method, which is a tool for decision making with various parameters (multi-criteria analysis). During the last three decades, especially when the social or administrative and environmental or hydrological impacts have been emphasized in decision making process, traditional methodologies such as Cost-Benefit Analysis (CBA) or Cost-Utility Analysis (CUA) have been gradually replaced or complemented by Multi-Criteria Decision Methods (MCDM), with prominence for AHP. The main concept is to examine relative importance of various factors for decision-making using a matrix chart called a "decision-tree". Comparison of importance is examined by hierarchy by examining relations of two items and then integrating the relations into one matrix.

Relative importance of items/decision factor called “natural states” regarded for categorization of SPs was considered and weights for scoring of these items were examined. The main procedure consists of

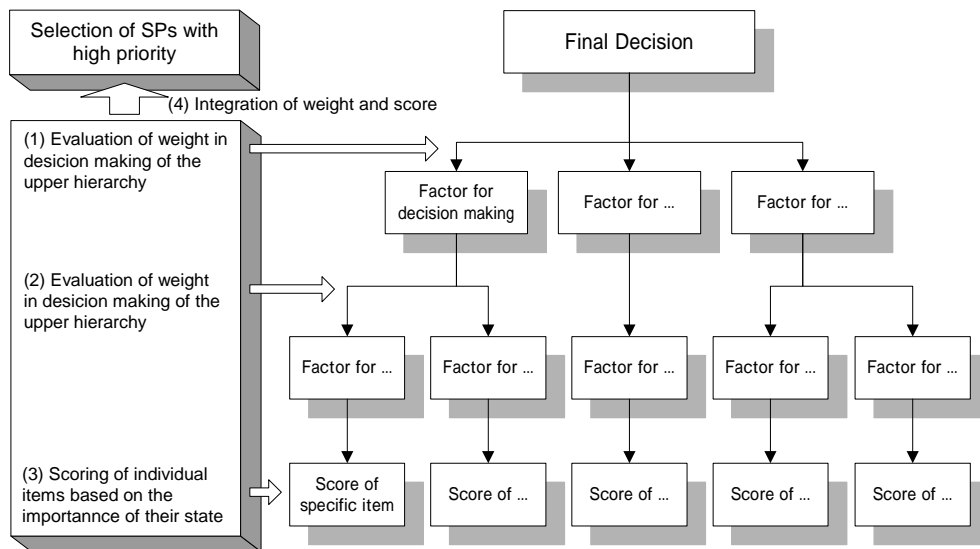
four steps.

- Examining weight of importance of each category
- Examining weight of importance of each item in the same category
- Scoring of individual items in consideration of each state
- Integration of individual scores and weight to prioritize potential subprojects

In scoring individual items, a pair-wise comparison matrix is formed reflecting relative importance of the items based on a nine-point Relative Importance Scale as shown in the right table.

**Pair wise Comparison Scale**

Relative Preference / Importance	Numerical Rating
Extremely preferred/important	9
Very strong to extremely	8
Very strongly preferred/important	7
Strongly to very strongly	6
Strongly preferred/important	5
Moderate to strongly	4
Moderately preferred/important	3
Equally to Moderately	2
Equally preferred/important	1



**Process of Subprojects Prioritization**

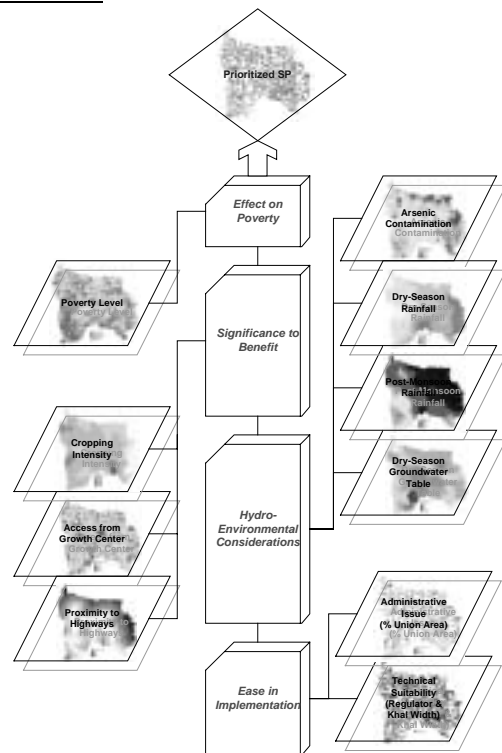
**c) Criteria for Scoring**

Among implementation, the basic requirements for SSWRD subprojects will be covered by applying the selection criteria of SSWRDSP-2. In this regard, scoring for prioritization of potential subprojects shall concentrate on selecting subprojects that may have more positive effect than the others. The items for considering the scoring of the subprojects are: 1) Effect on Poverty by the Subproject (applicable to all types of subprojects), 2) Significance of Benefit, 3) Hydrological and Environmental Considerations, and 4) Easiness in Implementation of the Subproject and O&M by Local Beneficiaries.

**d) Weighting of Scoring Criteria**

The basic idea of calculating evaluation weight of categories/items and scoring of individual items are shown in the table below. Importance of each factor is calculated so that the total of each category / item will sum up to a total of one (1). The method and weight of each criterion for prioritization are indicated in the following table.

In applying the AHP method, overlaying subproject with various data collected, updated and developed by the study



**AHP Data Layers**

team and converted them to buffers and grids, has been carried out under GIS environment. The figure on the right gives an image of the GIS data layers used in prioritization.

Sensitivity Analysis has been carried out to check the effect of weight of particular criteria on overall scores of the sup-projects. This eliminates skewness in sup-project priority such that a single criterion doesn't play a sharp role in overall priority and smoothes out the effect of different criteria. Through such sensitivity analysis, the final weights of the criteria have been decided. The table in the next page shows the final criteria and weight.

Weight of Multi-Level Criteria for Subproject Prioritization

Primary Criteria (Level 1)	Weight	Secondary-Criteria (Level 2)	Weight	Tertiary Criteria (Level 3)	Weight	
Effect on Poverty by the Subproject (Applicable to all types of SPs)	0.61*	Very High Poverty Area	0.59	-	-	
		High Poverty Area	0.22	-	-	
		Moderate Poverty Area	0.12	-	-	
		Low Poverty Area	0.07	-	-	
Significance of Benefit (applicable to all types of SPs)	0.13*	Cropping Intensity	0.75	Low having Inundation Land Type F3 & F4	0.76	
				Medium having Inundation Land Type F2	0.16	
				High having Inundation Land Type F0 & F1	0.08	
		Access to and from Growth Center	0.18		Easy	0.68
					Moderate	0.22
					Difficult	0.10
		Proximity to National and Regional Highways	0.07		Close	0.68
					Moderate	0.22
					Far	0.10
Hydrological and Environmental Considerations (depends on types of SP)	0.10*	Arsenic Contamination (applicable to WC type only)	0.64*	High Contaminated Area	0.69	
				Medium Contaminated Area	0.23	
				Low Contaminated Area	0.08	
		Dry Season Rainfall: Nov. ~ Mar. (applicable to WC type only)	0.14*		Low Rainfall	0.65
					Moderate Rainfall	0.23
					High Rainfall	0.12
		Post-Monsoon Rainfall: Sep. ~ Oct. (applicable to DI type only)	0.14*		High Rainfall	0.65
					Moderate Rainfall	0.23
					Low Rainfall	0.12
		Dry Season Ground Water Table: Nov. ~ Mar. (applicable to WC/ CAD type only)	0.08*		Deep Groundwater Table	0.65
Medium Groundwater Table	0.23					
Shallow Groundwater Table	0.12					
Easiness in Implementation of the SP and O&M by Local Beneficiaries in the SP Area (applicable to all types of SPs)	0.16*	Administrative Issue	0.75	Single Union	0.83	
				Multiple Unions	0.17	
		Technical Suitability	0.25		Structures are of adequate scale	0.90
					Structures exceed adequate scale	0.10

\* Different weight applied depending on type of SPs. For detailed figure, refer to Annex-7.

## 2) Prioritization of Potential Subprojects

### a) Screening of D Category Subprojects

Screening of Category D subprojects were done based on the costs of individual subprojects estimated from their components. In the District, out of the 99 qualified subprojects, 17 subprojects were determined to have costs exceeding US\$500/ha (US\$1,000/ha for CAD type subprojects). In total, 146 subprojects were screened into Category D. The numbers of such subprojects by district are indicated below.

Screening of Category D Subprojects

District	Number of qualified subprojects	Number of category D subprojects	Number of category A- C subprojects	Gross area of category A-C subprojects (ha)	Average gross area of category A-C subprojects (ha)	Total area in the District (ha)	% of gross area of category A-C subprojects within the District
Mymensingh	99	17	82	52,443	639.5	436,300	12.0
Study Area Total	496	146	350	200,942	574.1	1,667,200	12.1

Type-wise Number of Category D Subprojects

District	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI & WC	District Total
Mymensingh	4	0	1	1	4	0	4	3	17
Study AreaTotal by type	32	3	2	22	25	7	32	23	146

b) Prioritization of Qualified Subprojects

After screening of Category D subprojects, each of the remaining subprojects are marked with a score indicating its relative importance in the light of the set criteria. The scores varied from 0.18 to 0.98 with the average of 0.45. However, it should be noted that because of the characteristics of the AHP method, the scores do not indicate the value of actual importance of the subprojects, but represent relative importance between the subprojects.

Prioritization of the scored subprojects was done upazila-wise in regard of the capacity of the Upazila Engineer office in implementation. One subproject with the highest score was selected in each upazila for implementation under the short-term activities of the Master Plan. Such subprojects were categorized as Priority A. Furthermore, some 30% were selected from the remaining 70 subprojects for categorization in Priority B. This counted up to 25 subprojects. Finally, the remaining 45 subprojects were categorized into Priority C, which will be implemented under the long-term activities of the Master Plan. The prioritized subprojects have been checked upazila-wise and then district-wise so that implementations of the prioritized subprojects become distributed among the upazilas and districts. Lists of prioritized subproject in each district are shown in Table 4.2. The following table summarizes the number of subprojects in each category. The distribution of prioritized subprojects is indicated in Fig. 4.3.

Prioritized Verified Potential Subprojects by Type in Mymensingh District

Category	FM	DI	CAD	WC	FMDI	FMWC	DIWC	FMDI&WC	Total	BWDB related
Category A	1	4	0	1	3	0	2	1	12	2
Category B	3	7	0	2	3	0	7	3	25	6
Category C	2	12	0	1	6	1	18	5	45	10
Category D	4	0	1	1	4	0	4	3	17	6
Total	10	23	1	5	16	1	31	12	99	24

## Chapter 5 Master Plan on Small Scale Water Resources Development

### 5.1 Basic Concept of Small Scale Water Resources Development Plan

#### (1) Objectives

The National Water Policy (NWPo) has been formulated to provide direction to all agencies working with the water sector, and institutions that relate to the water sector, for achievement of specified objectives. Under this policy, the sector agencies of Government and local bodies will prepare sub-regional and local water-management plans in conformance with the NWMP and approved Government project appraisal guidelines. In regard of the above, the Master Plan of District Water Resources Development has been started by LGED including the Study covering 6 districts in Greater Mymensingh as one of the pioneers. The overall goal of the Study is to secure safe and sustainable water resources management and to increase farmers' income. The Master Plan is prepared comprising of strategies, prioritized subproject list, priority programs, and the scope for the follow-on investment project which include effective use of surface water.

#### (2) Basic Concepts of the Small Scale Water Resources Development

Integrated Rural Development: Improvement plan of agriculture, livestock, and fisheries including extension credit, system, post harvesting, marketing, etc., shall be conducted in the subprojects.

Water Resources Development complying with NWPo and NWMP: The Master Plan prepared through this Study should be positioned under the NWPo and NWMP, and must be in line with the contents of the policy.

Flood management in Small Scale Water Resources Development: Human life shall be protected from all the conceivable floods. In reality, complete flood management conditions cannot be realized, and flood management would be improved only in steps both in areal extent and increase level of protection.

Participatory Development Process: At all stages of the subproject, local stakeholders shall be involved or participated in order to formulate the ownership of the subproject for the sustainable O&M.

Income Generation for Weak through the Project Implementation: Specific measures shall be taken to ensure the poor, marginal/small farmers and destitute women benefit from the subprojects.

Institutional Strengthening: Small scale water resources development is implemented in the rural area, and Union and Upazila level officials shall act as the enabler. But considering the present conditions, they need capacity building for implementation.

### 5.2 Small Scale Water Resources Development Plan

#### (1) Target Year and Phasing of the Implementation

The target year of these plans, the target year of the Master Plan shall be the year of 2015. And the target year of the Master Plan is set in the following three stages;

- Short Term: by 2007 to implement 12 Priority A subprojects
- Mid Term: by 2010 to implement 25 Priority B subprojects
- Long Term: by 2015 to implement 45 Priority C subprojects and complete the permissive subprojects proposed

#### (2) Strategy of Small Scale Water Resources Development Plan

Basically the implementation of Master Plan will follow the on the line of SSWRDSP-2 after modification of its procedures.

Upazilas in the District is categorized into three (3) major zones; 1) highland, 2) medium highland,

and 3) Medium lowland by the inundation land type. Strategies for the small scale water resources development of each zone shall be set as follows:

Highland: The Madhupur Tract area is a typical area of the highland zone. Strategy of SSWRD shall be based on water retentions of the monsoon flood water and rainfall for irrigation during the dry season. The development potential of the pond at the depression of the hill shall be examined.

Medium highland: The medium highland spreads outside of the highland zone in the old Brahmaputra flood plain. Strategy of the SSWRD of the zone shall be based on flood management to reduce damage of *aman* at the beginning of flood season and to drain submerged water for the early re-trans planting *aman* paddy.

Medium lowland: The medium lowland spread outside of the lowland and the young Brahmaputra and Jamuna flood plain. The strategy of SSWRD shall be based on flood management to delay the submergence of grown *aman*, and drainage improvement after flooding. Embankment height will be reasonably set.

Also, in this Master Plan Study, paurashavas areas are excluded from the Study Area basically.

### (3) Upazila-wise hydrological condition and Development Strategy of SSWRD

#### 1) Bhaluka Upazila

Most of the land of Upazila spread on the Madhupur Tract. The Upazila belongs to the North Central Hydrological Region. Main rivers are the Sutia, Kaoraid, Lalti and Bajua rivers. The annual average rainfall at BWDB Bhaluka station is recorded at 2,644 mm of which 65 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m and 20 m (PWD).

Most part of the Upazila is classified as highland of Madhupur Tract. The strategy of SSWRD in the highland will be the water conservation of the monsoon flood water and rainfall to use the supplemental irrigation in post-monsoon season.

#### 2) Dhobaura Upazila

There are many hillocks on the north region of the upazila The Upazila belongs to the Northeast Hydrological Region. Main rivers are the Nitai and Kangsa rivers. The annual average rainfall at BWDB Durgapur station, the nearest station, is recorded at 3,566 mm of which 73 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m to 25 m (PWD).

Most part of the Upazila classified as 1) highland of Northern and Eastern Piedmont and 2) medium highland of North-western Plains and Basins. The strategy of small scale water resources development (SSWRD) in the highland of Northern and eastern piedmont shall be the water retentions of the monsoon flood water and rainfall to use the irrigation during the dry season, and flood management against the flash floods and early floods. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy

#### 3) Fulbaria Upazila

The Upazila belongs to the North Central Hydrological Region. Main rivers are the Khiru, Nageshwari, Banar and Bajua rivers. Main beel is Bhawal Beel. The annual average rainfall at BWDB Bhaluka station, the nearest station, is recorded at 2,644 mm of which 65 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m to 20 m (PWD).

Most part of the Upazila is classified as medium highland of Old Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy. The strategy of SSWRD in the highland will be the water conservation of the monsoon flood water and rainfall to use the supplemental irrigation in post-monsoon season.



#### 4) Gaffargaon Upazila

The Upazila belongs to Planning Unit (PU) 3 of the North Central Hydrological Region. Main rivers are the Old Brahmaputra and Banar rivers and noted beels are Taltala, Subi, Mulaplia, Badua, Hoara. The annual average rainfall at BWDB Gaffargaon station is recorded at 2,408 mm of which 62 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m to 15 m (PWD).

Most part of the Upazila classified as medium highland of Old Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy

#### 5) Gauripur Upazila

The Upazila belongs to the North East Hydrological Region. Main rivers are the Old Brahmaputra, Soai, Suria and Mogra rivers. Noted beels (depressions) are Sidhal and Dalia Beel. The annual average rainfall at BWDB Mymensingh station, the nearest station, is recorded at 2,365 mm of which 66 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m to 15 m (PWD datum).

The Upazila is classified as medium highland of Young or Old Brahmaputra floodplains. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 6) Haluaghat Upazila

The Upazila locates on the foot of the Garo Hills of India. The Upazila belongs to the North East Hydrological Region. Main rivers are; the Kangsa, Memong and Bhogai rivers. The annual average rainfall at BWDB Nalitabari station, the nearest station, is recorded at 2,668 mm of which 68 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m and 30 m (PWD).

Most part of the Upazila is classified as medium highland of Old Brahmaputra or North-western Plains and Basins. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 7) Ishwarganj Upazila

The Upazila belongs to the North East Hydrological Region. Main rivers are; the Old Brahmaputra, Soai and Kanchamatia rivers in the western part and the Mogha River at southern part of Upazila. Noted depressions are; Kaila, Dalia, Sinni, Diga and Katla beels. The land in the Upazila is at the elevation between 7 m and 15 m (PWD).

Most part of the Upazila is classified as medium highland and medium lowland of Young and Old Brahmaputra Floodplains. The strategy of SSWRD in the medium highland and medium lowland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 8) Mymensingh Sadar Upazila

Most of the land of Upazila spread on the Brahmaputra Flood Plain. The Upazila belongs to the North Central Hydrological Region. Main rivers are the Old Brahmaputra, Sota, Sutia, Barera and Negeshwari rivers. The annual average rainfall at Mymensingh Agriculture University station is recorded at 2,365 mm of which 63 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m to 20 m (PWD).

Most part of the Upazila is classified as highland of Young or Old Brahmaputra floodplains and highland of Old Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage

improvement at post monsoon season to accelerate transplanting Aman or Boro paddy. The strategy of SSWRD in the highland will be the water conservation of the monsoon flood water and rainfall to use the supplemental irrigation in post-monsoon season.

#### 9) Muktagachha Upazila

The Upazila belongs to the North Central Hydrological Region. Western part of the Upazila is eastern end of the Madhupur Tract. Main rivers are the Aiman/Deorai/Thadokura River through western area, the Sirkhali River running in northeaster area, and the Sutia River along the eastern border. Noted depressions are; Baril, Haoda, Raiha, Khalia, Daria Chital Beels. Forestry occupies 1,252 ha. The annual average rainfall at BWDB Mukutagacha station is recorded at 2,424 mm of which 68 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m and 20 m (PWD).

Most part of the Upazila is classified as medium highland of Old or Young Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 10) Nandail Upazila

The Old Brahmaputra River running along the western border of the Upazila, the Mogha river and Narasunda River, which is mostly silted up, are major rivers. Noted depressions are Talar Kur, Zilla Beel, Hamai Beel, Aralia Beel, Balda Beel and Tongi Beel. The annual average rainfall at BWDB Nandail station is recorded at 2,861 mm of which 58 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m and 15 m (PWD).

Most part of the Upazila is classified as medium lowland and medium highland of Old and Young Brahmaputra Floodplains. The strategy of SSWRD in the medium lowland and medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 11) Phulpur Upazila

The Upazila belongs to the North East Hydrological Region. Main rivers are; the Kharia and Kangsha rivers. The annual average rainfall at BWDB Phulpur station is recorded at 2,749 mm of which 72 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 7 m and 15 m (PWD).

Most part of the Upazila is classified as medium highland of Old Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy.

#### 12) Trishal Upazila

The Upazila belongs to the North Central Hydrological Region. Main rivers are the Old Brahmaputra, Khiru, Sutia, Meduari, Nageshwari, Pagra and Barer rivers. Notable depressions are; Beel Galhar, Shukni, Singaduli, Durbachora and Kumuria. The annual average rainfall at BWDB Gaffargaon station, the nearest station, is recorded at 2,408 mm of which 62 % of rainfall concentrates in monsoon season. The land in the Upazila is at the elevation between 5 m to 15 m (PWD).

Most part of the Upazila classified as medium highland of Old Brahmaputra Floodplain. The strategy of SSWRD in the medium highland will be the flood management to reduce the damage of planted paddy in the pre-monsoon season and drainage improvement at post monsoon season to accelerate transplanting Aman or Boro paddy

### **5.3 Relevant Sectors' Development Strategies and Plan**

As the nature of SSWRD other sector activities can not involve in the project like those in integrated rural development. It is considered that beneficiary sector activities will be implemented by the other financial resources. However, beneficiary sector development shall be implemented together with small scale water resources development in order to achieve the targets of the Master Plan.

#### **(1) Agricultural Development**

- Improve human nutrition by diversified agriculture
- Focus on profitable farming through higher productivity
- Upgrade of general agricultural technology–Technical packages other than water management will not be obstacle to agricultural production
- Collaborate with other agricultural projects
- Develop Value Added Agriculture
- Develop community-based activities to fulfill basic regional needs for the rural human security
- Develop wide-area based water management: Ex. Multiple function of paddy fields
- Human Resources Development

#### **(2) Fishery Development**

- Encouragement of integrated fish culture
- Introduction of tilapia culture
- Introduction of freshwater prawn culture
- Introduction of freshwater ornamental fish culture
- Conservation of indigenous/natural fish in Beel, Khal, River and Haor
- Propagation of indigenous/natural fish by fish culture

#### **(3) Livestock Development**

- Stability of feed supply
- Development of animal health
- Processing/ slaughtering of animals

#### **(4) Suggestions to Future Development in Agriculture and Livestock**

- Rice Terrace Cultivation in. Haor Area
- Rural Industrial Complex
- Development of vaccination system in rural areas.
- Efficient Irrigation Technology in Highland Area.
- Small Scale Mechanization
- Field Training for Seed Production and Processing for Farmers Own Use.
- Development of Rural Recycling in Farming System
- Integrated forestry-livestock farming
- Development of market information system for fish and fresh vegetables
- Human Resources Development

### **5.4 Priority Programs**

In order to implement the SSWRD Project smoothly and assure the expected effects, the priority programs will be conducted in parallel with the SSWRD subproject implementation.

#### **(1) Collaboration and Coordination among Stakeholders**

Collaboration works with relevant government agencies are strongly expected to the implementation of SSWRD Project. National, district and Upazila level government agencies coordination committees should be maintained to achieve multiplication effects of the Project.

#### **(2) Strengthening of Local Government Engineering Department**

In order to support smooth implementation of daily works of the Project office equipment and facilities will be improved at District and Upazila level offices. This includes transportation vehicles,

computer and peripherals/software, photocopy machines, etc.

### (3) Capacity Building of the Local Government Level Technical Officers

There are not enough water resources development planners/engineers in LGED, especially at district and upazila level. Technical training program shall be considered to strengthen the capacity of local government level officials of LGED for planning and implementation of SSWRD.

### (4) Water Management Associations

In order to maintain the sustainability of SSWRDP sub-projects, capacity building of WMA members is indispensable. In parallel with training of WMA members, national level association of WMAs will be formulated to exchange experiences and information among individual WMAs for better activities of WMAs.

### (5) GIS and IT

At present, the GIS coordination system between WARPO and LGED is deferent. Standardization is required for exchanging information of GIS. Inventory of water bodies and existing projects under the NWRD is no completed yet. It needs to formulate nation wide inventory survey of water resources among stakeholders under the coordination of WARPO.

## **5.5 Implementation Plan (Action Plan)**

### (1) Project Implementation

The Project aims to achieve the sustainable agriculture and improve the farmers' living conditions through increase of agricultural production and resources mobilization in the Project Area. The Project consists of two major components; 1) SSWRD Subprojects and 2) Priory programs. Considering the similarity of interventions, implementation arrangement of SSWRDSP-2 will be applied for the Project with improvement, if appropriate. The Project is basically assumed to be implemented by the Bangladesh Government budget with external financial support.

### (2) Executing Agencies

The LGED will be the executing agency of the Project. The project management office (PMO) will be established at LGED headquarters. The major functions of the PMO are: i) coordination of agencies concerned, ii) preparation of overall implementation plan, annual project work plans and budget, iii) review and approve subproject appraisals, iv) review and approve designs, v) supervise LGED district offices in preparing tender documents, evaluating bids, and awarding contracts, vi) maintain financial accounts, vii) prepare periodic reports on implementation progress and viii) monitor project progress and evaluate environmental impact. PMO will procure the consultants to support the PMO on the technical aspects and institutional strengthening.

Under close guidance and supervision of the PMO, LGED district offices will be responsible for the day-to-day implementation at the subproject level with assistance from the upazila offices. The LGED district Executive Engineer will act as Subproject Manager and 1) prepare individual subproject implementation with stakeholder participation, 2) coordinate with other agencies and organizations, 3) support organization of WMAs, 4) carry out field surveys, 5) supervise construction activities and make payments to contractors, and 6) monitor and report subproject development to the PMO.

At National Level, Inter-ministerial Coordination Committee (IMCC) shall coordinate the agencies for smooth implementation of the Project. District-level Small-scale Water Resources Development Committees (DSSWRDCS) will meet when required to coordinate the activities of the district level Government agencies. MOLGRDC will issue an order requiring the Upazalial Development Coordination Committee (UDCC), composed of the union chairpersons and upazila-level officials, to put the review of subproject progress on the agenda of all its regular meetings. LGED district offices will maintain close coordination with BWDB through the Inter-Agency Project Evaluation Committee to ensure that proposed subprojects do not conflict with planned or existing BWDB projects.

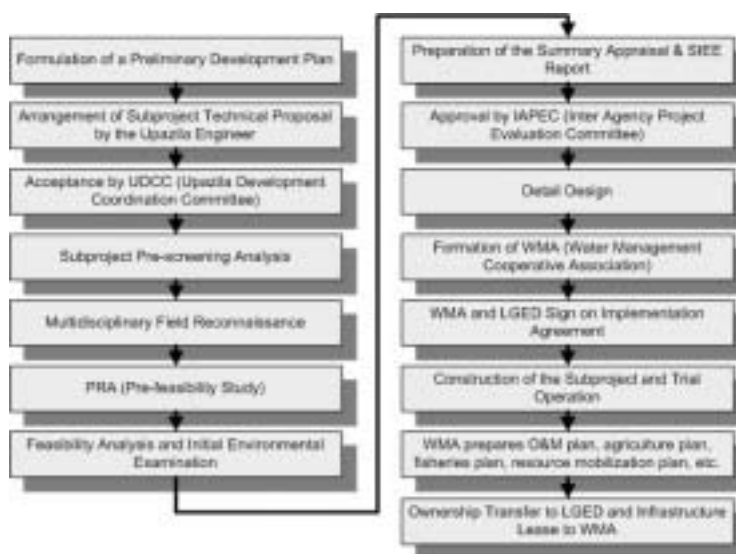
### (3) Implementation Plan

#### 1) Implementation Procedures

Identification and appraisal process for an individual sub-project on SSWRDSP-2 set by the LGED are as indicated in the diagram.

#### 2) Subproject Implementation

The high priority subprojects, after prioritization, are not equally distributed to each district and upazila. Some Upazila concentrate many high priority subprojects and only few high priority subprojects in some upazila. If subproject selected to implement from higher priority, some upazila has no subproject and some upazila concentrate more than 3 subprojects. To avoid these cases, SPs were selected based on higher prioritized subprojects in the upazila.



Selection of subprojects in each phase, are set as follows:

- Short term* (2 years): 12 Category A subprojects of the highest in each upazila
- Medium term* (3 years): 25 Category B subprojects of the secondary highest in each upazila
- Long term* (5/4 years): 45 Category C subprojects of the thirdly highest in each upazila

Civil works of subproject will be contracted with local contractors under local competitive bidding (LCB) under the standard LGED procurement procedures. Small scale earthwork contracts with labour contracting societies (LCSs).

After completion of the sub-project construction, WMA conduct O&M and management under guidance of Upazila Engineer office for one year. After one year, O&M committee of WMA takes responsibility of subproject O&M. WMA bare the O&M expenses by collecting fees, based on the investment cost of subproject, from WMA members.

Implementation schedule of the whole Project component are indicated in the following chart.

Phase	Short Term		Medum Term			Long Term					Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
<b>Small Scale Water Resources Development (No. of Subproject)</b>											
Mymensingh	5	7	7	8	10	12	12	12	9		82
Study Area Total	25	33	29	33	37	46	50	52	45	0	350
Monitoring & Evaluation by PMO											
Engineering Services											
<b>Priority Programs</b>											
Capacity Building of Upazila Engineers Office											
Training of WMA Management Board Members											
GIS Database system improvement											
Collaboration works on the Stakholders											

### 3) Subproject Investment Costs

Subproject investment cost of 82 subprojects in the District is estimated at Tk. 846 million, based on the unit rates of SSWRDSP-2. Their breakdowns by the short, medium and long term periods are summarized as follows:

Terms	Total Number of SP	Total Gross Area (ha)	Average Gross Area (ha/SP)	Investment Costs in Tk. '000'				
				Earthworks	Structures	Total Construction	Land Acquisition	Total Investment
Short Term	12	7,374	615	46,328	65,200	111,528	560	112,088
Medium Term	25	14,581	583	95,308	144,490	239,798	5,600	245,398
Long Term	45	30,488	678	228,072	256,488	484,560	4,120	488,680
Total	82	52,443	640	369,708	466,178	835,886	10,280	846,166

Notes: \*direct investment costs only, not including engineering service, contingencies, price escalations etc.

## Chapter 6 Further Activities Required at Upazila Level

Potential subprojects identified and prioritized through surveys under the Study are only at the initial stage of the whole procedure. The Upazila Engineers are required to take necessary measures to mature the technical proposals of these subprojects. In this process, emphasis should be put on potential subprojects with higher priority. At the actual proposal preparation stage, some of them will be selected and requested as subprojects for SSWRDSP-2.

### 6.1 Union Level

The potential subproject appeared through the discussion with UP members and representatives of villagers. It is necessary to discuss among the potential stakeholders at union level to confirm the needs and get the consensus among stakeholders to the potential subproject. It is recommended to conduct the PRA among stakeholders as the JICA Study team demonstrated in Noabad, Joyka nad Boulai Unions of Karimganj Upazila in the District. During the formulation of consensus of the potential subproject, technical assistance will be required from the upazila engineer's staff. The proposal will be discussed and authorized at UP meeting for submission to Upazila Engineer.

### 6.2 Upazila Level

After the approval of the prioritized potential subproject list, the upazila engineers are expected to start the technical support for the stakeholders' discussions/workshops in the union level for the preparation of the technical proposal to submit to District LGED executive engineers.

Table 1.1 Outline of National Water Policy (NWPo)

Issues	Description
<i>River Basin Management</i>	The government will work with co-riparian countries to establish a system for exchange of information and data on relevant aspects of hydrology, morphology, water pollution, ecology, changing watershed characteristics, cyclone, drought, flood warning, etc., and to help each other understand the current and emerging problems in the management of the shared water sources.
<i>Planning and Management of Water Resources</i>	<ul style="list-style-type: none"> <li>WARPO will prepare, and periodically update, a NWMP addressing the overall resource management issues in each region and the whole of Bangladesh.</li> <li>Sector agencies of the government and local bodies will prepare and implement sub-regional and local water-management plans in conformance with the NWMP and approved government project appraisal guidelines. The Executive Committee of the National Water Resources Council (ECNWRC) will resolve any interagency conflict in this regard.</li> <li>BWDB will implement all major surface water development projects and other FCDI projects with command area above 1,000 hectares. <b>The Local Government will implement FCDI projects having a command area of 1,000 hectares or less after identification and appraisal through an interagency Project Appraisal Committee.</b> Any interagency dispute will be resolved by means prescribed by the government</li> </ul>
<i>Water Rights and Allocation</i>	<ul style="list-style-type: none"> <li>In general, the priority for allocating water during critical periods in the water shortage zones will be in the following order: domestic and municipal uses, non-consumptive uses (e.g. navigation, fisheries and wild-life), sustenance of the river regime, and other consumptive and non-consumptive uses such as irrigation, industry, environment, salinity management, and recreation. The above order of priority could however be changed on specific socio-economic criteria of an area by local bodies through local consensus.</li> <li>The government may empower the local government or any local body it deems fit, to exercise its right to allocate water in scarcity zones during periods of severe drought, and it will monitor the water regime and enforcement of the regulations through specifically designed mechanisms.</li> </ul>
<i>Public and Private Involvement</i>	<ul style="list-style-type: none"> <li>The management of public water schemes, barring municipal schemes, with command area up to 5,000 ha will be gradually made over to local and community organizations and their O&amp;M will be financed through local resources.</li> <li>Public water schemes, barring municipal schemes, with command area of over 5,000 ha will be gradually placed under private management, through leasing, concession, or management contract under open competitive bidding procedures, or jointly managed by the project implementing agency along with local government and community organizations.</li> <li><b>Ownership of FCD and FCDI projects with command area of 1,000 ha or less will gradually be transferred to the local governments,</b> beginning with the ones that are being satisfactorily managed and operated by the beneficiary/ community organizations.</li> </ul>
<i>Public Water Investment</i>	<ul style="list-style-type: none"> <li>Planning and feasibility studies of all projects will follow the <b>Guidelines for Project Assessment (GPA)</b>, the <b>Guidelines for People's Participation (GPP)</b>, the Guidelines for Environmental Impact Assessment (EIA), and all other instructions that may be issued from time to time by the government.</li> <li><b>Interests of low-income water users, and that of women, are adequately protected in water resource management.</b></li> </ul>
<i>Water Supply and Sanitation</i>	<ul style="list-style-type: none"> <li><b>Preserve natural depressions and water bodies in major urban areas for recharge of underground aquifers and rainwater management.</b></li> <li>Mandate local governments to create awareness among the people in checking water pollution and wastage.</li> </ul>
<i>Water and Agriculture</i>	<ul style="list-style-type: none"> <li><b>Improve efficiency of resource utilization through conjunctive use of all forms of surface water and groundwater for irrigation and urban water supply.</b></li> <li>Strengthen crop diversification programs for efficient water utilization.</li> </ul>
<i>Water and Industry</i>	Standards of effluent disposal into common watercourses will be set by WARPO in consultation with DOE
<i>Water and Fisheries and Wildlife</i>	<ul style="list-style-type: none"> <li><b>Water bodies like baors, haors, beels, roadside borrow pits,</b> etc. will, as far as possible, <b>be reserved for fish production</b> and development. Perennial links of these water bodies with the rivers will also be properly maintained.</li> <li>Water development plans will not interrupt fish movement and will make adequate provisions in control structures for allowing fish migration and breeding.</li> </ul>
<i>Water and Navigation</i>	<ul style="list-style-type: none"> <li>Water development projects should cause minimal disruption to navigation and, where necessary, adequate mitigation measures should be taken.</li> <li>Minimum stream-flows in designated rivers and streams will be maintained for navigation after diversion of water for drinking and municipal purposes.</li> </ul>
<i>Water for Hydropower and Recreation</i>	Recreational activities at or around water bodies will be allowed provided it is not damaging to the environment.
<i>Water for the Environment</i>	<ul style="list-style-type: none"> <li>Give full consideration to environmental protection, restoration and enhancement measures consistent with the National Environmental Management Action Plan (NEMAP) and the NWMP.</li> <li>Adhere to a formal environmental impact assessment (EIA) process, as set out in EIA guidelines and manuals for water sector projects, in each water resources development project or rehabilitation program of size and scope specified by the Government from time to time.</li> <li>Protect against degradation and resuscitate natural water-bodies such as lakes, ponds, beels, khals, tanks, etc. affected by man-made interventions or other causes.</li> </ul>
<i>Preservation of Haors, Baors, and Beels</i>	<ul style="list-style-type: none"> <li>Haors that naturally dry up during the winter will <b>be developed for dry season agriculture.</b></li> <li>Take up integrated projects in those <b>water bodies for increasing fish production.</b></li> </ul>
<i>Economic and Financial Management</i>	<ul style="list-style-type: none"> <li><b>Water charges realized from beneficiaries for O&amp;M</b> in a project would be <b>retained locally for the provision</b> of services within that project.</li> <li><b>Effective beneficiary participation and commitment to pay for O&amp;M will be realized at the project identification and planning stages by respective public agencies.</b></li> </ul>
<i>Research and Information Management</i>	Develop a central database and management information system (MIS) consolidating information from various data collection and research agencies on the existing hydrological systems, supply and use of national water resources, water quality, and the eco-system.
<i>Stakeholder Participation</i>	<ul style="list-style-type: none"> <li>The "<b>Guidelines for People's Participation (GPP) in Water Development Projects</b>" be adhered to as part of project planning by all institutions and agencies involved in public sector management of water resources.</li> <li>Guidelines for formation of water user groups (WUG) and similar community organizations will be formulated.</li> <li><b>Generally 25 % of the earthwork of any public water project will be offered to specific target groups or beneficiaries.</b></li> <li>New projects proposed by a community or local institution will be considered for implementation on a priority basis only when the beneficiaries have mobilized a certain percentage of the total cost as their contribution to the project.</li> </ul>

Table 4.1 List of Proposed Subprojects to SSWRDSP-2 in Mymensingh District (1/3)

Upazila	Union	No. of SP	Propose Subproject Name	Pre-screen	Reconnais sance	PRA	Appraisal
Bhaluka	Bhaluka	1	Re ex cvn Moranodi,Chullar khal &Jonakirtek Emb	X			
	Dakatia	1	Neora Khal Subproject	Pass	X		
	Meduari	1	Lohaboi Subproject	Pass	X		
Dhobaura	Dhobaura	6	Gashapara Subproject(FMD)	X			
			Joy rampara Subproject(FMD)	X			
			Khilagora/Bagpara Subproject(FMD)	X			
			North Majipara DR & Irrg. Subproject(DR&Irrg.)	X			
			North Ranipur Subproject(DR&WC)	X			
			Vedikura Subproject(FMD)	X			
	Bagber	3	Khamarbasha -Taraikandi GCC Rd. FMD	X			
			Munshirhat-Goriabeel DR Subproject	X			
			Tarai Nadi DR Subproject	X			
	Gamaritala	2	Rubber Dam over Netai river at Ronosinghapur	X			
			Old Netai river DR &WC Subproject	X			
	Ghoshgaon	4	Baligaon Nayabeel WC Subproject	X			
			Ganoi Pechachara WC Subproject	X			
			Netai Nodi FMD Subproject	X			
			Tarai Khal WC Subproject	X			
	Goatala	6	Behi Beel Subproject	Pass	X		
			Bilniakanda-Gogrerpar FMD Subproject	X			
			Gagotia-Mathikhola FMD Subproject	X			
			Gobindapur-Mathikhola FMD	X			
			Gogra Beel DR & WC Subproject	X			
			Marjan-Jirakhali FMD Subproject	X			
	Porakandulia	4	Chonnerchar Netai river -Rupla Nodi DR &WC	X			
			Kashinathpur-Bhularkhal DR Subproject	X			
Nidoya Beel Subproject			Pass	Pass	Pass	Pass	
Duthnai GCCR-Kashinathpur Bazar Subproject			X				
South Majipara	2	South Majipara DR & Irrg. Subproject	X				
		South Majipara DR & WC Subproject	X				
Gamaritala	1	Netai River Rubber Dam Project					
Fulbaria	Fulbaria	4	Const Sluice at Boril khal ov. Dhiblia khal	X			
			Re ex cvn of Dhainer beel	X			
			Rubber Dam	X			
			Trimohini-Dorar khal FMD Subproject	X			
	Bakta	2	Baza beel DR Subproject	X			
			Salner khal DR Subproject	X			
	Balian	4	Baidabari-Nayanbari FMD Subproject	X			
			Const. of Sluice at Kalmina Khal	X			
			Jangal beel DR Subproject	X			
			Re ex cvn of Gaiper Khal	X			
	Bhaw anipur	1	Sharashati Khal Subproject	X			
	Enayetpur	1	Nainderjura-Suait beel DR Subproject	X			
	Fulbaria	2	Chowder Chhagalchhira Khal Subproject	X			
			Chowder Naligang Khal Subproject	X			
	Kaladash	1	Barilbeel Subproject	Pass	Pass	Pass	Pass
	Kushmain	1	Dhamor Digombari Khal Subproject	X			
	Putijana	3	Katakuri Khal DR Subproject	X			
			Patura Khal DR Subproject	X			
			Peal beel DR Subproject	X			
	Radhakanai	1	Sachalia river DR Subproject	X			



Table 4.1 List of Proposed Subprojects to SSWRDSP-2 in Mymensingh District (2/3)

Upazila	Union	No. of SP	Propose Subproject Name	Pre-screen	Reconnaisance	PRA	Appraisal	
Gafargaon	Gafargaon	12	Beer Khawla FMD Subproject	X				
			Char Atgi FMD Subproject	X				
			Const Kajla baidya pucca bridge to Shila nodi	X				
			Golabari Irrigation Subproject	X				
			Pylhol Irrigation Subproject	X				
			Re const Char Atgi BeriBundh	X				
			Re ex cv n khal of Bamni & Badai beel	X				
			Re ex cv n Matiabeel khal	X				
			Re ex cv n of Anandapuri khal	X				
			Re ex cv n of Labrer khal	X				
			Re ex cv n of Motima & Maliakuri khal	X				
			Re ex cv n of Mukhi Bara chil beel	X				
	Barbaria		2	Bara-Namalaskanpur WC Subproject	X			
				Charipara WC Subproject	Pass	Pass	Pass	Pass
	Basati		1	Re ex cv n of Bajjana Khal	X			
Datter Bazar		2	Ummesh CAD Subproject	Pass	Pass	Pass	Pass	
			Malmal Subproject	Pass	Pass	Pass	Pass	
Jassora		1	Re ex cv n of Nalua beel-Hoogly beel khal	X				
Mashakhali		1	Re const Mashgakhali-Bhaturi BeriBundh	X				
Panchabag		1	Kkurshidmohal-Char Gavi-Char Kaona FMD	X				
Gauripur	Gauripur	1	Majigaon DR & Irrigation Subproject	X				
	Achindapur	1	Agrail Beel Subproject	X				
	Mailakanda	1	Lanka khal DR Subproject	X				
	Mailakanda, Achintapur	1	Chatuli-Agrail Beel Subproject	Pass	Pass	Pass	Pass	
	Ramgopal	1	Re ex cv n of Beel Kalia	X				
	Shahanati, Achintapur	1	Telky Beel Subproject	Pass	X			
Haluaghat	Haluaghat	3	Const Emb atLaksmikura over Meneng river	X				
			Kurerkhal FMD Subproject	X				
			Trimohini Nodi FMD Subproject	X				
	Amtoil	3	Const. Emb. on bank of Kodalia Khal	X				
			Const. Sluice gate over Kodalia khal	X				
			Koladia Khal FMD Subproject	X				
	Beeldora	4	Const.Emb. on Goradia & Ramkhali River bank	X				
			Godaria River WC (Rubber Dam) Subporject	X				
			Jambeel Subproject	Pass	X			
			Ramkhali FMD Subproject	X				
	Bhubankura	3	Meneng River FMD Subproject	X				
			Meneng River Dr. Subproject	X				
			Bishnojuri khal Subproject	X				
	Dara	4	Amtoil-Kodalia FMD Subproject	X				
			Const. of Sluice gate over Sikla khal	X				
			Re const. Emb Dara Bahir Simul-East Mym. Road	X				
			Sikla Khal DR Subproject	X				
	Dhurail	2	Const. Sluice over branch of Kongsho & Ichhamoti	X				
			Ichhamoti River FMD Subproject	X				
	Gazirvita		1	Boraghat Rubber Dam Subproject	Pass	Pass	Pass	Pass
	Haluaghat		3	Darsha River WC (Rubber Dam) Subproject	X			
Darsha River Dr. Subproject				X				
Old Darsha River Dr. Subproject.				X				
Jugli		4	Meneng River Rubber Dam	X				
			Darsha River Subproject	Pass	Pass	Pass	Pass	
			Dorsha River Eembankment Const.	X				
			Gangina River DR Subproject	X				

Table 4.1 List of Proposed Subprojects to SSWRDSP-2 in Mymensingh District (3/3)

Upazila	Union	No. of SP	Propose Subproject Name	Pre-screen	Reconnaissance	PRA	Appraisal
Haluaghat	Mailakanda	1	Chatol Beel Subproject	X			
	Narail	3	Old Darsha (Nakdhara) Emb. Re const.	X			
			Old Darsha (Nakdhara) River FMD Subproject	X			
			Rubber Dam on Old Darsha(Nakdhara) river	X			
	Sakuai	3	Const. Emb. & Sluice gate fr. Sakuai Sch.-Dekulia	X			
			Sakuai High School-Dekulia Ferryghat FMD	X			
			Salonger Khal FMD Subproject	X			
	Swadeshi	3	Barabeela Subproject	Pass	Pass	Pass	Pass
			Itakhola-Krishnapur FMD Subproject	X			
Re ex cvn khal fr. Krishnapur to Ramkhali			X				
Iswarganj	Ardrail	1	Sharmara beel DR & Irrigation	X			
	Athurbari	1	Re ex cvn of Sonachurni beel khal	X			
	Borohit	1	Andrial beel DR & Irrigation	X			
	Iswarganj	2	Govia Beel Subproject	Pass	Pass	Pass	Pass
			Re ex cvn of Cinni beel khal	X			
	Jatia	3	Bhubial beel DR & Irrigation Subproject	X			
			Digha Beel Subproject	Pass	Pass	Pass	Pass
			Kumuria beel DR & Irrigation Subproject	X			
Mogtola	1	Goja beel DR & Irrigation Subproject	X				
Sorisha	1	Kodaldhoa beel DR & Irrigation Subproject	X				
Tarundia	1	Keila beel FMD Subproject	X				
Muktagacha	Baragram	1	Khatajora Khal Subproject	X			
	Basati	1	Baijana Khal Subproject	X			
	Bashati	1	Baijana (Bashati part) Khal Subproject	X			
	Gogha	1	Haora Beeler Khal Subproject	X			
	Kashimpur	2	Haora Beeler Khal Subproject	X			
			Talla Beeler Khal Subproject	X			
	Kheruajani	1	Aymonadi-Jatrati Subproject	X			
	Kumargata	1	Shapmarir Khal Subproject	X			
Tarati	1	Gourinadi-Katakhali Subproject	X				
Sadar	Sadar	3	Re ex cvn Hargozir beel to Bareba khal	X			
			Re ex cvn of ajmatpur Kaliakuri beel to Sutia Nodi	X			
			Re ex cvn of Nama Kaltaser Ranakhali khal	X			
	Dhapunia	3	Ajmatpur Kaisal beel-Sutia Nodi Khal Subproject	X			
			Kaltaser-Sutia Nodi Khal Subproject	X			
Dublakuri-Sutia Nodi Khal Subproject			X				
Ghagra	1	Beki Beel Subproject	Pass	Pass	Pass	Pass	
Trishal	Balipara	1	Dobadanga Subproject	X			
	Kanihari	1	Baroigaon-Jhilki CAD Subproject	Pass	Pass	Pass	Pass
	Mothbari	2	Mothbari DTW Subproject	X			
			Porabari-Bamnakhali Subproject	X			
Rampur	1	Chhiratal Beel Subproject	Pass	Pass	Pass	Pass	

Table 4.2 List of Prioritized Potential Subprojects in Mymensingh District (1/4)

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Bhaluka	Uthura	36113100	Bajuajora Khal SP	WC	536	None	A	
	Kachina	36113030	Shalda Khal SP	WC	419	None	B	
	Bhaluka & Bharadoba	36113061	Chullar Khal - Afainya/Harar Khal SP	DIWC	940	Existing 5-vent regulator	C	
	Birunia	36113080	Langolhata Khal SP	DIWC	896	BWDB Embankment	C	
	Meduary	36113040	Nijhura Khal SP	FMDI	550	None	D	Further examination to be required
	Rajai	36113090	Urahati SP	FM	220	Andijuri Pilot Project (Both LGED and BWDB's Projects exist there)	D	Further examination to be required
	Dakatia & Uthura & Khalla	36113020	Neora Khal - Bogajan Khal SP	DIWC	4,953	None	L	Benefited area more than 1,000 ha
	Habirbari & Mallikbari	36113051	Lauti Khal SP	DIWC	1,693	Existing regulator	L	Benefited area more than 1,000 ha
	Dhitpur	36113070	Please refer to SP 36194140 of Trishal/Mymensingh					
Dhobaura	Dakshin Majjpara	36116030	Shashi Khal SP	DIWC	292	None	A	
	Ghoshgaon	36116020	Ghoshgaon-Bhuiyanpara SP	DIWC	1,135	None	B	
	Baghber	36116010	Tarai Khal SP	DIWC	757	None	C	
	Guatola	36116060	Gogra Beel SP	FMDIW C	126	None	D	Further examination to be required
	Dhobaura	36116040	Tarai - Satra Khali SP	FMDIW C	5,708	None	L	Benefited area more than 1,000 ha
	Gamaritola & Porakandulia	36116050	Mora Nitai Khal SP	DIWC	1,503	None	L	Benefited area more than 1,000 ha
Fulbaria	Balian	36120010	Kalmina Khal SP	FMDI	567	None	A	
	Bakta	36120100	Baza Beel Khal SP	DIWC	157	None	B	
	Fulbaria	36120110	Naligang Khal SP	FMDIW C	217	Re-excavation of Ishail Beel Khal	B	
	Radhakani	36120140	Boga-ora Khal SP	FMDIW C	393	None	B	
	Naogaon	36120030	Folair Khal SP	FMDI	783	None	C	
	Enayetpur	36120050	Thanar Khal SP	FMWC	729	None	C	
	Achim Patuli	36120070	Doradia SP	DIWC	860	None	C	
	Kaladaha	36120080	Ghazakuri Khal SP	FMDI	846	None	C	
	Bakta	36120090	Salnar Khal SP	DIWC	605	None	C	
	Deokhola	36120120	Kalibazail-Laxmipur SP	DI	1,137	None	C	
	Fulbaria, Radhakani	36120130	Chhagalchira Khal - Radher Khal SP	FMDIW C	796	Re-excavation of Ishail Beel Khal	C	
	Rangamati	36120040	Bara Beel SP	FMDI	589	Bara Beel FCD	D	Further examination to be required
	Kushmail & Putijana	36120022	Digambori Khal - Hizla Khal SP	FMDIW C	1,545	None	L	Benefited area more than 1,000 ha
	Bhabanipur	36120060	Sharashati Khal SP	DIWC	1,240	None	L	Benefited area more than 1,000 ha
Gaffargaon	Rasulpur	36122010	Bangalil Khal - Chat Beel Khal SP	FMDIWC	629	None	A	
	Masakhali	36122060	Ubakuri Khal SP	DI	237	None	B	
	Gaffargaon	36122070	Bhatiar Beel SP	FMDIW C	1,067	None	B	
	Jessor	36122020	Kura Beel Khal SP	FMDIW C	232	None	C	
	Barabaria	36122030	Charipara Khal SP	FMDI	483	None	C	
	Masakhali	36122050	Kuti Beel Khal and Adbander Khal SP	DI	325	None	C	
	Char Algi	36122110	Char Algi SP	FMDI	1,198	Char Algi Flood Embankment	C	
	Raona	36122130	Julnar Khal SP	DI	439	None	C	

Table 4.2 List of Prioritized Potential Subprojects in Mymensingh District (2/4)

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Gaffargaon	Saltia	36122040	Rouha CAD SP	CAD	412	None	D	Further examination to be required
	Paithal	36122080	Dubail - Doulpara - Barai SP	FMDIWC	918	Upper Sila FCD Project	D	Further examination to be required
	Nigari	36122090	Dholair Khal SP	FMDI	217	Dholair FCD Project	D	Further examination to be required
	Tengaba	36122100	Boumara - Khaluner Khal SP	FMDIWC	2,472	None	L	Benefited area more than 1,000 ha
	Dalter Bazar & Langair & Panchbag & Usthi	36122121	Damini Khal - Bauleswar River Siuli - Simakhali Khal SP	FMDIWC	5,938	Bauleswar Drainage SP Simakhali Khal Project	L	Benefited area more than 1,000 ha
Gouripur	Mailakanda	36123020	Bogadia Khal SP	DI	691	None	A	
	Achintapur	36123040	Suria River SP	DIWC	464	None	B	
	Dowhakhola	36123062	Angrail-Beel Kalia-Shalpa Dowhakhola-Kaladia Khal	FMDI	1,163	None	B	
	Sidhla	36123010	Bora Beel -Sidhlong Beel Khal SP	FMDI	668	None	C	
	Bokainagar	36123070	Maizga Khal SP	FMDIWC	513	None	C	
	Gouripur	36123030	Lanka Khal SP	FMDI	2,079	None	L	Benefited area more than 1,000 ha
	Ramgopalpur	36123061	Mirkhali-Balloa Khal SP	DI	1,285	None	L	Benefited area more than 1,000 ha
	Maoha	36123050	Please Refer to SP 37247130 of Kendua/Netrakona					
Bhangnamari	36123090	Please Refer to SP 36131020 of Ishwarganj/Mymensingh						
Gouripur & Ishwarganj	Sahanati & Sohagi	36123080	Doyka Khal, Daya - Dalia Beel SP	DIWC	1,230	None	L	Benefited area more than 1,000 ha
Haluaghat	Bildora	36124090	Kala Anda - Jam Beel SP	FMDI	1,129	Auti to Futkai Ferryghat Embankment	A	
	Jugli	36124020	Tukiar Khal SP	WC	811	None	B	
	Dhara	36124050	Silka Khal SP	DI	703	None	B	
	Dhurail	36124040	Mora Kangsha SP	DIWC	1,147	None	C	
	Swadeshi	36124070	Swaseshi - Bausi SP	DI	523	Konapara-Futkai Embankment	C	
	Sakuai	36124080	Balijuri-Sakuai Embankment SP	FMDI	767	Batta-Otipara Embankment	C	
	Gazir Bhita	36124110	Shimulkuchi - Borak Ghoshgaon SP	WC	683	None	C	
	Bhubankura	36124010	Karaitala - Kumargati SP	WC	645	None	D	Further examination to be required
	Kaichapur	36124030	Boro Khal SP	DIWC	736	None	D	Further examination to be required
	Narail	36124120	Narail Rubber Dam SP	DIWC	951	None	D	Further examination to be required
	Amtoil	36124060	Kodiala - Nagla Khal SP	FMDI	1,666	Bahisimul-Sarchapur left Kangsha Embankment	L	Benefited area more than 1,000 ha
Haluaghat	36124100	Kuchandhara Khal SP	WC	1,229	None	L	Benefited area more than 1,000 ha	
Iswarganj	Atharabari	36131110	Dholai Beel - Kachamatia River Khal SP	DI	171	None	A	
	Sohagi	36131080	Doran Barabagh Khal SP	FMDI	522	None	B	
	Sarisha	36131100	Baugola - Dhalai Beel Khal, Bhangnamari SP	DI	821	None	B	
	Tarundia	36131030	Zia Khal SP	DI	772	None	C	
	Uchakhila	36131041	Bot Tol Beel SP	DIWC	633	None	C	
	Barahit	36131042	Shamara - Sakrail Beel Khal SP	DIWC	454	None	C	
	Iswarganj	36131070	Sinduk Khal SP	DI	384	None	C	
Atharabari	36131120	Dholeswari Khal SP	DI	515	None	C		

Table 4.2 List of Prioritized Potential Subprojects in Mymensingh District (3/4)

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Iswarganj	Magtola & Majibag	36131051	Maga Khal - Katta - Dubdil - Hingua Beel SP	DIWC	1,357	None	L	Benefited area more than 1,000 ha
	Jatia & Majibag	36131061	Bagjuri Khal - Kumuria Beel SP	DIWC	1,432	None	L	Benefited area more than 1,000 ha
	Sohagi	36131090	Please Refer to SP36123080 of Gouripur/Mymensingh					
Iswarganj & Gouripur	Rajibpur & Uchakhila & Bhangnamari	36131020	Char-Noapara - Char-Algis Embankment SP	FMDI	1,974	Embankment from Napiter Algi to Chandrapara	L	Benefited area more than 1,000 ha
Mymensingh Sadar	Dapunia	36152050	Kasma Beeler Khal SP	DI	172	None	A	
	Kushtia	36152010	Dari Kustia SP	DI	217	None	B	
	Borarchar	36152030	Char Ragabpur Embankment SP	FM	456	Flood Control Drainage Project	B	
	Kushtia	36152020	Ganginar Khal SP	DIWC	544	None	C	
	Ghagra	36152060	Indrajan Khal SP	DIWC	688	None	C	
	Paranganj	36152040	Sonadia SP	DIWC	219	None	D	Further examination to be required
	Sirta	36152080	Sirta SP	FMDI	952	Large scale flood control project by BWDB	D	Further examination to be required
	Char Ishwardia	36152090	Char Iswardia Embankment SP	FM	779	None	D	Further examination to be required
	Akua & Baera & Bhabakhali & Khaadhar	36152073	Akua Khal - Sailmari Khal - Pagaria River- Matium Khal SP	DIWC	4,621	None	L	Benefited area more than 1,000 ha
Char Nilakshia	36152100	Sree Khali SP	FMDIWC	1,531	None	L	Benefited area more than 1,000 ha	
Muktagechha	Baragram	36165030	Tekhala - Nowdhara - Katajora Khal SP	DIWC	986	None	A	
	Daogaon	36165020	Khaila Beel SP	DIWC	615	Embankment & sluice gate (inoperative)	B	
	Kheruajani	36165050	Singra Khal SP	DI	839	None	B	
	Ghoga	36165010	Haora Khal SP	DIWC	619	None	C	
	Dulla	36165045	Kuripara Kuhur Khali Khal SP	DI	372	None	C	
	Kheruajani	36165060	Kejakuri Khal SP	DIWC	628	None	C	
	Basati & Kashimpur & Mankon	36165043	Bajjana Khal, Kochua - Dholar Khal & Bajjana Khal, Baril Beel & Aimon River SP	DIWC	3,549	Begunbari sluice gate	L	Benefited area more than 1,000 ha
Kumarghata & Tarati	36165071	Katakhali Khal - Gouri Khal SP	FMDI	1,286	Begunbari sluice gate	L	Benefited area more than 1,000 ha	
Nandail	Gangail	36172091	Betai River SP	DI	660	Embankment from Galipara to Sundail via Nasratpur Bridge	A	
	Singrail	36172080	Bhedapuri - Narsunda Khal SP	DI	988	Baroikhali Sluice Gate to Dhakipara Embankment Project	B	
	Chandipasha	36172092	Dholeswari River SP	FMDI	513	Re-excavation of Dholeswari River	B	
	Pourashava	36172130	Borbori Beel SP	DIWC	218	None	B	
	Betagair	36172010	Char Lakshmidia to Char Uttar Bandh SP	FMDIWC	807	Ujanpara - Komorbhanga Embankment SP	C	
	Kharua	36172030	Komola Narendrapur Khal SP	DIWC	819	None	C	
	Sherpur	36172040	Brahman Khali Khal SP	DIWC	933	None	C	
	Achargaon	36172070	Noldighir Khal SP	DI	216	None	C	
	Rajgati	36172100	Rairar Khal SP	DI	890	Sukajuri Embankment Project	C	
	Achargaon	36172120	Tongi Khal SP	DI	719	None	C	
Moazzempur	36172020	Chengua Khal SP	FMDIWC	1,216	Re-excavation of Kath Mojha Khal	L	Benefited area more than 1,000 ha	

Table 4.2 List of Prioritized Potential Subprojects in Mymensingh District (4/4)

Upazila	Union Proposed	SP_ID	Title	Type	Gross Area (ha)	BWDB Project	Implementation as SP for SSWRD	
							Priority	Remarks
Nandail	Nandail	36172060	Bolda - Gangina Beel SP	FMDIWC	1,604	Re-excavation of Khal Connecting Gozaria Beel to Jhalua Bridge	L	Benefited area more than 1,000 ha
	Musulli	36172110	Please Refer to SP34849022 of Sadar Kishoreganj					
Nandail & Hossainpur	Jahangirpur & Gobindapur	36172050	Tamni Beel - Kopaler Beel - Moral Beel, Bogar Khal SP	DIWC	1,467	Re-excavation of Rohila Khali River	L	Benefited area more than 1,000 ha
Phulpur	Bishka	36181170	Mesera Embankment SP	FM	690	None	A	
	Dhakua	36181120	Tukanda - Kathuri Embankment SP	FM	498	Excavation of Dhalai River	B	
	Kamargaon	36181130	Kamargaon - Kalika Ferryghat Embankment SP	FM	678	None	B	
	Galagaon	36181140	Dharakandi Khal SP	DI	519	None	B	
	Kakni	36181080	Pungai Bastala Khal SP	FMDIWC	948	None	C	
	Balikhani	36181090	Balikhani Khal SP	DIWC	300	None	C	
	Banihala	36181110	Digarkanda - Banihola Embankment SP	FM	594	Gazipara to Dieranadi Khal re-excavation and construction of embankment	C	
	Kamaria	36181152	Khoiyapuri Khal - Datter Khal SP	DI	516	None	C	
	Tarakanda	36181180	C&B Bridge - Dhalil Kanda Embankment SP	FM	476	Tarakanda-Rangsha Nadi Embankment	C	
	Rahimgonj	36181050	Payari Rahimgonj Road - Beltali Bazar Embankment SP	FM	781	None	D	Further examination to be required
	Singheswar	36181060	Nishuniakanda Regulator SP	FM	745	Embankment from Kotura Kanda Alimuddin's House to Fazlul Haque's House	D	Further examination to be required
	Chandhara	36181010	Malijhee River SP	FM	1,261	None	L	Benefited area more than 1,000 ha
	Bhaitakandi, ambhadrapur & Payari	36181030	Kharia River, Rambhadrapur Eidgah Math - Beltali Embankment SP	FM	2,513	None	L	Benefited area more than 1,000 ha
	Phulpur	36181070	Fatehpur - Thakur Bakhai Embankment SP	FMWC	1,635	Kaziakanda to Moishraanda Embankment cum Road	L	Benefited area more than 1,000 ha
	Balia & Baola & Rupasi	36181102	Solonga - Boroikandia, Boroikandi - Medha, Due - Ghumbaon Embankment SP	FM	1,765	Dampara scheme Embankment from Basati to Ghumbaon	L	Benefited area more than 1,000 ha
Rampur	36181160	Bara - Bisundar - Burburia Beel SP	DIWC	1,420	None	L	Benefited area more than 1,000 ha	
Trishal	Mokshapur	36194060	Medoari River Embankment SP	FMDI	851	None	A	
	Mathbari	36194040	Dubura Chara Beel SP	DIWC	376	None	B	
	Balipara	36194110	Dobadanga Khal SP	DIWC	555	None	B	
	Mathbari	36194050	Bolon - Dawhail - Kechuri - Gerakuri Beel SP	DIWC	721	None	C	
	Kanihari	36194090	Budhir Khal SP	DIWC	433	None	C	
	Mathbari	36194030	Murai Beel SP	DIWC	116	None	D	Further examination to be required
	Trishal	36194150	Dhalir Beel - Dari Beel SP	FMDIWC	339	None	D	Further examination to be required
	Dhanikhola	36194012	Nageshwari River SP	DI	1,484	None	L	Benefited area more than 1,000 ha
	Bailar, Kthal & Rampur	36194070	Dharar Khal, Kanthal, Katakali Khal - Hagra Khal SP	DI	3,098	Sluice gate at downstream of Buka beel	L	Benefited area more than 1,000 ha
	Harirampur & Sakhua	36194131	South Kanda - Chater Ghat Embankment & Laitar Khal, Bairar Khal SP	FMDIWC	2,132	None	L	Benefited area more than 1,000 ha
	Rampur	36194100	Please Refer to 36194070 of Trishal Mymensingh					
Trishal & Bhaluka	Amirabari & Dhitpur	36194140	Amirabari - Gopalpur, Shimulia Khal SP	DIWC	1,180	None	C	

Table 5.1 List of Potential Subproject for SSWRDP in Mymensingh District (1/5)

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Investment Cost (Tk. 'ooo)
								Earth Work	Structure		
1	Bhaluka	Uthura	A	36113100	Bajuajora Khal SP	WC	536	None	1 regulator	None	7,200
2	Dhobaura	Dakshin Majjpara	A	36116030	Shashi Khal SP	DIWC	292	Re-excavation of Shashi khal: L=5km, W=9m, D=1.2m	None	None	5,646
3	Fulbaria	Balian	A	36120010	Kalmina Khal SP	FMDI	567	New construction of Embankment (L=1km, W=6m, D=2m), Re-excavation of Kalmina Khal (L=1km, W=6m, D=2m) and Re-excavation of Hugli Khal (2km, W=2.25m, D=1.05m)	1 regulator	None	9,482
4	Gaffargaon	Rasulpur	A	36122010	Bangalil Khal - Chat Beel Khal SP	FMDI WC	629	Re-excavation of Chat beel khal: L=2km, W=10m, D=2.5m; Re-excavation of Bangalil khal: L=6km, W=10m, D=2.5m Re-excavation of Chater Khal: L=2.5km, W=10m, D=2.5m Re-excavation of Barail Khal: L=2km, W=10m, D=2.5m	One regulator	None	18,170
5	Gouripur	Mailakanda	A	36123020	Bogadia Khal SP	DI	691	Re-excavation of Khal (L=1.3km, W=6m, D=2.1m)	None	None	789
6	Haluaghat	Bildora	A	36124090	Kala Anda - Jam Beel SP	FMDI	1,129	Re-excavation of Kanakuri Kanda khal: L=3km, W=6m, D=1m; Re-excavation of Haora khal: L=1.5km, W=15m, D=1m; Re-excavation of Bhangar khal: L=1km, W=8m, D=1m; Re-excavation of Kala Anda khal: L=3km, W=15m, D=1m	One regulator	Auti to Futkai Ferryghat Embankment	14,155
7	Iswarganj	Atharabari	A	36131110	Dholai Beel - Kachamatia River Khal SP	DI	171	Re-excavation of Khal: L=4km, W=4.5m, D=1.8m	None	None	1,637
8	Mymensingh Sadar	Dapunia	A	36152050	Kasma Beeler Khal SP	DI	172	Re-excavation of Kasma Beeler Beel Khal: L=1.5km, W=6m, D=2.4m	None	None	1,091
9	Muktagachha	Baragram	A	36165030	Tekhala - Nowdhara - Katajora Khal SP	DIWC	986	Re-excavation of Tekhala, Nowdhara and Katajora khals: L=4km, W=6m, D=1.2m	One regulator at the mouth of Katajora khal	None	5,782
10	Nandail	Gangail	A	36172091	Betai River SP	DI	660	Re-excavation of Betai river: L=7km, W=9m, D=1.5m	Upgrade BWDB 4-vent sluice gate at Tarail	Embankment from Gatipara to Sundail via Nasratpur Bridge	10,930
11	Phulpur	Bishka	A	36181170	Mesera Embankment SP	FM	690	Rehabilitation of embankment: L=3.5km, W=4.3m, H=2.1m	One regulator on Soai river	None	10,010
12	Trishal	Mokshapur	A	36194060	Medoari River Embankment SP	FMDI	851	Rehabilitation of Medoari river embankment: L=6.5km, W=4.9m, H=3m; Re-excavation of Doradi khal: L=2km, W=10m, D=2.5m; Re-excavation of Boali khal: L=1km, W=6m, D=1.8m; Re-excavation of Kuch Khali khal: L=2km, W=10m, D=2.5m	Three regulators on embankment at Narai river, Boali khal and Doradi khal	None	27,195

Table 5.1 List of Potential Subproject for SSWRDP in Mymensingh District (2/5)

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Investment Cost (Tk. 'ooo)	
								Earth Work	Structure			
13	Bhaluka	Kachina	B	36113030	Shalda Khal SP	WC	419	Re-excavation of Shalda Khal (L=4km, W=20m, D=0.9m)		None	9,627	
14	Dhobaura	Ghoshgaon	B	36116020	Ghoshgaon-Bhuiyanpara SP	DIWC	1,135	Re-excavation of Tarai khal: L=3km, W=18m, D=1.2m; Re-excavation of Pachai khal: L=3km, W=12m, D=1.2m; Three new lined irrigation canals: L=7km, W=3m, D=1.5m		One weir (instead of originally proposed rubber dam) on Nitai river	None	35,240
15	Fulbaria	Bakta	B	36120100	Baza Beel Khal SP	DIWC	157	Re-excavation of Baza Beel Khal (L=1km, W=6m, D=1.5m)		1 regulator	None	3,991
16		Fulbaria	B	36120110	Naligang Khal SP	FMDI WC	217	Re-excavation of Naligang Khal (L=3km, W=6m, D=3m)		1 regulator	Re-excavation of Ishail Beel Khal	6,584
17		Radhakanai	B	36120140	Boga-ora Khal SP	FMDI WC	393	Re-excavation of Boga-ora Khal (L=4km, W=9m, D=3m)		1 regulator	None	8,716
18	Gaffargaon	Masakhali	B	36122060	Ubakuri Khal SP	DI	237	Re-excavation of Ubakuri khal: L=4km, W=9m, D=1m		None	None	1,326
19		Gaffargaon	B	36122070	Bhatiar Beel SP	FMDI WC	1,067	Re-excavation of Bhatiar khal: L=9km, W=15m, D=3m; Re-excavation of Bhatiar Kennar khal: L=3km, W=10m, D=2.5m		One regulator on Bhatiar khal downstream of confluence with Kennar khal	None	30,684
20	Gouripur	Achintapur	B	36123040	Suria River SP	DIWC	464	Re-excavation of Suria River (L=9km, W=30m, D=1.5m)		None	None	11,501
21		Dowhakhola	B	36123062	Angrail-Beel Kalia-Shalpa Dowhakhola-Kaladia Khal	FMDI	1,163	Re-excavation of Khal (L=4km, W=1.5m, D=0.45m)		None	None	10,924
22	Haluaghat	Jugli	B	36124020	Tukiar Khal SP	WC	811	Re-excavation of Tukiar khal: L=2.5km, W=9m, D=1.8m		One regulator	None	12,463
23		Dhara	B	36124050	Silka Khal SP	DI	703	Re-excavation of Silka khal: L=4.5km, W=7.6m, D=1.2m		None	None	1,603
24	Iswarganj	Sohagi	B	36131080	Doran Barabagh Khal SP	FMDI	522	Re-excavation of Doranborbagh Khal: L=5km, W=6m, D=2m New excavation of Khal: L=1km, W=6m, D=1.5m New construction of flank embankment on both sides of the proposed regulator: L=0.5km, W=5m, H=2.5m		One regulator	None	11,715
25		Sarisha	B	36131100	Baugola - Dhalai Beel Khal, Bhangnamari SP	DI	821	Re-excavation of Khal: L=5km, W=7.5m, D=2.1m		None	None	3,531
26	Mymensingh Sadar	Kushtia	B	36152010	Dari Kushtia SP	DI	217	Re-excavation of Dari Kushtia Khal: L=1.5km, W=20m, D=3m		None	None	3,482
27		Borarchar	B	36152030	Char Ragabpur Embankment SP	FM	456	Improvement of existing kacha road into road cum embankment: L=4km, W=5m, H=3m		One gated outlet	Flood Control Drainage Project	13,136
28	Muktagachha	Daogaon	B	36165020	Khaila Beel SP	DIWC	615	Re-excavation of Ganiar khal: L=7km, W=10m, D=1.2m		One regulator at downstream of Khaila beel at Porabari	Embankment and sluice gate (inoperative)	10,330
29		Kheruajani	B	36165050	Singra Khal SP	DI	839	Re-excavation of Singra khal: L=10km, W=2.7m, D=1.2m		None	None	1,705
30	Nandail	Singrail	B	36172080	Bhedapuri - Narsunda Khal SP	DI	988	Re-excavation of Bhedapuri khal: L=5km, W=6m, D=1.5m; Re-excavation of Narsunda khal (uppermost stream of Narsunda river): L=5km, W=15m, D=1.5m		One regulator on Narsunda khal near Sayed Ali's house	Baroikhal Sluice Gate to Dhakipara Embankment Project	11,640



Table 5.1 List of Potential Subproject for SSWRDP in Mymensingh District (3/5)

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Investment Cost (Tk. 'ooo)
								Earth Work	Structure		
31	Nandail	Chandipasha	B	36172092	Dholeswari River SP	FMDI	513	Re-excavation of Dholeswari river from Basati C&B road to Narsunda river: L=5km, W=9m, D=1.5m	One regulator on Dholeswari river at confluence with Narsunda river	Re-excavation of Dholeswari River	9,865
32		Pourashava	B	36172130	Borbori Beel SP	DIWC	218	Re-excavation of Borbori khal: L=0.5km, W=9m, D=1.2m	One regulator on downstream of Borbori khal before confluence with Narsunda river	None	4,805
33	Phulpur	Dhakua	B	36181120	Tukanda - Kathuri Embankment SP	FM	498	Rehabilitation construction of embankment: L=5km, W=4.3m, H=2.4m	None	Excavation of Dhalai River	14,891
34		Kamargaon	B	36181130	Kamargaon - Kalika Ferryghat Embankment SP	FM	678	Rehabilitation of embankment: L=10km, W=4.3m, H=3.7m	None	None	10,798
35		Galagaon	B	36181140	Dharakandi Khal SP	DI	519	Re-excavation of Dharakandi khal: 3km, W=11m(B=6.1m), D=1.2m (khal re-excavation need to be extended 3km upstream up to Phenera beel)	None	None	1,796
36	Trishal	Mathbari	B	36194040	Dubura Chara Beel SP	DIWC	376	Re-excavation of Dhubra Chara khal: L=5km, W=6m, D=1.8m	One regulator at mouth of Dhubra Chara khal	None	6,073
37		Balipara	B	36194110	Dobadanga Khal SP	DIWC	555	Re-excavation of Dobadanga khal: L=6km, W=6m, D=1.2m	One regulator on Dobadanga khal over road at upstream of Bonna beel	None	8,974
38	Bhaluka	Bhaluka & Bharadoba	C	36113061	Chullar Khal - Afainya/Harar Khal SP	DIWC	940	Re-excavation of Chullar Khal: L=3km, W=42m, D=1.5m Re-excavation of Afainya/Harar Khal: L=10km, W=6m, D=1.5m	None	Existing 5-vent regulator	20,996
39		Birunia	C	36113080	Langohata Khal SP	DIWC	896	Re-excavation of Langohata Khal (L=6km, W=30m, D=1.5m)	One 1-vent sluice gate	BWDB Embankment	19,966
40	Dhobaura	Baghber	C	36116010	Tarai Khal SP	DIWC	757	Re-excavation of Tarai khal: L=6km, W=9m, D=1.5m	One regulator at the union boundary	None	10,397
41	Fulbaria	Naogaon	C	36120030	Foliar Khal SP	FMDI	783	Re-excavation of Jalkhora Beel Khal (L=2km, W=6m, D=2m), Fariar Khal (4km, W=15m, D=3m), Bengachonar Khal (L=3km, W=7m, D=5m) and construction of embankment (L=1km, W=4.5m, D=1.5m)	None	None	23,521
42		Enayetpur	C	36120050	Thanar Khal SP	FMWC	729	Re-excavation of Thanar Khal (L=2.5km, W=6m, D=2m), New construction of embankment (L=4.5km, W=4.5m, H=2m)	1 regulator	None	14,311
43		Achim Patuli	C	36120070	Doradia SP	DIWC	860	Re-excavation of Doradia Khal (L=1km, W=20m, D=3m), Sripolia Khal (L=2.5km, W=15m, D=3m), Kalail Khal (L=2.5km, W=12m, D=3m), Simulia Khal (L=1.5km, W=10m, D=2.5m), Chand Khal (L=2.5km, W=10m, D=2.5m) and Khapsaker Khal (L=2km, W=10m, D=2.5m)	1 regulator	None	28,161
44		Kaladaha	C	36120080	Ghazakuri Khal SP	FMDI	846	Re-excavation of Guzakuri Khal (L=4km, W=3m, D=2.1m) and New construction of Embankment (3km, W=4.5m, H=1.5m)	1 regulator	None	15,209
45		Bakta	C	36120090	Salnar Khal SP	DIWC	605	Re-excavation of Salner Khal (L=2km, W=4.5m, D=0.9m)	1 regulator	None	7,533
46		Deokhola	C	36120120	Kalibazail-Laxmipur SP	DI	1,137	Re-excavation of Bazail Khal (L=7.5km, W=15m, D=3m), Laxmipur Khal (L=2.5km, W=10m, D=2.5m)	None	None	16,570
47		Fulbaria, Radhakani	C	36120130	Chhagalchira Khal - Radher Khal SP	FMDI WC	796	Re-excavation of Chhagalchira Khal (L=3km, W=6m, D=3m) Re-excavation of Radher Khal (L=3km, W=18m, D=4.5m)	1 regulator	Re-excavation of Ishail Beel Khal	20,736
48		Gaffargaon	Jessora	C	36122020	Kura Beel Khal SP	FMDI WC	232	Re-excavation of Kura khal: L=4km, W=6m, D=1.5m	One regulator	None
49	Barabaria		C	36122030	Charipara Khal SP	FMDI	483	Re-excavation of Charipara khal: L=2.5km, W=4.6m, D=1.5m	One regulator on Charipara khal	None	8,011

Table 5.1 List of Potential Subproject for SSWRDP in Mymensingh District (4/5)

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Investment Cost (Tk. 'ooo)
								Earth Work	Structure		
50	Gaffargaon	Masakhali	C	36122050	Kuti Beel Khal and Adbander Khal SP	DI	325	Re-excavation of Kuti beel khal: L=1km, W=4.5m, D=1m; Re-excavation of Adbander khal: L=1.5km, W=4.5m, D=1m	None	None	474
51		Char Algi	C	36122110	Char Algi SP	FMDI	1,198	Rehabilitation of east embankment: L=3.5km, W=3.7m, H=1.8m; Re-excavation of Nayapara - Char Algi khal: L=2km, W=4.8m, D=1m; Re-excavation of Adiakhali khal: L=1.5km, W=3m, D=1m; Re-excavation of Char Moslanda - Kurutalipa khal: L=2km, W=3m, D=1.5m; Re-excavation of Char Moslanda - Hatimara khal: L=2.5km, W=3m, D=1.5m	None	Char Algi Flood Embankment (almost flushed out)	14,598
52		Raona	C	36122130	Julnar Khal SP	DI	439	Re-excavation of Julnar khal: L=3km, W=15m, D=1.2m	None	None	1,910
53	Gouripur	Sidhla	C	36123010	Bora Beel -Sidhlong Beel Khal SP	FMDI	668	Re-excavation of Khal (L=6km, W=1.5m, D=0.45m)	None	None	7,385
54		Bokainagar	C	36123070	Maizga Khal SP	FMDI WC	513	Re-excavation of Khal (L=1.5km, W=1.5m, D=0.45m)	1 sluice gate	None	7,246
55	Haluaghat	Dhurail	C	36124040	Mora Kangsha SP	DIWC	1,147	Re-excavation of Mora Kangsha river: L=7km, W=60m, D=1.8m; Re-excavation of Chakua beel khal: L=1.5km, W=6m, D=1m; Re-excavation of Komila beel khal: L=1.5km, W=4.5m, D=1.5m	None	None	25,784
56		Swadeshi	C	36124070	Swadeshi - Baushi SP	DI	523	Re-excavation of Baushi khal: L=2km, W=7.6m, D=1.8m; Re-excavation of Swadeshi Gatar khal: L=1km, W=7.6m, D=1.2m	None	Konapara-Futkai Embankment	1,527
57		Sakuai	C	36124080	Balijuri-Sakuail Embankment SP	FMDI	767	Rehabilitation of embankment: L=4km, W=3.7m, H=1.2m	Two regulators	Batta-Otipara Embankment	8,517
58		Gazir Bhita	C	36124110	Shimulkuchi - Borak Ghoshgaon SP	WC	683	None	One regulator	None	7,200
59	Iswarganj	Tarundia	C	36131030	Zia Khal SP	DI	772	Re-excavation of Zia Khal: L=1km, W=10.5m, D=2.7m Re-excavation of Mirkhali Khal	None	None	1,241
60		Uchakhila	C	36131041	Bot Tol Beel SP	DIWC	633	Re-excavation of Bot Tol Beel Khal: L=2km, W=6m, D=2m New excavation of Khal: L=0.5km, W=5m, D=1.5m	Two regulators	None	8,699
61		Barahit	C	36131042	Shamara - Sakrail Beel Khal SP	DIWC	454	Re-excavation of khal: L=6km, W=10m, D=1.2m	1 regulator	None	9,883
62		Iswarganj	C	36131070	Sinduk Khal SP	DI	384	Re-excavation of Sinduk Khal: L=3km, W=6m, D=2.4m	1 regulator	None	5,783
63		Atharabari	C	36131120	Dholeswari Khal SP	DI	515	Re-excavation of Dholeswari Khal: L=5km, W=7.5m, D=1.8m	None	None	2,899
64	Mymensingh Sadar	Kushtia	C	36152020	Ganginar Khal SP	DIWC	544	Re-excavation of Ganginar Khal: L=3km, W=10m, D=3m Re-excavation of Gori Khal: L=4km, W=10m, D=3m	One regulator	None	16,816
65		Ghagra	C	36152060	Indrajan Khal SP	DIWC	688	Re-excavation of Indrajan Khal: L=7km, W=10.5m, D=2.5m	1 regulator	None	14,799
66	Muktagachha	Ghoga	C	36165010	Haora Khal SP	DIWC	619	Re-excavation of Haora khal: L=4km, W=5m, D=1.2m	One regulator at Chanpur village	None	4,631
67		Dulla	C	36165045	Kuripara Kuhur Khali Khal SP	DI	372	Re-excavation of Kuripara Kuhur Khali khal: L=1.5km, W=10m, D=2m	None	None	1,232
68		Kherujani	C	36165060	Kejakuri Khal SP	DIWC	628	Re-excavation of Kejakuri khal: L=2km, W=6m, D=1.5m	One regulator at mouth of Kejakuri khal	None	5,382

Table 5.1 List of Potential Subproject for SSWRDP in Mymensingh District (5/5)

Sr. No.	Upazila	Proposed Union	Priority	SP_ID	Title	Type	Gross Area (ha)	Expected Work Volume		BWDB Project	Investment Cost (Tk. 'ooo)
								Earth Work	Structure		
69	Nandail	Betagair	C	36172010	Char Lakshmidia to Char Uttar Bandh SP	FMDI WC	807	Re-excavation of Char Lakshmidia to Char Uttar Bandh khal: L=5km, W=10m, D=1.8m	None	Ujanpara - Komorbhanga Embankment SP	14,410
70		Kharua	C	36172030	Komola Narendrapur Khal SP	DIWC	819	Re-excavation of Komola Narendrapur khal: L=7km, W=9m, D=1.2m	One regulator on upstream of Bapail beel at Abdullahpur	None	13,665
71		Sherpur	C	36172040	Brahman Khali Khal SP	DIWC	933	Re-excavation of Brahman Khali khal: L=6.5km, W=15m, D=1.2m	One regulator on Brahman Khali khal downstream of confluence with Kantoiler khal at Hashimpur - Shekher Dagor	None	16,111
72		Achargaon	C	36172070	Noldighir Khal SP	DI	216	Re-excavation of Noldighir khal: L=3km, W=6m, D=1.2m	None	None	4,487
73		Rajgati	C	36172100	Rairar Khal SP	DI	890	Re-excavation of Rairar khal: L=5km, W=9m, D=1.5m	Upgrade BWDB 4-vent sluice gate at Tarail	Sukajuri Embankment Project	8,265
74		Achargaon	C	36172120	Tongi Khal SP	DI	719	Re-excavation of Tongi khal: L=5km, W=9m, D=1.2m	None	None	2,046
75		Phulpur	Kakni	C	36181080	Pungai Bastala Khal SP	FMDI WC	948	Re-excavation of Pungai Bastala khal: 8km, W=11m, D=1.5m	One regulator	None
76	Balikhan		C	36181090	Balikhan Khal SP	DIWC	300	Re-excavation of Balikhan Khal (L=4km, W=14.1m, D=1.5m)	None	None	6,698
77	Banihala		C	36181110	Digarkanda - Banihola Embankment SP	FM	594	Rehabilitation of embankment: L=4km, W=4.3m, H=2.4m	One regulator	Gazipara to Diaranadi Khal re-excavation and construction of embankment	11,129
78	Kamaria		C	36181152	Khoiyapuri Khal - Datter Khal SP	DI	516	Re-excavation of Nao Dhara khal: L=2km, W=21m, D=1.2m; Re-excavation of Khoiyapuri khal: L=2km, W=21m, D=1.2m Re-excavation of Datter khal: L=1.5km, W=15m, D=1.2m	None	None	4,411
79	Tarakanda		C	36181180	C&B Bridge - Dhail Kanda Embankment SP	FM	476	Rehabilitation of embankment: L=3km, W=4.3m, H=2.1m	None	Tarakanda-Rang sha Nadi Embankment	9,608
80	Trishal	Mathbari	C	36194050	Bolon - Dawhail - Kechuri - Gerakuri Beel SP	DIWC	721	Re-excavation of Bolon khal: L=0.5km, W=7.5m, D=0.6m; Re-excavation of Dawhail khal: L=2km, W=6m, D=1.2m; Re-excavation of Kechuri khal: L=3km, W=6m, D=1.5m; Re-excavation of Gerakuri khal: L=1km, W=7.5m, D=0.6m; Rehabilitation of embankment along Khiru river: L=5.5km, W=4.3m, H=2.4m	Four regulators at mouths of beels	None	14,604
81		Kanihari	C	36194090	Budhir Khal SP	DIWC	433	Re-excavation of Budhir khal: L=4km, W=6m, D=1.4m	One regulator at mouth of Budhir khal	None	8,632
82	Trishal & Bhaluka	Amirabari & Dhitpur	C	36194140	Amirabari - Gopalpur, Shimulia Khal SP	DIWC	1,180	Re-excavation of Noa beel khal: L=5km, W=10m, D=3m Re-excavation of Simulia khal (Trishal side): L=3km, W=7m, D=3m Re-excavation of Hoinder beel khal: L=1.5km, W=8m, D=3m Re-excavation of Shimulia Khal (Bhaluka side): L=8km, W=21m, D=1.5m	Four culverts	None	22,212

Table 5.2 Major Development Possibilities of Agroecological Zones in the Mymensingh District

No	Region	Major Development Possibilities						
		Agriculture	Fishery	Livestock	Water resources	Infrastructure	Socio economy	Forestry/ Environment
1	Hilly Areas (AEZ-22: Northern and eastern piedmont and AEZ-29 Northern and eastern hills)	Integrated agriculture on cereals, horticultural (especially pineapple, jack fruit, banana), green manure crops.	Open water and closed water fisheries	Dairy farm. Aqua animal mainly duck.	Surface water storage by dyking hill streams.	Development of road communication, settlements market places.	Improvement of social amenities.	Protection of the environment.
2	Terrace Areas (AEZ-28: Madhupur Tract)	The region is no longer subject to inundation by normal flooding. The soils are comprised of Madhupur clays. The dominant cropping pattern is two rice crops followed by a rabi crop.	Open water and closed water fisheries	Duck, poultry (mainly layer and broiler) farm.	Surface water storage by dyking hill streams..	Improvement of all weather road communication, housing and settlements, market places etc.	Improvement of social amenities.	Protection of poor masses.
3a	Floodplain Areas (AEZ-9: Old Brahmaputra & Jamuna river)	Rice based agriculture is the main economic output of the area and increased production is caused by inadequate pre-monsoon and post-monsoon drainage. On-going sediment deposition in the drainage system will result in increasing crop losses in dry season.	Open water and closed water fisheries	Aqua animal (Duck in T.Aman field).	Planned expansion and efficient use of tube-well irrigation Multipurpose development of surface water.	Improvement of road communication, housing and settlements, commercial, administrative and educational centers.	Planned population settlement. Backyard poultry and kitchen, gardening to improve family income. Village banking to promote saving habit.	Protection against water and air pollution. Strict compliance of land use policy. Expansion of trees through annual programs.

Table 5.3 Promising Farming in Various Areas in the Study Area

Zone	Characteristics	Promising Farming System
Lowland	The lowland areas have regularly flooding and sedimentation. Two times rice cultivation can be performed, but flood damages often happened. Intensive fish culture is widely done.	In well managed lowlands an efficient farming system such as Boro-Aman-vegetables is performed. Water management and introduction of short-duration crops are important for successful cropping. 1) Improvement of farming system 2) Community seed production activities
Medium lowland	In the appropriate natural conditions integrated agricultural activities can be widely accepted by various combination of agriculture.	The integrated farming is useful for the development of rural areas. It has already been practiced in various areas , and successful cases are reported. Examples of development projects are: (1) Integrated rice-duck farming (2) Rice-fish farming
Medium highland	The area is flood-free or slightly flooded but no sedimentation area. Triple cropping is practiced in the area: Boro-Aman-potato/ vegetables. Due to Boro-Aman crop rotation, soil-born diseases or laterization are limited.	Examples of development projects. (1) Triple paddy + potato cropping after flood-free condition by SSWRDSP-1, Kanmona-Haraboti WCS Subproject, Kalai, Joypurhat> (2) Traditional potato farmers, Kishoreganj (3) Goat rearing by a rural woman of farm household.
Highland area	Highland areas are flood-free, but soil problems such as soil-nematode and laterization always happen. Water is usually supplied to soil only by rainwater. The water is short for crop growth, especially in winter.	Although natural conditions are severe, there are several promising farming systems in these areas. a. Perennial crops such as banana and pineapples b. Rice cultivation in depressed areas. c. High value-added crops can be cropped using DTW. d. Aman-vegetables-livestock (poultry) e. Crop rotation, ex. Eggplant-wheat-leek will be effective Due to no submerged conditions, damages by soil nematode are severe, crop rotation is important as well as chemicals to nematodes
Hilly land	The areas are flood-free, but soil erosion happens, and damages by flush water are also serious problems. Upland terrace and upland ridges will be useful to protect lands from soil erosion. Cover crops are also effective to protect agricultural lands. Livestock is a suitable farming system, but it often accelerates soil erosion, when grasses are eaten from roots by animal.	Due to steep slope, poor irrigation facilities and road network, farming systems vary depending on location. In steep slope area, tree crops such as rubber, tea and fruits are appropriate for marketing. Vegetable growing at homestead area can be developed. In the valley area aman rice can be grown for family consumption. For the cash generating, integrated farming with vegetable/forest-cattle will be promising. Besides the agricultural production, water conservation for Boro cultivation in dry season is also important work in the areas

Table 5.4 Development Potential of Fish Production by Agroecological Zone in Mymensingh

No	Region	Potential of development fish production in SSWRD
1	Hilly area (AEZ-22:Northern and eastern piedmont and AEZ-29 Northern and eastern hills)	<p>Generally it is not suitable for fish culture. If water remains in ponds/ditches/khals/rivers more than 50 cm depth and minimum for 6 months, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditches <ul style="list-style-type: none"> <li>◦ Tilapia mono culture,</li> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <li>◦ Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> </ul> </li> <li>• Open water bodies- Khals and rivers (dries up at dry season ) <ul style="list-style-type: none"> <li>◦ Small size pen culture (tilapia, major carps, grass carp, plankton feeder fish, <i>rajpunti</i>),</li> </ul> </li> </ul>
2	Terrace Area (AEZ-28:Madhupur Tract)	<p>Generally it is a suitable for fish culture. If water remains in ponds/ditches/khals/rivers/beels more than 1m depth and minimum 6-10 months, Such site may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch etc., <ul style="list-style-type: none"> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <li>◦ Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>◦ Rice- com fish culture,</li> <li>◦ Rice- com fish culture with duck,</li> <li>◦ Poly fish culture (major carps, Indian carps, <i>pangus</i>, etc.,)</li> </ul> </li> </ul> <p><u>To need investment large amount of finance</u></p> <ul style="list-style-type: none"> <li>◦ Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>◦ Fresh water shrimp poly culture (shrimp with fish, except carnivorous fish)</li> <li>◦ Fresh water ornamental fish poly culture (golden fish, fancy carp etc.,)</li> <li>◦ Indigenous/natural fish culture (for natural resource propagation)</li> <li>• Open water bodies- Khal/ beel/river <ul style="list-style-type: none"> <li>◦ Khal: pen or cage culture of <i>pangus</i> or major carps</li> <li>◦ Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>◦ Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure)</li> <li>◦ Kuas in beel and khal (like small hole or pool, it becomes fish shelter in low level water)</li> </ul> </li> </ul>
3a	Floodplain Areas 8AEZ-9: Old Brahmaputra & Jamina river)	<p>Generally it is a partly suitable for fish culture. If water remains in ponds/ ditches/ khals/ rivers/ beels more than 1m depth and minimum 6-10 months, it may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <p>Closed water bodies- pond and ditch etc.,, if the flood doesn't break the pond or ditch.</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch <ul style="list-style-type: none"> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <li>◦ Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>◦ Rice- com fish culture with duck,</li> <li>◦ Poly fish culture</li> <li>◦ Indigenous/natural fish (fish naturally enters the pond due to a flood) and stocking fish culture</li> </ul> </li> </ul> <p><u>To need investment large amount of finance</u></p> <ul style="list-style-type: none"> <li>◦ Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>◦ Fresh water shrimp poly culture (shrimp with fish, except carnivorous fish)</li> <li>◦ Fresh water ornamental fish poly culture (golden fish, fancy carp etc.,)</li> <li>◦ Indigenous/natural fish culture (for natural resource propagation)</li> <li>• Open water bodies- Khal/ beel/river <ul style="list-style-type: none"> <li>◦ Khal: pen or cage culture of <i>Pangas</i> or Major carps</li> <li>◦ Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>◦ Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground</li> <li>◦ Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water) by some structure) and Kuas</li> </ul> </li> </ul>

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2	Terrace Area (AEZ-28:Madhupur Tract)	<p>Generally it is a suitable for fish culture. If water remains in ponds/ditches/khals/rivers/beels more than 1m depth and minimum 6-10 months, Such site may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch etc., <ul style="list-style-type: none"> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <li>◦ Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>◦ Rice- com fish culture,</li> <li>◦ Rice- com fish culture with duck,</li> <li>◦ Poly fish culture (major carps, Indian carps, <i>pangus</i>, etc.,)</li> </ul> </li> </ul> <p><u>To need investment large amount of finance</u></p> <ul style="list-style-type: none"> <li>◦ Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>◦ Fresh water shrimp poly culture (shrimp with fish, except carnivorous fish)</li> <li>◦ Fresh water ornamental fish poly culture (golden fish, fancy carp etc.,)</li> <li>◦ Indigenous/natural fish culture (for natural resource propagation)</li> <li>• Open water bodies- Khal/ beel/river <ul style="list-style-type: none"> <li>◦ Khal: pen or cage culture of <i>pangus</i> or major carps</li> <li>◦ Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>◦ Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure)</li> <li>◦ Kuas in beel and khal (like small hole or pool, it becomes fish shelter in low level water)</li> </ul> </li> </ul>
3a	Floodplain Areas 8AEZ-9: Old Brahmaputra & Jamina river)	<p>Generally it is a partly suitable for fish culture. If water remains in ponds/ ditches/ khals/ rivers/ beels more than 1m depth and minimum 6-10 months, it may be possible to introduce low cost subsistence fish culture or income generating fish culture such as;</p> <p>Closed water bodies- pond and ditch etc.,, if the flood doesn't break the pond or ditch.</p> <ul style="list-style-type: none"> <li>• Closed water bodies- pond and ditch <ul style="list-style-type: none"> <li>◦ Tilapia with <i>Pangas</i> poly culture,</li> <li>◦ Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike,</li> <li>◦ Rice- com fish culture with duck,</li> <li>◦ Poly fish culture</li> <li>◦ Indigenous/natural fish (fish naturally enters the pond due to a flood) and stocking fish culture</li> </ul> </li> </ul> <p><u>To need investment large amount of finance</u></p> <ul style="list-style-type: none"> <li>◦ Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike,</li> <li>◦ Fresh water shrimp poly culture (shrimp with fish, except carnivorous fish)</li> <li>◦ Fresh water ornamental fish poly culture (golden fish, fancy carp etc.,)</li> <li>◦ Indigenous/natural fish culture (for natural resource propagation)</li> <li>• Open water bodies- Khal/ beel/river <ul style="list-style-type: none"> <li>◦ Khal: pen or cage culture of <i>Pangas</i> or Major carps</li> <li>◦ Beel fish culture (stocking cultured fingerling only or with natural fish )</li> <li>◦ Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground</li> <li>◦ Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water) by some structure) and Kuas</li> </ul> </li> </ul>

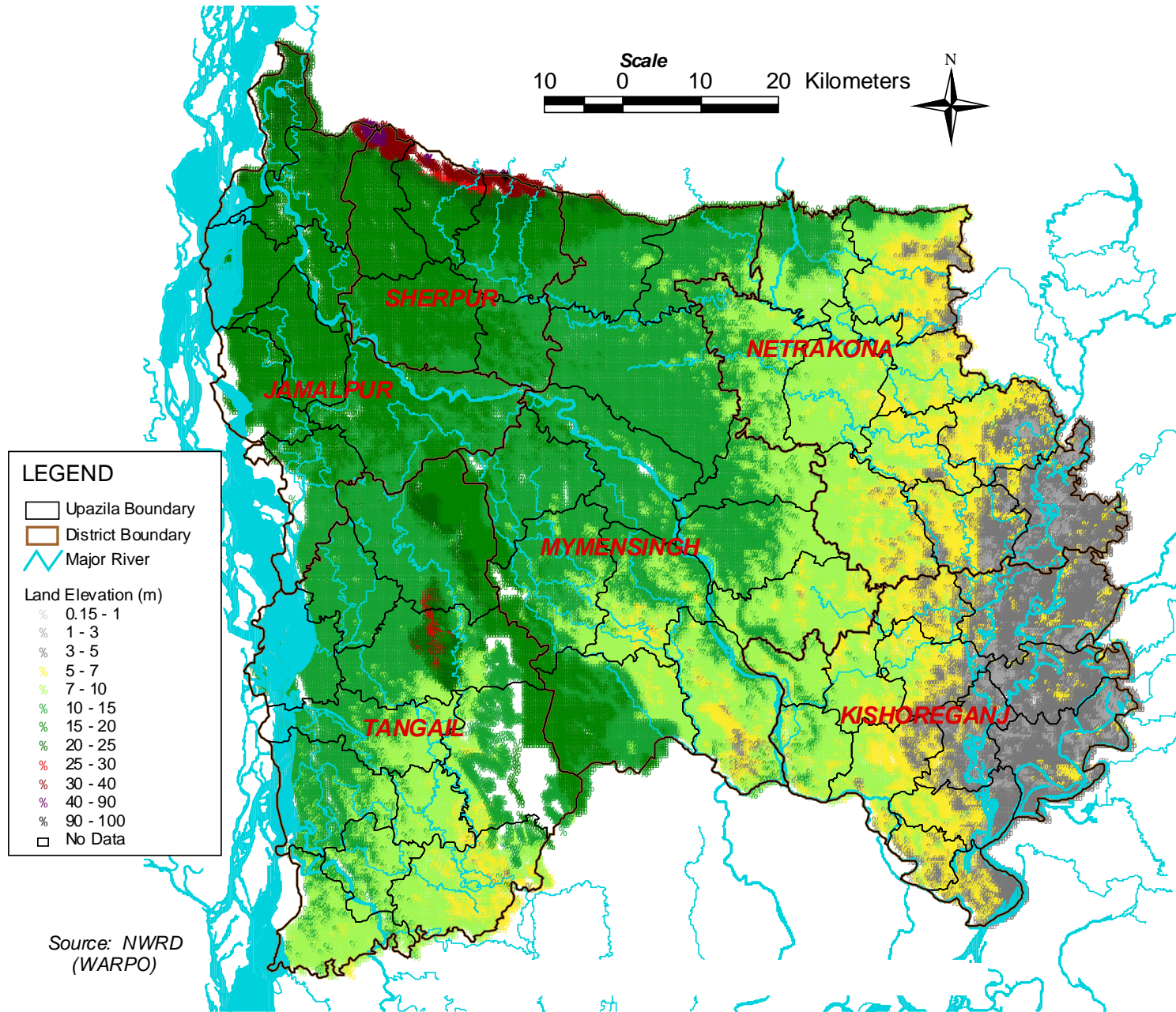


Fig. 2.1 Topographic Map of Mymensingh District and Study Area



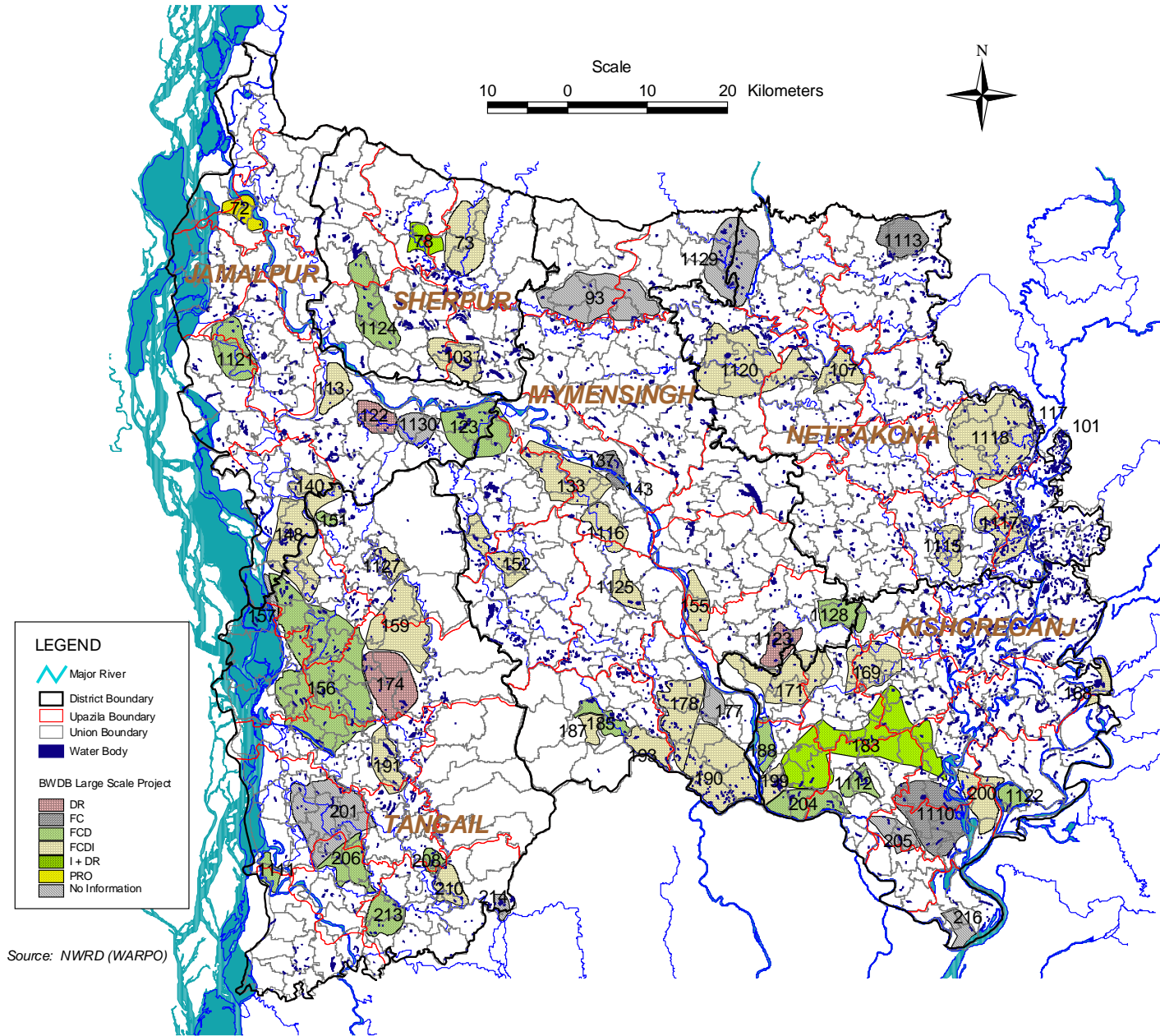


Fig. 2.2 Perennial Water Bodies and Large Scale Water Resources Development Projects of BWDB in the Study Area

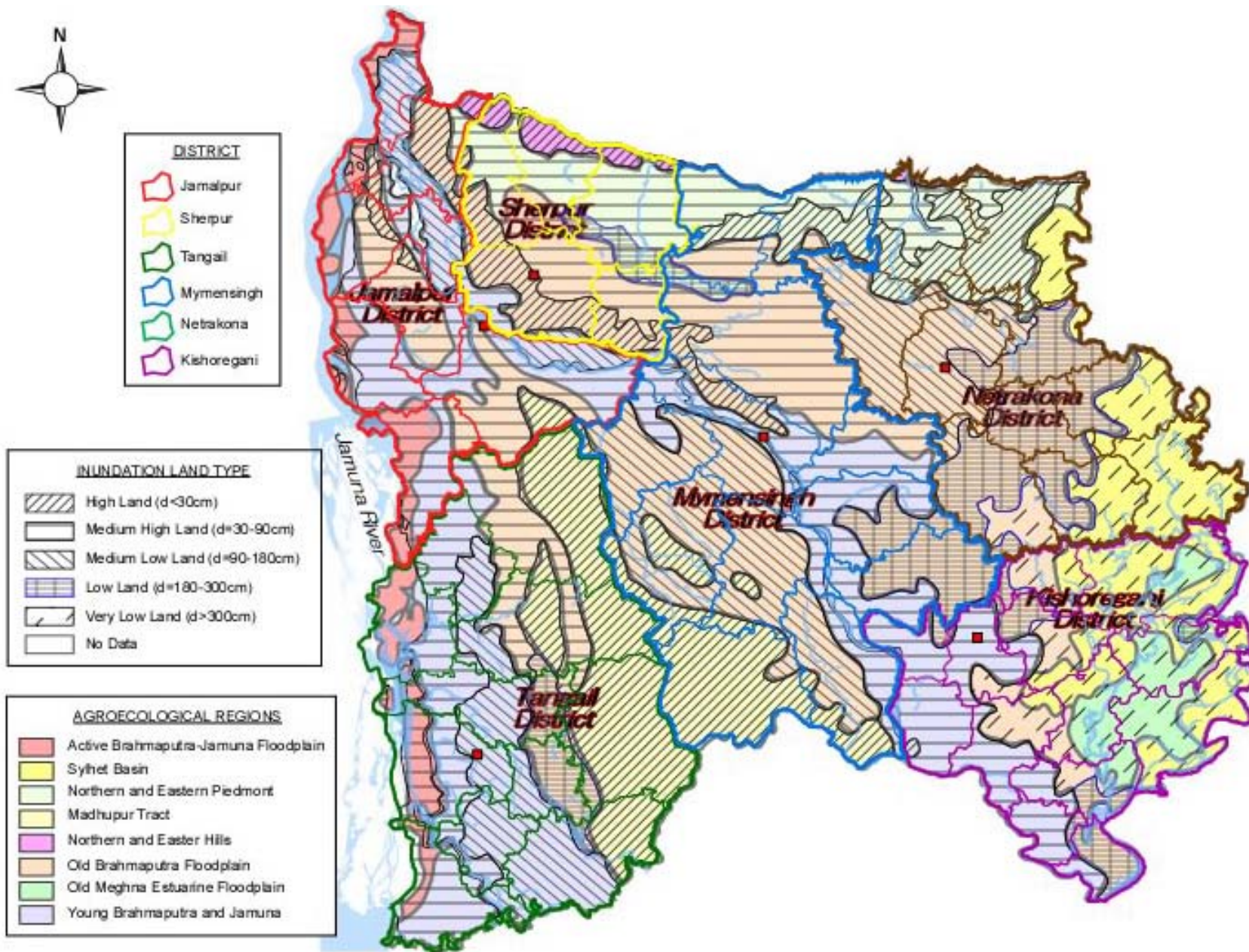
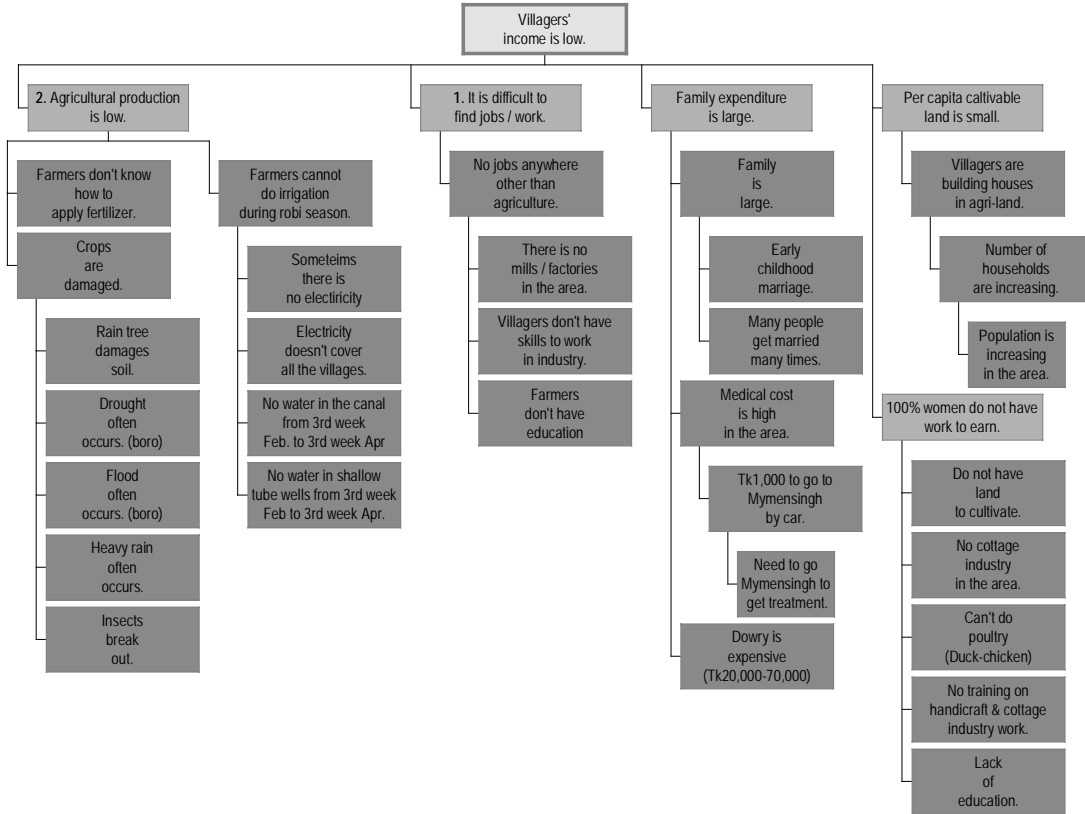


Fig. 2.3 Zoning of Mymensingh District and the Study Area

A. Problem Analysis at Char Hossainpur Gov't Primary School, Iswanganj Union, Iswanganj Upazila, Mymensingh District ( 16 September 2004)



B. Problem Analysis at Jatia UP Office, Jatia Union, Iswanganj Upazila, Mymensingh District ( 17 September 2004)

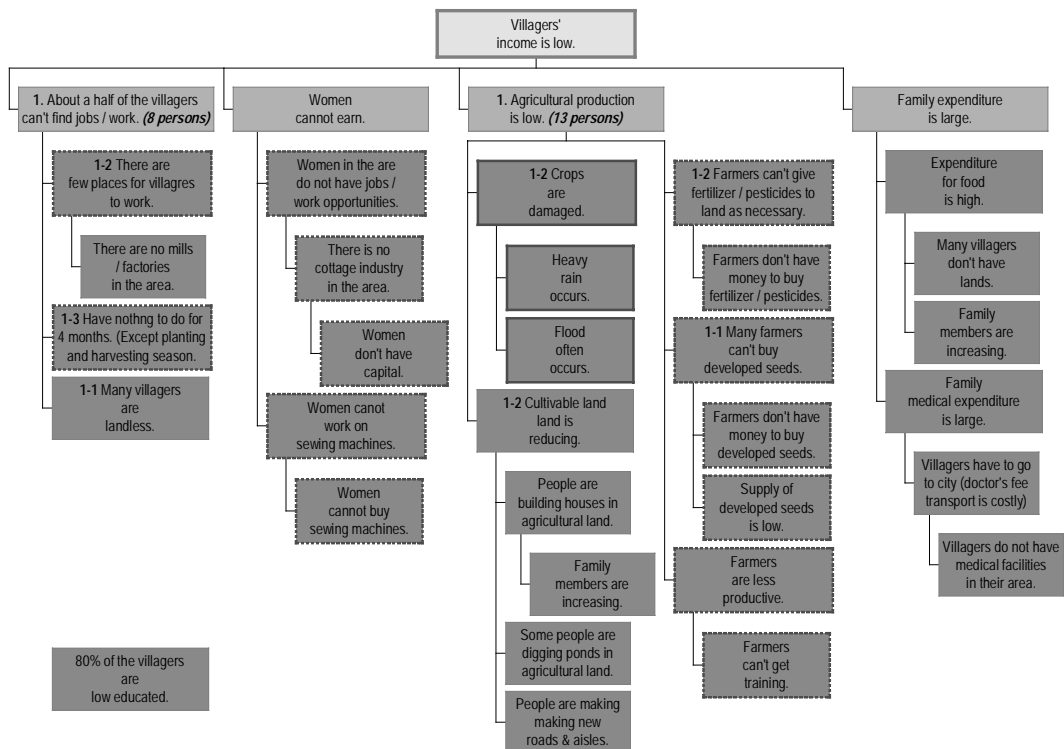


Fig. 3.1 Problem Trees at Union Level Workshops in Mymensingh District

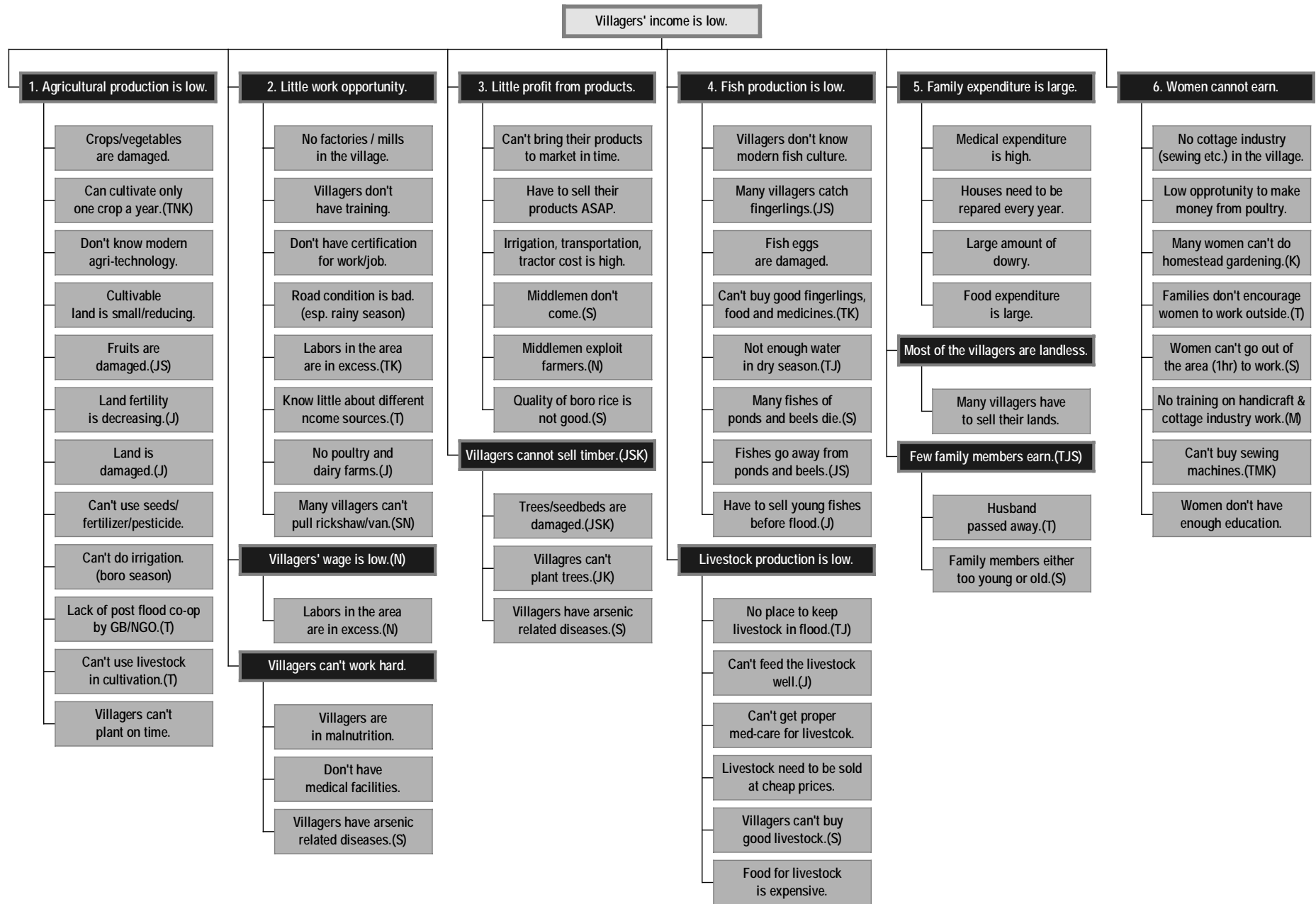


Fig. 3.2 Problem Analysis Model for Greater Mymensingh (simplified)