

ANNEX 3

AGRICULTURE, FISHERIES AND LIVESTOCK DEVELOPMENT

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TABLE OF CONTENTS

3.1	Agriculture-----	A 3 - 1
3.1.1	Agriculture in Bangladesh -----	A 3 - 1
3.1.2	Agriculture Extension -----	A 3 - 5
3.1.3	Agribusiness Development -----	A 3 - 6
3.1.4	Marketing Development -----	A 3 -14
3.1.5	Agriculture in the Study Area -----	A 3 -19
3.1.6	Farm Household Survey -----	A 3 -22
3.1.7	Problems on Present Agriculture-----	A 3 -24
3.1.8	Agriculture Development -----	A 3 -31
3.1.9	Agriculture Development Strategy in the Study Area-----	A 3 -46
3.2	Fisheries-----	A 3 -53
3.2.1	Present Conditions of Fisheries in Bangladesh -----	A 3 -53
3.2.2	Present Fisheries in the Study Area-----	A 3 -59
3.2.3	Present Problems and Development Potentials of Fisheries in the Study Area --	A 3 -62
3.2.4	Fisheries Development in the Study Area -----	A 3 -69
3.3	Livestock-----	A 3 -78
3.3.1	Present Conditions of Livestock in Bangladesh -----	A 3 -78
3.3.2	Development Policies of Livestock -----	A 3 -80
3.3.3	Livestock in the Study Area -----	A 3 -83

A3: AGRICULTURE, FISHERY AND LIVESTOCK DEVELOPMENT

3.1 Agriculture

3.1.1 Agriculture in Bangladesh

(1) General

The role of the agriculture sector is critical in the socio-economic and sustainable development of the country. The contribution of the agriculture sector (includes crops, fisheries, livestock and forestry) to GDP was 33.21%, 31.46%, 29.52%, 26.02%, 25.58%, 22.83%, and 21.91 % respectively in 1979-80, 1984-85, 1989-90, 1994-95, 1999-00, 2003-04 and 2004-05 (BBS and Bangladesh Economic Review of 2003, 2004 & 2005) The contribution of agriculture sector to provide employment for the agricultural labor force was 63.2 %, 62.3 %, and 51.69 % respectively in 1995-96, 1999-00, and 2002-03 (BBS and Bangladesh Economic Review of 2003, 2004 & 2005). Besides, exports of primary agricultural products constituted 10.4% of total exports of the country in 1997-98. For nearly three decades since the early 1970s, agricultural growth in Bangladesh has been predominantly led by food grains, mostly rice. Although acceleration of rice production resulted in an increase in per capita availability, there has been concern about the sustainability of rice-led agricultural growth. There is a need to devise a strategy that can deal with the new challenges and opportunities to make agriculture more flexible, diversified and efficient.

Ministry of Agriculture (MoA) is deals with the crops sector Research & Development (R&D), and Extension Services. In MoA, Department of Agricultural Extension (DAE) is responsible for the dissemination of improved varieties, agricultural technologies and Human Resources Development (HRD) through demonstration and training activities. DAE has its offices and staff up to Upazila and Union level. At Upazila level, Upazila Agriculture Officer, and Subject Matter Officer on related field are posted- In each Upazila, 20-30 Block Supervisors-recently re-designated as Sub-Assistant Agriculture Officer (SAAO). In each Union, 2-3 SAAO are posted, and they work under Upazila Agricultural Officer. Each Union is divided into 2-3 blocks, and each block has 1 BS/SAAO who is engaged in preparing crop production plan, crop survey, and render technical assistance to farmers on crop production and management practices and technologies. The BS/SAAO is the only government functionary/staff who has permanent and maintains direct linkages with farmers.

In agricultural production, quality seeds of modern/high yielding varieties are one of the most effective inputs. Bangladesh Rice Research Institute (BRRI-mandated for development of rice) and Bangladesh Agricultural Research Institute (BARI-mandated for development all crops other than rice) are the two research institutions under NARS responsible for agricultural research and development. Out of more than 42 modern/HYV rice varieties, developed by BRRI, BR-11, BRRI Dhan-28 and BRRI Dhan-29 are most popular to the farmers and widely cultivated. The BRRI developed HYVs such as BR-3 (popular name is Biplob) and BR-11 (popular name is Mukta) released respectively in 1973 and 1980 are still highly popular to the farmer.. Certification of Breeder Seed (BS), Foundation Seed (FS) and Certified Seed (CS) of Rice, Wheat, Jute and Potato is carried out by Seed Certification Agency (SCA). About 90% of the seeds are obtained by farmers themselves from their own saved seeds or by exchanging with the neighbors. Seeds are often mixed with different varieties. Any good variety may degenerate if it continued for cultivation up to four years from the progeny of certified tier. To maintain the potentiality of a good variety it is recommended to replace the seeds of the same variety with seed source from either breeder and/or foundation. Bangladesh Agricultural Development Corporation (BADC) provides quality seeds to farmers. The share of the quality ensured seeds supplied by BADC (the only public sector organized and formal seed industry) is about 5% of the total needs. The remaining about 5% quality seeds are supplied by the formal private sector seed industries/organizations (the breakup of seed supply is BADC 5%+Private 5% + Farmers own saved seed 90%).

(2) Function of Agriculture sector in Socioeconomic Development in Bangladesh

From a view to considering demand-led agricultural development, it is convenient to categorize the

agricultural functions to major three steps: Supply of sufficient food, increase of cash generating for farmers and improvement of rural society. In the first step, increase of rice production is the principal target. The rice production has been increasing, and the per capita supply is maintained at 155 kg/year. The rice supply has achieved almost self-sufficiency, and the per capita calorie intake was 2,372 Cal. Majority of rural areas of Bangladesh have finished the first step, and is presently entering to the second stage as shown below. However, the protein intake was 46.8 g/day, and its supply is not sufficient, and farmers are suffering from low cash income. Besides, improvement of farmers' living conditions is also important.

The final target of SSWRDSP is to alleviate poverty. The Master Plan activities were focused on analyzing problems, identification of potentials and approaches to break-through the current agricultural situations and by exploring possible ways for the future development.

Functions of agriculture	Targets of development in Bangladesh
Supply of sufficient food	Self-sufficiency of rice Stabilization of food supply/ food security
Increase of cash generation for farmers	Increase of cash generation/ approaches to poverty alleviation Balanced nutrition intake (Protein, etc) Improvement of farmers' living conditions
Improvement of rural society	Improvement of rural infrastructure Protection of environmental conditions Development of rural welfare

Trend of Rice Production, Supply and Nutrition Intake

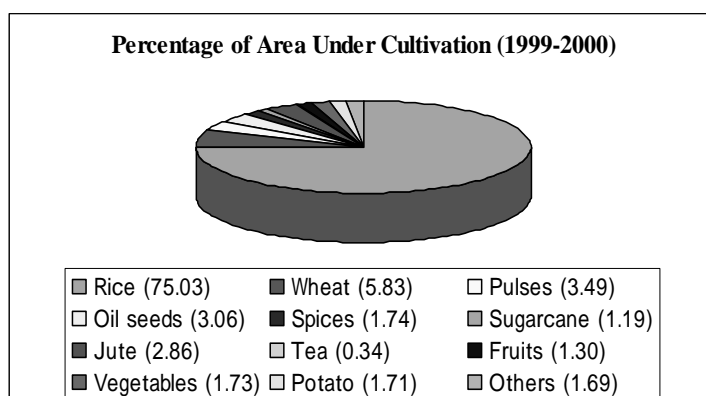
Year	Rice (1000 ton)		Per-capita rice supply Kg/year	Calorie and protein intake per capita			
	Production	Import		Calorie Cal/day	Protein		
					Total Gram/day	Animal Gram/day	Vegetables Gram/day
2001	24,201	151	155	2,372	46.8	6.0	40.7
2000	25,096	259	157	2,158	45.8	6.1	39.6
1996	18,799	1,037	153	2,046	44.3	5.6	38.8
1995	17,607	986	146	1,986	43.1	5.3	37.8
1991	18,261	18	158	2,074	44.6	5.0	39.6
1990	17,861	382	157	2,092	44.9	4.8	40.1
1986	15,414	53	150	2,013	43.0	5.1	37.9
1985	15,045	674	138	2,012	44.6	5.1	39.4
1981	13,637	78	143	1,941	42.3	4.7	37.6

Source: FAO Food Balance Sheet (2004)

(3) Agricultural Production

As shown in the figure, three-fourth of the cultivated area is cropped with rice followed by other crops such as wheat, pulses, oilseeds etc.

The area, yield and production of crops from 2000-2001 to 2002-2003 are shown in Table 2.3.3. The rice yield of *boro* is higher than that of *aus* and *aman*, mainly because of irrigation, and hazard free climatic conditions and use of quality seeds of high yielding varieties. Although Bangladesh is one of the largest rice producers in the world, the average rice yield is at a relatively low level of 2.34 ton/ha (2002-03). However, an average yield of 3.18 ton/ha was attained by the



Ref : Yearbook of Agricultural Statistics of Bangladesh, 2000

high yielding variety (HYV) in *boro* season (2002-03).

(4) Food Grains Production, Requirement and Self Sufficiency

Food grains production and requirement are shown in Table 2.3.4. By comparing food grain requirement and net total requirement, it can be seen that food self-sufficiency has been achieved in the late 1990s. By projecting population and the production, it was estimated that the self-sufficiency trend could be continued until 2020.

(5) Cash Income in Agricultural Production

Although the food supply has been improved, it is reported that the cash income of farmers is still low and poverty alleviation is one of the main priority subjects of rural development. Higher profitable farming systems will be major targets and to be maintained efficiently after the achievement of rice self-sufficiency.

(6) Land Use and Size of Landholdings

Of the total land area of 14.85 million ha, the cultivable area was estimated as 8.48 million ha (2001-02), which was about 57 % of the total area. The net area sown was 8.08 million ha (2001-02), leaving about 400,000 ha area as fallow land. However the total cropped area was about 14.3 million ha with an average cropping intensity of 177 % because of the double cropping and triple cropping in some areas. In 2001-02, it was estimated that 2.87 million ha were single cropped, 4.13 million ha were double cropped and 1.02 million ha were triple cropped.

Cropping Intensity from 1997-98 to 2001-02

Items	1997-98	1998-99	1999-2000	2000-01	2001-02
Cultivable Area (Mill, ha)	8.36	8.43	8.45	8.40	8.48
% of Total Area	56.30	56.77	56.90	56.57	57.14
Net Area Sown (Mill, ha)	7.97	7.99	8.13	8.08	8.08
Total Cropped Area (Mill, ha)	14.09	13.96	14.27	14.30	14.30
Cropping Intensity (%)	176.79	174.72	175.52	176.98	176.98

Source: Bangladesh Bureau of Statistics (BBS)

Land use in Bangladesh during 1974 to 2001 is shown in the following table. Land under 'not available for cultivation' has increased from 19% in 1974 to 23% in 2001. It can be safely presumed that most of this land was used for non-agricultural purposes such as urban development and construction of various infrastructure facilities. The cultivated area from 1974 to 2001 was reduced from 59% to 54%.

Land Use in Bangladesh 1974-2001

Nature of Land Use	Area in '000 ha			Percentage of total		
	1974	1990	2001	1974	1990	2001
Cultivated Crop Land	8,489	8,827	8,081	59%	58%	54%
Currently Fallow	627	288	399	4%	2%	3%
Cultivable Idle Land	272	267	321	2%	2%	2%
Forests	2,229	1,858	2,627	16%	12%	18%
Not available for cultivation	2,661	3,934	3,410	19%	26%	23%

Source: Bangladesh Bureau of Statistics (BBS)

Basic information on the land holdings in Bangladesh is shown in Table 2.3.5. The percentage of small farm holdings with an area of less than 1 ha occupied 79.9% of the total holdings and the medium (1-3 ha) and large holdings (>3 ha) were 17.6% and 2.5% respectively.

Population of livestock and poultry according to the size of holdings is shown in Table 2.3.6. The holdings with cattle, goat, fowl and duck were 46%, 31%, 76%, and 39%, respectively.

(7) Export and Import

Agriculture export constitutes a prime component of the total exports of the country. The major agriculture exports were jute, tea and vegetables, which contributed Tk 4774.6 Million, Tk 895.9 Million., and Tk 766.6 Million, respectively in 2002-2003.

Export of Agricultural Commodities from Bangladesh 1998-99 to 2002-03

Crops	Unit	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Jute	'000 bales	1,748.00	1,738.00	1,500.00	1,283.00	1,995.64
	Million Taka	3,442.00	3,588.00	3,621.00	3,509.50	4,774.63
Vegetables	ton	13,106.00	1,027.30	9,509.30	12,751.40	2,972.00
	Million Taka	848.23	701.22	689.20	879.10	766.58
Tea	ton	22.68	12.91	17.89	13.86	10.35
	Million Taka	1,850.00	886.20	1,163.20	998.00	895.85

Ref : NBR/Export Promotion Bureau (EPB)

The major imported agricultural commodities were edible oil, oil seed, pulses, onion, ginger and sugar. As it can be seen the amount spent on import was much higher than that of the export of agricultural commodities.

Import of Agricultural Commodities into Bangladesh 1999 to 2004

Crops	Unit	1999	2000	2001	2002	2003
Oilseed	ton	-	-	-	132,844	231,322
	Million Taka	-	-	-	1,996	4,586
Edible Oil	ton	2,087,615	2,245,165	2,598,743	1,608,264	1,613,262
	Million Taka	23,925	25,875	29,946	32,766	43,284
Pulses	ton	106,874	115,524	137,735	109,796	118,550
	Million Taka	1,455	1,573	1,875	2,495	2,847
Onion	ton	2,434	2,099	2,366	1,381,875	128,194
	Million Taka	209	180.00	203	1,149	565
Ginger	ton	498	512	610	5,698	12,864
	Million Taka	8	8	10	71.00	158
Sugar	ton	364,516	359,856	372,915	196,508	439,989
	Million Taka	2,687	2,595	2,689	2,533	5,651

Ref : NBR/Export Promotion Bureau (EPB)

Notes: Edible oil includes crude oil

(8) Value-added of Agriculture Sector and Different Crops

Gross value-added of agriculture sector at constant (1995-96) price is shown in Table 2.3.7. As it can be seen in the table, agriculture, horticulture and fisheries increased to about 130% in 2001-2002 in comparison with 1995-96, which implies that the farmers have been receiving better values in comparison with the situation of 5 years before. The distribution of weights of value-added of different crops at constant prices is shown in Table 2.3.8. It can be seen that the value added of *boro* rice was about 159% and that of spices and potato were 198% and 179% respectively. It implies that a better value has been added to the production of rice, spices and potato in comparison with the situation of 1995-96.

(9) Marketing

Development of marketing system is crucially important to cope with the poverty alleviation and low cash income. Several measures should be carried out to improve marketing capacity such as development of transportation, market information services and improvement of market infrastructure in all areas of agriculture.

The functions of rural markets include obtaining of daily goods, exchange of agricultural products to cash, wholesale function to large cities such as Dhaka, collection and distribution function to users such as rice mills and livestock farmers.

(10) Profitable farming

The food supply, which is the main priority function in agricultural production, has been improved in the past decades. Cash income, poverty alleviation and human welfare in the rural areas are increasingly important. To cope with these issues, the development of profitable farming by upgrading productivity will be targeted by combining the items mentioned above.

3.1.2 Agriculture Extension

Extension activities cover all the areas of agricultural and rural development. The activities are positioned at a strategic area to take entire views of the past experiences, current activities and future development. Agricultural technology, especially rice production technology, is well developed to use limited farming areas. However, after the self-sufficiency of rice a new farming system is required to be established. Priority in the future development is forecasted on 1) Stabilization of food supply to vulnerable groups, 2) alleviation of malnutrition and 3) profitable farming.

To meet the new demands in the agriculture, the extension of new technology is urgently required not only in production but also in marketing and processing. The Department of Agricultural Extension (DAE), MoA formulated "The DAE Strategic Plan 2002-2006." This strategic plan has been framed on five objectives to implement the New Agricultural Extension Policy (NAEP) 1996 as mentioned below:

- i. increase agricultural productivity
- ii. provide pro-poor service
- iii. strengthen partnership and links with local government
- iv. develop DAE as an effective institution to provide quality and quantity services
- v. develop performance measurement

For the development of extension work, the extension services draw its strength from research findings as well as from farmer's innovation. Strengthening of three way linkages among research, extension and farmers community is of vital importance for the rural and agricultural development. The items cover all the areas required to develop agriculture and rural area. The points are as follows:

(1) Increase Agricultural Productivity

To achieve the targets, several important pillars were mentioned for food production; food security by development of crop and non-crop activities, input and credit support, crop diversification, appropriate land use, soil health improvement, etc. Importance of sustainable agriculture and environment are also included from a wider point of views. To develop commercialized farming, The issues to be considered for rapid commercialization are: promoting production for domestic markets, mechanization, promoting agricultural exports through local/ foreign entrepreneurs and the introduction of location-specific technologies for specific crops. Considering the landless and small farmers situations, opportunities for the non-farm economy in agricultural development was stressed.

(2) Provide Pro-Poor Services

Poverty reduction was a priority area, and for this purpose "Programs will be targeted at special geographical areas such as hills, chars, haors, beels, and special needs groups such as landless, and marginal farmers, women, and the rural youth." Gender awareness; women in agriculture is also included. "Farmers charters" was proposed.

(3) Develop Partnership and links with Local Governments

Partnership with research agencies and educational institutions was the major activities in it. Links with local governments will strengthen the relations between DAE and farmers, as mentioned "The Department wishes to align its service delivery with local government, particularly at the Union level. Block Supervisors will be allocated to work in Unions."

(4) Develop DAE as an Effective Institution for Providing Quality and Quantity Services

1) Restructuring of Wings

The department recognizes that its structure needs to be reorganized in order to concentrate on the core function of the delivery of agricultural advice. The reorganized structure would be as follows:

	Present structure	Reorganized structure would be	Core Responsibility for
1	The Food Crops Wing	Horticulture Development Wing	
2	The Cash Crops Wing	Crops Wing	Research-Extension Linkage
3	Planning & Evaluation Wing	Will be strengthened	
4	Finance, Audits and Accounts Section		
5	The Agricultural Information Service	To bring under the DAE Umbrella	
6	Department of Agricultural Marketing		
7	The department will examine the role of the central extension resources development institute (CERDI) and will take necessary action for improving its capability and reducing dependency on DAE for fund.		
8	A long term plan will be undertaken for ensuring the full utilization of existing horticultural centers (HC) by restructuring and providing specialized service to them.		
9	Field staff will be redistributed to ensure a focus on the Union, and on disadvantaged areas.		

Sources: DAE Strategic Plan 2002-06

2) Strengthening of Activities

Among various intensified activities the following are emphasized:

- Field staff was redistributed to ensure a focus on the Union.
- Activities were focused on disadvantaged areas.
- Close relations with Agricultural Information Services and Department of Agricultural Marketing were also important.

(5) Develop Performance Measurement

In spite of the great contributions to the self-sufficiency of rice by DAE, the Strategic Plan mentioned “Measuring the impact of extension services is notoriously difficult. The Department considers it has made a significant contribution to agricultural development in Bangladesh, but is unable to provide evidence of this. Monitoring and evaluation system will be studied.

3.1.3 Agribusiness Development

(1) Agribusiness

As I-PRSP indicates top priority is given to agribusiness and agro-processing as a thrust/priority sector to promote value addition to cereals, livestock, fish and horticultural crops. Agribusiness has relations with various fields in agriculture, and it is composed of wide range of activities: rice milling, production of small tools for fieldwork, transportation, aquaculture, feed production, etc. Agribusiness is one of the indispensable factors for the development of agricultural productivity. It is increasingly important in the Bangladesh farming. Functions of the agribusiness on the agricultural development are as follows:

- i. Enhance agricultural production through technical support
- ii. Strengthen marketing/ consumption through processing and transportation
- iii. Enlarge employment in rural areas.
- iv. Develop and support mechanization and modernization
- v. Develop food safety
- vi. Develop environment-friendly production and processing.

To develop agribusiness smoothly it also needs government supports such as infrastructure development, concession on import duties, export bonus and income tax exemption. Besides, the private sector will also get support for technical training, technology development and improvement of hygienic standard, handling and packaging of processed products.

Women's work in agriculture customarily involves post-harvest processing of crops, rearing of small animals and poultry birds and home gardening for fruits and vegetables. Crop planting, weeding and other intercultural operations are also included. Women also shoulder various works in household management.

The agribusiness and agro-processing require new technology; low-middle level but unfamiliar technology to farmers. Therefore, introduction of new technology and HRD is indispensable to enhance agribusiness. In rural area, women friendly agricultural extension and training services including technical, literacy and marketing are important in rice-based farming area with a view to widening their participation to rural societies. High school level education for strengthening human resources of senior field technicians is urgently required.

Several examples of agribusiness, which stimulate the agricultural production and marketing, were observed during the field trips and will be shown in the following section. The observation and findings will support the better implementation of the SSWRMSP Projects

(2) Rice Mill

1) Function of rice mill

- The rice grain is recovered with a woody husk or hull, which is indigestible and is to be removed in the first step during processing for making the rice edible. The grain has still another outer bran layer which, being fibrous in nature, is also removed in the next processing stage for better digestibility.
- The ultimate products are called:
 - i. The first important product is called 'white rice' or 'raw rice.'
 - ii. The second important product is called 'parboiled rice.'
- The process of removing the husk and bran is called milling of rice. Two valuable by-products obtained during milling are (i) husk, and (ii) bran.
- The process of par-boiling involves: soaking of paddy in water enabling the grains within the husk to absorb 30% to 50% water on grain weight, quickly steaming the grains and drying.
- The dried paddy is then milled to remove husk and the bran layer, and
- The resulting grain is the 'par-boiled rice.'

A rice mill is a key agricultural machine in rural areas. There are 4 types of rice milling in Bangladesh. Appropriate methods are selected by targets of milling.

- Manual milling for family consumption of rice in small family.
- *Engelberg* rice mills for local consumption.
- One-pass rice mills for selling at ordinary markets.
- Integrated rice mills for quality rice and export.

Rice is to be milled before eating; therefore, efficient rice mills are indispensable. Extension of rice mills in rural areas could help farmers as well as traders to get better marketing facilities.

Milling of paddy involves removal of husk and outer bran layer from the grain to produce edible rice. In fact, milling consists of a series of operations:

- a. Cleaning of paddy to remove straw, chaff, dirt, etc
- b. Shelling the husk
- c. Polishing to remove the outer bran layer
- d. Grading
- e. Separation of husks, un-shelled paddy, bran and broken at appropriate stages.

The whole operation involves a number of equipment such as:

- a. Paddy cleaner

- b. Sheller
- c. Paddy separator and/or husk aspirator
- d. Polishing cone
- e. Rice cleaner and
- f. Rice grader

These operations and equipment involved are part of a modern rice mill. Traditionally, the whole job used to be carried out by pounding in a mortar and pestle-type device, which is considered to be most primitive method.

2) Traditional Methods:

a) Home-pounding:

For pounding rice at home, the common implements used are: i) Mortar & pestle, ii) Dhenki and iii) Hand-chakkis.

- A mortar is generally made of wood or stone. The pestle is made of wood and is fitted with an iron hub at one end and an iron ring at the other, so that it can be used for dehusking as well as for removing bran.
- A Dheki is an improvement of the mortar and pestle arrangement operated with the help of a lever system.
- The major drawback of home-pounding is its cost of operation being larger than in the mechanized mills.

b) Huller-Mills

The earlier mechanical rice mill consists of a huller usually called Engelberg or Kishkisan. An iron-ribbed cylinder, having helical ribs upto half-to-one-half of the length and straight ribs in the remaining portion, rotates in a cylindrical housing made of sieves.

c) Sheller-Mills

These mills are improvements over the huller-mills in the sense that husking, polishing, separation and grading are performed by separate machine. In a sheller-cum-huller mill, a sheller is used in place of huller no.1 huller mill for de-husking paddy. Polishing is done in two-hullers in parallel and separation of bran is followed in a gyratory sieve. Here bucket elevators are used for conveying the paddy to the sheller and huller units and also to the sieve.

3) Modern Methods

Modernization of traditional huller and sheller rice mills refers to the use of latest knowledge in milling operation for maximum yield of rice with best possible quality and minimum losses. The modern rubber roll-shellers, developed as the most modern equipment for shelling operation give the highest outturn of rice from paddy: 2-3% more than shellers, 6-7% more than hullers. It also produces clean, uniform polished rice with minimum broken. Before modernization of mills, some amounts of winnowing by the farmers after threshing were practiced for removal of chaff, dust and lighter impurities. There were lack of facilities for complete cleaning to remove grit and stones from paddy. As a result 0.2% to 0.8% of external materials and impurities are left in the rice.

The important features of modern rice mills are:

- Equipped with rubber-roll shellers instead of the conventional emery under-runner sheller
- Mills have arrangement for recovery of broken and germs from the bran which substantially increases the outturn
- Provision of an efficient paddy cleaner removes most of the impurities, reducing breakage during milling
- Better performance due to general provision of the equipment.

4) Type of milled rice and milling methods in Bangladesh

In Bangladesh there are 3 types of milled rice: Parboiled rice/ half-boiled rice (80%), milled rice (20%) and broken rice (a few %). Types of milled rice are decided by function of milling.

a) Processing of parboiled rice

The type of current processing units for par-boiling was established in 1970s and the same type of machines is used widely in the Greater Mymensingh area.

- Paddy is soaked and cleaned in water for 12 hours.
- Soaked paddy is steamed for 20-30 minutes in concrete-made cylinder.
- Steamed paddy is dried for 1-2 days under the sun on drying field <Women are usually hired as laborers for drying>.

b) Dried paddy is milled by manual milling, Engelberg type rice mill or integrated rice mills

- Manual milling

This is a traditional method in rural areas, and operated by hand and foot and no use of industrial power. Milled rice can be used domestic consumption.

- Engelberg type rice mill

Most of the rice mills used in rural areas are this type. Husk and bran are not separated. But it is durable, easy to handle and portable; therefore, the rice mills are suitable for rural areas. Milled rice has high broken rice ratio and poor quality milled rice. Parboiled rice can have high head rice ratio.

- Integrated rice mill

Processes are composed of husking by rubber roll, separator and milling by Engelberg or friction type rice mill. Milled rice has low broken rice ratio and high quality. Milling of aroma rice and quality rice for examples rice for export needs to be milled by integrated rice mills.

c) Milling yield: Husk – 30%, Bran – 10%, milled rice – 60%

5) Example of integrated rice mill

Location and establishment	Mirzapur, Tangail, Establishment: 1995 Employees: 10-20 laborers					
Type of milling machines	Structure of machine: Chinese husker with rubber roll <Price: Tk. 30,000-> Engelberg rice mill < Tk. 40,000.-> Wooden structure by local resources Capacity of machines: Milling capacity is about 0.5t /hour, and the machines are usually operated 8 hours a day. <120 (maunds) × 37 (kg/mound) = 4,440 kg of paddy per 8 hours>					
Procurement of paddy	Local markets and surrounding farmers. Price: Tk. 9,000/- to Tk. 12,000 depending upon the availability of paddy					
Milling cost	By various processing practices, approximate milling cost can be estimated. Estimated cost and profit are as follows (Tk/kg)					
	Milled rice type	Paddy	Steam and dry	Milling	Total cost	Selling price (Milled rice)
	Par-boiled rice	10	2	4	16	19.2
	Milled rice	10	-	4	14	16
Replacement of rubber roles	Rubber roles need frequent replacement. In case of parboiled rice production about 2 rubber roles are used per day, and in case of other preparation they need one role per day. The rubber role being used by them is made in China. “Rubber roles are available with reasonable price in Dhaka”, said the owner					
Production period	Throughout the whole year except two months (April and May) before the boro harvesting					
Marketing	Selling to local markets and Dhaka					
Trend of rice milling	The production and consumption of rice has been increasing, and the rice mill has been run stably for the past 10 years.					
Future development and possible benefits from SSWRMSP	<u>Recycle of by-product:</u> Husk is used for fuel of par-boiling, and rice bran is sold with a price of Tk 18-20 / kg for animal feed. Ash can be used for organic fertilizers. Semi charcoaled ash is a useful fertilizer for seedlings; some times it is sold at 2-3 Tk/bag. In the current farming system, the semi-charcoaled ash is not used for cultivation, and piled ash destroys environments. It is recommended to use it for vegetable growing.					

	<u>Quality of paddy/ rice:</u> Quality of milled rice is decided by quality of paddy. Quality of paddy is deteriorated by water shortage, nitrogen deficiency, late harvesting and lodging at harvest time. Water management can improve these factors. SSWRDSP will contribute to the development grain quality.
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(3) Sugar Mills

1) Sugar Mills in Bangladesh

Sugar is one of the fundamental foods, and its consumption increases as general economy develops. Sugar is also a commodity of international markets; therefore, if management of sugar cane farmers and sugar mills are appropriate, they will obtain good results in developing economic world. If not, they will be forced to close their activities. The domestic production ratio decreased from 54% in 1980 to 28% in 2001. It is reported that there are several idling sugar mills. Revive of these facilities will contribute to rural development through consumption of sugarcane produced in Bangladesh.

Trend of production and import of sugar, raw equivalent.

(1,000MT)

Items	1980	1985	1990	1995	2000	2001
Production (a)	102	97	200	294	134	106
Import (b)	88	174	99	151	263	274
Ratio (a/(a+b)) %	54	36	67	66	34	28

Source: FAO Food Balance Sheet (2004)

2) Example of Sugar Mills

Location and establishment.	Location: Zeal Bangla Sugar Mills Ltd. Located at Dewangonj, Jamalpur.. This sugar mills was established in 1957 by the East Pakistan Industrial Development Corporation renamed after 1971 into Bangladesh Sugar & Food Industries Corporation under Ministry of Industries with 100% ownership of the government. Subsequently the share of the enterprise was distributed to public 34 % and owned by the government 66 %.
Sugar cane cultivation methods	<ul style="list-style-type: none"> - The supervised zone of the sugar mills covers 4 Upazila under Jamalpur district. The area under sugar cane cultivation is about 5000-6000 ha each year. - Crop duration: Sugar cane is planted usually in October-December (early) and continued up to January-February (late plantation). The duration of crop is 12-18 months from plantation to harvesting and crushing in the sugar mills for production of sugar. There are two types of planting methods, one is direct plantation of sugar cane plant using as seed material (vegetative propagation) and crop is called plant crop, and second crop grows from the previous years' planted planting material which is called ratoon crop. - There are three types of cropping patterns with duration of three years. <ul style="list-style-type: none"> ◇ Type-I: Pre-sugar cane crop – Jute, Post-sugar cane crop – Rice ◇ Type-II: Pre-sugar cane crop – Rice, Post-sugar cane crop – Wheat ◇ Type-III: Pre-sugar cane crop – Winter crops, Post-sugar cane crop – Rice - In the existing conditions, each year the area is flooded for 3-4 times. - Another problem is drought. Land is not leveled in the area. Therefore, flood irrigation is not appropriate for this area, as the soil type is sandy loam and water infiltrates very quickly. - To solve this problem, use of surface water for supplementary irrigation could be effective.
Sugar cane production	<p><u>Irrigation and yield:</u> Yield could be increased if 1 to 2 times irrigation could be provided during the dry season (from March to April)</p> <p><u>Variety:</u> So far > 32 sugar cane varieties developed by Bangladesh Sugarcane Research Institute (BSRI). Out of which, some varieties are tolerant to drought and waterlogging conditions.</p> <p>Yield of sugarcane in the area is 18-20 MT per acre on average.</p> <p><u>Fertilizer application:</u> Urea 120 kg, TSP 120 kg and MP 80 kg per acre.</p> <p><u>Crop management:</u> 60-80 % plantation is early and 20-40 % is late plantation. The reason for later transplantation is fields' covering with previous crops (other than sugar cane).</p> <p><u>Methods of plantation:</u> Spacing and depth of trench: 1m spacing from row to row and 6 to 9 inch depth is appropriate. The process is done manually where there is no mechanical facility.</p>

Sugar Mills capacity	The capacity of the Zeal Bangla Sugar Mills is 1,016 tons cane crushing per day (TCD) at 8-8.5 % sugar recovery for 120 effective crushing days (ECD). To run the mills profitably by achieving its capacity, the mills need to crush 130,000 tones of sugar cane a year. But at present the mills is running with loss mainly due to suffering from shortage of sugar cane (presently crushing about 100,000 tones of sugar cane). One of the main reasons of getting inadequate cane is due to diversion of about 30-40 % of sugar cane to production of molasses by the individual farmer using country crusher as well as power-operated crusher. In pursuance of Molasses movement Act, the crushing of sugar cane by power-operated crusher is restricted, but this law is not honored properly.
Contract with the farmers	The sugar cane is cultivated in the sugar mills zones following contract growing system supported by supervised credit mainly in kinds (seeds, fertilizers, biocides, irrigation, etc.) provided to the farmers directly by the sugar mills. The farmers are given proper training on modern planting methods by the sugar mills. Crop purchasing price: The present price is Tk. 1,100 per MT
Competitive crops:	Potato, banana, vegetables, rice and jute.
Future development	<ul style="list-style-type: none"> - Modernization of the mills: Restructuring to energy-saving machines - Introduction of improved varieties - High sugar content varieties (10% in India, 8% in Bangladesh) - Drought resistant and high water-logging tolerant varieties

There are only one-sugar mills (in the Jamalpur district) situated in the Study Area. There are 20,000 to 25,000 sugar cane farmers are directly involved and benefited by this sugar mills. In this regard, the effective utilization of capacity of the mills will help farmers to bring more area under sugar cane cultivation and their economic conditions will be improved significantly.

(3) Commercial Poultry

1) Commercial poultry in Bangladesh

Poultry is composed of two major parts: commercial poultry and rural scavenging poultry.

Commercial poultry farming needs cool and dry climatic conditions. Eggs are perishable, and heavy products, and hence marketing of eggs needs convenience of transportation. Gazipur, close to Dhaka, is located in the middle highland area, and it is the largest egg producing area in Bangladesh.

There are several requirements in the commercial poultry, and some of them are supported by NGOs and other outside organizations.

- Funds for initiation of commercial poultry,
- Technology of large scale poultry farming,
- Feed obtaining routes
- Marketing information
- Cooperatives for production and selling in case of small poultry farmers.

2) Example of commercial poultry in Mymensingh

Location and establishment	Location: Bhaluka, Mymensingh, Establishment: 1998
Facilities:	Hen houses (2 houses) of 5 acres: All for egg laying
Production of poultry	<ul style="list-style-type: none"> - Chickens: 1 day old chicken from Kazi Farm in Mymensingh - Nursery: 1-50 days: space – 0.5 ft²/ chicken 50 – 100 days: space – 1.0 ft²/ chicken - Mortality: 1 – 100-day mortality: 2% on average
Feed supply	Major ingredients of poultry feeds used in the commercial farming are imported from neighboring countries. Daily supply is 115-120g/hen/day in rainy seasons, and the supply is increased 4-5% higher from the rainy season supply in dry seasons

Diseases	<ul style="list-style-type: none"> - Species of diseases: Major poultry diseases are Kokusidium, Newcastle, Mycoplasma, Salmonella and CRD (Chronic Respiratory Diseases: Most serious diseases) - Vaccination: Chickens are inoculated during 1- 30 days after birth. Upazila office vaccinates for Newcastle and farlfox. Private companies (Intervet Novaritis, others) inoculate other vaccines.
Egg lying	All hens were raised for egg lying: There are 6 batches, and each batch has 5,000 heads . Duration of egg lying is a period of 20-72 weeks. Development of ratio of egg-lying hen is 50% for 20-22 weeks, 90% for 22-26 weeks, 96% for 26-40 weeks, and 70% for 40-72 weeks. 85% on average.
Use of litter	Litter contains high crop nutrients such as N, P and K, and is useful organic fertilizers for agriculture and aquaculture. Recycle of the rural waste will produce lowermost products and protect rural environments. Price of litter is 2 Tk/bag (40-50 kg)
Marketing	<ul style="list-style-type: none"> - Production of eggs: 17,500-18,000 pieces / day - Price: White leghorn 2.50 Tk/piece Starcross 579 – 2.65 Tk/piece - Market: Egg market in Tejigaon, Dhaka
Cost-profit of poultry farming	The feed cost was Tk 583, with a share of 70%-80% of total cost. Benefit was Tk 36. bird/year, and the total net-return was Tk 1.08 million (30,000 birds). The return of egg was Tk 21 /bird/year. (Refer Table Below
Future development	<ul style="list-style-type: none"> - The share of feed cost was as high as 70%-80% of the total cost; therefore, lower price of feed is crucially important for profitable farming. It is also useful for local employment, use of local resource and land use. It is necessary to study the efficiency of integrated crop-poultry farming by using domestic maize, wheat and bran in poultry producing areas. - Recycling of poultry wastes for cropping is useful low cost farming and environmental protection. - Egg is one of the cheapest animal protein sources. Feed efficiency of poultry is high: 2.8. Range of appropriate temperature for rearing is wide: 13-30degree Centigrade. Egg laying in winter is also efficient. From these advantages of poultry farming, it needs to be extended more widely.

Commercial farming in Mymensingh

Items	Unit	Amount (g/bird/day)	Total (Tk/bird/day)	Yearly amount (Tk/bird/year)
One-day chicken	1 head			5
Vaccination	1 unit			1
Medicine	1 unit			10
Feeds	Feed cost: 0.0133	120	1.596	583
	<Duration egg laying: 20-80 weeks>			
Water				50
Housing cost			0.1	37
Labor of feeding				18
Total cost (A)				704
From egg	Egg laying: 85%	Price: 2.6 Tk	279 pcs/year	725
	Mortality: 10%			
From litter	Tk.2/50kg	* 100 kg		4
From hen (0.65 year)				10
Total return (B)				739
<Benefit> (B-A)				36

* Estimated from 44kg/year of total feeds and 32 kg of husk.

(4) Small Scale Broiler Production and Export

1) Production of halal chicken by small livestock farmer

Halal chicken is produced by small livestock farmers near Dhaka, and is exported to Middle East countries by the support of NGO in exporting procedures. This is a kind of rural activities in which a specialized high-market value product is produced by small well-organized farming groups, and receives high market evaluation in Bangladesh, and exported to foreign countries. This small but

active practice of rural farmers are equivalent to “One village, Best product” activity in Japan. It is a good example of income generating in rural areas.

2) Production and marketing

a. Production of halal chicken

Small farmers, which raise 100 to several hundred broilers, organize a small cooperative for halal chicken production. Feeds are produced from imported maize, and ingredients provided by farmers themselves.

b. Exporting

Export of the halal chicken is facilitated by NGOs such as BRAC. Halal means approved in the Islamic religion for Muslims; therefore, the halal chicken is mainly exported to the ME countries.

3) Future development

It is necessary to annualize methods to produce and export the halal chicken, and extend to other areas by the agricultural extension work in cooperation with NGOs. The methods can be applied to other livestock products. These activities will provide farmers good chances to improve technologies for production, marketing and quality control including food hygiene.

(5) Mustard oil extraction

1) Oil extraction in Bangladesh

Mustard oil is the most popular edible oil in Bangladesh. Due to the tight trend of supply and demand of edible oil in the international markets, price of mustard is increasing, and demand of cultivation from farmers is strong. However, the existing varieties of mustard have longer duration of than the required time of rice production. Therefore, many farmers cannot cultivate mustard to complete with the Aman and Boro crops.

2) Example of mustard oil extraction in Mymensingh

Establishment and operation	<ul style="list-style-type: none"> - Mustard oil Extraction Company in Mymensingh city was established in 1999. - It is run for 24 hours a day and seven days a week. - Staff Members: There are 6 laborers and one manager. Three laborers work at day shift and three at night, 12 hours for each shift. The wage of each laborer is 82 Tk for 12 hours work. All the laborers are permanent. - Brand: The mill has its own brand and that is <i>NIKTI</i>. 																							
Production of mustard oil	<p><u>Materials:</u> Domestic varieties: BARI bred and released 8 varieties in the past. Characteristics of major varieties are of short duration (About 80 days), high oil content and resistant to high soil moisture.</p> <p><u>Price of mustard:</u> Tk 860/ 40 kg by local varieties and Tk 920/ 40kg by imported varieties</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Variety</th> <th>Mustard oil content (%)</th> <th>Oil cake (%)</th> <th>Moisture content (%)</th> <th>Price of oil (Tk/Lit.)</th> <th>Oilcake price (Tk/lit.)</th> </tr> </thead> <tbody> <tr> <td>Local</td> <td>33-35</td> <td>58</td> <td>8</td> <td>55-60</td> <td>9-10</td> </tr> <tr> <td>Imported</td> <td>38-40</td> <td>50</td> <td>10</td> <td>55-60</td> <td>9-10</td> </tr> </tbody> </table>						Variety	Mustard oil content (%)	Oil cake (%)	Moisture content (%)	Price of oil (Tk/Lit.)	Oilcake price (Tk/lit.)	Local	33-35	58	8	55-60	9-10	Imported	38-40	50	10	55-60	9-10
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Quality and price of mustard oil	<ul style="list-style-type: none"> - The quality of oils from local varieties is better and is of high demand in markets. - Price of oil cake: 9-10 Tk/kg - Uses of oil cake: For fishmeal, animal feed and fertilizers. 																							

Future development	a. In addition to the increase of edible oil consumption in the international markets, the demand for domestic mustard oil is also high. Farmers also have a strong intention to cultivate mustard to achieve the triple cultivation. It is necessary to breed early varieties and extend to farmers.																																												
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Source: BARI (Bangladesh Agricultural Research Institute) 2005, * This variety was selected through screening method.																																													
b. Profitable farming by integration of rice-mustard cultivation. Considering land crop negative ratio/competition, farmer's preference is short duration, high yielding oilseed varieties. For example, BARI Sorisha-7 have high yield, and the net return per acre is also high. Hence, integrated farming like fish (rainy season)-mustard (post rainy season)-boro (dry season) could be economically better suited for the profitable farming system-																																													

3.1.4 Marketing Development

Rural markets shoulder various important functions such as exchange of agricultural products and supply of daily goods, In addition, with a view to increasing of cash income and rural development, acceleration's marketing of agricultural commodities in rural area and collection of agricultural produce are also important. At the current situation in which agricultural production has been developed and rice production has almost achieved self-sufficiency, development of marketing is an urgent matter for agricultural diversification and income generation. The problems and requests farmers made to Union Parishads in the JICA Farm Household Survey (2004) were analyzed as a case study survey.

(1) Selling at markets

In the ratio of frequency of selling agricultural products by farmers, rice was the highest: 74%, followed by fish: 8% and livestock and vegetables: 4 %, respectively. For number of sold products 1 kind of product is 43% and 2 kinds of products was 29%. Number of selling products was also limited. The answer might be influenced by the fact that male heads of family replied to the question. If women answered, ratio of vegetables and small ruminants might be increased. In any case, it is true that rice is the dominant income source. Reason why the ratio of fish is high is fish is of vital importance, because rice + fish is the major combination of meal in Bangladesh. In the existing situation since rice composes the major part of cash income, it is necessary to increase rice productivity and strengthen rice marketing. From the importance of protein nutrition and income source, marketing of fish needs to be enhanced.

Number of farmers who put the product as No. 1 in selling at markets.

Products	Jamalpur	Kishoreganj	Mymensingh	Netrokona	Sherpur	Tangail	Total	(%)
Paddy	9	8	9	10	11	6	53	74
Fish	1	2		1		2	6	8
Livestock	1	1			1		3	4
Vegetables			2			1	3	4
Others	1	1	1	1		3	7	10

Source: JICA Farm Household Survey (2004)

(2) Problems from farmers and improvement of marketing.

1) Price of selling at markets

During survey (JICA Team-2004), farmers pointed out that price of commodities are the highest concern. Retailer prices in markets are almost one/constant/similar price due to their mutual exchange of price information. Buying prices of traders are not clear, and farmers have complaints to their farm gate prices/ selling prices at markets. Openness of price is important for getting fair pricing. Showing/Displaying prices of the day of the market by white boards will be useful for fair pricing. This is an effective experience in vegetable markets in Indonesia.

2) Improvement of rural road network.

When farmers sell their products, they usually carry the products to markets by themselves. Farmers usually use vans for transportation of commodities; therefore, road conditions are important for marketing. It appears from the interview survey (JICA Team-2004) that the distance from farmer's field/house to market is average 7 km. However, difference by district was large, for example 1.5 km in Mymensingh and 3.8 km in Netrakona and Sherpur. Size and distribution of markets are not decided by government regulation, but is dependent on volume of production and purchasing capacity: mainly number of consumers. After the successful implementation of SSWRDSP agricultural productivity will be increased, it will dictate improved road networks and marketing facilities and its infrastructures. The newly decided project titled "Second Rural Infrastructure Improvement Project (RIIP 2)" will be implemented from 2006 to 2012. It is expected to play an important role in socio-economic development and poverty reduction through construction of road network and marketing facilities.

3) Enlargement of marketing areas.

Difference in price between farm gate and large cities was also collected in the survey (JICA Team-2004). The price increase was not so high in village level, but in large city areas such as Upazila and District Sadar and Dhaka Cities the price increase was very high. The average price of vegetables was 3.14 times in Dhaka as high as the farm gate price. It indicates that marketing areas of agricultural products are needed to be wider for rural development.

Ranking of Major problems in marketing by farmers.

Items	Jamalpur	Kishoreganj	Mymensingh	Netrokona	Sherpur	Tangail	Average
Selling price	1	1	1	1	1	1	1.0
Market information	2	2	2	2	4	2	2.3
Road conditions	3	4	3	3	5	5	3.8
Distance to markets	5	3	6	5	2	3	4.0
Market capacity	4	4	6	3	5	3	4.2
Carrying methods	6	4	6	5	3	7	5.2
Quality control	6	7	4	7	7	6	6.2

Source: JICA Farm Household Survey (2004)

Price Development by Step of Selling.

Crops/ commodities			Farmers gate price	Selling price at markets		
				Union	Upazila/District	Dhaka
Rice (3 kinds)	Average	Tk/40kg	340	357	383	467
	Ratio		100	1.05	1.13	1.37
Cereals (2 species)	Average	Tk/kg	13	15	16	20
	Ratio		100	1.12	1.19	1.54
Vegetables (6 species)	Average	Tk/kg	13	14	18	41
	Ratio		100	1.10	1.35	3.14
Fish (10 species)	Average	Tk/kg	82	92	110	150
	Ratio		100	1.12	1.34	1.83

Source: Binnati Union, Kishoreganj Sadar Upazila (JICA Team -2004)

4) Strengthening of selling cooperatives.

Interests of farmers to cooperatives are not high, but aggressive cooperative activities are highly needed to accelerate marketing of agricultural products and improve marketing system. In the current situation, cooperative work in agricultural production (Except specialized cooperatives such as water use association) is not well organized from the mode of Bangladesh people. The reason is not clear, but it is estimated that agricultural producers are independent and that successful farmers' independent activities in rice production using shallow tube wells is highly appreciated. Therefore, even if farmers understand possibilities of obtaining higher profits by cooperative activities in cost-reduction, indirect effects of collaborative work in production may not be accepted. Procedures that have direct effects on farmer's profits will be accepted. It is likely promising from the facts that credit cooperatives were first organized and is still active in many countries. Japanese farmers also had the same experience that the first modernized cooperatives were organized from the acceleration of silk marketing. Since farmers can obtain cash directly through cooperative activities, farmers will actively join the marketing cooperatives.

(3) Export of agricultural products

Since the rice production has reached the self-sufficiency, export of agricultural, livestock and fish is one of the most important subjects in the mid-term rural development. Understanding of the importance of export of agricultural products has been advancing as observed in the International Workshop on the Agro-processing and Export in March 2005. In the interview survey to scientists of BARI, the following points were mentioned:

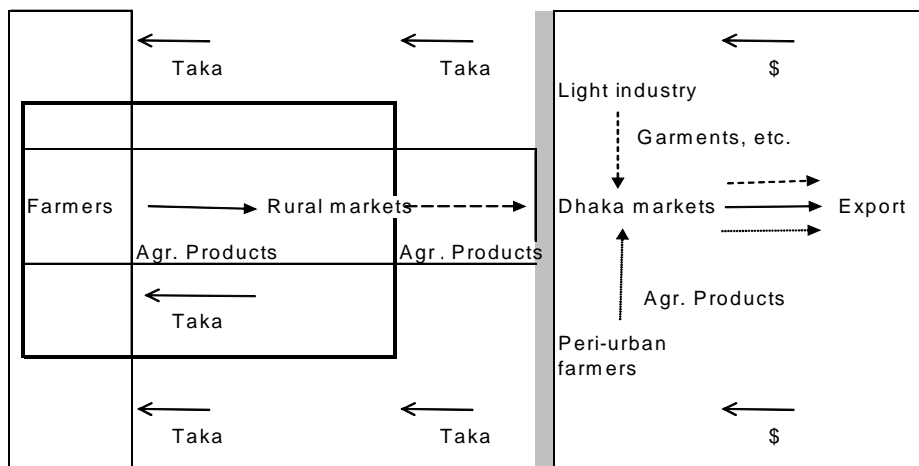
- 1) Taiwan was a typical case that the export of agricultural products promoted the development of agricultural and rural economy.
- 2) Current export of agricultural products from Bangladesh

There are many promising agricultural products of Bangladesh such as frozen vegetables during winter, fruits (Jackfruits in March-July, pineapple in March-September) and processed foods (Dehydrated foods, fruit juice, syrups, jam, etc.). Major importing countries are European, ME countries, Sri-Lanka, etc. Producers of high quality agricultural products are middle/small aggressive farmers. The tuber (potato) and horticultural crops exporters (private and NGO) have successfully developed contract growing of standard quality tuber and horticultural crops mainly in the Gazipur and Comilla district areas (nearest to Dhaka city). The BADC is providing technical supports for production and specialized cold storage facilities for exporting agricultural produces. The Bangladesh Biman (Bangladesh International Airways) is providing Cargo Services with competitive tariff facility for exporting agricultural produces. The *HORTEX FOUNDATION*-a project under the Ministry of Agriculture is providing technical support for development of international standard packaging and maintaining quality as well as international market information and access to the global market for exportable agricultural produces.

The nationalized commercial banks (NCB) are also supporting the exporters with financial package facilities as decided by the government. The Bangladesh Bank-BB (the central bank) has set new criteria for government subsidy on export of agro-processing products. The Central Bank has taken the move to encourage local entrepreneurs for producing agricultural products of international standards. Under the new packages the exporters of agricultural produces will receive:

- i. 30 % subsidy on net repatriation of FOB (Free on board) value if 80% local ingredients are used in exportable agricultural products.
- ii. 20% subsidy will be given to such products produced by using 70 % local ingredients.

- iii. At list of 60 agro-processing items include: fruits juice, prepared nuts, fried peanuts, aromatic rice, fine rice, flattened rice, puffed rice, fruit jelly, marmalade and extruded snacks, etc.

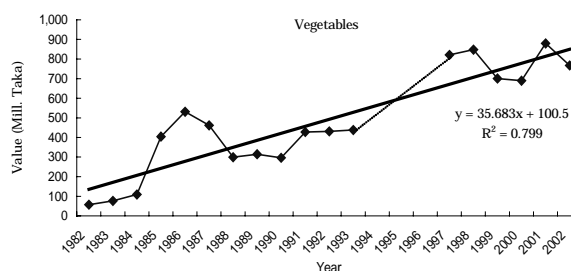
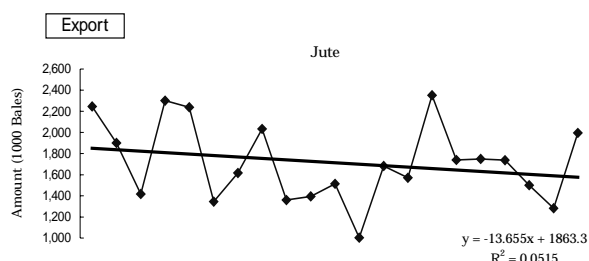


3) Advantages of Bangladesh in agricultural production

Winter crops of Bangladesh have high market competitiveness from the following reasons:

- Winter seasons in Bangladesh is off-seasons of cropping in England, ME countries, Canada, etc.
- Price of vegetables and fruits is remarkably low in winter seasons.
- Reductive and oxidative soil conditions provide appropriate production environments for vegetable production.
- Farmers request and explore a new specialized farming system for the future development.

Trends of export of jute and vegetables and import of major foods.



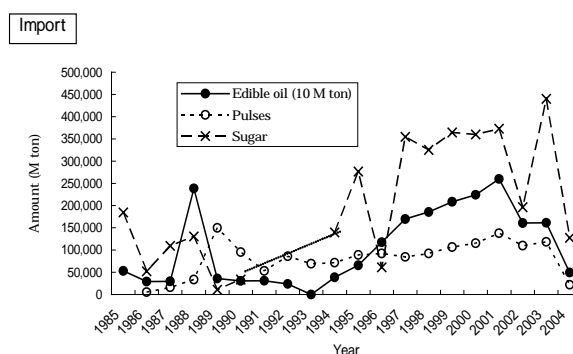
4) Problems

Problems in the agricultural export are similar to the domestic marketing. But the following items are more severely appeared:

- High transportation cost
- Poor quality control
- Poor marketing infrastructure

5) Requirements

Requirements in the agricultural export extend much more widely than in the domestic trades. In addition, these requirements are new to farmers.. Therefore, farmers need to introduce new technology from outside their societies and develop cooperative activities with



NGO and other parties.

- Development of marketing infrastructure such as cold storage/specialized storage facilities for horticultural crops/produces.
- Improvement of quality control
 - Improved seed production and distribution
 - Introduction of integrated rice mills
 - Market information system
 - Quality standard for marketing
- Development of export system such as exporting cooperatives and NGO
 - Organization of collecting and processing system
 - Financial and credit system

There is enormous scope for development of agriculture supported by modern technologies and management practices. The crop yield could be increased manifold if surface water could be made available for crop irrigation as well as for fisheries.

(4) Specialization of agricultural products <Aroma rice production and export>

The specialization is highly requested by farmers for the future development. Several successful cases in agriculture, livestock and fisheries have already mentioned in other sections. The rice production and export will be a unique and challenging subject in the future. Maintaining of high quality and high land-productivity requires lowland field conditions that enable to use it for a long time under successive cultivation without salinity or problem soils. Therefore, quality rice can be a specialized product of these areas.

From the agro-meteorological, topographic conditions and international market points of views, it is important to develop land suitable to rice cultivation and specialized production in the areas. Bangladesh is located at a strategic position, and has a strong possibility of being a promising rice exporting country. There is enormous potentiality to export aromatic rice to European countries like UK, and Canada, Southeast Asian countries and Middle Eastern countries. Bangladesh aromatic rice such as Kalijira and Chinigura has intermediate to high amylases content and short bold grains in size and shape. Various aromatic rice is used for special occasions and becoming popular among consumers of Bangladesh as well as Bangladeshis living abroad. Aromatic rice is sold at twice the price of ordinary varieties. Strengthening improvement of varieties and exporting system will enhance the commercialization of agriculture.

Grain Quality of Aromatic Rice in Bangladesh

Variety	Head rice outturn %	1000 milled rice weight g	Physical characteristics of rice grain				Protein content %	Amylase content %	Aroma
			Length mm	Breadth mm	L/B ratio	Size and shape			
1 Kalijira	98	8.2	4.2	1.7	2.4	Short bold	7.8	24.1	++
2 Kalijira TPL-62	96	8.8	3.5	1.6	2.1	Short bold	10.5	24.2	++
3 Chinigura	97	8.8	3.6	1.7	2.1	Short bold	8.3	23.2	++
4 Chini Atap	98	8.0	3.4	1.8	1.9	Short round	9.0	23.1	++
5 Chini Kani	98	9.1	3.6	1.8	2.0	Short bold	8.9	23.4	+
6 Madhumala	98	12.0	5.1	1.6	3.2	M. Slender	8.6	22.4	+
7 Sakkor Khorma	98	9.1	3.6	1.8	2.0	Short bold	8.6	22.7	+
8 Khakhani	98	7.9	3.8	1.6	2.4	Short bold	8.6	24.1	+
9 Radhuni Pagal	98	8.1	3.5	1.8	1.9	Short round	7.4	24.1	+
10 Tulsimala	98	8.3	3.7	1.7	2.2	Short bold	6.5	24.4	++
11 Tulsi atap	98	8.8	3.8	1.8	2.1	Short bold	7.5	23.7	++
12 Badsha bhog	98	8.4	3.5	1.8	1.9	Short round	10.3	21.9	+
13 Khorma	82	11.3	4.6	1.7	2.7	Short bold	9.8	26.4	-
14 Madan bhog	86	10.6	4.9	1.5	3.2	Short bold	8.7	27.4	-
15 Rajbhog	92	7.3	3.2	1.5	2.1	Short bold	9.6	21.6	+
16 Tulsimoni	94	8.4	3.7	1.7	2.2	Short bold	10.4	23.5	++
17 BR 5 (Dulabhog)	98	8.9	3.7	1.9	2.0	Short bold	7.9	23.5	++
18 Basmati-D	52	14.1	5.4	1.7	3.1	M. Slender	7.3	24.7	++
Average	92.7	9.2	3.9	1.7	2.3	-	8.7	23.8	-
Sd. +-	11.2	1.7	0.6	0.1	0.5	-	1.2	1.4	-

Notes: 1. Milling outturn was 71.6% on average with SD 0.7%.

2. Chalkiness of all the varieties was translucent.

Source: S.K.Biswas et al, Ann. Bangladesh Agric. 10 (1): 93-104, 2000

3.1.5 Agriculture in the Study Area

(1) General Condition of Agriculture

1) Land Type

Inundation land type of the Study Area is shown in Fig.3.2.10. Land type of majority of the Study Area is medium highland (61%) and suitable to crop production of rice and other upland crops with double cropping. However, the northern area and middle parts of the southern area belong to highland type (19% of the total study area). The eastern parts of the Study Area are medium lowland (3%) and lowland (14%) which forms haor, and covers large areas of Kishoreganj and southern area of Netrakona. In rainy seasons, the haor is flooded with different levels of water depth. Farmlands are cropped after the flood recedes the wide inundation areas, and mainly single cropping (HYV-Boro) is practiced.

Drought prone areas in the Study Area are shown in Fig. 2.2.5. During the rainy season-II (Kharif-II), the western parts of the area are slightly drought prone and the highland area is moderately prone. The north-western parts of the Bangladesh, for example the Barind Tract area (mainly Rajshahi Division), are severely prone to drought. The land conditions of the Study Area are generally moderate as compared with other areas. In the flood prone area, the farmers have no other option at present to keep their lands fallow or wait until water recedes, hence single cropping is practiced (*boro*) in the lowland area in eastern parts of the region (particularly in the Study Area). Farmers are more concerned to availability of irrigation water during dry seasons cropping.

2) Soil type

There are 5 major soil types in the Study Area such as (1) Non acid soils (Black, Dark, Grey and Brown), (2) Brown acid soil, (3) Non-calcareous alluvial soils, (4) Grey and grey dark non-saline soils and (5) Grey dark acid soils. Most of the area is covered by non-acid soils (Black, Dark, Grey and Brown). Brown acid soil is distributed in the highland area and in few parts of the northern area.. Non-calcareous alluvial soils are formed along the Jamuna River. Soil reaction in terms of soil acidity is not extreme and therefore, a large part of the area is suitable to agricultural production.

Concerning to the soil physical characteristics, the land type is closely related to the soil classification: High Land-silt loam, Medium Highland-clay loam, Medium Lowland-silty clay, Lowland-clay and Very Lowland- heavy clay. When farmers select crops, they need to consider the appropriateness of soil characteristics.

3) Farm House Holdings in the Study Area

Total number of house holdings in the study area was 2.076 millions, and among them 35.4% were non-farm house holdings and 64.6% were farm holdings (1996). The distribution of farm households in the Study Area is shown below.

Farm House Holdings in the Study Area

	District	All holdings	Non-farm house holds	Farm holdings	Farm holdings (Acre /holding)						
					Small					Medium	Large
					0.05-0.49	0.50-0.99	1.00-1.49	1.50-2.49	Total	2.50-7.49	>7.50
1	Jamalpur	380,336	37.3	62.7	16.7	15.0	10.3	10.2	52.2	9.6	1.0
2	Kishoreganj	417,186	39.3	60.7	16.4	13.6	9.9	9.3	49.2	9.6	1.8
3	Mymensingh	776,727	33.3	66.7	16.9	15.1	11.1	11.3	54.4	11.1	1.2
4	Netrakona	337,079	37.4	62.6	13.1	11.4	9.6	11.2	45.3	14.4	2.9
5	Sherpur	235,000	34.8	65.2	17.2	14.8	9.8	10.5	52.3	11.3	1.5
6	Tangail	561,241	30.1	69.9	19.5	16.7	11	11.6	58.8	10.2	1.0
	Total/ Average	2,707,572	35.4	64.6	16.6	14.4	10.3	10.7	52.0	11.0	1.6

Source: Census of Agriculture - 1996 (BBS)

As shown above, 52.0% belongs to the small farm holdings with an area of less than 1 ha. The medium and the large farm holdings were 11.0% and 1.6% respectively. In the farm holdings, 84.1% belongs to the small farm holdings. Comparison of the 1983-84 of holdings with the 1996 indicates that the non-farm holdings increased by 1.70 times during this period. The farm holdings increased by

1.23 times, much smaller than the non-farm holdings. The small farm holdings increased by 1.42 times. On the other hand, the medium farm holdings decreased to 0.82, and the large farm holdings decreased to 0.62.

By District, Kishoreganj, Netrakona and Jamalpur has showed the lowest 60.7%, 62.6% and 62.7 % respectively of the farm holdings. The level of the change was different, but all the districts in the Study Area showed the same tendency. Land area of farm holdings are decreasing, which causes fragile food supply conditions in small farm holdings.

An estimation of number of farmhouse holdings, which can secure the minimum level of rice-sufficiency, is shown below:

Preposition: Requirements of grains per day per capita	454g/day/person
Number of family of farm house	6 people
Yield of rice in milled rice	2.34 t/ha
Grain supply	All milled rice
Crop intensity	<u>1.77</u> (177 %)
$(454g/1000 \times 365 \text{ days} \times 6 \text{ persons} \times) / 2.34 \text{ t/ha} / 1.77 = 0.6 \text{ acre}$	
% of small farm holdings less than 0.6 acre = 27.9% + (23.9% x 10/50) = 32.7%	

Therefore, one-third of farm holdings cannot afford to obtain minimum amount of food grains by their own fields.

(2) Production Characteristics

1) Cropped area by major crops

Area, Production and Yield of major crops in the Study Area are shown in Table 3.4.1. Rice is the dominant crop in the Study Area with an average of 77.3% of the area with a high percentage in every district. Distribution of rice in the Study Area is shown below. Both Aman and Boro were cultivated in more than 30% of the area, but Aus were cultivated in an area as low as 12.9%. Following rice, wheat, jute, oil seeds, and maize were cultivated in 4-5% of the area.

Distribution of Rice in the Study Area

District	Gross Cropped area (Acre)	Aus			Aman			Boro			Rice Total %
		Total %	Local %	HYV %	Total %	Local %	HYV %	Total %	Local %	HYV %	
Jamalpur	592,689	6	83	17	32	48	52	28	16	84	66
Kishoreganj	570,559	10	63	37	20	43	57	49	29	71	80
Mymensingh	1,322,188	22	68	32	39	58	42	25	24	76	85
Netrakona	660,622	14	71	29	36	60	40	39	26	74	88
Sherpur	409,148	16	83	17	41	65	35	29	30	70	85
Tangail	828,577	10	93	7	26	61	39	30	15	85	65
Average (2003-04)	-	13	75	25	32	57	43	33	24	76	78
	-	-	38	62	-	41	59	-	5	95	-

Source: Census of Agriculture - 1996 (BBS)

Cropping pattern is decided by water availability. Boro (December – May) – Fallow (May – July) - T. Aman (August – November) is the typical cropping pattern of the Study Area. Most of the area is cropped 2 times in a year. The current cropping intensity is 1.77 (177%) in 2001, and its level is not low. However, considering the limitation of available farmland, it is necessary to develop the cropping intensity by the improvement of water management.

The major farming style in the Study Area is rice based farming including rice and upland crops. By District, the highest percentage of cultivation is Boro and lowest is Aman in Kishoreganj, The coverage of rice is low, but wheat, spices and jute is highest in Jamalpur among the six districts. The area covered with sugar cane cash crop is also high in Jamalpur, mainly due to a sugar mills exists in this district. The gross cropped area and the percentage of distribution of crops in the study Area is shown below.

Distribution of Crops in the Study Area

(%)

District	Gross Cropped Area (1,000 acre)	Aus	Aman	Boro	Total Rice	Wheat/maize	Potato	Vegetables	Spices	Pulses	Oil Seeds	Jute	Sugar Cane
a	b	c	d	e	f(c+d+e)	g	h	i	j	k	l	m	n
Jamalpur	593	6.4	31.6	27.4	65.3	7.8	1.5	1.4	5.1	1.1	6.8	8.9	1.7
Kishoreganj	571	9.7	19.2	48.1	77.1	4.1	2.1	1.2	2.6	1.4	4.3	5.5	0.1
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
Netrakona	661	13.3	33.6	36.4	83.3	1.7	0.9	0.7	1.5	0.5	2.6	8.0	1.2
Sherpur	409	16.0	40.6	29.0	85.7	3.3	1.6	1.7	2.2	0.4	2.6	2.9	0.2
Tangail	829	9.7	26.2	29.9	65.7	5.0	1.3	1.4	1.7	2.8	14.5	6.0	1.4
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)

2) Varieties improvement

HYVs are high yield potential, stress resistant and high fertilizer efficient cultivars HYVs have been widely gained its popularity over traditional/LIV (local improved varieties) all over the Bangladesh, and the ratio of HYV was rapidly increased in the past ten years (From 1996 to 2003-04): in Boro from 76% to 95%, in Aman from 43% to 59% and in Aus from 25% to 62%.

(3) Economic Factors

1) Value added of major crops

Gross value-added of major crops in the Study Area is shown below.

Gross value-added of agriculture by District at constant Prices (2000-01)

(Unit: million Taka)

District	Crops	Animal farming	Forestry	Fishing	Total
Jamalpur	5,901	1,078	669	846	8,494
Kishoreganj	5,349	1,171	828	3,458	11,806
Mymensingh	12,183	2,478	1,567	8,667	24,895
Netrakona	6,584	1,154	894	3,255	11,887
Sherpur	3,746	642	443	752	5,583
Tangail	7,877	1,818	1,105	854	11,654
Dhaka Division	71,696	15,048	9,804	27,090	123,638
Bangladesh	287,664	59,470	36,996	120,020	504,150
<Share in Agriculture>					
Jamalpur	69.5	12.7	7.9	10.0	100.0
Kishoreganj	45.3	9.9	7.0	29.3	100.0
Mymensingh	48.9	10.0	6.3	34.8	100.0
Netrakona	55.4	9.7	7.5	27.4	100.0
Sherpur	67.1	11.5	7.9	13.5	100.0
Tangail	67.6	15.6	9.5	7.3	100.0
Average	59.0	11.6	7.7	20.4	100.0
Dhaka Division	58.0	12.2	7.9	21.9	100.0
Bangladesh	57.1	11.8	7.3	23.8	100.0

Source: Statistical Yearbook of Bangladesh (2001)

By District, the share of crops in Jamalpur, Tangail and Sherpur showed a high percentage, but low in Kishoreganj and Mymensingh. In animal farming, Tangail showed the highest share. Kishoreganj, Mymensingh and Netrakona indicated high percentages in Fishing. In regard to the change in the past 5 years, the crops increased by 27.3% on average in the same period. Spices showed the highest increase, and potatoes, boro and vegetables also increased rapidly. Aman, Aus and Jute increased slightly. Fruits, oil seeds, pulses and sugar cane decreased. Commercial edible oil is produced from both local and imported oil seeds such as mustard/rapeseed. Soybean oilseed is never imported because there is no facility for soybean oil extraction in Bangladesh. Crude de-gummed soybean oil (CDSO) is imported and refined in Bangladesh. Out of consumption of about 0.7-1.0 million tones of

vegetable edible oil, 70%-80% is soybean oil, which is 100% imported). In Bangladesh, other than soybean, there is a facility mainly for extraction of mustard /rapeseeds. Out of total mustard oil, 70%-80% is imported and 20%-30% is locally produced. Hence, production of local oilseed crops needs to be increased. Due to long duration (>18 months) from planting to completion of crushing in sugar mills, the sugar cane crop is less profitable in comparison with short duration and open marketing facilities cereals and horticultural crops. In Bangladesh, sugar cane, jute, cotton, etc., are mainly cash crops.. The decrease of value-addition in cash crops is one of the serious factors in stagnation of farmers' cash income.

2) Marketing and Price of agricultural products.

Farmers have often complained a low price of agricultural products. It is mainly effected from poor transportation networks in rural areas. The road conditions are also inferior use of low quality construction materials and lack of regular maintenance. There are almost no and/or lack of gravel resources in Bangladesh: Cracked bricks are usually used for construction.

Rural markets have various functions such as: obtaining of daily goods, exchange of agricultural products to cash, wholesale function to large cities like Dhaka, collection and distribution function to large users: rice millers, livestock farmers, etc. To cope with the poverty alleviation and low cash income, the development of marketing is crucially important. It includes several measures to improve marketing capacity such as development of transportation, market information services and improvement of market infrastructure in all the areas of agriculture.

Cottage Industry Rural Transport Facilities in the Study Area

(Units/1000 Farm holdings)

District	Cottage Industry	Rural Transport	Tractor	Power Tiller	Boat	Rickshaw	Rickshaw Van	Bicycle
Jamalpur	35.6	129.3	3.7	3.7	13.1	12.2	9.0	95.4
Kishoreganj	31.8	140.8	3.9	5.4	39.9	14.6	6.7	76.7
Mymensingh	23.8	104.7	4.3	3.8	8.0	17.8	10.9	69.4
Netrakona	33.0	101.9	3.9	4.8	50.4	10.2	3.5	40.5
Sherpur	30.8	124.9	5.1	3.4	9.0	20.9	15.5	81.8
Tangail	38.6	155.3	4.6	3.6	29.2	6.3	19.2	106.1
Average	32.3	126.1	4.2	4.1	24.9	13.7	10.8	78.3

Source: Census of Agriculture - 1996 (BBS)

In regard to rural transportation, Tangail and Kishoreganj (excepting haor areas) have high rural transport facilities. Major methods are based on human power such as rickshaw, vans and boats (manual/mechanical power). In Kishoreganj and Netrakona, boats (mainly mechanical power operated) are used as major method of transportation. In Tangail, there is a high percentage of use of rickshaw, vans and bicycles. Methods of transportation are different by land /geographic conditions. It is important to develop transportation facilities and improve the marketing conditions.

3.1.6 Farm Household Survey

The results of the Farm Household Survey (2004) were attached as a supplementary document.

(1) Methods

- i. The survey was conducted to understand effects of SSWRDSP on farmers and examine possibilities and effectiveness of the project.
- ii. Seventy-two farmers were selected from Unions, the methodology was followed:
 - a. 3 farmers from one Union (total farmers: 3 farmers x 1 union x 24 unions=72 farmers),
 - b. 2 Unions from one Upazila (total unions: 2 unions x 2 upazila x 6 districts=24 unions), and
 - c. 2 Upazila from each of the 6 Districts (total upazila: 2 upazilas x 6 districts=12 upazilas),
 - d. the number of enumerators were 6, they were divided into 3 groups comprising 2 in each

group..

- iii. The survey was mainly focused on the collection of base line data and explores advisable farming styles. Prior to meeting farmers, survey sheet was prepared with cooperation by UP Chairman and farmers for pre-test,
- iv. Two enumerators composed one interview team, and interviewed a head of family of a farmer for 2 to 3 hours.

(2) Major results

- i. Interviewees were all men and heads of families. Average family members were 6.2 people and area of using land were 3.07 acres of which 89% was owned by family and 11% was rental. All the households were stable farmers
- ii. The farmers selected right fields for their crops, although they had little knowledge on the Land Type (Only a few answers).
- iii. Major farming patterns are Boro-Fallow-Aman, and but in Kishoreganj, the pattern is Boro-Aus-Fallow-Aman. Traditional crops such as vegetables, oil crops and jute were are matched in next patterns.
- iv. Ratio of the irrigated area was well developed, as high as 77%. Source of water was varied in locations; 39% surface water, and 61% groundwater (mainly STWs).
- v. Soil moisture content in rainy season was remarkably varied due mainly to the effects of alternate changes of growth of soil microbes, and weeds were suppressed and desirable agricultural effects were revealed.
- vi. More than half of the farmers' income came from rice, and the rice production was the most important source of income. More than 30% of the total family expenditure was covered by food, followed by 25% for agricultural inputs. The irrigation cost was about 5%, which is one-fourth of the total costs for agricultural inputs.
- vii. In the interview survey (JICA Team-2004), it indicates that 15% farmers were deficit in the balance of income-expenditure.

Major characteristics are as follows:

- 1) There was no difference in family member.
- 2) Education level of the head of family was low; the ratio of non-school educated heads of family accounted to 47% of the total deficit family. Those who received secondary education such as SSC (Secondary School Certificate-education up to 10th class) were as low as 7 %.
- 3) Besides, the area of land use was small; the ratio of rent was higher. There is no difference in use of ground water, but ratio of DTW was high. It caused low profitability in the deficit farmers
- 4) In the income source by farming system, dependence on rice was high, but share of vegetables growing was low, and almost no family cultivates fruits or aquaculture, which are high profitability in the survey area. On the other hand, share of employment in agricultural work was high.
- 5) In expenditure, ratio for foods was high, but the expenditure for child education was low.
- 6) Flood damages and delay of agricultural diversification indicate high ratio in the constraints of agricultural production.
- 7) Strong requests were proposed to Union Parishad for the development of non-agricultural fields such as sanitation and communication (Rural road construction) and other environment related items.
- 8) For future development in the post-rice self-sufficiency era, farmers' desires were indicated in diversification from rice, to specialized farming, and mechanization, etc.
- 9) In addition to economic development, different type of prosperous country-life is observed; a family enjoys pastoral life by growing rice, vegetables, fruits and rearing goats and working as schoolteacher. Profile of farmers to achieve is of wide variety.

Background of survey farmers.

	Items	Deficit farmers	Total farmers
1	House hold members		
	Man	3.5	3.3
	Woman	2.5	2.9
	Total	6.0	6.2
2	Age of head of family	46.9	45.3
3	Education background of head of family	%	%
	Not educated	47.0	22.2
	Up to SSC	47.0	66.7
	Above SSC	7.0	12.5
4	Major kinds of work of family (Ratio to total house holds)		
	Rice	%	%
	Aus	33.0	16.7
	Aman	100.0	98.6
	Boro	100.0	98.6
	Vegetables	20.0	38.9
	Fruits	0.0	25.0
	Fisheries	0.0	25.0
	Aquaculture	0.0	2.8
	Livestock	73.0	79.2
	Forestry	7.0	13.9
	Sale own labor (Agricultural work)	33.0	11.1
	Non-agriculture work	20.0	20.8
5	Number of households	15.0	72.0

Source: JICA Farm Household Survey (2004)

3.1.7 Problems on Present Agriculture

Bangladesh agricultural conditions are still vulnerable, especially in terms of natural conditions and agricultural technology. The master plan for SSWRDSP is the development of water resources, which is required for cultivation of crops, activities for fisheries and livestock and human welfare. Irrigation and drainage are not smaller inputs rather considered most important input (irrigation) and facility (drainage); therefore, it is important to secure that these essential interventions should not be limiting factors. In this survey, the following items of technical package and marketing of agricultural products were examined on their current supply conditions in a view to confirming stability of supply system. Production costs and income expenditure of farm households were also surveyed by the interview survey to farmers. Income diversity by agricultural diversification such as crop diversification, fisheries and livestock was also examined. The items need to be improved urgently are as follows:

(1) Land Development

Agricultural lands in Bangladesh are generally flat by a macroscopic point of view, but in actual farming, the farmers utilize the small difference of land elevation. A farming case observed in Kishoreganj is informative. The difference of the land elevation is as small as 0.5 to 1.0 m. In this small different land elevation, the farmers changed planting time for about one month, and also changed varieties according to water depth: HYV T. Aman in higher place and local variety in lower area. They expressed that higher profits are obtained in higher places. From these observation, preparation of terraces will be useful, and worth to study. Considering the development of mechanization of rural area, ridges are required to be passable to tractors. The terraces will be useful for water retention in dry seasons.

(2) Problems in Agriculture Production and Food Supply

1) Recent trend of food supply

Rice cultivation and other water-based farming have well developed since the independence of Bangladesh. Although there is a large fluctuation in the food supply, the rice production is almost achieving the self-sufficiency, and other agricultural production is also increasing. The current

nutrition intake and food consumption are shown below:

Trend of Nutrient Intake and Food Consumption.

Products	1985	1990	1995	2000
Wheat (Kg/year)	34.1	20.6	22.6	20.6
Rice, milled eq. (do),	137.7	157.3	146.1	156.5
Vegetables (do)	11.2	11.9	11.0	12.1
Meat (do)	2.7	2.8	3.0	3.1
Egg (do)	0.6	0.6	0.8	1.0
Fish (do)	7.6	7.4	8.6	10.9

Source: FAO Food Balance Sheet (2004)

From these data the following characteristics of food supply can be understood:

- i. Calorie intake has been improved through increasing rice consumption
- ii. High protein vegetable foods are decreasing, and protein intake and vegetable consumption are insufficient.
- iii. Production in fisheries and livestock is also insufficient.

Trend of Rice Production, Supply and Nutrition Intake.

Year	Rice ('000' ton)		Per-capita rice supply Kg/year	Calorie and protein intake per capita			
	Production	Import		Calorie Cal/day	Protein		
					Total Gram/day	Animal Gram/day	Vegetables Gram/day
2001	24,201	151	155	2,372	46.8	6.0	40.7
2000	25,096	259	157	2,158	45.8	6.1	39.6
1996	18,799	1,037	153	2,046	44.3	5.6	38.8
1995	17,607	986	146	1,986	43.1	5.3	37.8
1991	18,261	18	158	2,074	44.6	5.0	39.6
1990	17,861	382	157	2,092	44.9	4.8	40.1
1986	15,414	53	150	2,013	43.0	5.1	37.9
1985	15,045	674	138	2,012	44.6	5.1	39.4
1981	13,637	78	143	1,941	42.3	4.7	37.6

Source: FAO Food Balance Sheet (2004)

2) Malnutrition in vulnerable groups

Child mortality is high in Bangladesh, and even the richest 20% had high child mortality. Children stunted and children underweight were widely spread in this country, and even in the richest 20%, 23.5% stunted and 28.1% underweight were observed. In Bangladesh it is reported that at the household level food distribution among the family members is not necessarily equal. Generally, women and children have less access to food than adult male (I-PRSP). Malnutrition of vulnerable (Poor people, children, pregnant women) is serious.

Items	Poorest 20%				Richest 20%
Child mortality per thousand births	141.1	146.9	135.2	122.3	76.0
Children stunted (%)	50.5	50.8	41.9	34.8	23.5
Children underweight (%)	60.3	53.5	49.2	41.8	28.1
Low mother BMI (%)	64.4	57.4	53.3	48.3	32.6

Source: Field (1995) * BMI: Body Mass Index

3) Problems in protein supply

Insufficient supply of protein to children and pregnant women was reportedly concerning the World Bank Human Nutrition Project. A comment was made as "Maternal and children protein energy malnutrition in Bangladesh remains amongst the highest in the world"(The Daily Star, June 22, 2005, cited from Annual Programmer Review Mission for HPSP by World Bank). This evaluation indicates that the production of protein foods is of vital importance in the future agricultural production. Protein foods should be targeted in the future farming system.

(3) Food Consumption and Household Management

1) Food consumption by size of own land.

Combination and consumption of foods varied with income levels. In rural area it changes by size of land holdings. As general economy develops, the share of food combination also changes. The share of food component indicates the current situation of food consumption, and future share of food combination can be estimated from a higher rank of land holding. Demand-driving agricultural production needs change of market requirements.

Expenditure to food items increased in every rank of the land holding from 1995-96 to 2000. The share to cereals decreased rapidly, and the shares of meat-egg-poultry and fruits increased. In 2000, the cereals have the highest share in all the rank. It appears that the shares of cereals, pulses, and vegetables have been gradually decreasing. On the other hand the shares of meat-egg-poultry and milk increased rapidly. There was no clear difference in the share of fish consumption. From these data if the general economy increases, the consumption of livestock products will also increase. The change of consumption indicates the urgency of production increase by commodity. High priority should be given to farming system agriculture related to livestock. Considering the low income farmers, production of cereals and fish production is also important.

Share of expenditure on major food items by size of land owned in rural area.

Size of land owned	Av. expend. on major food items	Share of food component on nmajor food items (%)							
		Cereals	Pulses	Vegetables	Fish	Meat, egg poultry	Milk	Fruits	Others
<2000> (Tk)									
All group	2,300	41.23	2.79	9.44	12.06	6.97	3.62	2.57	21.32
Landless	1,712	41.97	2.82	10.33	10.95	6.17	3.06	2.50	22.20
0.01-0.04	1,982	41.93	2.89	9.91	12.21	5.95	2.53	2.36	22.22
0.05-0.49	2,138	42.59	2.76	9.95	11.44	6.36	3.18	2.56	21.16
0.50-1.49	2,400	41.87	2.74	9.27	11.87	6.92	4.03	2.46	20.84
1.50-2.49	3,000	38.96	2.77	8.63	12.68	9.06	4.93	3.05	19.92
2.50-7.49	3,467	38.98	2.61	8.45	12.49	8.57	5.57	2.98	20.35
7.50+	4,952	38.28	2.77	7.52	11.39	11.05	5.91	2.98	20.01
<1995/96> (Tk)									
All group	2,137	47.8	2.6	9.0	11.0	5.0	3.4	1.9	19.3
Landless	1,610	47.8	2.4	7.8	9.7	4.6	2.2	2.0	23.3
0.01-0.04	1,421	50.2	2.5	9.7	9.8	4.1	2.3	1.7	19.6
0.05-0.49	1,825	49.2	2.5	9.4	10.8	4.1	2.6	1.8	19.6
0.50-1.49	2,186	48.5	2.6	9.1	11.5	4.7	3.2	1.8	18.5
1.50-2.49	2,545	46.7	2.3	8.8	11.1	5.6	4.4	2.2	18.9
2.50-7.49	3,166	45.7	2.7	8.4	11.3	6.5	4.6	2.3	18.6
7.50+	4,870	41.8	3.1	8.0	11.4	6.8	5.8	1.7	21.4

Source: Report of the Household Income & Expenditure Survey, 2000 (March, 2003), BBS

2) Economic aspects of agricultural production

i) Cost-benefit analysis

Production cost and benefit in Boro production is shown in the table below (Ref: the JICA Farm Household Survey 2004). The production cost was Tk 13,789/acre on average of 6 Districts. Yield on average was 2.20 ton/acre, and the selling earnings were Tk. 21,974/acre when unit price of paddy was 10 Tk/kg. Crude profit was Tk. 8,186/acre. The crude profits of Netrakona and Sherpur were lower

Cost (Cash expenditure)-return for Boro rice production.

Items	(Tk/acre / year)						(%)	
	Jamalpur	Kishoreg.	Mymens.	Netrakona	Sherpur	Tangail	Average	Ratio
<Cost>								
1 Land rent	1,000	333	2,146	1,875	1,209	0	1,094	8
2 Land preparation	1,285	200	1,225	1,109	1,000	1,064	980	7
3 Fertilizer cost	2,856	1,202	1,355	2,006	2,492	2,429	2,056	15
4 Seeds cost	435	219	195	518	877	45	382	3
5 Seed bed preparation	58	27	142	18	67	159	78	1
6 Irrigation	4,167	1,875	2,088	4,217	3,329	2,888	3,094	22
7 Transplanting	1,642	855	1,942	1,676	1,846	1,446	1,568	11
8 Weeding	1,471	655	673	1,889	1,225	1,135	1,174	9
9 Pesticides	473	418	443	745	526	595	533	4
10 Harvesting	1,792	1,140	2,533	2,190	2,792	1,405	1,975	14
11 Threshing	400	488	1,164	1,142	375	373	657	5
12 Drying	42	100	208	96	217	73	123	1
13 Winnowing	25	100	33	78	133	73	74	1
Total	15,644	7,611	14,147	17,560	16,086	11,684	13,789	100
<Income>								
1 Yield of paddy	2.53	2.18	2.33	2.20	1.98	1.96	2.20	
2 Selling amount (Unit price= Tk10/kg)	25,300	21,780	23,333	22,000	19,833	19,600	21,974	
<Crude profit>								
<Income>-<Cost>	9,656	14,169	9,186	4,440	3,747	7,916	8,186	

than other Districts. (Effects of bias by the interview might be involved.)

Among the total cost, irrigation cost was the highest; Tk 3,094 or 22% of the total cost. The value was similar to the results of the Interview survey to Union Parishad, Tk. 3,000 to 3,500 or 1/4th of the total cost. Fertilizer cost was Tk. 2,056 or 15%. Although the seed cost was as small as 3% (may be due to

using of farmers own seed or exchange with neighbor), the total cost of nursery and transplanting amounted to 15%. Irrigation cost of T Aman was small (because T.Aman does require supplementary irrigation).

Rice production is stable in farming such as production practices and selling. In addition it is useful in food security. However, productivity is not high, or rice is not appropriate source of protein nutrition. In the future agricultural production of post- rice self-sufficiency, crop diversification needs to be developed to increase farmer's income and farmers' nutrition. In production costs irrigation and fertilizers showed high rates; therefore, development of methods how to use water and fertilizers efficiently is urgently are required.

ii) Problems of deficit farmers

Balance of income and expenditure is one of the common important factors, which cover from large-scale farmers to small-scale farmers. Deficit farmers are in unstable economic conditions, and they will face poverty in the long run. In the Farm Household Survey 15 of 72 farmers was deficit in their income-expenditure balance. There were 11 households, which had higher income than Tk. 30,000/house.

Several features of the deficit farmers are as follows:

- No difference in family members.
- Low educational background. High ratio of non-educated house owners, and low ratio of house owners with higher education than SSC.
- Rice was a dominant product, less diversified to vegetables, fruits and others. Aquaculture was not performed
- High ratio of employment to Non -farm labor
- Holding smaller farmland and higher ratio of rental land.
- Higher ratio of irrigated land.
- Higher ratio of DTW (Higher cost than STW)
- Higher ratio of earnings from rice, and higher dependence on Aman.
- In expenditure, ratio of food is higher and lower amount and ratio of education.
- Lower amount and ratio in agricultural inputs.
- Due to low expenditure of child education, the poor conditions of the deficit farmers may be reproduced.

(4) Seed Production and Supply

1) Improvement of seed quality

Various projects have been implenting to stabilize access of farmers to quality seeds. In the current situation, seed supply is relatively well maintained except during severe damages by floods or other climatic disasters such as the floods and seed shortages in 2004. Seed quality needs to be improved.

Quality seeds can be obtained from fully matured reproductive products, which have their indigenous grain weight. The SCA should incorporate "one-thousand grain weight" indicator in the seed standard.

Comparison of cash income and expenditure of house hold.

Items	Amount (Tk/house/year)			Composition ratio (%)		
	Deficit profit	Surplus profit	Above Tk 30,000	Deficit profit	Surplus profit	Above Tk 30,000
<Cash income>						
1 Rice	28,918	44,070	71,721	68	50	38
1 Cereal Aus	1,391	1,650	177	3	2	0
2 Aman	13,726	16,214	29,801	32	18	16
3 Boro	13,801	26,205	41,744	33	30	22
4 Vegetables and fruits	271	6,739	20,527	1	8	11
5 Jute	420	212	0	1	0	0
6 Oil seeds	107	21	0	0	0	0
7 Fish production	0	15,613	47,148	0	18	25
8 Livestock	873	1,958	1,300	2	2	1
9 Poultry	173	259	45	0	0	0
10 Non agr. production	4,761	11,790	32,900	11	13	17
11 Sales of self labor	3,980	1,517	1,636	9	2	1
12 Others	2,800	6,514	14,182	7	7	7
13 Total (A)	42,303	88,692	189,461	100	100	100
<Expenditure items>						
1 Food	17,513	19,817	27,818	38	30	25
2 Clothes	4,600	6,316	10,273	10	10	9
3 Child education	1,187	5,559	12,600	3	8	11
4 Housing	2,000	2,526	3,864	4	4	4
5 Health	2,227	3,081	5,136	5	5	5
6 Irrigation	2,723	3,600	4,377	6	5	4
7 Agricultural inputs	10,250	16,830	28,200	22	25	26
8 Credit refunds	1,755	3,642	5,604	4	5	5
9 Entertainment	1,453	2,981	7,682	3	5	7
10 Others	1,935	1,883	4,091	4	3	4
11 Total (B)	45,643	66,234	109,645	100	100	100
Balance (A)-(B)	-3,340	22,458	79,816			
Number of household	15	58	11			

Source: JICA Farming Household Survey (2004)

The current factors are all related to general characteristics regardless to variety. To obtain healthy seedlings well-matured products should be used for seeds. Size of products is decided by characteristics of variety. Therefore, certification emphasized on variety.

Seed Standard in Bangladesh

Factors	Foundation seeds			Certified seeds			
	Paddy	Wheat	Jute	Paddy	Wheat	Jute	
Pure seeds	Min. %	97	97	98	96	96	96
Foreign materials	Max. %	2	2	1	3	3	3
Other seeds	Max. %	1	1	1	1	1	1
Other crop seeds	Max. in number	5/kg	5/kg	5/kg	10/kg	10/kg	10/kg
Total weed seeds	Max. in number	8/kg	8/kg	8/kg	10/kg	10/kg	10/kg
Germination ratio	Min. %	80	80	70-80	80	80	70-80
Moisture content	Max. %	12	12	8-12	12	12	8-12

Source: Seed Certification Agency, MOA, 2004

In the potato producing area in

Kalai, Joypurhat, medium to small size tubers are used for seeds due mainly to shallow soil depth, from the opinion of farmers. The products contain a large amount of small potatoes: 40% by large, 40% by medium and 20% by small on weight basis. High ratio of small potatoes is affected by using small tubers.

2) Degradation of seed quality by low renewal of seeds

Due to high price of seeds and difficulty in access to certified seeds farmers usually use their own saved seeds. It implies the degradation of seed quality, and the ultimate results in poor quality of products. From interviews to farmers, several problems were raised as follows:

- a. Radish: Due to the degradation of seed quality, roots of radish become smaller especially in summer.
- b. Potato: Ratio of small size of tubers is high: 40% in large, 40% in middle and 20% in small in Diamont variety. Market price of large size is higher than small ones. Large Size of tubers needs to be maintained for profitable farming. Degradation of seed quality and use of small size tuber may cause smaller tuber of products. (Kalai, Joypurhat) There are many disadvantages in degraded seeds: Advantages of varietal characteristics will be disappeared, maturing time is varied, and quality of seeds is changed.

3) Supply of pure seeds

BADC provides 5-10% of the requirement of entire quality seeds. BADC's function is not only to provide pure seeds, but also to demonstrate practical seed production methods from cultivation to processing. BADC has developed modern seed processing and storage facilities. But farmers have no such processing type of processing storage facilities. Simplified processing and storage facilities should be provided to farmers which will help increase coverage of quality seeds.

4) Self-supply

About 90% of rice seeds are used by farmers own saved seeds. To improve farmers' seed quality, it is necessary to develop farmers' skill for quality seed production. To produce quality seeds, farmers should follow the procedures of processing, free from floods, damages by early floods, well-ripened grains, purity, not drying in strong sunshine etc.

5) Community based seed supply

Seed production does not require a large amount of grains, but it needs good crop management, and the grains should be of good quality. Therefore, the areas/ fields should be specified as specialized area for seed production, free from flood. Besides, special processing is also needed. From these reasons, community based seed supply is useful to farmers.

Seed Exchange Program (SEP) is conducted in all districts by DAE through a government financed Seed Exchange Program. The share of the program has been increased equivalent to 12.5% of the total requirements. This is a successful case of seed production. For further development, local certification and package are required for rural marketing.

Source	Rice Seed Market (unit in ton)							
	1997/98		1999/2000		2000/01		2001/02	
	Amount	(%)	Total	(%)	Total	(%)	Total	(%)
BADC	10,300	(2.6)	14,000	(3.5)	2,000	(3.0)	10,500	(2.6)
DAE/SEP	1,000	(0.3)	3,700	(0.9)	18,000	(4.5)	50,000	(12.5)
Farmers	388,400	(97.1)	381,300	(5.3)	365,500	(1.7)	333,700	(3.4)
Total w/others	400,000	(100)	400,000	(100)	400,000	(100)	400,000	(100)

Source: JICA Farm household survey (2004)

(5) Rice Monoculture (Poor agricultural diversification)

The Bangladesh rice farming system based on water-based farming is well adapted to the natural conditions of the country. It provides great advantages for farmers' food security or stable rice production. However, rice monoculture has to be diversified in the post-rice sufficiency era. Crop diversification is an important factor to develop farming system. The success stories by the crop diversification can be seen in various places in the SSWRDSP-I such as from rice to vegetables and other upland crops, from rice to potato and from DWR to HYV. However, for the stable diversified farming, there are still important items to be solved as follows:

- Water resources management is not widely practiced.
- Land area is limited for rice production for small farmers.
- Farmers' agricultural technology is not high enough for diversification such as fish culture and vegetable growing on commercial bases.
- Financial status of small farmers is not sufficient for diversification.

(6) Traditional Farming (Poor agricultural mechanization)

1) Land preparation: ploughing and puddling

Ploughing and puddling are done by power tillers and hired power tillers are used in most cases. Introduction of agricultural machinery is costly. Therefore, it is necessary to organize a collaborative group for low-cost mechanization. Union offices will be appropriate to organize a community-based body to provide machinery services.

Mechanization is not advanced in the survey areas due to low cash- income of farmers and limited farmland. Country plough (Plowing by bullock) is a typical traditional agricultural practice and still used in rural areas. However, it has several problems and needs to be replaced to power tillers or hand-tractors.

- Rearing of water buffalo is increasingly difficult due to limited supply of grasses and small water ponds for buffalo.
- Shallow soil depth by country plough is not suitable to vegetable growing, especially tuber and root crops

2) Farm Mechanization

Current and future farming demands small-scale mechanization involving a hand tractor, STW and Engelberg rice mill. Cooperative activities for purchasing and maintenance services are useful.

3) Healthy rice seedlings

BIRRI recommended optimum seedling age for rice crop is as follows:

Name of rice crop	Optimum Seedling Age (Days)
i. Boro	40-45
ii. T.Aman (early)	30-35
iii. T.Aman (late)	45-50
iv. T.Aus	20-30

Yellowed, over-aged and unhealthy rice seedlings of T. Aman were often observed in rice producing areas in several districts of the study area. These seedlings are required for transplanting of rice in deep water paddy field. The fact that there may be no difference in yield between the yellowed

seedlings and healthy seedlings in grain yield as reported. However, if water management is properly done and actual yield will be increased, but the poor growth in early stage will cause lower yield. As farmers in Haor area mentioned healthy rice seedlings of 25-days old for T.Aman provide higher rice yield than the older rice seedlings. In post-project areas of SSWRM, crop management of seedling will be important work.

4) Fertilizer use, soil fertility and recycling

Fertilizer use is directly related to crop yields – Ex. Every 1 ton paddy /ha needs 20 kg N/ha. Chemical fertilizers such as Urea and TSP have a relatively high share in crop production. Therefore, efficient use of fertilizers, use of green manure (e.g. Sesbania) and improvement of soil fertility are strongly requested by farmers. Soil Fertility and Fertilizer Management Project (SFFP) (Phase-I: 1993-1999), (Phase-II: 1999-) has been conducted for demonstration to individual farmers. For low-cost farming and environmental protection in rural areas, besides fertilizer use, recycle of wastes of livestock, poultry production and rural industrial residues (i.e. bagasse a by-product of sugar mills) are important.

(7) Water Related Problems

1) Flood Damages: Most serious damages

Farmer's constraints in the Farm Household Survey indicate the flood damages as the most serious damages.

Rank of constraints in agricultural development.

Constraints	Jamalpur	Kishoreganj	Mymensingh	Netrakona	Sherpur	Tangail	Average
1 Flood damages	1	1	1	1	1	1	1.0
2 Mono-cropping	3	2	2	2	2	2	2.2
3 Traditional farming	2	3	3	3	3	3	2.8
4 Inadequate irri. water suppl.	4	6	4	4	4	4	4.3
5 Marketing problems	5	4	5	6	6	5	5.2
6 Poor land preparation	6	5	6	5	5	6	5.5
7 Inadequate quality seed avail.	9	7	8	7	8	7	7.7
8 Land fragmentation	10	8	9	8	7	8	8.3
9 Poor agricultural technology	8	9	7	9	10	10	8.8
10 Low inputs	7	10	10	10	9	9	9.2

* 2: Crop diversification is not developed.
 3.: Mechanization is not developed.
 4.: Irrigation nsystem is not well developed.
 Source: JICA Household survy (2004)

Damages on crops differ by vegetation of crops. In the Farm Household Survey, aman, vegetables and jute indicate high yield decrease frequency by flood damage. Winter crops such as boro and wheat have damages by drought. These data indicate effective counter measures are urgently requested in water resources management. Diseases and insect damages were widely spread in rice and vegetables and diseases in jute and insect damages are spread in wheat. The yield decrease was not severe. Rat damages were found in potato, rice and wheat, widely happened but not serious in yield decrease. Bird damages were happened mainly in winter crops. Dry and submerged conditions bring about advantages in crop protection.

Damages on crop yields and their frequency to major crops by cause.

Items	Reasons	(Kishoreganj District)								
		Rice	Aman	Boro	Vegetables	Jute	Oil seeds	Potato	Wheat	Banana
Average of damages (% in yield decrease)	Flood	38	37	0	54	24	38	20	0	0
	Drought	24	0	26	14	0	0	0	17	23
	Diseases	12	0	12	18	16	0	20	13	0
	Insect	19	-	-	20	12	0	13	18	0
	Rat	10	-	-	7	10	10	11	9	0
Frequency (% of union) Unions=84	Birds	6	-	-	6		13	20	6	0
	Flood	80	49	0	65	43	2	2	0	0
	Drought	20	0	60	35	0	0	0	4	2
	Diseases	78	-	-	72	45	0	8	2	0
	Insect	84	-	-	78	2	0	6	43	0
	Rat	45	-	-	18	1	1	54	33	0
	Birds	52	-	-	41	0	2	1	39	0

Source: JICA Household survey (2004)

2) Floods and sedimentation

Floods spread widely in Bangladesh. Floods are usually caused by a large amount of water from India and stay there for a long time. Therefore, there are no effective and economical countermeasures for agriculture at present. Farmers just wait for the time until floodwater recedes. Besides, farmers keep their fields in fallow condition in the second rainy seasons. Floods often bring about good harvests in dry seasons.

Floods by river water cause sedimentation. The sedimentation has double-edged functions of micronutrient supply and soil accumulation including sandy and clay soils. Sandy soil is not suitable to rice plants clay soil is appropriate for rice, it is not suitable to vegetables, especially root crops. It is necessary to explore methods to utilize advantages of flooding and sedimentation.

3) Inadequate irrigation water supply

Inadequate irrigation water supply was ranked forth of the 10 items. Problems in crop cultivation such as rice mono-cultivation (Poor diversification) and traditional farming (Poor agricultural mechanization) were ranked in the second and third. It indicates that farmers want to diversify in agricultural production and introduce machines in daily work. The marketing problems were ranked fifth, not very serious in the survey. The reasons are estimated, as mentioned later, the interviewed farmers were located within 2-3 km from their market, and most of them indicated surplus in the balance of cash income and expenditure. Inadequate quality seed availability, poor agricultural technology and low inputs were ranked the lowest group. It is estimated that due to activities by extension services and high rice consumption in markets, problems in crop cultivation were not serious presently.

3.1.8 Agriculture Development

(1) Agriculture Development under the PRSP (draft)

PRSP has been studied to for several years, and the final PRSP is expected to be finalized by October 2005 by the government. The major policy framework for the agricultural development was composed of 4 issues in the “Unlocking the Potential”, PRSP (draft), as follows:

- Intensification of major crops (i.e. cereals)
- Diversification to high-value non-cereal crops (i.e. vegetables and fruits),
- Development of non-crop agriculture (i.e. livestock, poultry, fisheries)
- Promotion of rural non-farm activities (i.e. rural construction, transport and services)

1) Changes of food production

In the PRSP (draft), it was pointed out that the food production has been attributed to significant policy shifts toward increased private sector involvement in input distribution, liberalization of equipment imports, deregulation, and rationalization of subsidy and restructuring of agricultural research-extension linkages. Priority was given to pro-market policies. In our survey these opinions were noted in the agricultural development.

2) Food security to the poor

The PRSP (draft) indicates that the long-term strategy for food security requires action on two fronts: First is assurance of a continuous and low-cost food supply, and second is an income distribution that provides adequate purchasing power in the hand of the poor. In our understanding, to achieve the first item, it is most practical approaches to enhance middle class development, and enlarge entire economic activities: production and consumption. Enhancing the middle class is also useful for better income distribution in a united local society.

3) Relation to SSWRDSP

The concepts of the government policy are general guidelines to various projects. The concepts are

shared by the SSWRDSP study on data collection and analysis for the formulation of the Master plan.

In the agricultural approaches in our study we consider that the agricultural development is at a large turning point. Based on the framework of the PRSP, new directions were studied, and major items are as follows:

- i. Development of agricultural production through
 - Development of agricultural technology
 - Crop diversification
 - Integration of rice, livestock and fisheries
- ii. Marketing
- iii. Alleviation of malnutrition through agriculture
- iv. Cash generation
- v. Poverty alleviation through middle class development.

(2) Development of Nutrition-linked Farming System

Agricultural production is a two-wheel carrier that carries quality life in rural areas as its final targets: Development of economic conditions and balanced nutrition. Malnutrition has been serious problems to human health. As food supply is improved, the malnutrition is getting to be realized major problems for the quality life.

1) Current malnutrition characteristics.

Rice is the major food of Bangladesh and all the people feed on rice. Rice is a good calorie source, and rice-based food system is established as well as rice-based farming system. However, although rice production has achieved almost self-sufficient level at nation level, rice supply is not enough in several social segments such as city slums and wide rural areas. Due to low protein content of rice it cannot provide enough protein and other human nutrients to men. Presently, malnutrition in protein, calories and other nutrient deficiency are summarized in the table below:

a) Protein energy malnutrition:

Calorie intake has been improved as rice production has been developed. However, rice supply is not still stable or uneven due to natural conditions and economic disparity. Protein malnutrition is the major problem in human nutrition. Of children under 5 years old 48% were severely malnourished (Stunting). Pregnant women also show deficit of protein and energy at as high as 40% of all (Low BMI).

b) Deficiency of micronutrients: Mineral and vitamin deficiencies.

Anemia and Fe, Zn and Ca deficiency are also reported to be wide spread. Anemia is as high as 70% among women. Tropical fruits are abundant in this country, but Vitamin-A deficiency disorder is widely spread, especially in women. Vitamin B2 deficiency disorder is also reported.

c) Reasons of malnutrition

- Protein deficiency is caused by low intake of animal protein. Due to limited land areas, livestock cannot be well developed. Fish production and per capita fish consumption are increasing, but the share of protein intake is low. Although rice has a good amino acid composition for cereal food (Amino acid scores are 80 by rice, 60 by wheat and 40 for maize, where egg protein is 100), protein content is as low as 6-7%. Crop diversification to wheat and other protein crops are limited.
- Low crop diversification causes unstable calorie supply in different places and seasons. Wheat, maize and potato are useful sources of calories, but shares of these crops are small. Due to continuous flooding, cassava and yam cannot grow in wide areas.
- Leafy vegetables are important sources for mineral and vitamin supply. Reasons of low vegetable and fruit consumption
 - i. Whole vegetable production is not sufficient for consumption.
 - ii. Vegetable supply is imbalance by season 70% of all vegetables are produced in winter

(December, January and February) and 80% of all fruits are available during summer (July and August).

iii. Vegetables are considered as the “Lowest status food” in Bangladesh. It means vegetables are foods of poor people.

- Nutrition education and campaign to farmers are not well developed.
- Appropriate food combination for necessary nutrient intake corresponding to income level has not been so far studied.

2) Possible counter measures

While food supply is not sufficient, development of production technology was the main subject to study. However, staple food supply is improved, malnutrition becomes new topics of food and agriculture. “Alleviation malnutrition through Agriculture” was closed up (2002). Nutrition is an adjoining field of agriculture; therefore, relationship between agriculture and nutrition should be studied in detail.

a) Increase of food production

Production of food crops such as, rice, wheat, maize and potato needs always to be increased under the heavy population increase pressure. It is not a new topic, but increase of rice production is most fundamental approach to stabilize rural welfare. New approaches should be developed in close relationship with rice cultivation as rice based farming.

b) Increase of protein food.

Protein intake, especially from animals improves not only protein nutrition but also mitigates deficiencies of micronutrients such as Fe, Zn and Vitamins. Small fish is useful source of Ca, Fe and minerals for poor people. Rice fields are useful for fast-growing fish even if it can be grown for 3-4 months in paddy fields.

c) Leveling of seasonal fluctuation in crop production

Generally leafy vegetables are not suitable to summer. Highlands can be useful areas for summer vegetables such as summer cabbage. Breeding of heat-tolerant crops is a key issue of the subject.

d) Animal protein

Integrated farming systems of rice with fish and animals are widely spread in rural areas. It has been done for cash income of farmers, but it needs to be done for the improvement of farmers’ nutrition.

e) Homestead farming for better family nutrition.

Traditionally farmers usually have their own small yards, and they produce various crops, animals and fish. It has been a good source of nutrition and supplemental income. For the better homestead farming, under conditions of wide spread of malnutrition in rural areas, farmers need to have better knowledge on nutrition.

f) Protein crops such as high-protein rice, wheat, and pulses

High protein crops are usually low yields and sometimes-poor taste and market preference. Protein production per unit area by pulses will be higher than rice, but income will far below rice. Farmers’ preference of cultivation is mainly decided by income. Therefore, it is important to grow under diversified cropping systems.

crops	Yield	Protein content		Income		Remarks
	Kg/ha	%	Kg/ha	Tk/kg	Kg/ha	
Rice	2,000	7.5	150	10	34,000	Paddy 3.4t
Pulses	900	25.0	225	30	27,000	
Potato	24,500	0.1	150	5.0	122,500	

g) Requests to research fields.

At a turning point of development of farming system, renovation of research is required in various

fields. Some of them are as follows:

- Formulate appropriate food combination patterns corresponding to income level
- Produce whole year food production scheme in homestead.
- Develop integrated farming system
- Formulate a Bangladesh model of quality life by rice-based farming.

h) Administration

Information between the government and farmers/ citizens should be well exchanged. The government is required to strengthen campaigns on importance of agriculture-nutrition linkage farming.

Current major malnutrition

No *	Name of deficiency	Deficit nutrient	Ratio of malnutrition
1	Protein-Energy Malnutrition	Protein and carbohydrates	48% of all children (<5 years old) 40% of pregnant women (BMI)**
2	Anemia	Iron deficiency	70% of women
3	Iodine deficiency disorder	(IDD) Iodine	43% of all population
4	Vitamin A deficiency disorder	Vitamin A	50% of women
5	Zinc malnutrition	Zn	-
6	Rickets	Ca	4-9 % of children
7	Riboflavin deficiency	Vitamin B2	-

* Ranking of seriousness

** BMI: Body Mass Index

Source: Institute of Nutrition and Food Science, Dhaka University (2005)

(3) Profitable Farming by Rice-Based Integrated Farming with Vegetables and Livestock

Rearing of a few heads of animals is profitable due to use of local resources such as straws, grasses on roadsides and wastes of home. Scavenging poultry is one of the typical cases of low-cost farming. There are several advantages and disadvantages in local low-cost livestock farming.

<Advantages>	<Disadvantages>
i. It can be managed in a small area,	i. Market competitiveness is low due to low quality and small lot,
ii. It can be started with small funds and low skills,	ii. Marketing area is small,
iii. Women and children can manage in their houses,	iii. Feed and other material supplies are fragile,
iv. Most of their skills are traditional and transferred in their family	iv. Information and production technologies and marketing is limited.
v. Local markets can absorb their products.	
vi. Animal rising can have saving effects in rural areas.	

Considering the livelihood of the rural poor, there are many possible ways that rural people can manage by themselves. Cost-return of several cases was analyzed in terms of poverty alleviation in rural areas. In the following analysis, considering poor farmers' actual situation, the cost-return was calculated on the assumption that

- farmers have 1 to 1.5 acres of rice land,
- target income Tk 35,000 in their family: low-moderate income level,
- rice production was calculated on value basis (Tk 10/kg)
- own labor is not included in the calculation.
- several unit prices of inputs were modified to general data obtained in the interviews.

Results of cost-return of the rice-livestock do not always indicate stability of income-expenditure of a family. The results usually do not have effects on nutrition conditions of farmers. However, cash income from rice is dominant in their family, and obtaining additional income to the income from rice will be a useful way to stabilize farmers' household economy. From an experience in Japan, at first farmers started with rice alone, included livestock in many places as a sideline: "rice + alpha" and finally the alpha grew to major and powerful business. We are sure that Bangladesh farmers will share the same experience in the future.

1) Rice production

HYV Aman and HYV Boro are the major income source for rural farmers. The income level from rice is a starting point/ base line of profitable farming system. In the JICA Farm Household Survey net return from HYV Aman was Tk 7,741 per acre, and that of Boro was Tk 9,984. In usual case Aman and Boro are cultivated in a year; therefore, the combined income level Tk 17,725. The minimum income level is reported to be Tk 30,000 to 35,000, which is equivalent to 2 acres of rice fields.

Cost-return in production of HYV Aman and HYV Boro

	Expenditure items	HYV Boro		HYV Aman		Total	
		Amount (Tk/acre)	Ratio (%)	Amount (Tk/acre)	Ratio (%)	Amount (Tk/acre)	Ratio (%)
<Cost>	1 Land rent	1,261	11	1,261	14	2,521	12
	2 Land preparation	980	8	980	11	1,961	10
	3 Fertilizer cost	2,056	18	2,056	23	4,113	20
	3.1 Seeds cost	382	3	382	4	763	4
	3.2 Seed bed preparation	78	1	78	1	157	1
	4 Irrigation	3,094	27	0	0	3,094	15
	5 Transplanting	784	7	862	10	1,646	8
	6 Weeding	587	5	646	7	1,233	6
	7 Pesticides	533	5	586	7	1,119	5
	8 Harvesting	988	9	1,086	12	2,074	10
	9 Threshing	657	6	722	8	1,379	7
10 Drying	123	1	134	2	257	1	
11 Winnowing	74	1	81	1	155	1	
Total		11,597	100	8,874	100	20,471	100
<Return>	Yield: paddy ton / acre	2.16		1.66		1.91	
	Paddy price: Tk 10/kg						
	Total(Tk/acre)	21,600		16,615		38,215	
<Profit (Tk/acre)>		9,984		7,741		17,725	
		0.56		0.44		1.00	

2) Vegetables – Eggplants

Eggplant is one of the most widely grown vegetable in Bangladesh. It can be cultivated in winter and summer. The table shows data in winter cropping by a medium size farmer: 0.24 acre, in Netrakona Sadar Upazila. The income was Tk 7,647 per plot (0.24 acre), equivalent to Tk 31,863 per acre per season. The area is flood-free, and needs to be irrigated. The irrigation cost was Tk 2,083 per acre, about a half of Boro rice, and 8% of the total cost. The ratio was not high as compared with the Boro rice. The eggplant cultivation can be water saving and high profit farming. The total labor cost amounted to Tk 10,970, 45% of the total cost. The eggplant cultivation is a labor-absorbing practice, and hence it is useful for improving rural employment. In addition, large consumption of local products such as materials for fencing and sticking is also stimulating to local workers.

Egg plant grower in Upazila Netrakona Sadar, District Netrakona (Tk/24 decimal)

	Expenditure items	No. unit	Unit price
<Cost>	1 Land rent	Own	0
	2 Land preparation	Own	0
	3 Fertilizer cost	NPK *	4167
	3.1 Seeds cost	Own	0
	3.2 Seed bed preparation	Own	0
	4 Irrigation		2083
	5 Transplanting	Laborers	1667
	6 Fencing		6250
	6.1	Bamboo	<4,167>
	6.2	Laborers	<2,083>
	7 Weeding	Laborers	2083
8 Pesticides		500	
9 Sticking		4167	
		Sticks	<2,500>
		Laborers	<1,667>
10 Laborers	2 days	3470	
Total		24,387	
<Return>	Selling	15 weeks	56,250
		90 (45*2) kg/week	
		10 Tk/kg	
<Profit (Tk/acre)>			31,863

* Urea: 6.5 Tk/kg, TSP: 15Tk/kg, MP: 15 Tk/kg, DAP: Tkm20/kg

* Ratio of labor cost to the total cost: (Tk 10,970/Tk 24,387): 45%

In the existing farming situation, additional 1.55 acre for rice cultivation is needed to achieve Tk 35,000. The ratio of the eggplant was

22% of the total income. The vegetable growing is a small enterprise, but a good source of supplemental cash income.

For future development there are several constraints such as difficulties in enlarging cropping area, high labor cost, high inputs and limited marketing area. Development of rural marketing system is a key issue.

3) Cattle-fattening

Cattle fattening is popular in Bangladesh, and local cow can be seen in everywhere even in municipal areas. An example of a cattle-fattening farmer in Tangail shown below indicates that the cost was Tk 15,926, in which the calf price was tentatively Tk 5,000. Majority of costs are feeds. The net return was Tk 10,075 in the cow fattening that was lower profit than milking cow. The cow fattening has several advantages: Low labor inputs, no regular fixed work, no special techniques such as milking, no needs of special marketing and no needs of cooling system. Therefore, farmers easily accept it. In the present situation, the cow fattening is the most favorable in the livestock and poultry farming.

To reach the target line Tk 35,000 additional income is required: Tk 24,997 or 1.41 acre. The ratio in composition to net return was 71% from

rice and 29 % from cow fattening. The cash from cow fattening is a good supplemental income source and an efficient saving method in rural areas. If farmers have 1.41 acre of rice fields, most of the feeds can be provided from their own farming. It is a profitable way especially to rural small-scale farmers.

4) Milking cow (I) – Peri-urban lowland area

Fresh milk is a perishable and heavy product; therefore, the production close to consuming areas or municipal areas has strategically advantages. The cost-return of milking cow was analyzed both in a peri-urban area and a local area. A milking cow has a calf after 280 day of pregnancy. In the table below the analysis was done on the assumption that a milking cow gave birth to a child, and the calf was brought up until 1 year old and sold (this is irrelevant here).

The production of milk was 4 liter/ day and was estimated to be 800 liter/ year. The level was not low for local breeds. The net-return of the milking cow and calf was Tk 12,867, and the rest to Tk 35,000 was Tk 22,133, equivalent to 1.25 acre. The share of the milking cow and calf was 37% and that of rice (Aman and Boro) was 63%. Among the fields; straw, rice bran and grazing were provided by own activities.

Cow fattening Upazila Tangail, District Tangail

		(Tk/head/year)	
Items	Unit	Total Tk/day	Total Tk/year
<Cost>			
Insemination	I unit		30
Calf price			5,000
Vaccination	1unit		50
Medicine			300
Feeds	Whole year	20	7,300
Grazing	Own	5	1,825
Water	Own		0
Housing cost	Own	0	0
Labor of feeding	Own	0	0
Others	10% of direct cost		1,451
Total cost (A)			15,926
<Return>			
From beef		25,000	25,000
From cow dung			1,000
Total return (B)			26,000
<Benefit> (B-A)			10,075

Milking cow (I) in Village Nayanagar, Upazila Uttra, Dhaka city

		(Tk/cow, calf)				
Items	Units	Unit price Tk/kg	Total/day Tk/kg	Days/year	Total Tk/kg	
<Cost>						
Innsemination	1 unit	30	-	-	30	
Vaccination	2unit	50	-	-	100	
Medecines					600	
Feed						
Milking		30	30	200	6,000	
Non-milking		15	15	165	2,475	
Calf		5	5	365	1,825	
Housing cost	Own	0	0	365	0	
Labor of feeding	Own	0	0	365	0	
Others	10%, direct cost	-	-	-	1,103	
Total cost (A)					12,133	
<Return>						
From milking	(Litre) 4	25	100	200	20,000	
From calf		-	-	-	5,000	
Total return (B)					25,000	
<Benefit> (B-A)					12,867	

Other ingredients are oil cake, bran and molasses. Here again the cash-income was useful supplemental source,

5) Milking cow (II) – Local area

The data in the list below were obtained from a local livestock farmer who rears 5 heads of milking cow. He rears improved breed, and daily milk production was 10 liters, or 1800-2000 liter per year. The level is high for the Bangladesh milking cow. The total cost was Tk 8,806, total return was Tk 26,600, and net-return was Tk 17,795, respectively. Generally, feed costs share 90% of total cost, and net-return is about a half of gross return. Feed requirements per day at the milk production of 10 liter/head are 5 kg of feed, 10 kg of grass and 5 kg of straw. The net-return was better results than the general milking cow. Aged people who have experiences in milking cow can manage it. The milking cow can be a profitable sustainable farming.

Milking Cow (II) Upazila Tangail Sadar, District Tangail

(Tk/cow, calf)					
Items	No. of units	Unit price Tk/kg	Total/day Tk/day	Days/yea r	Total Tk/year
<Cost>					
Innsemination	1unit	30			30
Vaccination	1unit	50			100
Madicine	Whole year				600
Feeds					
Milking	6 months		20	180	3,600
Non-milking	6 months		10	185	1,850
Calf	12 months		5	365	1,825
Grazing	Own		0	365	0
Housing cost	Own		0	365	0
Labor of feeding	Own		0	365	0
Others	10%, direct cost				801
Total cost (A)					8,806
(Return>					
From milking	(Litre) 10	12	120	180	21,600
From calf	-	-	-	-	5,000
Total return (B)					26,600
<Benefit> (B-A)					17,795

To achieve the target income Tk 17,205/0.97 acre in terms of area was required from rice cultivation. The share of rice was 49% and that of milking-cow was 51%. The share of milking-cow in cash income was quite high.

In town area processed foods from milk such as cheese and sweets are produced. It can increase value-added of milk in rural areas. Processed foods are often more durable than fresh milk. Milk processing is needed to develop. Livestock farmers try to diversify their farming style. The current profitability in their opinion was cow fattening in the first, followed by dairy farming, poultry farming and goat farming.

6) Goat rearing

Black Bengal Goat (BBG) is an internationally noted breed, as donated to the Thai Palace from Bangladesh. Goat rearing needs no technical skill or large initial cost. It is widely spread to rural area, especially to rural women and poor people. Besides, goats can be grown by small amount of feeds and local resources: scavenging rearing. Goat milk is usually consumed in farmer's house, and hence it can contribute to improvement of rural human nutrition. Children and women can manage goats in their houses. As the Poverty Alleviation through Increasing Goat Production project indicates, the goat rearing has useful functions for rural poor

Goat Rearing Farmer in Upazila Shelpur Sadar, Sherpur District

(1goat)			
Items	No. of units	Unit price Tk	Total /year Tk
<Cost>			
Vaccination	1 unit	0.5	0.5
Medecines	-	-	-
Feed			
Adults	Own work	0	-
Kids	Own work	0	-
Housing cost	Own work	0	-
Labor of feeding	Own work	0	-
Moirtality	10%		160
Others			
Total cost (A)			161
(Return>			
From milking	Own use	0	0
From kids	2 heads	800	1600
Total return (B)			1600
<Benefit> (B-A)			1440

people, especially poor single women.

Many farmers started small animal rearing from their hobby. Rural people can improve their nutrition conditions and upgrade rural community by exchanging the products. Goat rearing produces peaceful rural societies. This is an important another finding on the field survey other than economic point of view.

Goat rearing has low profitability as compared with cattle fattening. Besides, it needs periodical work for milking. If the goat rearing is combined with rice farming and cattle fattening, it will be more useful in farming. Nutrition intake can be improved and supplemental income can be expected.

7) Scavenging poultry

There are several advantages in recycling and integrated farming between poultry and crop production. If this type of poultry is managed by scavenging poultry, the profit from a bird per year was about Tk 700. This is substantial cash income in rural areas. It is reported that 5-10% of post-harvest happens in rice production. The poultry rearing on paddy fields can recover the loss in rice farming through scavenging. Litter is usually used for organic manure in crop production. The recycling is important for cost-reduction of crop production and environmental protection. In medium highland and highland area, maize production is increasing. Combination of maize production and poultry will be profitable integrated farming. This type of integrated farming is popular in many places in Europe.

8) Rice-duck farming

Vertical integration of farming is an efficient way to use agricultural land economically. Rice/ duck and rice/ fish are typical case of the vertical integration. The rice-duck farming has several advantages as follows:

- Ducks can reduce weeds by eating and removing weeds and scratching field surface.
- Wastes of ducks are good organic fertilizers.
- Wide and flat paddy fields are good place for duck growing.
- Rice and weeds provides duck for feeds.
- Ducks can live even if fields are dried.
- Different from hen, ducks are resistant to high water
- It needs to protect ducks from wild animals

BRRRI studied on the effects of duck on rice growing and entire profits. Rice production increased from Tk 7,019 of the rice alone to Tk 8,668 of the rice-duck cultivation, increased by 23%. The rice-duck net-return was Tk 12,616, 1.80 times as high as the rice alone. The rice of the share to the total net-return was 69%. The rice was the dominant source of income. However, a large part of rice is consumed in their family; therefore, the cash income obtained from the rest of rice will not be large, depending on their family size. The cash from the duck will actually share a large part. Thus, the duck rearing is important in the cash income.

Items	Composition of net return	
	Net return	
	Tk	Ratio (%)
Rice	7,019	56
Increment of rice	1,649	13
Duck	3,943	31
Total	12,611	100

(4) Development of Agricultural Technology

1) Change of rainfall in a period from 1977 to 2003.

As the earth warming develops in all over the world, the rainfall of the Bangladesh (Mymensingh area) is also affected. The amount of rainfall and fluctuation in the past 27 years (1977 to 2003) were analyzed with a view to understanding the change of seasonal difference of rainfall and estimating effects on crop production.

Yearly rainfall was 2,292 mm on average of 27 years. The equation of the linear regression was $y = -9.8315x + 21857$, and it indicates slight decrease during the period. To analyze change of rainfall in rainy season and dry season, the period was divided into two periods: The first period-from 1977 to 1990 and the second period- from 1991 to 2003.

The annual rainfall of the first period was 2,376 mm, and the second period was 2,202 mm, or 0.93 of the first period. CV% of the whole year in the first period was 24%, and it increased to 27% in the second period. It indicates that the rainfall in Mymensingh is decreasing and has become more variable recently. The rainfall in rainy season (May to October) is decreasing and fluctuates more in the second period. In the winter season (November to April) the rainfall was as small as 246 mm in the first period, and it decreased to 228 mm in the second period. However, CV% was remarkably decreased from 64% to 47%. The change of the rainfall in the winter season indicates that although the water supply is still severer, growing conditions of winter crops becomes less unstable/ unfavorable. The effects of winter seasons are not so large as observed in higher latitude areas such as Slovakia.

2) Increase of rice varieties and variation of rice use.

Rice is the dominant staple food of Bangladesh, and its production is always the basis of agriculture. It is necessary to pay the specific consideration to rice production by the project. The Bangladesh rice is composed of various varieties by season and water conditions, and their yield and profitability are

Cost-benefit analysis of rice-duck farming.

Activity	Rice alone	Rice-duck (Tk/ acre)		
		Rice-duck	Rice	Duck
<Cost>				
Duckling (30@Tk/duckling)	0	1,822	0	1,822
Seed	152	111	113	0
Bamboo & labor for fencing	0	2,783	0	2,583
Fertilizer	759	0	0	0
Labor for weeding	1,822	0	0	0
Insecticides	167	0	0	0
Labor for fertilizers & pesticides application	506	0	0	0
Feed (6 months)	0	7,743	0	0
Housing & labor for housing	0	734	0	0
Vaccine	0	455	0	457
Labor for rearing	0	11,640	0	0
Labor for moving in & out	0	4,555	0	0
Total variable cost	3,406	29,843	113	4,862
<Benefits>				
From paddy	8,097	8,780	0	0
From ducks *	0	8,806	0	8,806
Gross return	8,097	17,586	0	0
Net return on full cost basis	4,691	<-12,255>	0	0
Net return on cash cost basis	7,019	12,616	8,668	3,943

* Income from selling 6-7 month old ducks of 10% mortality rate.

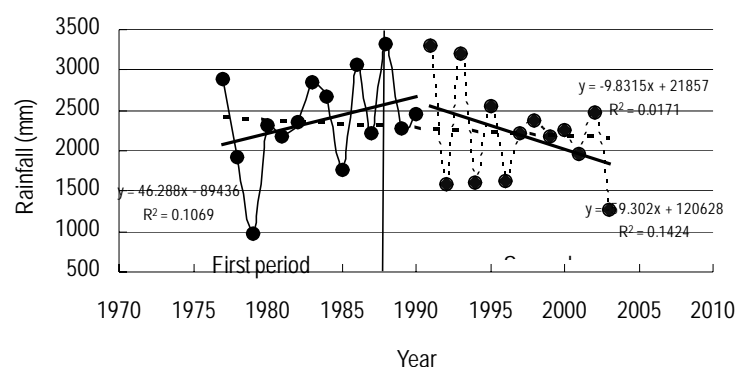
Source: IRR I Innovations in rural extension (2005)

Change of rainfall from 1977 to 2003.

Duration	Items	Total	Total rainfall	
			May-October	November-April
1977-1990 (14 years)	Average mm a	2,376	2,109	246
	Sd mm	570.6	493.5	156.4
	CV %	24	23	64
1991-2003 (13 years)	Average mm b	2,202	1,963	228
	Sd mm	588.0	561	108
	CV %	27	29	47
	Difference b/a	0.93	0.93	0.93

Source: BMD data in Mymensingh (2004)

Change of rainfall from 1977 to 2003 in Mymensingh.



different. The rice production was increased by 2.43 times from early 1970s to 2003. This is much higher than population growth and, especially the production growth was remarkably high after 1985. Recently the self-sufficiency of rice has achieved. The rapid growth of rice production was contributed by the production of Boro. Aman also made large contribution to rice production, but Aus indicates negative correlations to the total production. Therefore, recent rice production growth can be drawn like [Wide expansion of STW] → [Expansion of production area] → [Increase of rice production]. However, due to limited cropped land and widening of preference in the future, yield increase of rice will be needed, and diversification of rice itself and to other crops will be enhanced.

Local varieties shared major parts of rice varieties up to 1985, But after the time local varieties were decreasing due to its low response to fertilizers and irrigation. Local varieties are usually photoperiodic and low yield, but have tall grass height and resistant to pest and diseases. Besides, many of local varieties are aromatic varieties, and used in specific occasions and exported to Arabic countries targeting ethnic Bangladeshis.

Development of rice production is not only increase of production but also variation of rice use. Thus local varieties are still cultivated in places unfavorable to HYV by a view of “Right place for right crop”

Correlation between Production and Related Parameters.

Total rice production				
Parameters	Total	Aus	Amnan	Boro
Total	1.000			
Aus	-0.709	1.000		
Amnan	0.945	-0.617	1.000	
Boro	0.979	-0.800	0.870	1.000

Boro production				
Parameters	Product.	STW	Yield	Area
Production	1.000			
STW	0.962	1.000		
Yield	0.805	0.719	1.000	
Area	0.985	0.970	0.697	1.000

Source: MOA Handbook of Agricultural Statistics (2004)

HYV has advantages for daily laborers and during food shortage. The reasons are low price and staying longer in stomach. Local varieties are evaluated better taste and good flavor. It is used in special occasions: “Guests like it.” is the highest rank in selecting local varieties. As rice supply is improved better and meal will be a part of pleasure, local varieties will be more widely used.

Major varieties by rice categories.

Categories			Major varieties		
HYV	Non-aromatic	BR	4, 10, 11, 22, 23, 25,		
		BRRRI Dhan	30, 31, 32, 33, 37, 39, 40, 41		
HYV	Aromatic	BR	5		
		BRRRI Dhan	34, 38		
Local	Non-aromatic	Pajam	Nizersail	Rajasail	Latisail
		Binni	Ranga binni		
Local	Aromatic	Kalijira	Chinigura	Barisal Kataribhog	Kalposail
		Begarhat local	Bogra Kalosail	Sakkurkhora	Jira Katair
		Sada bsailka	Surjamukhi	Kataribhog (232)	Chiniatap
		Barisal Kalijira	Lalsaila	Kataribhog (4363)	Jeera
Imported	Aromatic	Basmati 370	Basmati 385	Basmati 386	
		Basmati super	Shadi	Colonel Basmati	

Source: IFPRI, INFS and BRRRI: Alleviating Malnutrition Through Agriculture in Bangladesh (2004)

3) Yield increase and change of rice varieties by water management.

Crop yield is decided by technical packages such as variety, irrigation and fertilizers. If crop yield of a variety is increased the variety is widely extended. In the SSWRDSP-I pre-project data were obtained only 1 year. And the post-project data were obtained for 2-3 years. In these survey conditions, it is not appropriate to compare the change of yield or profits by project quantitatively. However, change of rice variety from the pre-project to post-project and change in the post-project period by rice yield can be a useful qualitative indicator of project effects. It can be a good incentive to farmers that they observe and realize difference of yield by variety and extending of high yielding varieties. From these farmers attitudes it is possible to evaluate whether the project is acceptable and well managed.

The following change of varieties can be observed by the change of yields in the drainage project in the SSWRDSP-I:

- Aus ----- B. Aus => LIV Aus => HYV Aus,
- Aman ----- DW Aman => LIV Aman => HYV Aman
- Boro ----- L Boro => HYV Boro

Development of Rice Varieties by Project

Items		B. Aus	→	LIV Aus	→	HYV Aus
Rice production	kg/ha	2,717		2,964		3,952
Ratio of cropped area						
Pre-project	%	100		0		0
Post-project	%	11		34		55

Items		DW Aman (B+T)	→	LIV Aman	→	HYV Aman
Rice production	kg/ha	2,730		3,086		5,331
Ratio of cropped area						
Pre-project	%	86		14		0
Post-project	%	48		39		13

Items		L. Boro	→	HYV Boro
Rice production	kg/ha	2,964		5,187
Ratio of cropped area				
Pre-project	%	100		0
Post-project	%	8		92

Source: SSWRDSP-I (Bhola) Note: LIV: Local Improved Variety

4) Diversification of rice cropping to other crops.

i) Diversification to more profitable crops than rice

If drainage develops, upland crops such as vegetables, potato and wheat can be widely grown. Under the rice self-sufficiency, profits of rice will be stagnated, and more profitable crops need to be explored. Presently rice is the dominant income source, but for the future development, within the target period of the project, the diversification will be one of the key issues for the rural development.

ii) Economic use of water by introducing upland crops

Rice is one of the largest water consuming crops. Cultivation of rice in one season water requires about 1000 mm/ha on average. However, vegetables consume about one third to a quarter in one season. Rainfall in winter is small, but combination of vegetables with rice will economize water use, and reduce production cost.

Type of crop	Water requirements (mm/season)
Boro rice	1,000
Wheat/potato/groundnuts/sunflower	350
Mustard/soybean	300
Sweet potatoes	200
Lentil and chickpea	150

Source: Field (1995)

iii) Residual water, N and other fertilizers after Aman cropping.

Production of Aman has large residue of soil water for succeeding crops before winter. If those crops are well cultivated, triple cropping a year can be performed. In the current situation duration of crop growth is not suitable to the triple cropping: Most of the crops have more than 60-70- day of growth. Use of residual plant nutrients has high potentials for Rabi crops.

5) Advantages of alternate changes of soil from oxidative conditions to reductive conditions

Most of the Bangladesh croplands have oxidative conditions between Aman harvest and/ in winter seasons and between Boro harvest and before Aman cultivation. The reductive conditions happen in summer seasons and Boro cultivation. The change in soil ET (Evapo-transpiration) produces great advantages in crop cultivation. In reductive conditions most of nematodes and upland weeds die, and lowland weeds and other living things adapted to reductive conditions die in oxidative conditions. The alternate changes of soil characteristics are the largest assets in Bangladesh.

The SSWRDSP can provide the effects on agricultural production. Due to water resources development by the subprojects, water level of agricultural fields will be controlled, and hence the diversification of land use and cropping will be enhanced. In this diversification paddy fields will be reduced, and various upland crops will be grown. Cultivation of cash crops such as potato, carrot and radish are suitable to sandy soil. These root and tuber crops are easily damaged by nematodes, and surface of products are destroyed. The natural conditions specifically provide strategic points to winter crops.

The alternative change of soil conditions also provides useful effects on weed and soil animal control. Weeds are not serious problems of cropping. Flooding also decreases rat density in agricultural fields.

Reduction-oxidation cycle of farmland soil by inundation and drying.

	Kharif-I	Kharif-II	<Transition>	Rabi
Water conditions	Rain water River water Excess water	Rain water River water Excess water	Water residue in soil Low humidity	No rain water Low river water => Ground water use
Soil Eh	Lowland conditions	Lowland conditions Reductive condition	Upland conditions Oxidative condition	
Biological characteristics				
Soil nematode/ insects		Decreasing		Increasing
Soil animals/ rats		Decreasing		Increasing
Upland type weeds		Decreasing		Increasing
Lowland type weeds		Increasing		Decreasing
Upland type diseases		Decreasing		Increasing
Lowland type diseases		Increasing		Decreasing
Soil hardness	Hard	Soft Easy to root growth		Hard Difficult to root growth Shallow soil layer Need power tillers
Crops	Food crops Aus	T. Aman Summer vegetables	Mustard Upland crops	Boro Winter crops

6) Crop protection from soil-born diseases in continuous crop cultivation

Damages by nematodes are one of the most serious problems in upland crops when crops are continuously cropped. Levels of the damages are different by kinds of crops and types of nematodes. Soybean and yam are typical crops, which have severe damages in continuous cropping. There are several methods to protect crops from soil born diseases.

- Use of insecticides: (D.D.T insecticide is band and not import and use in Bangladesh), Methyl-bromide and Chloropicrin are often used.
- Development of resistant varieties: Resistant varieties are developed in various crops such as

barley, red beans, soybeans, potato and sweet potato.

- Crop rotation and use of resting crops: groundnuts and crotalaria are popular as nematode resistant crops. If these crops are cultivated as previous crops or inter-crops, nematode damages will be decreased. (cultivation period for sugar cane and potato is same, so this recommendation not relevant).

7) Increase of labor absorption by crop diversification and agribusiness

Unemployment is the worst cause of poverty. Cultivation of HYVs usually need more labor inputs and growing of vegetables and other upland crops absorbs more labor than rice cultivation. Crop diversification is a useful way to increase labor absorption. Off-crop agri-business, such as poultry, also has employment effects in rural areas.

Labor Inputs in Different Crops and Varieties.

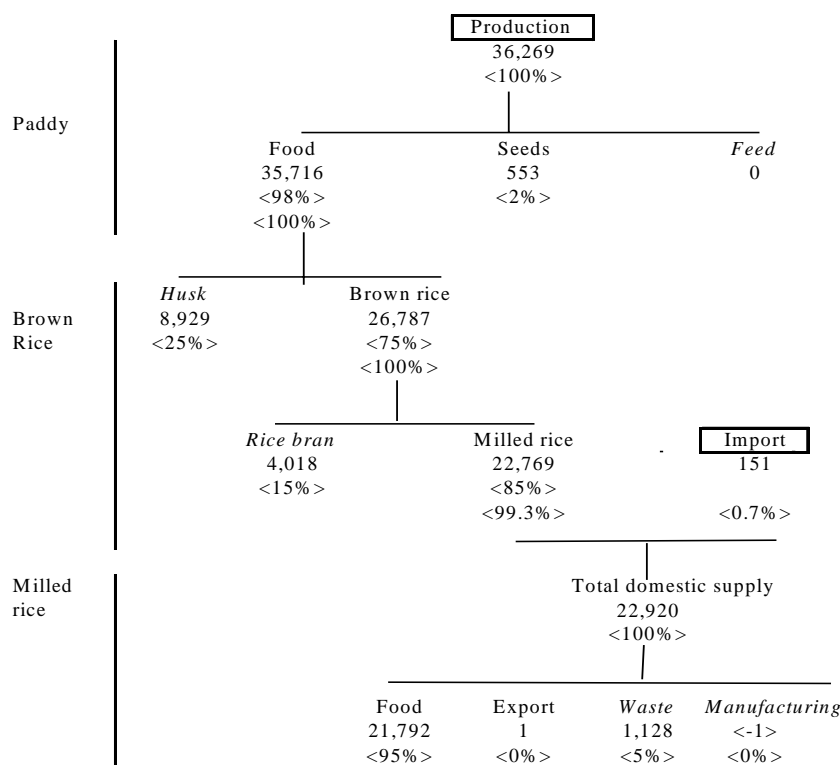
Crops/ varieties	Rajshahi	Khulna	Barisal	Faridpur	Average
T. Aus (Local)	123	123	75	75	99
T. Aus (HYV)	100	148	103	103	114
T. Aman (Local)	121	109	89	114	108
T. Aman (HYV)	136	147	90	120	123
Boro (Local)	74	37	37	60	52
Boro (HYV)	158	160	138	143	150
Wheat	95	86	54	84	80
Jute	171	195	95	153	154
Sugarcane	189	175	124	228	179
Potato	144	124	124	124	129
Oil seeds	48	63	58	40	52
Vegetables	154	183	86	202	156

Source: LGED (2004)

8) Food/rice processing by light /small industry

Rice is usually used for staple food; par-boiled rice and small portion of ordinary milled rice. Processed food of rice such as various types of rice cakes and drinks are not well developed. Especially young people will change present eating habits--heaping a bowl with rice mixed with curry-- in future. Majority of processed food in supermarkets are produced and imported from foreign countries. Food processing is usually done by light /small industry. Garment industry, a typical light /small industry, has been developing in Bangladesh using domestic cotton. Processed fruits are also produced. Agro-industry by light /small industry is suitable to present Bangladesh. Food processing provides high-value for agricultural products, and absorbs a large amount of labor. Food processing is a useful procedure for rural development and poverty alleviation.

Food system of rice in Bangladesh, 2001



Unit: Thousand MT <%>

Source: FAO Food Balance Sheet (2001)

(5) Agriculture Extension Services

1) Subjects for the development of extension work in rural areas

Although the extension work covers entire aspects of agricultural and rural activities, actual extension work should be focused on priority fields to make efficient implementation.

- a) Cooperation with Union Parishad (UP) to strengthen function of local governments. In the existing conditions function of UP is weak. When Unions appeal the farmers' requests to national governments, Unions need strong secretariat function. It is a practical way to encourage the collaboration between the UP and BS, absorb farmers opinions and reflect them in the consultation on technical and administrative management with Upazila offices.
- b) Development of structure of poverty alleviation through agricultural extension: Bangladesh model for poverty alleviation. There are innumerable activities for poverty alleviation by governments and NGOs, but it seems that systematic approaches are not well organized. Concerning the agricultural extension, the 4 parties, DAE, BS, UP and farmers need to coordinate together.
 - DAE: Formulate manuals for farming systems
 - BS/SAAO: Extend the manuals to farmers.
 - UP: Intermediate activities between DAE/ government activities and farmers.
 - Farmers: Enlarge agricultural and rural production/ consumption through diversification and specialization.

c) Technical subjects on priority

Various subjects to develop were mentioned in the Strategic Plan. Priority needs to be given to the items below:

- Development of BS/SAAO capacity.
 - <Partnership with research agencies and educational institutions>
- Marketing
 - <Quality control, marketing standards, inspection, marketing system>
- Upgrade of food policy
 - <Food security, nutrition, household management>
- Change from increase of cropping area to yield increase
- Integration of rice-production with non-crop diversification
- Specialization of cropping/ non-cropping production
- Export of agricultural products
 - < Winter crops, aromatic rice, poultry, etc, in cooperation with NGO, private traders, others>
- Development of cooperatives (Especially, for joint selling)
- Mechanization
- Cash generating cropping/ farming
 - <New cash crops, off-season production/ harvesting, etc.>
- Training of BS/ SAAO

2) Partnership with research organizations.

Technology gap between the research/ development and extension is always a big problem. To cope with the gap, there are 2 possible ways to tackle: Partnership (Mutual exchange of researchers and extension workers) and specialization of extension workers. The both of the approaches are different the training of BS mentioned above, but to develop technological driving force of extension. From the experience in Japan the both are indispensable to improve the extension technical level and support diversification in agriculture.

The partnership is useful for introducing latest technical knowledge. Besides, it is important to develop extension methods such as field exhibition, new equipment and new technology. In the field exhibition accuracy is a key issue to provide exact information in variable natural conditions. In the partnership senior or influential extension workers have to study in research institutes for 1 to 2 years. Exchange of a piece of information is not effective.

As agriculture is diversifying, extension workers are required to cover wide areas of farming, and each field requires high level of technology. At the same time with the development of marketing, especially to large markets and export, marketing competition will be severer, and hence high cultivation level and quality control are important. At least, soil science, upland crops, lowland crops, crop protection, and post-harvest are necessary specialized fields. A national license should be established, and the District extension offices need to employ these senior extension workers who have licenses of these high-specialized technology. The licensed senior extension workers will upgrade the BS technical level.

3) HRD: Establishment of vocational school/ agricultural high school

In the existing educational system, there are no vocational agricultural school or agricultural high school. The current technical human resources are mainly composed of 2 groups: a group with just literacy but no special agricultural technology and the other group with high education with no field experience. It resulted in poor human resources in educated technical field workers. With these human resources composition, it is difficult to develop diversified agricultural production scheme in field level. It is necessary to develop middle class technician groups to enlarge the middle class to alleviate rural poverty.

What is different from ordinary training in LGED and DAE is;

- wide areas of necessary technical fields can be covered,
- wide views on agricultural development will be obtained,
- human resources of educated technical field workers will be developed, and
- high possibilities in selecting appropriate jobs will be given.

4) Technology development and extension in livestock/ poultry farming.

Livestock and poultry farming is important for cash generating farming and nutrition linked farming. It can be a high land productive farming, if farmers manage it properly with appropriate technology. Basic knowledge and technology on livestock farming are as follows:

- i. Enhancement of the knowledge base of small holders on animal husbandry, nutrition and disease control through a community participation
- ii. Provision of technological support with respect to disease control, genetic stock development, and supply of quality feeds, vaccines and medicines,
- iii. Training and education on livestock and poultry development,
- iv. Strengthening and broadening of livestock extension and veterinary services, integrating community-based participation at the local level,
- v. Introduction of livestock insurance programs

Budget and Expenditure of DAE

Cost center	Actual	Budget	Required	
	2000/2001 Value	2001/2002 Value	2002/2003 Value	%
DAE (HQs)	47,208	52,344	50,338	2.3
Field services	188,365	19,044	212,035	9.8
Plant protection	25,378	25,860	28,834	1.3
Cash crops	3,363	3,463	3,679	0.2
Food crops	65,215	66,165	73,313	3.4
Agricultural training	61,146	62,280	88,159	4.1
Upazila agriculture offices	1,481,301	1,577,567	1,707,828	78.9
Grand total	1,871,976	1,806,723	2,164,186	100

Source: The Department of Agricultural Extension Strategic Plan (2002-2006)

3.1.9 Agriculture Development Strategy in the Study Area

Agricultural patterns are different by water supply, climatic conditions and land conditions. The survey area is composed of various land types; therefore, farming system to be established and necessary technology to be introduced are different. In the following section land type- characteristics- necessary technology-successful model will be discussed.

(1) Agricultural Zones in the Study Area

In Bangladesh the basic land type was decided by FAO and UNDP in 1970th based on the land elevation, water depth and soil association. It was closely to agricultural pattern or farming system. But recently in relation to the Pro-poor poverty alleviation approaches, Char, Haor and hilly land have been given priority. In this survey the revised land type classification was proposed. While after the self-sufficiency of rice the development of farming system was targeted nutrition linked farming and cash generating farming by integrated farming, with a view to selecting “Right place and right time for right crops”, combination of appropriate land type and farming system was discussed in this section

Land type	Soil	Major farming system.	Example of farming
(I) Unstable Char land	Sandy soil Erosion by river	Fishing (All year) Temporary crop.	Fish (Crop)
(II) Stable Char land	Silt- sandy High percolation	Fishing (Seasonal) Cropping	Fish DWR, LT, Boro-Aman
(III) Haor	Deep flood High sedimentation.	Fishing (Seasonal) Boro (Winter)	Fish Boro
(IV) Very lowland	Deep flood High sedimentation. Flat	Fishing	Fishing
(V) Lowland	Flood, Sedimentation	2 rice crops Fallow, fish	Boro-Aman/ vegetables Intensive aquaculture
(VI) Medium lowland	Slight flood, Sedimentation	3 rice crops, fish Livestock	Boro-Aman-vegetables. Cattle
(VII) Medium highland	Flood-free, soil problems. No sedimentation, No laterization	3 cropping Livestock, poultry	Boro-Aman-potato Vegetables Rotation, cattle
(VIII) Highland	Flood-free, soil prob. Laterization	Perennial crops, rice Livestock.	Banana, Aman Cattle, poultry
(IX) Hilly land	Flood-free, terrace Flush water	Permanent crops Livestock,	Tea, tree crops

(2) Unstable Char Area

1) Characteristics of unstable char area

The area is composed of sandy soil newly sedimented by river water, especially flooding. Almost no vegetation are appeared on the sand, and the land is eroded or sediment; therefore, the land it self are changing/ moving. Fishing is the major work, and it is performed round the year. However, crops of short duration can be grown in these areas during winter.

2) Possible crops: Mustard, feed crops

There are no permanent fields, but depending on land conditions short growing crops such as mustard and feed crops can be grown,

(3) Stable Char Area (Old, inhabited area)

1) Characteristics of Stable Char area

The soil of the area is silt- sandy, and inhabited long/ recent period. The agricultural land is porous and has high percolation. It needs frequent irrigation and fertilization. By the opinions of farmers and Union chairmen, costs of these inputs were generally 20% higher than ordinary soils. Organic substances in soils are less than other soils. Soil fertility is low but clean in biological infection.

2) Example of development project

In Charfassan, Bhola, the char area of Southern part of Bangladesh, water depth was decreased/

managed by the water works of the project. Areas of cropped land was not changed, a large but by its activities HYV of Aus and Amman were introduced instead of LIV (Local Improved Variety) Aus and LIV Aman that have tall and long duration of growth. The total area of LIV was 601 ha before the project, but the area decreased to 379 ha at Post-project. The areas of HYV were increased from 90 ha at pre-project to 364 ha at post-post project. The area of Rabi decreased in the post-project. The reason of the decrease is not clear, but it indicates that the post-project cultivation still needs appropriate irrigation. Mungbean was changed to potato and lentil. In char area irrigation cost is about Tk. 4,000/acre, while in normal fields irrigation of Tk. 3,000-3,500/acre is required. Other costs are also estimated to be higher in char areas.

Change of cropped area and production in Post-project.
South Char Aicha DR & IRR Subproject Charfassion, Bhola

Crops	Area: Ha		Major Crops	Area: Ha	
	1999	2003		1999	2003
Kharif-1	311	261	LIV Aus	181	132
Kharif-2	510	510	LIV Aman	420	247
Rabi	361	282	HYV Aus	0	101
Total	1,182	1,053	HYV Aman	90	263
Crops	Production: Ton		HYV Boro	115	100
	1999	2003	Potato	20	48
Kharif-1	699	706	Mungbean	166	67
Kharif-2	1,476	1,808	Mustard	30	12
Rabi	1,163	1,181	Lentil	0	32
Total	3,338	3,695	Vegetables (Rabi)	10	4

(4) Haor area

1) Characteristics of Haor

Haor area is also covered with deep water about 5-6 m in depth for 4-5 months during rainy seasons. The unusual natural conditions produce various specific characteristics in soil and cropping.

The observations of the land in Karimganj, Kishoreganj, are as follows:

Limited cropping seasons	<ul style="list-style-type: none"> - Deep water covers agricultural fields from May to December. - No cropping can be done during then season. - Boro can be cultivated one time a year: from December to March. - Amount and species of weeds were quite small.
Soil fertility	<ul style="list-style-type: none"> - Soils contains silt and sand, and many shells in topsoil - It is fertile in terms of minerals such as N, P, K, Ca , Mg and microelements. Organic substances are well kept due to long time submergence and short time of upland conditions,
Clean soil	Alternate change of submerged conditions and upland conditions produce low weeds, low soil-born diseases, low damages by soil animals, and hence environment-friendly agriculture can be practiced.
Healthy crops	Rice plants were well managed at a tillering stage (Middle of February). From the natural situation high quality other crops such as leafy crops can be expected.
Suggestions	BRRI should undertake a special location base research program for development of short duration (120-130 days) HYV Boro rice with yield potentiality as like as BRRI Dhan-28. It will help save Boro rice from flash flood calamity in haor area.

2) Possible farming system

In these conditions types of farming system are limited, but specific cultivation can be developed. Several types are as follows:

- Boro-fish (aquaculture) cultivation
- Inter-linkage of resort development, environmental protection, rice/ crop production and fisheries needs to be developed.
- Seed multiplication (Clean and isolated area)

(5) Very Lowland Area

Very lowland areas have deep flood and high sedimentation during rainy seasons, and spread to wide

areas of water bodies. Fish culture is a major business. For the future development, water bodies need to be maintained for fishing and aquaculture.

(6) Lowland

1) Characteristics of Lowland area.

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 could be performed. Water management and introduction of short-duration crops (such as 120-130 days HYV Boro with yield potentiality like BRRI Dhan 28) are important for successful cropping.

2) Example of development project <Rampur FCD Subproject, Natore Sadar, Natore>

a) Improvement of farming system

The area is wide and flat, located at the eastern part of Padma river basin. In the pre-project period, the area was regularly flooded, and hence cropped area in rainy season was extremely limited. HYV Boro in winter was dominant and in a position of almost monoculture. Major subjects were to manage high water and diversify crops. In 1999 the SSWRDSP-I was implemented for water management and farming system improvement. The Post-project successful changes happened.

- In comparing cropped area of pre-project with post-project, the area in Kharif-1 was increased from 31.8 ha to 147 ha, 4.62 times, and in Kharif-2 the area increased 38.3 ha to 117 ha, 3.05 times. In both cropping seasons the cropped area increased remarkably (From 70.1 ha in 1997 to 264 ha in 2003 in total cropped area)
- Area for Rabi was also increased, although large fluctuation was observed by cropping year.
- Cultivation of vegetables and lentils was diversified to wheat, spices, and potato. Potato and Boro were newly introduced.
- Crop yields were also improved 1.24 times in Kharif-1, 1.46 times in Kharif-2 and 1.35 times in Rabi, respectively. Impact on the area expansion was larger than yield increase in this project period

b) Community seed production activities

A unique community based seed production, processing, storage and marketing system has been operating by the WMCA of the SSWRDSP since its establishment in 1999. Fifty farmers were organized a group in the WMCA for seed production with total area of 12 ha. Foundation seeds of rice were purchased from BADC and distributed to the farmers with seed ration of 5-50 kg per farmer. Farmers were given training by DAE on seed production and drying technologies. WMCA procures Boro and Aman quality seeds at prices of Tk 9/kg and Tk. 10.5/kg, respectively from the seed producing farmers. The price is higher than ordinary seeds by Tk 1/kg. The seeds are certified by Regional Field Officer of SCA based in Ishwardi Upazila of Pabna District.

Items of seed standards are purity, moisture, germination ability and impurities. 15 dealers sell the certified seeds to 6 surrounding districts. 40 tons of rice seeds were sold at Tk 20/kg, and 1.2 tons of wheat seeds were sold at Tk 24/kg. In addition, onion seed were also produced and sold.

Comparison of cropping of Pre-project with Post-project in Rampur FCD Subproject, Natore.

Crops	Pre-project (1997)		Post-project (2003)		Difference (Times)	
	Area (Ha)	Yield (t/ha)	Area (Ha)	Yield (t/ha)	Area	Yield
<Kharif-1>						
B. Aus	6.0	1.65	20	1.6	3.33	0.97
LIV. Aus	10.9	1.65	28	1.85	2.57	1.12
Mixed Aus	10.9	1.20	10	2.1	0.92	1.75
Jute	4.0	1.90	14	2.1	3.50	1.11
HYV Aus	-	-	67	3.21	-	-
Vegetables	-	-	8	18.86	-	-
(Total)	31.8		147		4.62	

<Kharif-2>						
LF LIV Aman	4.0	2.22	39	3.09	9.75	1.39
HYV T Aman	8.1	2.5	58	3.83	7.16	1.53
DW Aman (B)	16.2	1.67	-	-	-	-
DW Aman (M)	2.0	1.67	-	-	-	-
Vegetables	8.0	24.1	4	11.86	0.50	<0.49>
Onion/chili			16	6.67	-	-
(Total)	38.3		117	-	3.05	1.46
<Rabi>						
HYV Boro	80.1	5.40	97	5.93	1.21	1.10
Wheat	9.0	2.40	12	2.72	1.33	1.13
Vegetables	45.0	5.90	11	11.61	0.24	<1.97>
Spices	4.0	1.00	7	1.20	1.75	1.20
Mustard	6.1	1.50	12	1.61	1.97	1.07
Sugarcane	34.8	32.00	38	59.3	1.09	1.85
Lentil	29.0	1.00	15	1.11	0.52	1.11
Sesame	2.8	1.80	-	-	-	-
Local Boro	-	-	69	2.59	-	-
Potato	-	-	10	15.31	-	-
(Total)	210.8	-	271	-	1.29	1.35

Source: LGED (2004)

This is a good model of farmers' collaborative activities in rural areas. It will contribute to high quality seeds supply, technology development and fund raising for the association. It also has useful functions as an agro-industry for rural development

(7) Medium Lowland

1) Characteristics of Medium lowland areas.

In the appropriate natural conditions integrated agricultural farming can be widely accepted. The integrated farming is useful for the development of rural livelihood. It has already been practiced in various areas, and successful results are reported. From experiences in the past, several advantages are found as follows:

- Low-cost and environment-friendly farming,
- Participation of women and children to farming,
- Contribution to cash income as supplemental cash generation,
- Possible to start with small initial fund.

2) Examples of development projects.

a) Integrated rice-duck farming

Rice-duck farming is a compatible organic farming method, introduced in Bangladesh in 2001. Ducks are allowed to forage in the paddy 20 days after man paddy transplanting until the flowering stage. By bearing ducks in the Aman paddy field, no chemical fertilizers or pesticides are applied, but 20% higher crop yields were obtained and net income on a cash cost basis increased by 80%.

Several advantages, as follows, are expected in the integrated rice-duck farming by SSWRDSP:

- Suitable to natural environments of Bangladesh,
- Higher rice yields by environment-friendly farming (Removing and eating weeds and worms) was observed: Providing natural fertilizers by dropping of ducks,
- SSWRDSP provides good chances with female household members in the duck rearing activities,
- Surface soil can be softened (mulching) by ducks' movement.
- Use of surface water in the SSWRD Sub-project area for *Boro paddy* provides appropriate water depth for both paddy and *ducks (improved species)*.

Several requirements are also reported to extend the activities in rural areas and stabilize the water-based farming. Several development activities are as follows:

- Improvement of vaccination services
- Technical training to women and beginners for duck rearing
- Development of egg marketing
- Supply system of chickens
- Supply of credit system for initial fund

b) Rice-fish farming

Fish culture requires specific technologies and initial funding for establishment. It enables farmers to obtain more profits than rice cultivation, if the fish culture is managed properly. In the future to economize water use and develop profitable farming, integration of rice-fish farming needs to be developed.

(8) Medium Highland

1) Characteristics of Medium highland.

The area is flood-free or slightly flooded but no sedimentation. Triple cropping is practiced in the area: Boro-Aman-potato/ vegetables. Due to Boro-Aman crop rotation, soil-born diseases or laterization are limited.

2) Examples of development projects <Kanmona-Haraboti WC Sub-project, Kalai, Joypurhat> ---- Successful case of SSWRDSP-I

The area is located in flood-free area, and hence it is possible to cultivate triple cropping. Major cropping pattern is T. Aman (July-October), potato/mustard (November-January) and Boro (February-May).

	/Veg.			Boro				Aman				Potato
	=====	████████████████████			████████████████████			████████████████████			████████████████████	
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul	Aug.	Sep.	Oct.	Nov.	Dec.

Flood-free conditions are well utilized for farming system. In the Pre-project period T Aman-Mustard-Boro was the major type of cropping. Before SSWRDSP frequent water logging caused

- Crop damages such as 2-3 times of re-transplanting of T. Aman
- Decrease of yield of rice: 0.5-0.6 t/acre
- Delayed crop cultivation of mustard, wheat, etc. by water logging and high soil moisture content

In the post-project periods, the cropping conditions were improved.

- From the natural advantages flood-free conditions enable to transplant Aman earlier than the normal cropping season,
- The SSWRD project eliminated inundation during rainy season

Potato production was introduced for a cash crop. It was widely adopted in the area, and it is now a major crop as well as T. Aman and Boro. Advantages of the area for potato cultivation are as follows:

- Potato (duration 75-95 days) is suitable for triple cropping
- Potato can be more profitable than rice in case of early cropping.
- The land is located in the medium highland area.

3) Traditional potato farmers, Kishoreganj

The flood-free of the Medium Highland enables various vegetables growing due to no damages from early floods, and hence quality products can be harvested and collected. T. Aman can be transplanted earlier than the ordinary cropping. Therefore, 3 times of cropping can be practiced a year. Inundation during rainy seasons provides soil health. From these conditions the areas are suitable for root and tuber crops.

Place of potato farmers	<ul style="list-style-type: none"> - Roadside fields in Mymensingh. - Females were harvesting potatoes. Women usually do not go to crop fields. They only harvest potatoes and grow vegetables in their homesteads - During the flood 8" deep-water stagnant condition occurs for 3 months. - The basic crop rotation is Boro-T Aman-potato.
Varieties	<ul style="list-style-type: none"> - Challisha: derived from the Bangla name Challish (Forty). It is harvested within 40 days after sowing the tubers. <p>Rangpuri</p>
Reasons of growing traditional varieties	<ul style="list-style-type: none"> - High selling price (Traditional red small variety: 9 Tk/kg, Traditional white small variety: 8 Tk/kg, Improved white large variety: 7 Tk/kg) - Short duration: They may be able to have enough time for Boro Taste and huge demand in the market.
Consumption of potato	They keep 100-120 kg for their family consumption and the rest are sold to markets
Fertilization	Follow the BS advice
Disease and insect-pest	<p>Bacterial blight but not very severe.</p> <ul style="list-style-type: none"> - The major pests of the area are rats and cutworm: killing by hands. - Training: IPM club by DAE-DANIDA.

4) Goat rearing by a rural woman of farm household.

Goat rearing can be possible in most of the areas in Bangladesh. The Medium Highland is suitable and profitable for goat rearing because of flood-free and land conditions and abundant grasses. This case is observed in our survey in Netrakona District. This is a peaceful friendly model of rural life, and it can be a final target of rural and agricultural development projects.

Establishment:	1998, with her husband and 2 children.				
Initiation	Started with one goat by receiving loan, from her hobby. Other animals: Ducks (8-9), hens (20-30) and pigeons (4-5).				
Goat feeds	<p><Scavenging livestock farming> Major feeds were grasses from the grazing lands and bank of the pond.</p> <p><Supplementary feeds> Wheat bran ·Rice bran (purchasing at Tk 14/kg), (1 kg /day for 3 goats)</p>				
Selling	Selling amounts are shown in the table below:				
	Sold goats	Age	Number	Unit price (Tk/heads)	Amounts
	1	2 years	1	Tk 1,200 (F)	Tk 1,200
	2	1.5 years	1	Tk 800 (F)	Tk 800
	3	1 year	2	Tk 500(F)	Tk 1,000
	4	0.5 year	3	Tk 400 (F+M)	Tk 1,200
	5	Young goats	7	Tk 400 (M), 200(F)	Tk 2,200
	Total		14	Tk 457	Tk 6,400
Milk production and consumption	<ul style="list-style-type: none"> - Milk production: Daily milk production is 750g~1 kg/head, and it lasts 2-3 months. (There are two times of child birth a year.) - All the milk is consumed in their house. 				
Agricultural production	Possessing 1 acre land, cultivated 2 times through the year as shown below:				
	Crop	Production	Family use	Selling	
	Aman	1.85 ton	0.74 ton (40%)	1.11 ton (60%)	
	Boro	2.22 ton	1.11 ton (50%)	1.11 ton (50%)	
	Vegetables	-	Almost all	-	
	Cash income	-	-	Tk 15,500	
Cash income	Major source - Her husband is a high school teacher (.Tk 70, 000) Rice production: 2.22 ton of paddy would be equivalent to Tk. 15,500 Goat rearing: Supplementary sources – (Tk 6,400. for 1 years)				
Expenditure	Purpose of expenditure: To buy ornaments for her daughter.				

Expectation to Livestock Office and future development	She tries to obtain larger loans so that she could buy more goats, hen, ducks, and pigeons. She could also try to rear cows then. She expects her children entering her business and makes her business bigger
Goat rearing in the family	<ul style="list-style-type: none"> - Goat milk was a major source of the improvement of nutrition conditions of their family. - Goat selling was supplementary income source for specific expenditure. - Selling price was not high, but reproduction of goats contributed to cash income.
Possibilities of contributing poverty alleviation	<ol style="list-style-type: none"> 1) Goat rearing is a promising way to increase supplemental cash income for women. 2) Combination of <agricultural production> – <livestock> – <non-agricultural work> is a stable and useful approach of agricultural diversification for increasing cash income. 3) Rice production is an indispensable factor to stabilize household management in rural area.

Occasions of entertainments are not abundant in rural area. In the JICA field surveys, rearing of small animals such as goats and poultry by housewives from their hobby was often observed in rural area. These activities have various creative effects on their daily lives. Improvement of their nutrition intake and additional cash income will bring about profitable life economically. In addition, the goat rearing can provide mentally affluent life. Farmer's life with free and easy manner will be one of the targeted models in future in ten to fifteen years in our survey

(9) Highland

1) Characteristics of 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. Perennial crops such as banana and pineapple can be grown in the water-limited areas. Rice is also cultivated in rainy season in depressed areas or by DTW. Livestock and poultry are suitable to these areas. Diversification to rice-vegetables-livestock is useful for future development. Due to no submerged conditions, damages by soil nematode are severe, crop rotation is important as well as chemicals to nematodes.

2) Several promising farming systems

Although natural conditions are severe, there are several promising farming systems in these areas.

- a. Perennial crops such as banana.
 - b. Rice cultivation in depressed areas.
 - c. High value-added crops can be grown using DTW.
 - d. Aman-vegetables-livestock (poultry)
 - e. Crop rotation, ex. Eggplant-wheat Leafy crops will be effective.
- * Examples in SSWRDM-I will be attached.

(10) Hilly land

1) Characteristics of Hilly land area.

The areas are flood-free, but soil erosion happens, and damages by flash flood are also serious problems.

2) Agriculture Development Plan

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. Permanent crops and tree crops such as fruits, jackfruits, pineapple, lemon, banana and timber are useful for agriculture in the hilly land area. Besides the agricultural production, water conservation for Boro cultivation in dry season is also important potentialities in the areas.

3.2 Fisheries

3.2.1 Present Conditions of Fisheries in Bangladesh

(1) Natural Environment and Fisheries Resources

Bangladesh, a country of delta plains of 147,570 km², is dominated by the Ganges–Padma, Brahmaputra-Jamuna and Meghna rivers and their tributaries. It is estimated that the country has about 700 rivers, streams and canals that total some 24,000 km in length and covering about 7% of country's total surface area. Inland water bodies of the country cover an area of 4,415,657 ha of which 91.20% comprise open water body and 8.80% closed water body. The major inland open water areas are floodplains, river and tributaries, beels and haors. The only reservoir is Kaptai Lake. The inland closed water areas comprise of ponds, Oxbow lakes and shrimp farms.

Total Catch and Area Productivity, 2002 - 2003

Sector of Fisheries	Water Area (Hectare)	Total Catch (Metric Tons)	Share to Total Catch	Catch/Area (Kg/Hectare)
A. Inland Fisheries				
(i) Capture				
1. River & Estuaries	1,031,563	137,848		134
2. Sundarbans	-	13,884		-
3. Beel	114,161	75,460		661
4. Kaptai Lake	68,800	7,025		102
5. Flood Land	2,832,792	475,116		168
Capture Total	4,047,316	709,333	35.50%	
(ii) Culture				
1. Pond & Ditch	290,500	752,054		2,589
2. Baor	5,488	4,098		747
3. Coastal Shrimp & Fish Farm	141,353	100,804		713
Culture Total	437,341	856,956	42.89%	
Inland Total	4,484,657	1,566,289	78.39%	
B. Marine Fisheries				
(i) Industrial Fisheries (Trawl)		27,954		
(ii) Artisanal Fisheries		403,954		
Marine Total		431,908	21.61%	
Country Total		1,998,197	100%	

Source: Fisheries statistical year book of Bangladesh 2002-2003, DOF

Along with potential inland water resources, the country is also rich in the diversity of various fresh water fish species. About 260 species of finfish live in the inland open waters, mostly the large and medium size fishes, hilsa, carps and catfishes undertake long migration in rives of breeding. Endemic carp species of Bangladesh can be sub-divided into two sub- groups, 1) Major carps (eg. catla, rohu, mrigal, calbus), 2) Minor carps (eg. bata, nandin, gonia,etc). (Source: Role of aquatic ecosystems in the food and livelihood security in the Gangetic basin Bangladeshs, M.G.Hussain, BFRI). The other fish species including exotic and indigenous are rui, silver carp, grass carp, tilapia, magur and shol, etc.

(2) Production and Consumption

Between the two broad categories of fisheries environment in Bangladesh, namely, inland and marine, the former is dominant in terms of its contribution to total national fish production. Inland water fisheries are divided into two types. One is inland openwater and the other is inland close water.

Fish production in 2002-03 is 1,998,197 metric tons (MT) with the inland openwater fisheries providing 709,333 MT (35.5%), the marine fisheries providing 431,908 MT (21.6%) and inland closed water fisheries providing 856,956 MT (42.9%). While available statistics place limits on the ability to analyze fisheries trends, there has been a decline in production of inland capture fisheries, river & estuary, beels and Laptai Lake.

Comparison of Annual Total Catch of 2002-03 with those of 2001-02

Sector of Fisheries	Annual Total Catch (M.T.)		Increase (B)-(A)	Percent Increase
	2001-02 (A)	2002-03 (B)		
A. Inland Fisheries				
(a) Capture				
1. River & Estuaries	143,592	137,848	-5,744	-4.00
2. Sundarbans	12,345	13,884	1,539	12.47
3. Beel	76,101	75,460	-641	-0.84
4. Kaptai Lake	7,247	7,025	-222	-3.06
5. Flood Land	449,150	475,116	25,966	5.78
Capture Total	688,435	709,333	20,898	3.04
(b) Culture				
1. Pond & Ditch	685,107	752,054	66,947	9.77
2. Baor	3,892	4,098	206	5.29
3. Coastal Shrimp & Fish Farm	97,605	100,804	3,199	3.28
Culture Total	786,604	856,956	70,352	8.94
Inland Total	1,475,039	1,566,289	91,250	6.19
B. Marine Fisheries				
(a) Industrial Fisheries (Trawl)	25,165	27,954	2,789	11.08
(b) Artisanal Fisheries	390,255	403,954	13,699	3.51
Marine Total	415,420	431,908	16,488	3.97
Country Total	1,890,459	1,998,197	107,738	5.70

According to the Medium Term Plan for Economic and Social Development 2003-04 to 2005-06, it is stated that the present level of per capita fish consumption is about 34 g (2001-2002). In order to raise the level of consumption to about 40g/capita/day at the terminal year of the plan period, the required production of fish would be 2.29 million ton.

As shown in the table below, the total projected target production after ten years is below the total production in 2003-04. It is expected that the production quantity of inland aquaculture (inland fish culture) will be increased wider range from 1,465,744 to 2,524,455 ton by 2015.

Outline scenarios for major sub-sectors (Unit: mt)

Production sector	Current (2003-2004)	Potential for 10 year		Annual Change (%)	
		Low	High	Low	High
Inland aquaculture	850,000	1,465,744	2,524,455	5.6	11.5
Coastal aquaculture	94,580	129,597	228,048	3.2	9.2
Inland capture fisheries	750,419	606,919	685,552	-2.1	-0.9
Coastal/marine fisheries	589,500	501,689	555,070	-1.6	-0.6
Total	2,284,499	2,703,949	3,993,125	1.5	5.4

Source: Economic study conducted by the Department of Fisheries, 2003-2004

(3) Socio-economic Factors

The fisheries sector, capture fisheries and aquaculture have been contributing a very significant role in the over all economy of Bangladesh as a source of employment generation, foreign exchange earning and improving environmental condition and for human nutrition from animal protein. 63% of the demand for animal protein in the country is still met by fish as available and cheap sources of protein (source: Fisheries and Livestock sub-sector, three year rolling plan 2002-2005).

According to 2000-2001 statistics, the sector contributes about 5.30% of GDP, which is about 21% of the value of agricultural production. In addition, there are about 12 million people whose livelihood depends indirectly on fisheries as subsistence fisher, part time fishing labor, aquaculture operator, fisheries trade and business etc. The sector contributes 5.77% to the country's total export earnings (2000-2001), ranks third in the list of export commodities. The annual growth rate since 1991 ranges between 6 and 8 % supporting its immense potential which needs comprehensive and concerted efforts to harness the maximum potential (source: The medium term plan for economic and social development 2003/04- 2005/06, Fisheries sub-sector).

(4) Fisheries Development Plan

National Fisheries Policy prepared in 1998, but it did not implement up to now. The I-PRSP(2003) and draft PRSP (2004), the latest government development strategy declares the fisheries development strategy as follows:

- The overall strategy of fishery sector development will envisage 1) intensification of aquaculture by species and ecosystems, 2) addition of export-oriented species, 3) product diversification and value addition, and 4) development of appropriate marketing infrastructure.
- The capacity of the Department of Fishery (DoF) will be redefined and strengthened so that it can consolidate and continue to support inland aquaculture through intensification of culture fisheries with improved knowledge of fish culture, brood fish stock, quality fingerlings and feeds.
- The underlying strategy will be to promote a dynamic rural aquaculture, involving the key actors among NGOs and private sector entrepreneurs, i.e. fish farmers, hatchery and nursery operators, fingerlings vendors, feed manufacturers, fish processors.
- DoF will preserve, patronize and make more productive use of inland capture fishery through community based participation of fishermen and fishery related stakeholders.
- Fisheries research will be upgraded to continue flow of technology generation.
- Various policies of other ministries impinge upon the fishery sector development because these policies regulate the availability of, access to and use pattern of the open water bodies. These will be coordinated and a necessary legal framework will be formulated.
- Specific programs will be undertaken to maintain water bodies and make them available for improved aquaculture. Development of water bodies should be planned by BWDB and LGED in coordination with DoF and DLS.
- The strategic plan for the implementation of the National Fisheries Policy will be finalized so as to increase productivity of scarce fishery resources and also to ensure access of the poor and fishermen community to water bodies.
- The plan of action will address development of inland and coastal fishery management, education, research and extension services, organizational as well as commercial policies (i.e. marketing, processing, quality control, export and transportation). Especially quality assurance in fish harvesting and processing will be emphasized.
- Human resource development will be given priority by the DoF, while skill development with respect to fish production, processing and marketing at the local level will be accomplished through public sector agencies, NGOs and private sector.

(5) Fish Act and Other Relevant Regulations

1) Fish Act

Basic law of the fisheries is Fish Act which originated the East Bengal Protection and Conservation of Fish Act was passed in 1950 by the provincial legislative, with a view to conserving young and brood stocks of specific species of fish and restricting certain fishing activities. The Act, which is still in force, empowers the government to promulgate laws and regulations to ensure conservation of fishery resources. The Act was subsequently amended in 1963, 1970, 1982 and 1985-1988.

The outline of the preset Fish Act is as follows:

- fish means all cartilaginous and bony fishes, prawns, shrimps and other edible crustaceans, amphibians, tortoises, turtles, molluscs, and echinoderms;
- capture of fish by fixed net, cage, traps, etc put across the river, canal and outlet khal or beel is prohibited;
- such fixed structures may be removed or seized; construction of temporary or permanent weir, dam, *bund*, embankment except for flood control, drainage and irrigation is prohibited;
- capture of fish by use of explosives, gun, bow and arrow in inland and coastal waters is prohibited;
- destruction of fish by poisoning water or by polluting water by industrial wastes or other means is prohibited;
- capture of shoals of fry of Shol, Gazar and Taki (snakheads) or their broods in the river, canal, khal and beel from 1st April to 31st August, except for the purpose of culture, is prohibited;

- for the purpose of culture Rui, Catla, Mrigal, Kalibaus and Ghonia of any size may be caught in 27 selected rivers and khals after obtaining a license by the payment of prescribed fees to the District Fishery Officer;
- except for the purpose of culture, nobody is permitted to catch (i) Rui, Catla, Mrigal, Kalibaus and Ghonia below the size of 23 cm from July-December, Jatka (young Hilsa) and Pangas from November to April every year; and (ii) Shillong and Air below the size of 30 cm from February to June every year;
- fishing with the help of current net/mosquito net having mesh-size below 4.5 cm is prohibited;
- first-time violators are to be jailed for 6 months or fined Taka 500 or both;
- second-time violators are liable to be jailed for one year or fined Taka 1000 or both;
- violators may be arrested without warrant;
- all magistrates, sub-inspectors of police at upazila level, Deputy Rangers of the Sundarbans belonging to the Forest Department and Upazila Fishery Officer are empowered by the government to implement the Act. Nobody is permitted to appeal against a step taken under the Act.

However up to the present time, the following bylaws are not organized.

- a) Preventive measures to threatened fish
- b) Establishment conservation/ Sanctuary for indigenous/natural fish
- c) Fishing postponement in floodplain at spawning season.
- d) User restriction of a kind of drag net, which mainly used in Haor destroyed footpath in rice fields to protect erosion and siltation.

Recently, the Ministry of Fisheries and Livestock plans to complete the draft report of the law concerning the “Fish Food and Hatchery Registration Act”. The newspaper¹ reported that “According to the ministry sources, there has been no law relating to fish farming and hatchery in Bangladesh since independence, for which hatchery industries have haphazardly sprang up all over the country without ensuring any quality in fish breeding. Some of these hatcheries are allegedly engaged in producing substandard neglecting the genetic aspects of fishes to gain commercial benefit. These hatchery owners produce fish-fries from small-sized inferior quality fishes instead of the big ones, which hamper quality fish production, it is also alleged”. Above Act on fish feed and hatchery did not exist up to now, there is no quality control of fingerling and fish feed. In the Union questionnaire, there are problems such as low quality fry/fingerling supply and also commercial feed, which are expected to be solved by this Act being executed, gradually.

2) Management of Indigenous/Natural Fish

Above mentioned in Fish Act, the description concerning the natural/indigenous fish protection has not become concrete execution. And also, there is a mention of plan but the government doesn't take the initiative yet though a few projects have done by WorldFish center and NGO. The activities done by WorldFish center will be conservation and habitat restoration of the open water bodies through establishment of fish sanctuaries, awareness and motivation to fishermen and women, culture based and stocking management of open-water fisheries thought community involvement.

The medium-term and long term improvement of biodiversity strategies in “Fisheries and Livestock sub-sector, Three year rolling plan (2002-2005)” is mentioned as follows.

- Habitat restorations and the establishment of fish sanctuaries to conserve and facilities natural spawning and improved bio-diversity.
- Banning the exploitation of commercial shrimp species from thin breeding grounds and migration routes during breeding season.
- An immediate stop to the indiscriminate destruction of juvenile *Hilsa (Jatka)* through imposing stringent judiciary procedure.
- Biologically managing the open water –bodies, especially the *Jalmahals* through intervening culture-based production by ensuring the community involvement.

¹ “New Age” 15 May, 2005

- More emphasis on brood stock quality and management to prevent inbreeding depression and ensure supply of fish seeds.
- Regeneration of aquatic flora and fauna in the open water ecosystems.

Among the above-mentioned, the negative impact of influencing natural environment cannot be easily recovered; it is necessary to begin the project conducted by MFL and DoF, immediately.

A budget of materials is necessary to establish one conservation area as follows.

Conservation area 10 ha: Tk. 300,000 (only equipment and materials, bamboo, tree branch, labor cost, etc.). Moreover, the most important is motivation training and credit scheme for villagers.

In Greater Mymensingh area, 6-7 fish conservation areas have already been established at present. DoF has aims increasing conservation area up to 70 areas for five years; nevertheless it is not possible to put on more conservation water bodies owing to shortage of budget.

3) Lease of Water Bodies for Fisheries Development

In Bangladesh, the term fisheries management has until recently been used to describe the *Jalmahal* (Water bodies, which area Government Khas lands, leased out to Public exclusively for fishery, such as Khal, Beel, Haor, Baor and Dead river) leasing system administered by the Ministry of Land (MOL) in order to generate revenue for the government from the fish production in inland waters. As the *Jalmahal* lease system is oriented toward collecting revenue for the government, it had led to "resource mining" (i.e. exploiting resources to the maximum), as the lease holder considers all fish in the *Jalmahal* to be his personal property to be exploited. The government has introduced a form of leasing system. Rather than allocating *Jalmahal* leases through open auction, a system of sealed tender is introduced.

The ownership of *Jalmahals* by the MoL severely weakens the capacity of the Ministry of Fisheries and Livestock (MoFL) to carry out its mandate to scientifically managed, protect and conserve the inland fisheries resources. In 1987 the New Fisheries Management Policy (NFMP) was initiated by the MoFL to deliver the maximum benefits from fishing to the actual fishermen and put into place management systems, which attempt to ensure long-term sustainability of fisheries resources. Under NFMP, access to fishing rights is only given to "genuine fishermen" (also called "Ethnic Fishers"). These are individuals who are ethnically fishers and whose livelihood is and historically was predominantly earned from fishing activities.). This is done through a process of local peer-official selection and certification and issuing of renewable annual fishing licenses (the license is necessary for the boat with the engine) to approved and listed genuine fishermen. Because most *Jalmahals* are greater than the capacity of one fisherman to harvest, the DoF has elected to license out *Jalmahals* to fishermen in a collective manner through cooperatives, associations, etc.

The licence fee is based on the lease fee that would have been collected had that *Jalmahals* remained under the old leasing system, as the government insists that the aggregate total of all license fees for individual fishing gears issued for a particular *Jalmahal* must be equal to the old lease fee. If the license fee is too high, only middlemen and moneylenders can afford to pay. Poor fishermen cannot and must turn to them for credit. Ex-*Jalmahal* leaseholders and moneylenders are strong opponents of NFMP and try to take control of fishermen's cooperatives². Many genuine fishermen and women are facing problem that

“Establishment of Sanctuary by Community Based Fisheries Management”
at Trishal Upazila in Mymensingh District.

The project “Community Based Fisheries Management” organized by DoF, NGO and community established fish conservation area in a beel. 10 ha was reserved for conservation area among 100 ha. Nobody can catch fish in the conservation area even though genuine fishermen and women. Consequently, fishing ground was decreased, and the income of genuine fishermen and women has decreased, too. Unfortunately, DoF was not able to organize alternative job and credit scheme for genuine fisherman and women. However, all villagers are expecting that natural/indigenous fish resources will be haul recovery in the future.

² National Fisheries Development Programme, Ministry of Fisheries and Livestock, Bangladesh, Food and Agriculture Organization of the United Nations June 1994

lease fee is decided that a water bodies where is occupied abundant of fisheries resources is higher than other water area. Genuine fishermen and women can't lease suitable fishing ground such as abundant of fisheries resources. They never manage good fisheries activities even though they have an idea to make a conservation area in *Jalmahal* for the future.

In 1994, the Government decided to transfer management of small closed beel to the local government. In 1997, government ordered to transfer small water bodies up to 20 acres to the Ministry of Youth and sports will arrange training for youth group to explore better output from these water bodies³.

4) Fishermen Cooperative Association

In Bangladesh, Fishermen cooperative association began to be formed with the Government support form 1960. The objective of the cooperatives is to promote welfare of fishermen. Fishermen's cooperative is organized under the Ministry of Local Government and Cooperatives. The MoFL/DoF cannot take a part of cooperative's organization building. The relation between fishermen cooperative and DoF is fishermen cooperative become channels to gather participants when DoF organizes fisheries training.

In the fisheries sector, there are 4 types of cooperatives, fishermen cooperative, fish culture cooperative, fish businessmen cooperatives, and fish trader (Arat) cooperative. However, in general, these cooperatives are ruled by unscrupulous non-fishermen (e.g. fish traders or businessman who have a capital) and they find their own position and financial resources. In the absence of effective supportive structure within the cooperatives, to large extent fishermen members neither play a useful role nor get any benefits from the cooperatives. Based on above condition, there is a tendency such as leader or board member of fishermen's association exploits profit. Some of fisheries cooperatives were dissolution by fishermen themselves and also a lot of genuine fishermen they don't desire to organize any cooperatives again.

(6) Flooding, Water Control and Fish Habitat

Construction of a large number of Flood Control and Drainage (FCD) and Flood Control Drainage and Irrigation (FCDI) projects and unplanned flood protection embankments implemented under water resource development programs since 1960 within and around the major rivers and floodplains areas has adversely affected the aquatic ecosystem and habitat of fish population by obstructing their migratory route. Therefore, natural recruitment of fish in those rivers and floodplains has been declined. On the other hand, a large number of non-migratory, resident fish spawners have mostly lost their breeding grounds for natural seed production. Land reclamation by drainage works has greatly reduced the areas of permanent water bodies and especially within FCDI projects; many formerly perennial beels have been rendered season. As a result, it was said that many fin fish and prawn species of rivers, floodplains and estuaries have become threatened and endangered.

At the same time, the overall livelihood of the people surrounding these water bodies have severely been affected owing to the reduction of open water areas and declining the catch⁴.

(7) Role of Women in Aquaculture and Fisheries

The 1991 census estimated that 48.3% of the total population is women, of which about 90% live in the rural environment. The involvement of women in different aquaculture activities is increasing. The donor-aided projects have preconditioned to involve 30-50% female in the aquaculture related activities. The NGO's fisheries program included female in various activities to increase their income through training, motivation and also involved the common property resource management. Through this program, the women are being empowered that enable them to participate in the decision making process and address problems and establish right⁵.

³ A.K.M.Firoz Khan, WorldFish Center, Dhaka (2004) Challenges in open water fisheries management in Bangladesh, IIFET 2004 Japan Proceedings

⁴ M.G.Hussain, Role of aquatic ecosystem in the food and livelihood security in the Gangetic basin Bangladesh, BFRI

⁵ Profile of key aquaculture technologies and fisheries practices, Md. Nasir Uddin Ahmed, DG, DOF, Md. Mokammel Hossain, PSO, DOF, et al.

(8) Marketing

The availability of fish in the markets depends on not only the fish catch, but also on the efficient marketing and distribution of the catch. Poor physical facilities in the fish marketing centers and inadequate marketing channels hinder the development of fish marketing and distribution in the county restricting the profit and income of producers and fishers. The fish markets and the marketing of the fish are generally conducted by fish traders, either individually or as groups, or fish Traders Association or Fishermen's co-operatives societies. Almost of all fish markets operated by them are ill managed, unhygienic and unscientific. No standard practice of handling, washing, cleaning, icing or grading of fish is followed. Limited care is being paid on post-harvest handling with ultimate reduction in price and product quality. Most fish markets managed by fish traders in cities, district towns and rural areas have no modern infrastructure facilities not even with roofing facilities. In villages, fish is directly placed on the soil and in bamboo baskets and sold by auction, before being transported to cities/towns for retailing. City markets built by the municipal corporations/ Municipalities offer better facilities but are not managed according to any standards. The local Government Ministry is now constructing small fish markets in the rural areas of Bangladesh through the local Government Engineering Department (LGED)⁶.

3.2.2 Present Fisheries in the Study Area

(1) Production of Fishery in the Study Area

Inland water fisheries of Bangladesh are divided into two types. One is Inland openwater (river & estuary, Sundarban, Beel, Kaptai Lake, flood land), and the other is Inland closewater (pond & ditch, Baor, shrimp (freshwater shrimp) & fish farm). However in great Mymensingh area, there is no estuary, Sundarban, Kaptai Lake 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 proportions of the fishery industry in GDP of six districts included in the great Mymensingh area are as follows.

Jamalpur	Tangail	Mymensingh	Netrakona	Sherpur	Kishoreganji
3%	2%	11%	14%	12%	5%

Source: 2001 Statistical Year Book of Bangladesh

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. According to the table, Mymensingh District ranks first in terms of total catch. The second is Kishoreganj District, followed by Netrakona District. Since Mymensingh District is the center of the great Mymensingh area, and the Faculty of Fisheries of Bangladesh Agriculture University as well as Bangladesh Fisheries Research Institute (BFRI) are situated there, the fisheries activities are more active than five other districts. Production by shrimp farm is recorded only in Kishoreganj District.

⁶ Profile of key aquaculture technologies and fisheries practices, Md. Nasir Uddin Ahmed, DG, DOF, Md. Mokammel Hossain, PSO, DoF, et al.

Total Catch of Inland Water in the Study Area, 2002

(Unit: MT)

No.	District	River	Beel	Floodplain	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), DoF

The table below shows the area, total catch and catch/ha from Beel in 2002. Kishoreganj District and Netrakona District are most productive in Beel fisheries. So far it is not known whether the high productivity in those two districts is due to abundance of fisheries resources or intensive fishing effort.

Area and Fisheries Production of Beels, 2002

District	Area of Beels(ha)	Total Catch(MT)	Catch(kg)/ha
Jamalpur	3,360	2,287	680.7
Kishoreganji	6,837	5,584	816.7
Mymensingh	7,346	5,332	725.8
Netrakona	8,355	8,013	959.1
Sherpur	3,508	2,330	664.2
Tangail	2,333	1,456	624.1
Total	31,739	25,002	4,470.6

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

The table below shows number, ratio (to the total number of households), average catch and estimated total catch of subsistence fisheries households. These subsistence fisheries households are not only engaged in fisheries activities but also engaged in other economic activities. Those data indicate that many households depend heavily on fisheries resources in Great Mymensingh area.

Number of Subsistence Fisheries Households and Its Catch, 2002

District	Total number of households *	No. of subsistence fisheries households	Ratio of subsistence fisheries households (%)	Average Catch per household (Kg)	Estimated total catch (MT)
Jamalpur	481,152	409,000	85.0	16.50	6,746
Kishoreganji	726,561	343,000	47.2	37.80	12,973
Mymensingh	965,123	656,000	68.0	38.51	25,270
Netrakona	406,153	325,000	80.0	27.30	8,867
Sherpur	296,535	238,000	80.3	16.12	3,830
Tangail	528,323	407,000	77.0	17.84	7,263
Total	3,403,847	2,378,000	70.0	27.31	64,949

*: 2001 Statistical Year Book of Bangladesh

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

(2) Netrokona District

The total annual catch recovered in 2002 to the level in 1998 from the lowest level recorded in 2000. However, the catch from the floodplain was still at a very low level in 2002 compared to that in 1998. Production from the pond (by fish culture) gradually increased. Catch from the river drastically decreased from 1999 to 2001, but recovered in 2002 to the level of 1/3 of the catch in 1998 (Table 3.2.1).

Since, Netrakona District has a low land that covers the eastern part, its floodplain is wide and catching fisheries are active there.

The number of subsistence fisheries households increased in 2002. The average catch per household dropped in 2000 to the level of about 1/3 of that in 1998. The decrease in average catch per household

might be attributable to over-fishing. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects (Table 3.2.2).

(3) Kishorganj District

The eastern part of Kishorganj District is a low land and two large rivers flowing there. That part becomes a large flood plain named Haor in the rainy season, so that the catch from the floodland is high. The catch from the river dropped in 2002 to a level of 1/10 of the level in 1998. The production from shrimp farms increased year by year (Table 3.2.1).

Average catch per household in 2002 decreased to the level lower than 1/2 of the level in 1998, while number of subsistence fisheries households increased. The ratio of fishery industry production in GDP is low (5%) in the district. Also the ratio of subsistence fisheries household in the district is lower than that in other districts. However, average catch per household is high (37 kg). Those might indicate that dependency on fish resources by subsistence fisheries households in Kishoreganji District is higher than that in other districts. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects (Table 3.2.2).

(4) Mymensingh District

Mymensingh District is largest in area among six districts and is a center of great Mymensingh area. The Old Brahmaputra River flows through the center of Mymensingh District. In the rainy season, both sides of the river are inundated and create a large floodplain. The damage caused by the flood is not so serious because infrastructures are more advanced in the district than in other districts.

In Table 3.2.1, 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 for whole Mymensingh 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 deluge 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.

The number of subsistence fisheries households increased in 2002, while the average catch tended to decrease. This might be attributable to over-fishing. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects (Table 3.2.2).

(5) Tangail District

The Jamuna River flows through the western part of Tangail District, and causes some damage by the flood every year.

The Table 3.2.1 shows the general tendency of production increase every year except for some decrease in the catch from the flood land recorded in 2001. The fishery industry in this district seems not to be very active because it accounts for only 2 % of GDP. However, there are seven private hatcheries producing about 5,000 kg hatching/fry of fish a year, and also there are about 360 nurseries in this district.

It is likely to become over-fishing if catch increases any further. Therefore, some measures to introduce fish culture will be needed. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects (Table 3.2.2).

(6) Jamalpur District

The Jamalpur District is situated in the area between two rivers, namely, the Jamuna river to the west and the Old Jamuna river to the east. Therefore, fish culture activities suffer from damages caused by the flood every year. The total fisheries production in the district is low (5th among six districts), even though the ratio of subsistence fisheries households is the highest (85%).

According to District Fisheries Official, the present demand on fish fry cannot be covered by the fish fry production in the district, and the demand on fish fry keeps increasing (Table 3.2.1).

Average catch per household increased by 8 kg from 2000 to 2001, while the number of subsistence

fisheries households did not change. However, in 2002, the number of households increased, while average catch per household decreased. This decrease occurred in 2002 might be due to over-fishing in the district. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects.

(7) Sherpur District

Total production in this district is lowest among six districts, while the ratio of fishery industry production to GDP is as high (12%) as that in Mymensingh and Netrakona Districts. The ratio of subsistence fisheries households is also high (80.03% which is second highest among six districts).

The catch from the flood land rapidly decreased until 2002 to the level of almost half of the level in 1998. Since it is difficult to obtain fish fry in Sherpur District, fish culture farmers buy fish fry from Mymensingh District. The demand on fish fry by farmers keeps increasing.

Total catch tended to decrease year by year, while there was no change in the number of subsistence fisheries households from 1989 to 2001. The number of subsistence fisheries households increased in 2002, indicating that the population depending on fisheries increased. The increase in the number of subsistence fisheries households in 2002 might be occurred by an impact of execution of subprojects.

3.2.3 Present Problems and Development Potentials of Fisheries in the Study Area

(1) Present Problems and Constraints

1) Damages caused by Flooding

Inundated areas are widely spread in Bangladesh in the rainy season. Severe dry seasons after several months of flooding causes dry conditions, and induce inadequate length of fish culture. Ratio of cash income in agricultural production of households is low even in highly inundated areas.

Area	Agriculture	Fisheries	Livestock	Others
Dhobaura, Mymensingh	70% (Crops)	5%	5%	20%
Astagram, Kishoreganj	80% (Boro)	5%	-	15%
Kishreganj Sadar.	75%	10-15%	10%	5%

Source: Survey data from Interview survey, JICA 2004

2) Problem Identified through the Farm Household Interview Survey

The fisheries development constraints raised in the Farm Household interview survey are as follows:

- Shortage of appropriate water bodies: Devastation of fish growing areas by sedimentation
- Shortage of water in the water bodies in dry seasons.
- Shortage of fish feed
- Selling of fish in 6-9 months before fish are grown up. (Fish are sold before reaching ceiling in the growth curve, resulting in low profits due to shortage of water.)
- Loss of fish by flooding: wash-away
- Shortage of hatcheries and nurseries
- Less development of fisheries cooperative association.
- Shortage of improved species/varieties and quality fingerling
- Shortage of extension workers in Unions.

3) Lack of Communication among Upazila Officials

When the subproject is proposed, the UDCC in Upazila is held. Participation from Upazila Fisheries Office is obligated to the UDCC. However, Upazila Fisheries Office didn't obtain the information of SSWRDSP in UDCC.

Upazila Fisheries office understands best what fishery development potential they have in the subproject area in charge; it is necessary to attend positive participation in UDCC. DoF should be positively guided to take part in the subproject to every Upazila Office through District Fisheries

Office.

4) Insufficient Fisheries Extension Services

Fisheries research and extension service are done by Upazila Fisheries Officer in each Upazila. The officers engaged in extension service in Upazila are only Field Survey Officer and Assistant Fisheries Officer though there are five staffs in Upazila Fisheries Office. And it is difficulties to go to field frequently even though Upazila Fisheries Officer also is engaged in extension service.

Therefore, it can be said that fisheries extension service and research in Upazila hardly function even if it is said that fisheries sector is undeveloped. The reason is owing to the shortage of field officer.

It is a current state to supplement fisheries officer's lack in NGO now for the fisheries sector development though some projects in cooperation with NGO are doing which is the conservation of indigenous fish etc,

There are a lot of villagers who are engaged in subsistence fish culture but normally they don't be accounted recording in the official statistical data.

5) Lack of freezing storage

If steady fish production becomes possible by success in the flood management, not only sales of Greater Mymensingh area but also sales for the large cities such as Dhaka and Rajshahi, etc., becomes possible. Moreover, there is also possibility that the Study Area grows up as a freshwater prawn culture place such as Khulna and Satkhira.

In addition, it is necessary to think about various following strategies for getting profit by not satisfying with only increase in fish production.

- Shipment when amount of fish supply is a little in dry season
- Export of freshwater prawn

The price of fish goes up more than other season for Tk. 5-10 in dry season though price of the fish is different depending on the species. The shipment adjustment is sure to be needed, considering those possibilities.

If it supposes that annual fish production 272,689 ton (expected production of aquaculture 176,712 tons and expected capture fisheries production 95,977 tons) will be achieved by 2015, it is also possible to keep the amount of production about two months (45,448 ton) the shipment adjustment for dry season sales. As a measure for that, the necessity of freezing storage facility is thought.

6) No management of indigenous fish and conservation area

- Maintaining fish biodiversity.
- Maintaining the multiplication of small indigenous species (SIS).
- Establishment of facilities for the sustainability of both small and big fish species in area
- Shortage of appropriate water bodies:
- Devastation of fish growing areas by sedimentation

7) Lack of hatchery and nursery

- Establishment of hatchery and nursery for supplying good quality fish seeds
- Shortage of improved species/varieties and quality fingerlings
- Fish feed quality is not so good.

A stable fish fry/fingering supply is most necessary to increase fish culture production. District fisheries station is located in district centers or key Upazila for fish culture in each District. Moreover, private hatchery and nursery has been increased rapidly in Mymensingh District. The private hatchery and nursery are occupying a high production ration though both District station and private farm fry/fingerling are distributed in the Study Area.

When production of District hatchery and nursery stations are reaching the production estimated budgeting of fiscal year, District station doesn't produce fry/fingerling any more. It is a possibility of increasing fry/fingerling production more when the District stations can have the original operating

fund to increase fish production. On account of development of fisheries sector, it is necessary not only to rely on the private farm but also to be centered the District stations. Unfortunately, Sherpur and Netrakona District fisheries stations can not produce seed because underground pumping machine were destroyed for several years.

In addition, District fisheries stations have a very important role for development fisheries sector such as training and research center for small-scale fish farmers. A lot of Subproject in SSWRDSP are required good quality fingerlings and technical support to increase fish culture, therefore, it is requested that rehabilitation of facility and equipment are immediately planned. In Jamalpur District station, they produce fry: 135 kg, fingerling: 250,000 and table size fish: 1,400 kg every year. When even budget can be obtained, this facility can give production more. Netrakona District Station purchase fish fry from Mymensingh District Station, and sales these after nursing it up to fingerling and table size. Similarly, most fish farmers are buying fry from District and Private hatchery and nursery in Mymensingh District. Then Netrakona Station cannot supply enough fry/fingerling to fish farmer in the district.

The number of private hatchery is rapidly establishing in Mymensingh District and Kishoreganj District and also it is said that a supply of fry/fingerling has spread out enough. And farmers who live in District that hatchery hardly establishes are buying from other District. Therefore, it is said that the amount of fry/ fingerling supply in six Districts is enough though the fry/fingerling production place doesn't necessarily handle enough production excluding two districts.

The most effective in fish culture are quality of brood stock and initial stage feeding (nursing) for fry. Growth of fish improves neatly by giving and promoting the initial feed. Because normally, farmer had stocked fry fish without producing initial feed using organic fertilizer, the efficiency of production was not good

Recently it is guided from Fisheries officer that large size fingerling 4-6 inches are stocked in a pond. Therefore, the necessity for obtaining the fry that grew up well in a proper nursery comes out when fish culture promoted with subsistence and Beel fish culture. Thus, it is likely to become more important to establish or improve nursery than hatchery. Moreover, the problems such as fry/fingerling supply and feed with bad quality on the Union questionnaire are expected to be solved by above Act "Fish Food and Hatchery Registration Act" being executed, gradually.

8) Hard to access for water body leasing by poor fisherman

- Modification in the Fish Act for allowing the fishermen to get easy access in the open water bodies.
- Less development of fisheries cooperative association.
- Restriction against use of a special category of fishing gear (a kind of drag net) which erodes the footpath in paddy field and ultimately deposited the eroded soils to nearby water bodies like beels, khals which caused situation of the water bodies.

It is necessary to be centered DoF and cooperation with MLGRD&C, and MOL to plan the fishermen cooperative association improvement and rehabilitation project.

On restriction of special fishing gear, the rule can be made in the member of WMCA. Unfortunately, out of SSWRD area, it is difficult to introduce role to restrict negative fishing gear. It proposes that the DoF originally take measures.

9) Chemical used by agriculture

Maintaining the pesticide free-living habitat for fisheries. In the agriculture crop fields should be preferred for pest management.

SSWRDSP cooperates with Department of Agriculture and Extension, and agriculture output that don't add the excessive chemical use is planned for ecosystem.

10) Water shortage during dry season

Selling of fish in 6-9 months before grow-out. (fish are sold before reaching ceiling in the grow curve, resulting in low profits due to shortage of water)

The problems are solved if succeeding by SSWRD for the flood measures and the surface water use.

11) Anticipation of negative impact for indigenous/natural fish due to decrease inundation area.

According to fish production in floodplain there are various theories have been given in the world. For example, "An appraisal fishery production for floodplains, based on world-wide data, suggests that values typically range from 40-60 kg/ha/year flooded area (Welcomme 1979; 1985). However, this reflects yields at average effort over floodplains. Welcomme (1985) estimated that the mean yield for tropical rivers at maximum floods is between 16-40 kg/ha/year. The amount of effort deployed will obviously have an effect upon receded yield. Accounting for effort, Bayley (1988) was lead to suggest that maximum potential yields from tropical floodplains are of 110-160 kg/ha/year. This would correspond to about 13 fishermen/km², including both full-time and part-time fishermen, whilst the suggested "norm" of 40-60 kg/ha/year of Welcomme(1979; 1985). It would be equivalent to some 2.5 fishermen/ km². Baseline productivity from floodplains of the Third Fisheries Project in Bangladesh ranged from 86 kg/ha/year to 180 kg/ha/year whilst for FAP 17, the mean yield for all open water floodplains was 107±16 kg/ha/year. (Source: Chu-fa Tsai and M.Youssouf Ali (1997) Openwater Fisheries of Bangladesh)

In the "Approach to Fisheries Development", negative impact for indigenous/natural fish is described that "The FAP-17 study (Tsai and Ali, 1997) identified the flood control impacts on the fish and fisheries to be as follows: Loss of Catch Through Loss of Habitat: Whenever flood control projects reduce the area of flooded land, there will be a loss of habitat for fish production. Fish yield from the lost habitat was found to be 119 kg/ha in average by the Flood Action Plan (FAP) Team."

Definition of production of floodplain in SSWRDSP of Guideline as follows:

It should be noted that nominal quantification is possible for the pre-and post- subproject habitat extent (for the various habitat types) and fish catch. The value of lost fish catch due to potential negative impacts of the subproject (i.e. the worst case scenario) is incorporated into the economic model. Where better data is unavailable, fish catch on floodplains (land presently flooded throughout monsoon season, which corresponds to the are of F2 +F3) can be assumed to be 50 kg/ha, and in permanents water bodies 220 kg/ha. In general, without mitigation measures, it can be assumed that flood managements infrastructures reduce these values by 50%. Thus the subproject impact should be taken as combination of changes in floodplain area and reduction in catch per ha of habitat.

According to Feasibility survey report, in case of drainage improvement by re-and /or excavating drainage channels but without any stricter across the channel, post- subproject fish catch should be assumed to be equal to pre-subproject catch.

(2) Negative Impact Expected by SSWRD

1) Impact to genuine, substance fisherman

To identify surface water users in agriculture field, between agriculture farmer, fish culture farmer and fisherman. In general, fish culture is used rainwater and under ground water by operating STW or DTW. It is supposed that agriculture farmer also use surface water, rain water and supply it by STD or DTW. In a word, people who are engaged in only capture fisheries including genuine and subsistence are surface water users. Of course a lot of farmers become subsistence fishermen in monsoon season.

However, there is a various type of fisherman who uses surface water. When planning of surface water management, it is necessary to special attention to the people who use surface water where the influences are most seriously undertaken.

It is a classification of the fishery person as follows. The seriousness in these is the 1-4.

This is the definition of genuine fisherman in SSWRDSP.

- Genuine fishermen: "Also called Ethnic Fishers. These are individuals who are ethnically fishers and whose livelihood is and historically was predominantly earned from fishing activities."
- Subsistence fishermen: "Individuals who usually catch fish to supplement their food supply or income and usually harvest fish from common property resources or from land that may be privately owned but because of significant inundation, becomes common property for fisheries"

purpose during the monsoon.”

The following has been understood that type of fishermen (including both men and women) activities through the field JICA study team had organized interview to fishermen through villagers though villager didn't clearly understand fishing activities such as who is wage labor fisherman, who is only engaged in capture fisheries, etc..

The primary source of income is fishing.

- a) Fisherman is always being employed by the owner on the cultivation pond (a employer is fixation or many). Fisherman is not engaged in agriculture activities.
- b) Fisherman is being employed by the owner on the cultivation pond (a employer is fixation or many). Other work (cultivate of own field, leased land or wage labor) is done when there is no work (off fishing season) of fishing.
- c) Fisherman has done both fishing and fish culture activities. Fish pond is own or lease.
- d) Fisherman is employed by nobody.

Above fishing activities is including subsistence capture fishermen.

And fisherman catches fish in several fishing ground such as river, beel, khal, haor, floodplain. Although the selection of the fishing ground is divided into three types:

- a) Fisherman has only one fishing ground,
- b) Fisherman goes to catch fish in the vicinity (across a Upazila),
- c) Fisherman doesn't catch fish in their residential area.

Therefore, Guideline in SSWRDSP, here is mention about priority to proposed subproject, “No more than 30% of the households depend on subsistence capture fisheries”. As for the definition, there is obscurity means if subproject is taken prioritized using the definition.

2) Negative impact by SSWRDSP

This is a presented type of water management measures and impact on fisheries habitat.

Types of Water Management measures and their impact on Fish Habitat by ADTA

Type of Water Management Measures	Water Management Action Undertaken	Impact on Fisheries Ecosystem	
		Negative Impact	Positive Impact
Flood Management	Protective embankments to contain flooding	Reduction of fish habitat	Creation of protected and controllable fish habitat
Drainage Improvement	Drainage canal excavated to ease water logging	Fish habitat reduced	Drainage canal becomes added fish habitat
Water Conservation	Water shed created by excavation or dam building to hold water for irrigation	–	Watershed becomes added fish habitat
Command Area Development	Irrigation facilities are created/extended by making /improving drainage channels.	–	Irrigation channels may be used for fish culture as done in the arid regions.

(Source: ADTA Approach to Fisheries Development)

Habitat Rehabilitation

This measure is adopted to reduce the negative impact of flood control on fish production caused by loss of fish habitats. This measure will be applicable in high land areas of full flood control and controlled flooding where area and magnitude of flooding is affected by project infrastructure. The habitat loss could be compensated by re-excavation of affected fish habitat and maintaining optimal water level for rice and fish together.

A summary of the impact mitigation strategy is presented in table below.

Impact Mitigation Strategy by ADTA

Aspect	Impact	Mitigation Measures
A. Fisheries		
Habitat	Area, size and depth decreased	<ul style="list-style-type: none"> • Wherever possible, maintenance of water level congenial to rice-fish farming • Creation of additional fish habitat (as per project provision) by re-excavation wherever possible • Exploring alternative fish habitat (Rice field, derelict pond)
Fish	Biodiversity lost due to the barrier to the fish movement (Natural fish decreased)	<p>The biodiversity loss can be partly compensated by:</p> <ul style="list-style-type: none"> • Construction and fish-friendly operation of hydraulic infrastructure • Raising wild fish within the subproject area
Fish production	Decreased usually	<ul style="list-style-type: none"> • Improved methoDoF fish production • Extension of fisheries ecosystem
B. Fisheries Community		
Fishermen and others	Decreased fishing opportunity, fish production and income	<ul style="list-style-type: none"> • Employment in WMCA sponsored fish farm • Training and support to adopt alternative livelihood

(Source: ADTA Approach to Fisheries Development)

(3) Development Potential for Fisheries Development

The Study Area is one of the inland fisheries development center and having big potential of fishery development in Bangladesh. There are several fishery research institute, relatively shallow inundation depth of flood, and relatively near to the large markets such as Dhaka and Mymensingh. Therefore several pilot projects were and are implemented by the Government and NGOs in the Study Area.

The followings are the sample of the progressed pilot schemes in the Study Area:

1) Case study: Beel fish culture,

Media village Bhaluka Union, Bhaluka Upazila, Mymensingh District

One villager stocked fish in Pabna Beel (private) in 1996. The beel area is occupied about 200 acres (80ha) and kept less than 80acres (32ha) through 7 months from middle of May to November. And also there is 180 acres paddy field (Boro rice) in the beel. At first year, he stocked fingerling (Rui, Catla, Mrigal, Common carp, Grass carp, etc) and he got tremendously production after 7 months. Other villagers were interesting in his fish culture activities and they wanted to joint his practice. The following year, about 30 villagers invested Tk. 500,000 to buy fingerlings. They stocked Rui, Catla, Mrigal, Mirror carp, etc, about 300,000-350,000 fingerlings (2-3 inch size) and got plenty of production. They continue this activity every year so that fish culture makes a big profit. He didn't mention about their profit form fish culture.

The minimum profit is estimated from his story as follows.

Input fingerling: 300,000, Survival rate: 60%, Fish culture period: 7 months, regularly feeding (unknown feeding cost).

Production becomes 54,000 kg (2.7 ton/ha) in total if 180,000 fish survive, and estimated weight is 300g/fish. The total sales will be Tk. 3,240,000 when sales price is Tk. 60/kg. If it is divided by 30 villagers, the distribution of the profit becomes Tk. 108,000/person except some cost.

2) Fish culture, rice- com fish culture and poultry

Ganjana village, Dewpara Union, Ghatail Upazila, Tangail District

A family has six fish culture ponds, paddy field and poultry shed. Largest pond water area is occupied 300 decimals and smallest is 33 decimals. And also they manage rice-com fish culture in paddy field.

Usually, they bought Tk. 30,000 fingerlings/year (size: 3-4 inch, Tk. 1-1.5/piece, fish species: Catla, Rui, Mrigal, Grass carp, Silver carp, Shorputi and Pangus) from fingerling traders and spend feeding cost is Tk. 85,000/year. They give rice bran, mustard oil cake and rice medals as feed and don't use commercial feed to fish. And they also use chicken dropping as fertilizer from their own poultry.

Total fish production is 8-10 ton/year including 1 ton from rice- com fish culture. Estimated profit from fish culture and rice-com fish culture is Tk. 285,000 if they sell 8 tons fish about Tk. 50/kg. But amount of the profit is occupied about 15 % in the total income of the family.

Moreover, they are engaged in poultry from last year and operated 3 times up to the present. One operation period is about 2 months including preparation day. At first, they constructed a poultry house by Tk. 150,000 (1,950 ft²) and bought 1,000 broilers by Tk. 20,000. Feeding cost per one operation is need about Tk. 16,400 (Tk. 820/50 kg) and other cost is Tk. 5,000/operation such as medicine, kerosene and labor cost etc. They don't use electricity for poultry.

A net income from a sale of poultry becomes Tk. 15,600 per one operation if they sell a broiler 57Tk/kg in wholesale. In this time, they are planning that broiler operation will manage seven times a year. If their plan will be successes, a profit will become Tk. 109,200a year. Estimated total income from both fish culture and poultry a year, a profit will be likely to become Tk. 394,200 a year. But they said that "poultry farming has always been set with high risk even though fish culture is low risk."

3) Rice-cum-fish and veritable fish culture

Fulbaria Upazila, Mymensingh District

One man attended the aquaculture training organized by SARA and got some understanding of the rice- com fish culture method. After training, he started rice-com fish culture and cultivate some fruits and vegetables on the dikes around the rice field. The sales from vegetables were Tk. 1,200, papaya was Tk. 4,300, and his family harvested 483 kg of paddy. About fish, his family started consuming fish after two months of stocking and the value of the fish that they consumed would be about Tk. 3,000. Moreover, they get cash income from fish sales was Tk. 9,200. Total expenditure for paddy field preparation, fertilizer fish stocking etc. was Tk. 9,200⁷.

4) Fresh water giant prawn (Galda) culture

Chhoto Shunai Village, Bhaitkandi Union, Phulpur Upazila, Mymensingh District

A fish farm owner stated freshwater giant prawn culture form 1999. He had participated fresh water giant prawn culture training course by ATDP (USAID) project. He rears prawn from *postlarva* (PL) size to commercial size (about 100 g- 250 g) for 6 month. He conducts prawn culture 2 times/year from December to May and June/July to November. A price of PL is Tk. 1.5-2 /PL and he bought 20,000 PL for one operation. Feed for prawn is commercial feed and cost is about Tk. 100,000/year. Total cost of prawn culture per year is Tk. 250,000 and sale is Tk. 500,000. Annual Prawn Production is about 500 kg per acre and the price is 300-500 Tk/kg. And he manages polyculture prawn and other fish (catla and silver carp) in same pond. His profit from prawn culture is Tk. 250,000. He explains about prawn culture as follows; what is most difficult is nursing stage from post larva to 2-3 cm size

⁷ WorldFish Center, Adapted from Mid-term reviewer of the Development of Sustainable Aquaculture project, December 2004, Unlocking the Potential, National Strategy for Accelerated Poverty Reduction, General Economics Division, Planning Commission, Bangladesh

for 40-45 days. If the stage can be good successful, after grow out stage doesn't have big problem, he said. And if prawn nursery farm or station will be established prawn culture also will be more expand whole Greater Mymensingh.

5) Local small seller

Local small retailer, Sakhipur Upazila, Tangail Distric

One gentleman, he lives in Sakhipur Upazila and his job is a fish retailer. He doesn't have his own fish culture pond but has 150 decimals agriculture crop land. He sells a fish too even though doing the farming at the season of rice cultivation by himself. Croup pattern in his farming is T-Amon –Boro fallow.

He sells fish every day at Bazar or Hatt inside Sakhipur Upazila mainly, and has been engaged in the business for 7-8 years. His business type is as follows. He purchases cultured fish (Pangas, Rui, Catla etc) from several fish farms and that are carried by hired Van to a Bazar or Hatt. He moves there by his bicycle. The income from fish business is approximately 60% in total income.

Today, he purchases 60 tail Pangas (Tk. 2,350 = Tk. 45/kg) and has an idea to sell these Tk. 50/kg. at Hatt in Boheratoil Union. He makes a profit for Tk. 250 if business becomes success well by his effort.

3.2.4 Fishery Development in the Study Area

(1) Fishery Development Strategies in SSWRDSP

Based on the Government development strategies on the fisheries development, and the regional natural and social conditions of the Study Area, the following six fisheries development strategies are formulated:

1. Encouragement of integrated fish culture

Fish culture as low cost and advantage land using; rice- com fish culture, fish culture with chicken/duck, vegetable cultivation on a dyke and migration indigenous/natural fish with flood water. Every land size is available for above method. A lot of people know these methods though farmer who has actually introduced it is still little.

2. Introduction of tilapia culture

The tilapia culture is not widespread yet in Greater Mymensingh.

Some fish farmers believe that tilapia breed without farmer's control by themselves. Because information of fish culture method is insufficient for farmers. However, it will be suitable fish culture as low cost, low manpower and continue reproduction for subsistence household. Moreover, Tilapia also eats a wriggler and the alga etc, and prevents the mediation disease caused such as dengue fever and malaria by mosquito.

3. Introduction of freshwater prawn culture

Estimated profit from freshwater prawn culture increase to five times that of fin fish culture if succeeding in that though feed cost is higher than fish (price of fish Tk. 60/kg, price of prawn Tk. 300/kg).

Freshwater prawn PL (*Postlarvae*) is produced by private hatchery at Gouripur in Mymensingh District. Production capacity of PL in the hatchery is 20 million PLs in a year. But now hatchery produces PL 3 million a year.

Even if PL is produced up to capacity, it is not possible to sell it because there are a few prawn culture farms in Greater Mymensingh area.

For example, it accommodates PL of 20,000 ha, the PL supply form of 1,000 ha farm is possible. There is only one hatchery that can be sold PL in Greater Mymensingh area yet. When the prawn culture will be expanding in the area, hatchery is necessary more.

Although expenditure for initial investment of construction hatchery and management of PL production is higher than fin fish hatchery, profit is higher than fin fish hatchery. After hatchling, handling of PL is most important to grow well; it is necessary to establish not only hatchery but also nursery for prawn. Consequently, cooperation with private sector is applicable to improve prawn culture.

4. Introduction of freshwater ornamental fish culture

Target species are fancy carp and golden fish so that fish culture and artificial spawning method is almost same with carp species culture and also can possible polyculture. When fish pond can keep water through a year, natural spawning is possible both fancy carp and golden fish. At the present time, most of ornamental fish are imported form overseas. With regard to market, high-class hotels, restaurants and upper middle class people in Dhaka and large cities. It is expected that the demand of ornamental fish. It is expected that the supply of the ornamental fish in the country will be increased in the future. Market price is different depend on fish species, but normally those price (estimated age is 0.5-1 year old) are ranged 40-150 Tk/fish.

5. Conservation of indigenous/natural fish in Beel, Khal, River and Haor

Establishment of shelter, conservation area such as khua (like small hole or pool), and katas (making habitat and fish ground by some structure) for indigenous/natural fish and restriction of fishing (period, size fishing gear etc.,) in open-water bodies (beel, khal, river and haor).

A lot of people are known about effectiveness and some NGO conducted the activities with community based.

6. Propagation of indigenous/natural fish by fish culture

Cooperation is required to private sector (commercial based fish culture farm) for technical development of indigenous/natural fish (Koi, Chital, Boal etc.) propagation. If the technique is developed, it is effective to improve income form fisheries, because the price of indigenous/natural fish is higher than that of the kind for cultured fish.

7. Potential of suitable fish culture by agro-ecological zone.

The fish culture production is controlled by natural condition such as water, land type and temperature etc.,. If neither a regional characteristic nor diversity is understood enough, it is difficult to conclude the method of fish culture.

The followings 3 kinds of table are shown some potential promoting fisheries activities; the table 5 shows “Potential of development fish production by agro ecological zone”, the table 6 shows “The application of fish production activities” shows “Expected balance sheet by fish culture method”. And the effective successes fish culture activities are shown as some case studies.

Even if these fish culture method are conducted, all of the method does not necessarily obtain production like the forecast it. Moreover, it is an example that gave here, and if elaborate F/S is not investigated, it is difficult to introduce the best fisheries activities for suitable Agro ecological zoning.

(2) Development Plan in Each Agro-ecological Region in the Study Area

Based on the strategies mentioned above, the possible fisheries development in each agro-ecological region in the Study Area is studied as shown in the following table:

Potential of Development Fish Production by Agro-ecological Zone

	Region	Potential of development fish production in SSWRD
	<p>Hilly area (AEZ-22: Northern and eastern piedmont and AEZ-29 Northern and eastern hills)</p>	<p>Generally it is not suitable for fish culture. If water remains in ponds/ditches/khals/ rivers more than 50c m 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"> ● <u>Closed water bodies- pond and ditches</u> Tilapia mono culture, Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/ duck and vegetable crop on the dike, ● <u>Open water bodies- Khals and rivers (dries up at dry season)</u> Small size pen culture (tilapia, major carps, grass carp, plankton feeder fish, rajpunti),
	<p>Terrace Area (AEZ-28: Madhupur Tract)</p>	<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"> ● <u>Closed water bodies- pond and ditch etc.</u> Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/ duck and vegetable crop on the dike, Rice- com fish culture, Rice- com fish culture with duck, Polyculture (major carps, Indian carps, pangus, etc.,) <u>To need investment large amount of finance</u> Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Fresh water prawn polyculture (prawn with fish, except carnivorous fish) Fresh water ornamental fish polyculture (major carps, indian carps with golden fish and/or fancy carp etc.,) Indigenous/natural fish culture (for indigenous/natural resource propagation) ● <u>Open water bodies- Khal/ beel/river</u> Khal: pen or cage culture of pangus or major carps Beel fish culture (stocking cultured fingerling only or with indigenous/natural fish) Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure) Kuas in beel and khal (like small hole or pool, it becomes fish shelter in low level water)
	<p>Floodplain Areas (AEZ-9: Old Brahmaputra & Jamuna river)</p>	<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><u>Closed water bodies- pond and ditch etc.,, if the flood doesn't break the pond or ditch.</u></p> <ul style="list-style-type: none"> ● <u>Closed water bodies- pond and ditch</u> Tilapia with Pangas polyculture, Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/ duck and vegetable crop on the dike, Rice- com fish culture Polyculture Indigenous/natural fish (fish naturally enters the pond due to a flood) and stocking fish culture <p><u>To need investment large amount of finance</u> Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Fresh water prawn polyculture (prawn with fish, except carnivorous fish) Fresh water ornamental fish polyculture (major carps, indian carps with golden fish and/or fancy carp etc.,)</p>

		<p>Indigenous/natural fish culture (for natural resource propagation)</p> <ul style="list-style-type: none"> Open water bodies- Khal/beel/river <p>Khal: pen or cage culture of Pangas or Major carps Beel fish culture (stocking cultured fingerling only or with natural fish) Khal, beel and river: Indigenous/natural fish conservation and capture by katas/pen (making habitat and fishing ground by some structure) Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water)</p>
	Deeply Flooded Area	<p>Generally it is not suitable for fish culture because here are flooded for five to six months each year. But if pond/ditch etc., can be defended from flood, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> Closed water bodies- pond and ditch, etc. <p>Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike, Rice- com fish culture with duck, Polyculture</p> <p><u>To need investment large amount of finance</u></p> <p>Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Indigenous/natural fish culture (for natural resource propagation)</p> <ul style="list-style-type: none"> Open water bodies- Khal/ beel/river <p>Khal: pen or cage culture of Major carps Beel fish culture (stocking cultured fingerling only or with natural fish) Khal ,beel and river: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure) Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water) Floating cage culture</p>
	Charlands, River Char Lands (AEZ-7: Active Brahmaputra & Jamuna Floodplain)	<p>It is not suitable for fish culture. But fishing can be conducted at open water surrounding the area to get protein and income.</p> <ul style="list-style-type: none"> Open water bodies- Khal/ beel/river <p>Rivers: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure) Rivers: Floating cage culture Rivers: Collecting natural fish seed/fry for sale or own fish culture</p>
	Haor Areas (AEZ-16: Middle Meghna River Flood Plain, AEZ-19: Old Meghna Estuarine Flood Plain, and AEZ-21: Sylhet Basin Areas)	<p>These areas are not suitable for fish culture because of heavy flooding and strong waves. But if pond/ditch etc., can be defended from flood, it may be possible to introduce low cost seasonal fish culture such as;</p> <ul style="list-style-type: none"> Closed water bodies- pond and ditch etc. <p>Integrated fish culture; major carps, grass carp or plankton feeder fish with chicken/duck and vegetable crop on the dike, Rice- com fish culture with duck, Polyculture</p> <p><u>When an initial investment for fish culture is possible:</u></p> <p>Integrated fish culture: fish with chicken/duck (poultry house on the pond or side) and vegetable crop on the dike, Indigenous/natural fish culture (for natural resource propagation)</p> <ul style="list-style-type: none"> Open water bodies- Beels, haor and river <p>Beel fish culture (stocking cultured fingerling only or with natural fish) Beels and rivers: Indigenous/natural fish conservation and capture by Katas/ pen (making habitat and fishing ground by some structure) Kuas in beel, khal (like small hole, pool, it becomes fish shelter in low level water) Floating cage culture</p>

(3) Implementation of Fisheries Development in SSWRDP

Basically the SSWRDP will be implemented as similar approach of the on-going SSWRDSP-2. In SSWRDSP-2, “Approach to Fisheries Development” was prepared by ADTA in February 2004. They area as follows:

1) Collaboration with Department of Fisheries and LGED (In)

The LGED and DoF signed a Memorandum of Understanding (MoU) to obtain technical assistance for implementation of the fishery related activities of the SSWRDSP-2. In the MoU, the following collaboration between LGED and DoF are defined:

- DoF will provide technical assistance to the WMCA to carry out all fisheries related activities of the subproject starting from the implementation phase through the post project stage of the subproject fisheries activities. Beside the technical assistance to carry the project-supported activities, DoF will cover the subproject are in its own fisheries extension program.
- DoF officials at the middle management level will be made aware of the Project and DoF ’s role in supporting the Project. This is of particular importance for those officers located in the eastern half of Bangladesh, which is a new area for this project; and parts of this region have enormous capture fisheries resources in regard to which special care will need to be exercised. One way to inform officials would be to organize regional meetings for discussion of all fisheries related Project matters and issues with regional fisheries officials and LGED field officials together.
- Regular interaction with DoF is required, to identify ongoing programs that would be of interest to fishers and to encourage DoF to include these fishers in its fisheries support and extension programs. In this regard, due attention will be given to ensuring that women are included in these programs.
- DoF and relevant Project field officials will be provided assistance to develop appropriate materials and programs for training, demonstration, and other extension activities. DoF extension activities within the subprojects of fisheries importance will have to be monitored, and the ADTA/PMO Team will be working with DoF to strengthen and focus those activities.
- The Project will consider providing some support to Upazila DoF officials (such as fuel or other transport assistance), so that they can provide needed field assistance services.

(2) Leasing Water Bodies to WMCA for Fisheries Development

A state of water bodies relevant to fisheries activities is under the jurisdiction of the Government. A new order on leasing right of water bodies were taken for SSWRDSP-2.

Before starting the SSWRDSP-2, a Memorandum of Understanding (MoU) between Ministry of Land and the Local Government Division of MLGRD&C was signed on 7 October 2002.

In pursuance of the MoU, Government from the following Committee for leasing out the water bodies to the Water Management Cooperative Associations (WMCAs) of Small Scale Water Resources Development Subproject of SSWRDSP-2. Leasing right of water bodies in subproject area is obtained with the highest priority by WMCA. According to lease fee, Committee decide based on area of water bodies and it’s production quantity.

Committee at Upazila Level		
Up to 20 acres of water bodies will be leased out by the Committee		
Chairperson	1.Upazila Nirbahi Officer (UNO)	
Members	2.Assistant Commissioner (Land)	5.Upazila Cooperative Officer
	3.Upazila Agriculture Officer, DAE	6.Upazila Youth Development Officer
	4.Upazila Fishery Officer	
Member Secretary		7.Upazila Engineer, LGED
Terms of Reference	The committee will lease out the water bodies to the WMCA for 5 years (renewable) under the provision of Cooperative Societies Act, 2001.	

Committee at District Level	
Above 20 acres of water bodies will be leased out by the Committee	
Chairperson	1. Deputy Commissioner
Members	2. Additional Deputy Commissioner (Revenue) 3. Deputy Director, DAE 4. Executive Engineer, BWDB 5. District Fishery Officer 6. District Cooperative Officer 7. Deputy Director/Asstt. Director, DYD
Member Secretary	8. Executive Engineer, LGED
Terms of Reference	The committee will lease out the water bodies to the WMCA for 5 years (renewable) under the provision of Cooperative Societies Act, 2001.

Inter-ministerial Committee	
In pursuance to the MoU, the following committee consist with the members of different ministry will monitor the effective management of the water bodies leased out to the SSWRDSP of LGED	
Convener	1. Joint Secretary (Administration), Ministry of Land
Members	2. Deputy Secretary (Development), Local Govt. Div 3. Deputy Secretary, Ministry of Youth & Sports 4. Deputy Secretary, Ministry of Fisheries & Livestock 5. Deputy Secretary (Sayarat), Ministry of Land 6. Deputy Chief, Ministry of Land 7. Joint Registrar, Directorate of Cooperative
Member Secretary	8. Superintending Engineer (WR & EM), LGED
Terms of Reference	1. The committee will monitor the proper lease of water bodies and if needed they will practically visit the water bodies of MWCA under SSWRDSP and the they will regularly submit report to the Ministry of Land & Local Government Division of LGRD & C 2. The committee will also evaluate and report to the Ministry of Land & Local Government Division of LGRD & C on the income and production of the water bodies under the SSWRDSP. 3. The Committee will recommend regarding the management and development affairs of water bodies under SSWRDSP to the Ministry of Land & Local Government Division of MLGRD&C. 4. In view of the implementation of MoU, the Committee will submit report to the Ministry of Land & Local Government Division of MLGRD&C on relevant /modification /change on the "Existing water bodies, Sand bodies, and stone bodies management Policy". 5. The Committee will conduct meeting once in six month. 6. The Committee can co-operate any person in the committee, if needed.

(3) Dispatch WMCA Facilitators

Fisheries facilitators to be provided by the NGOs will assist the WMCA during all the implementation stages of the fisheries program in SSWRDSP-2. They will actively support all the WMCA fisheries program related activities.

When a subproject is found to be feasible and the implementation agreement is signed, Fisheries Facilitators will be assigned to assist the local stakeholders with their fisheries production efforts. An initial step will be for these facilitators to undertake a resource survey (Fisheries Sector Survey). The resource survey will document the existing water bodies, input supply, production, fisheries community, and any training that has been provided to the community either by the Department of Fisheries or NGOs. The work of the Fisheries Facilitators will be overseen by the district Executive Engineer.

(4) Proposed Fisheries Production Activities in SSWRDSP-2

"The Approach to Fisheries Development" attempts to quantify the expected fisheries production resulting from the SSWRDSP-1 fisheries development activities.

In the SSWRDSP of fisheries activities such as stocking fingerling and harvest in subproject area don't start at the present so that subproject structure constructions relating to fisheries program don't complete construction. Construction of subproject has started from 2004. So about consequence of subproject fisheries activities will be gotten in next year.

Although, fisheries training for member of WMCA had done in some project for example, Shanki Bhanga Khal subprojects Dewpara Union, Ghatail Upazila, Tangail District.

Shanki Bhanga Khal subprojects Dewpara Union, Ghatail Upazila, Tangail

The WMCA are established 2004 and are composed both 228 women (occupied 30% in total) and 531 men in total 759 members.

In geographic, a khal connects two beels and it flows to Babsi River. And a sluice gate is constructed in the confluence point. It is still at present (May, 2005) under construction. All WMCA members have to take part in beel fish culture activities. WMCA member gather initial investment from all members in to purchase fingerling.

Both 2 women and 2 men had gotten fish culture training in May 2005, and it is planning to participate in fish culture training about 16 members the end of May 2005 in BARD. The programs of training are pond fish culture, rice- com fish culture, fresh water prawn culture etc of technical method and management method of WMCA,

Both the WMCA/LGED and District Fisheries Office/Upazila Fisheries Office has established close relationship and after consequence of fin fish culture production they have project to star freshwater giant prawn culture. Although construction has not been completed yet (May 2005), fingerlings stocking is not done. Needless to say genuine fishermen are member of WMCA and the ration is 8%. All fishermen got loan from WMCA. As for the product in the future, it is planning to ship *Arat* directly (an *arat* is a local fish market such as wholesale, a bid is open in an *arat*). Moreover, it is forecast that after completed structure, a water holding capacity of a private pond near the beel and khal will be rising up rather than before. As a consequence, it is likely to become a double result that not only the WMCA fish production but also private fish production increases.

And as for the marketing for private fish farm, their production is to be sold to Arot with the production of the WMCA. When selling an individual production, a fish price set up low because individual bargaining power is not so strong. The members of WMCA have a strong desire to start fish culture when selling an individual production, a fish price set up low because individual bargaining power is not so strong. The members of WMCA have a strong desire to start cooperative marketing, when selling an individual production, a fish price set up low because individual bargaining power is not so strong.

(4) Proposed Fish Production Activities

Fish production activities in SSWRDSP will be expected as follows:

Proposed Fish production activities in SSWRDSP by ADTA

Type of fish production	Description
1) Pond fish farming	Most widely adopted fish production process common in almost all subprojects and mainly practiced individually by the subproject members. Pond size varies widely with an average of 30 decimal (1,200 m ² , or 0.12 ha). Various species of fish are farmed in ponds. Polyculture of carp is widely done in ponds. Cost of farming and size of production vary with the species, method of production and period of availability of water during a year for fish production.
2) Beel farming	Mostly seasonal fisheries ecosystem including peripheral low lands and rice fields suitable for community based fish production. Size varies from 50 to 200 ha. Such water bodies within flood management and drainage (FMD) subprojects have been proved to be very useful for very profitable fish farming. Supplementary feeding and bio-ecological managements are seldom needed for such farming. Security management and undue influence of the community elites are, however, major problems faced in this type of community based ventures.
3) Fish Nursery management (Carp)	Shallow pond and suitably prepared rice fields are used for nursery operation. Establishment of carp nursery will be an essential effort to make good quality fish fingerling available for fish production in the subproject waters. Besides, this is a low cost short-term highly profitable venture adoptable by relatively resource-poor members of the subproject. This is a suitable income generating activity (IGA) for poverty alleviation. Pond size varies from 10-100 decimals, with an average of 20 decimals (0.08 ha). Training and technical support are needed to help adopt the profession by the subproject beneficiaries.
4) Prawn nursery management	Prawn nursery is gaining importance because of the increasing demand of juvenile prawn for the quickly growing prawn farming. One bigha (33 decimal, or 0.13 ha) shallow pond is considered to be an ideal size of water body for prawn nursery. Prawn nursery is a relatively costly venture and requires some expertise to manage.
5) Rice-fish culture	This is an emerging technique with Greater potential for fish production in Bangladesh as most of the cultivable land is used in rice farming. Minimum 50 decimal (0.2 ha) rice fields is the ideal size for profitable rice-fish culture. Most of rice fields of the subproject area can be used for fish farming when proper training and technological support are made available to the beneficiary rice farmers.
6) Integrated fish farming	Pond fish farming practices may be integrated with poultry, duck, dairy and vegetable farming. Farming of fish with chicken and duck is more frequently practiced and are described here. One hundred broiler birds can support a fish pond of 1 bigha (1,320 m ²) size and a flock of 100 duck can be ideally raised in a 50 decimal (2,000 m ²) pond. These are, however, relatively costly ventures and demand considerable expertise.
7) Galda farming	Galda (fresh water giant prawn) farming is an emerging practice, which will very soon turn into a most rewarding and common aquaculture practice in Bangladesh. Shallow ponds, rice fields and Ghers (specially designed rice field used for prawn farming) have already been proved to be suitable for very profitable galda farming.
8) Natural fisheries	In some subprojects, natural fisheries, supported only by natural recruitment, become more profitable than the fisheries supported by artificial stocking. Planned management of the natural stock can enhance productivity of such fisheries. Production cost of such fisheries is least.
9) Cage culture	Cage culture is a recently introduced method of small-scale fish culture practiced by resource poor people usually done in large or open water bodies. Poor SSWRDSP-2 beneficiaries will be encouraged to adopt this IGA, after proper training to practice it in a profitable manner.
10) Pen culture	This is also a recently introduced fish production method yet to be popular in this country. Befitting training will be given to help he beneficiaries to adopt this innovative IGA. Pen culture are done in open waters like beels and canals.
11) Carp Hatchery	In some subprojects, small-scale carp nurseries are being operated. It is hoped that some more will be established during SSWRDSP-2.
12) Prawn hatchery	Recently, prawn farming is becoming increasingly popular practice. It is important to have at least small scale prawn hatcheries in order to obtain the needed supply of prawnlings. Available technology can support the establishment of such small-scale backyard prawn hatcheries.

Source: Approach to Fisheries Development” prepared by ADTA in February 2004”

Proposed description of fisheries related activities for poor people in SSWRDSP by ADTA

Activity	Brief description
1) Making fishing gear	Poor men and women of the fisher community often make small conventional fishing gear for relatively small-scale demands (big nets to meet larger scale demands are made by established net factories). Various gears need varied size of investments often less than Tk.1,000. Very often, they take the raw materials from their prospective customers to make the gears and receive simply the making charge.
2) Fingerling selling	This is a seasonal but relatively profitable IGA. In practice, a fingerling seller sbuy 200 to 1,000 fingerling early in the morning from a nursery and sell them in the afternoon at the latest so that the quality of the fingerling is not lowered. May to August is the peak time for selling the fingerling. No investment is needed when fingerlings are obtained from the contracted nurseries on credit and the bill is paid after the sale.
3) Contract fishing	Often a fisher with his own gear arranges to catch fish in other's water body on a preset contract terms. Fisher having no gears works more or less like a fish labor, but not on daily fishing contract.
4) Fish trading	Small scale trading in daily and weekly village markets. These traders buy fish either from fish stockiest, middleman or from the village pond owners and sell in the village bazars.
5) Nursery operation in leased pond	Truly landless poor fish farmers with some capital may establish small scale nursery of 10-25 decimal (0.04 to 0.1 ha) pond size, with an average size of 15 decimal (0.06 ha).
6) Nursery (in own pond)	Functionally landless, marginal and small farmers may establish a nursery in their own land/water body.
7) Rice-fish culture	Rice fish farming is a relatively newly introduced technology. Each rice farmer with appropriate training will be able to adopt this farming technology. Any size of rice farm may be used for the rice fish culture, as small as 20 decimal (0.08 ha). Functionally landless farmers, marginal and small farmers can adopt this technology
8) Pond culture	Destitute and truly landless farmers can adopt this type of production in leased ponds and others can practice it in their own ponds. Pond of any size could be used in fish farming using befitting technology. However, anticipated size would be around 10-20 decimals (0.04 to 0.08 ha).
9) Commercial fish farming	Commercial fish farming could be adopted by marginal and small farmer with reasonable financial capability. Minimum 1-acre (0.4 ha) pond area will be a small-scale commercial fish farm.
10) Fish worker / Fisher (includes shrimp, prawn worker)	Daily workers. More than 50% of the men and women engaged in the fisheries sector are fish workers.

Source: Approach to Fisheries Development" prepared by ADTA in February 2004"

(5) Capacity Building and Training requirement for WMCA and Relating Agency

Capacity building related to fisheries is to a large extent a mitigation measure where investment in water management infrastructure has adversely affected the fisheries of a subproject and thus affected the livelihood of those individuals that relied on this resource.

- mitigation measures to train the affected fisheries community to help adopt alternative fisheries profession
- development measures to train the beneficiaries interested in fisheries production to tap the subproject fisheries production potential
- poverty alleviation measures to train poor beneficiaries to help adopt low cost profitable fisheries activities
- project orientation, planning and management for different stakeholders

The capacity development plan of the fisheries program will provide training to the following groups:

- LGED and LGED managed officials
- Beneficiaries, and

- Partner Agency officials

3.3 Livestock

3.3.1 Present Conditions of Livestock in Bangladesh

(1) Administrative Structure

Ministry of Fisheries and Livestock (MoFL) is the prime organization of the livestock administrative structure of the country. The Department of Livestock Services (DLS) of MoFL is responsible for the development of livestock farming and marketing. DLS has offices up to Upazila level, but not up to union level like DAE. At Upazila level office, there are Officials designated as Upazila Livestock Officer, Upazila Veterinary Surgeon and staff designated as Veterinary Field Assistant (VFA), they are responsible for livestock farming and medical services. The present strength of Veterinary Surgeon (VS) and VFA posted at Upazila level is inadequate to assist farmers on livestock. At present only DAE has manpower strength up to UP level. The name of UP level staff of DAE is BS. The farmers as well as Upazila level officials of DLS had requested for creation of VS and VFA posts at UP level like BS (the post of BS has now been renamed as *Sub-Assistant Agriculture Officer* by the ministry of agriculture).

Like DAE the services of DLS should be strengthened up to UP level. In this plan of action, number of Veterinary Surgeon and VFA should be increased with a view to posting one VS and one VFA at each UP for meeting up the new millennium demand and necessity of increased livestock farming.

Private workers and distressed women are involved in technical support to livestock farmers. They work under the technical instruction of Livestock Officers and other government officials. Their work covers rearing and vaccination to farmers' animals. About 1 week of training is usually provided to private workers and distressed women on livestock farming those who are usually engaged in the livestock extension services. Vaccines are obtained from the Upazila Livestock Offices at a fixed price and extension services fees are also paid by farmers.

(2) Production and consumption in livestock areas

The livestock farming in Bangladesh was not a high priority issue in the past. The average of the national level population of cattle and buffaloes is maintained, but small ruminants, fowls and ducks are increasing. Livestock farming plays various roles in the rural areas. It shares about 6.5% of GDP, and about 20% of the population of Bangladesh earns their livelihood through work associated with cattle and poultry farming. Animal draft power shares 95% in agriculture and 50% in transportation (DLS, 2004). Livestock resources also play an important role in the sustenance of landless and small farmers.

Group-Wise Data of Livestock and Poultry Population

(Unit: million head)

Animals	1995-96	1996-97	1997-98	2004*	Trend
Cattle	23.20	23.32	23.40	22.5	Constant
Buffaloes	0.80	0.81	0.82	Na	Decrease
Goats	33.02	33.31	33.30	35.5	Increase
Sheep	1.07	1.08	1.11	Na	Decrease
Fowls	127.50	130.20	138.20	162.4	Increase
Ducks	12.65	12.70	13.00	17.7	Increase

Source: Department of Livestock Services, MoFL. * 2004: Interview to MoFL

Some of the main issues related to livestock farming are mentioned below.

- Veterinary services are not conducted properly due to lack of budget. Administrative vaccination systems are established. Extension Services are provided by Upazila Livestock Officers and veterinary services are provided by Veterinary Surgeons as well as VFA and Private Staff. However, the services are not adequate to meeting up the demand of farmers mainly due to lack of

budget and technical staff (as reported by the Upazila Offices, UP and Farmers). According to the information of DLS vaccination is almost fully supplied to poultry in the current situation, but it is still insufficient for cattle and ducks. Livestock farmers do not have enough scientific technology in livestock farming.

- b. Pasturelands are not abundantly available for cattle and goats. Recently water shortages and development of agricultural machinery have caused unfavorable conditions to buffalos.
- c. Animal breeding has been developed in Bangladesh. However, climatic and topographic conditions are not suitable to efficient domestic animals except aqua-animals. Poor genetic quality of the species of livestock is the main cause of acute shortage of milk, meat and eggs.

Comparison of Productivity by Local or Indigenous Varieties with Improved Varieties

Animals	Products	Local varieties	High productivity varieties	Ratio
Milking cow	Milk production per year (Kg)	221	4,920 (Denmark)	4
			5,377 (USA)	4
Cow for meat	Meat production (Kg)	50	224 (Denmark)	22
			271 (USA)	18
Hen	Egg laying per year	40-50	250-300 (Exotic breed)	16
Goat	Meat production (Kg)	10	11 (World average)	90

Source: Department of Livestock Services, MoFL (2004)

- Goat: Black Bengal Goat (Bangladesh) is the major species. The species has several strong features such as good reproduction capability (2 times per year, 3-4 kids /year) and good meat quality (Popular, no smell). A Goat Rearing Project has been implementing with GoB fund.
- Duck: It is a major aqua animal in inundated areas mainly for egg production. Main variety/species is Cambel (UK). At present, the commercial duck farming has gained its momentum mainly in the low-lying /haor areas where inundation condition is prevailed. According to the liking of aqua-habitat, there are two different types of duck species in Bangladesh, one is *indigenous species*, which liked *deep water* and another is *improved species*, which liked *low depth of water*. Rice (Boro) + Duck (improved species) integrated commercial farming could be highly profitable in haor areas.

(3) Effects on human nutrition

Livestock is one of the major sources of animal protein next to fish. Livestock combined with fisheries sector shares about 80% in nutrition (Protein intake). Protein intake per capita per day is 46.8 g in total: Majority of the protein is obtained from vegetable 40.7 g, and the protein from animal products is as low as 6.0 g.

Breakdown of the protein by source is as follows: 1) fish-3.0g, 2) milk-1.2g, 3) meat-1.2g, 4) egg-0.3g, and 5) others-0.3g.

Egg is low-cost protein from reproducible sources and a typical scavenging livestock farming. The production of egg should be enhanced more in the future.

Production, Demand and Deficit of Animal Products.

Products	Production <Million>	Need per capita	Demand <Million>	Deficit <Million>	Sufficiency Rate <%>
	(a)		(b)		(a/b : %)
Milk	1.62 ton	120 g/day	11.04 ton	9.42 ton	15
Meat	0.62 ton	240 g/day	6.40 ton	5.78 ton	10
Eggs	3,252	180 / year	22,680	19,428	14

Source: Department of Livestock Services, MoFL.

(4) Socio-economic factors

Share of the livestock in income source is estimated to be about 5-10%. The share is still low now. Livestock farming should be developed in the future as an important source of income particularly for the land less and marginal farmer's. As the national economy improves, the consumption of livestock

will also be increased. Livestock can be a demand-driven sector and. In addition, livestock farming can play an important role in recycling of agricultural by-products in the rural areas. There are various promising aqua-animals to be developed such as ducks, buffalos, geese and reptiles. Livestock farming can play an important role in recycling of agricultural by-products in the rural areas to conserve environments and establish low-cost ecological farming system by integrating with agriculture farming. For this purpose, development and extension of new technology are urgently required.

3.3.2 Development Policies of Livestock

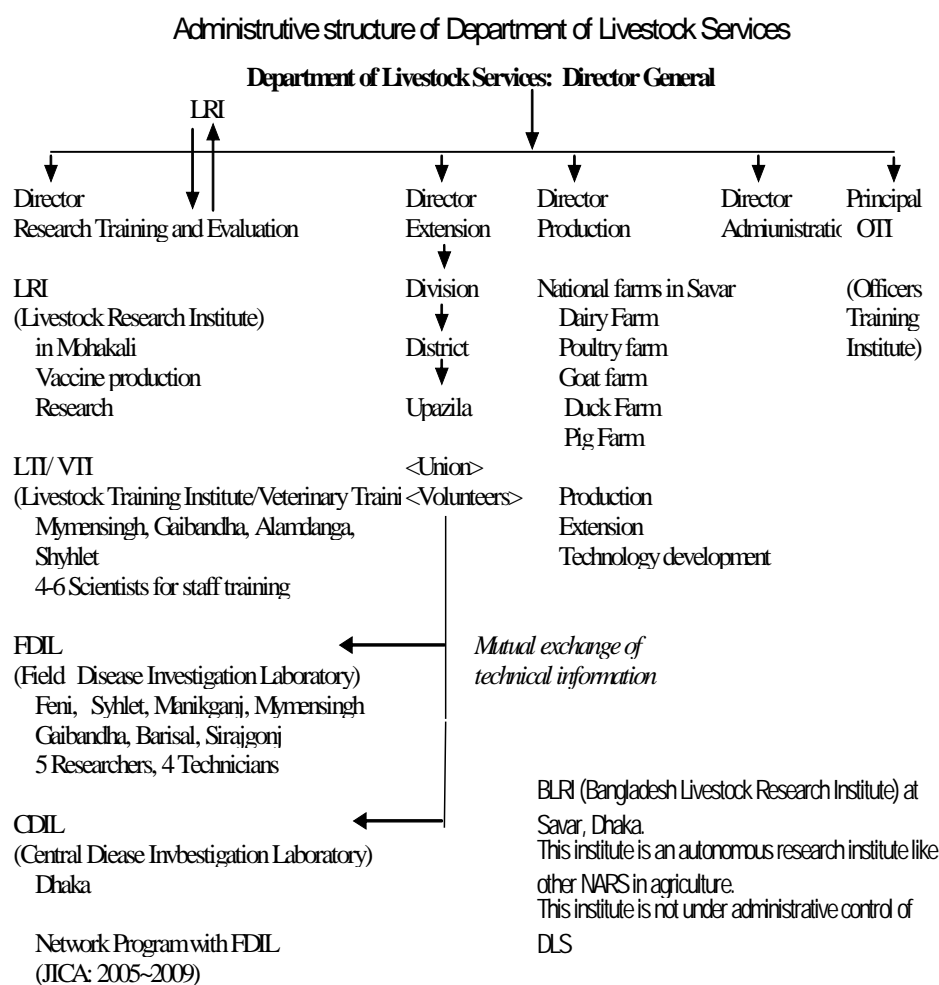
(1) Livestock Development Plan

Livestock farming is important as malnutrition becomes serious problems. Livestock farming has also large effects on rural economy, especially on poor and landless farmers. Presently, livestock farmers are facing two serious problems: first, feed supply and second, animal disease. Majority of livestock farmers are small, except few numbers of commercial poultry and livestock enterprises. Priority should be attached on development of facilities for landless and small farmers for livestock farming..

(2) Administrative structure and field services

The Department of Livestock Services (DLS) under the MoFL is composed of 5 wings such as (i) Research, Training and Evaluation, (ii) Extension, (iii) Production,(iv) Administration, and (v) Officers Training Institute.

The Research and Training Division mainly manages animal health. The Organization diagram of DLS is shown above.



(3) Animal Health

1) Vaccination

Production of vaccines: Livestock Research Institute (LRI) at Mohakali is in charge of the domestic production of vaccines. LRI produces vaccines to all the diseases of poultry, cattle and goats in Bangladesh. Necessary amount of vaccine is produced to inoculate animals.

Supply and storage system of vaccines: The supply and storage systems are established by Upazila office, but capacity of storage is not large enough to supply vaccine to animals.

Field services: Field services are composed of two parts: Government organizations and private workers. The Administrative structure of DLS includes District Livestock Officer at district and Upazila Livestock Officer, Veterinary Surgeon and Veterinary Field Assistants (VFA, 3 persons in each Upazila) at Upazila. Their major functions are planning and instruction for implementation of field services. Private workers provide actual field services: Volunteer Field Assistants, under the instruction of Upazila Livestock Officer. The Volunteer Field Assistants are employed after graduation of 12 classes (HSC-Higher Secondary Certificate) and 3-months foundation training. After employment 10-15 days training is given every year.

Presently, 1 volunteer will be selected from each Union. He will be trained up by Upazila Livestock Officer and dispatched to and work in Union seating with office accommodation in the UP Complex.

Current problem areas are summarized below:

- Field services of vaccination for farmers are still not well supplied
- Field workers are inadequate
- Technical level of Volunteer field workers is not high.
- Government supported vaccination cost is limited.

Item	Jamalpur	Kishorgonj	Mymensingh	Netrakona	Sherpur	Tangail	Average
a. Vaccination services	2.2	2.5	2.3	2.4	2.5	2.4	2.4
b. Shelter at flooding	2.5	2.3	2.8	2.3	2.3	2.3	2.4
c. Feed supply in dry season	2.4	2.3	2.3	2.2	2.3	2.3	2.3
d. Access to animal health services	2.0	2.2	2.0	2.3	2.2	2.0	2.1
e. Water supply in dry season	2.3	1.7	2.3	1.5	1.9	2.3	2.0
f. Feed supply in rainy season	2.0	1.8	2.3	1.5	2.0	2.3	2.0
f. Access to slaughter house	0.0	2.0	2.0	1.0	1.4	1.5	1.3

* Scores indicate 3.0: Serious, 2.0: Medium and 1.0: Low.

Source: JICA Farm Household Survey (2004)

2) Medical treatment

When animal diseases outbreak, farmers inform (Volunteers in Union Parishad and) Upazila Livestock Officer. If the diseases are not identified or the problem is not mitigated, Upazila Livestock Officer informs District Livestock Officer and Field Disease Investigation Laboratory (FDIL), and Central Disease Investigation Laboratory (CDIL), if necessary.

There are several problems raised from the veterinary side.

- Farmers do not have appropriate knowledge on animal diseases
- Many farmers are illiterate
- Farmers do not have medicines and apparatus for livestock treatments.

(4) Feed Supply

1) Development of feed technology for cattle fattening by BLRI (Bangladesh Livestock Research Institute) at Savar, Dhaka.

It is a good way to extend newly established technology by research institutes to farmers level through development projects. Straw is the largest local feed resource in Bangladesh. However, quality of

straw is a serious problem, especially low protein content. BLRI studied to improve straw quality, and established a new feed system: Urea-Molasses-Straw (UMS). It is produced from straw mixed with a solution of 3% urea and 15% molasses on dry matter basis. It can be fed to the animals of all ages or physiological groups (Calf, heifer, bulls, lactating cows, pregnant cows) without any danger of toxicity or harmful effect on animals or its products.

It is not easy to dry wet straw during rainy seasons to preserve it for animal feeds. Production of silage from wet straw (Containing 60-70% of moisture) is a simple way to use wet straw. During heaping, each layer of 100 kg of wet straw is spread with 1.5-2.0 kg of urea. The heap is covered with polythene to create airtight conditions. The wet straw is preserved for a month. The cost is Tk 350 for each ton. Green grasses also can be used for silage.

The following items need to be implemented as newly developed technology:

- i. The technology mentioned above is practical approaches; therefore, it needs to be a packaged model for livestock farmers.
- ii. So far we have surveyed, water hyacinth, one of the largest biomass, is not widely used. These biomass can be used by changing it to silage. It will be effective not only on feed supply but also protection of environments.

2) Local feed resources: maize

Maize is the highest content of ingredient (50-60%) of concentrated feeds. However, share of domestic products is only 10-20%, and that of imported maize is 70-80% in Bangladesh. Buying price of maize by livestock farmers is 8-10 Tk/kg.

- i. If maize + livestock/ poultry farming is carried out in high land area, livestock farmers will obtain a good profit. Integration of cereal production and livestock/ poultry farming is promising in naturally unfavorable area.
- ii. SSWRDSP and other water resources management projects will develop diversification of cropping including maize and wheat.

3) Forestry-livestock farming

The PRSP also mentioned the importance of forestry-livestock farming. There are several requirements for the sustainable forestry-livestock farming system by public forests, because the system always lasts for a long time.

- Forest division needs to be decided by usage
- Only cow and calf can be accepted. It is good for accelerating to build calves body (not for cattle fattening).
- Lease agreement between government, Union Parishad (UP) as management body and livestock farmers needs to be exactly formulated.
- A group needs to be organized for managing the forestry-livestock farming
- Contract farmers should pay rental fees to government through Union. Management fee should be paid to the Union. If these contracts are decided by the three parties: farmers, UPs and government, feed supply will be surely improved.
- A successful case was observed in Ajjana Union, under Mirzapur Upazila of Tangail District.

(2) Vaccination and disease control

In BLRI research major animal diseases such as Foot and Mouth Disease (FMD), *peste des petites ruminant (PPR)* were studied and developed in the institute. It was reported that

- new approaches to disease diagnosis/treatment,
- livestock disease diagnostic kit and vaccines,
- peste des petits ruminants (PPP or goat plague vaccine),
- monoclonal based enzyme immune slide assay, and
- herd health management package,

Salmonella vaccines and goat plague vaccines were produced and used in Bangladesh. Several types of vaccine production are sufficient, and the government support is established. However, vaccine

supply system is not well developed. To meet up the demands of livestock/ poultry farmers several countermeasures need to be urgently implemented /developed, these are as follows:

- i. The Upazila storage system is limited; therefore, types and storage of vaccines need to be varied and increased.
- ii. Manpower and technology, field workers need to be improved by upgrading the voluntary vaccination and strengthening of training.
- iii. To develop rearing methods of scavenging, semi-scavenging improved poultry needs to be extended.

* Annual egg production

Crossbred chicken: 156

Indigenous chicken: 45

(3) Improvement of Breeds

The productivity of animals in Bangladesh is generally much lower than international levels. One of the major reasons is local variety that are resistant to diseases but low productivity. There are several promising breeds developed in BLRI. However, access to new breeds is insufficient to farmers.

- i. To connect technology generation and technology dissemination, the activities of Government Farms need to be enhanced, as observed by the successful services in day old chick (DOC) supply by the Government Poultry Farm at Savar, Dhaka.

* Government farms are established for cattle, goat, pig and poultry.

- ii. Livestock and poultry fairs need to be held in Union and Upazila level to create awareness and dissemination of technologies.
- iii. Native breeds need to be improved to utilize high adaptability to the natural and economic conditions in rural areas: goats, poultry and ducks.

Production potentiality of different types of ducks.

Parameters	Desi White	Desi Black	Khaki Campbell
Adult body weight (kg)	1.60	1.60	1.50
Feed consumption (g/duck/day)	178	180	177
Age at onset of lay (days)	126	135	141
Age at peak production (days)	213	235	230
Egg production at the peak (%)	77	67	62
Duck house egg production (%)	44	44	37
Mean egg weight (g)	71	70	69

Source: BLRI An Overview (2001)

3.3.3 Livestock in the Study Area

(1) Current situation

The conditions mentioned below are the same in the Study Area as the national situation, but the development of livestock varies largely due to species of animals and the natural conditions.

Climatic and topographic conditions, especially the high temperature and high humidity and frequent flooding, are not suitable to domestic animals. Pasturelands are not abundantly available for cattle and goats. Recently water shortages and development of agricultural machinery have caused unfavorable conditions to buffalos. Due to shortage of feed /green fodder, it has been difficult to enhance livestock farming in Bangladesh. Hence, livestock farming has not been a priority area in the past. It may be noted here that a project "FCDI" has implemented jointly by BWDB, DLS and DoF in 1994-2000. Under this project, the crops, fisheries and livestock sectors were benefited. In terms of livestock, large-scale green fodder was grown on the banks of canals and embankments. This type of integrated projects should be developed and implemented for the greater interest of improvement of productivity, income generation and poverty reduction.

However, livestock has to be developed as an important income source of farmers. Livestock can be a demand-driven sector. As the national economy improves, consumption of livestock will be relatively increased.

The *water buffalo* is an animal resource whose potential seems to have been barely recognized in Bangladesh. Throughout the world there are proponents and enthusiasts for the various breeds of cattle; the water buffalo, however, is not a cow and it has been neglected. Nevertheless, this symbol of Asian life and endurance has performed notably well in recent trials in such diverse places as the USA, Australia, Papua New Guinea, Trinidad, Costa Rica, Venezuela, and Brazil. In Italy and Egypt as well as Bulgaria and other Balkan States the water buffalo has been an important part of animal husbandry for centuries. In each of these places certain herds of water buffalo appear to have equaled or surpassed the local cattle in growth, environmental tolerance, health, and production of meat and calves. Hence, Bangladesh may consider starting water buffalo research and development for economic benefit of the rural people, if it gains market acceptance.

(2) Production: Number of livestock in each district of the Study Area according the size of holdings is shown below.

Number of livestock in the Study Area

Number in 1000s

Districts	1983-1984						1996					
	Holdings		Farm Holdings				Holdings		Farm Holdings			
	All	Non-farm	Total	Small	Medium	Large	All	Non-farm	Total	Small	Medium	Large
Cattle												
Jamalpur	375	15	360	155	155	51	367	25	342	224	101	17
Kishoreganj	452	17	435	212	154	69	398	29	369	222	108	40
Mymensingh	835	30	805	355	355	95	833	53	780	488	247	45
Netrakona	57	2	55	20	27	9	57	3	54	30	20	5
Sherpur	219	7	212	83	98	31	233	14	220	128	74	18
Tangail	723	20	703	327	301	75	638	33	604	402	175	28
Total	2,661	91	2,570	1,151	1,089	329	2,526	156	2,370	1,493	724	152
Goats												
Jamalpur	324	52	272	157	90	25	180	42	138	104	30	4
Kishoreganj	207	31	176	121	43	12	167	38	128	102	22	4
Mymensingh	539	65	474	265	170	39	528	95	433	313	103	16
Netrakona	27	4	23	12	9	2	25	4	21	14	6	1
Sherpur	141	23	118	68	41	10	143	29	114	81	27	5
Tangail	449	47	402	233	136	33	309	52	256	190	56	10
Total	1,687	221	1,465	855	489	122	1,351	260	1,091	805	244	42
Fowls												
Jamalpur	1,218	195	1,023	570	354	100	1,517	333	1,184	881	262	41
Kishoreganj	1,658	253	1,405	882	393	130	1,742	419	1,324	973	282	68
Mymensingh	2,588	322	2,266	1,260	829	177	3,360	620	2,740	1,981	657	102
Netrakona	160	18	142	68	58	16	185	31	154	102	43	9
Sherpur	730	115	615	334	224	56	909	179	730	507	187	37
Tangail	1,734	192	1,543	933	506	104	2,632	488	2,180	1,643	465	72
Total	8,087	1,094	6,993	4,047	2,363	583	10,346	2,070	8,311	6,088	1,896	328

Source: Census of Agriculture - 1996 (BBS)

* In 1983-84, Cattle includes Cattle and Buffaloes, Goat includes Goats and Sheep, Fowl includes Fowls and Ducks.

1) Numbers of cattle, goats and fowls were 2.526 million, 1.351 million and 10.346 million heads in 1996, respectively. In terms of number of livestock, cattle are the major animals in the Study Area. Due to the large size of the land area, Mymensingh itself has the largest number in all the animals among the 6 districts.

Non-farm holdings shared substantial parts in livestock and poultry in 1996: about 20%. For cattle the share was small. In farm holdings, the small farmers shared about 58% in the 3 animals. In comparison with the data of 1983-84, the share of the non-farm holdings increased, and the share of the small farmhouse holdings also increased. The share by the large farm holdings decreased by half on the

average.

2) 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. Cattle were raised by 41.6% of all holdings in 1996. While for non-farm holdings, only 11.3% of the all house-holdings raised cattle, farm holdings raised cattle with a high percentage of 57.6% in total. Larger size of farm holdings grew with higher percentage of cattle rearing. In the large size class as high as 88.3% of all the farmers in the class reared cattle. There was no high difference among the districts, but Netrakona showed relatively high percentage. For goat rearing, the tendency was the same as the cattle, but the ratio was generally lower than the cattle. Farmers in Netrakona and Mymensingh had higher percentages in goat rearing. 69.3% of the total holdings raised fowls. Even more than a half of non-farm holdings raised fowls. In Netrakona, the ratio was lower than other Districts. For ducks, the percentages showed the same tendency as the fowls, but they were much lower than the fowls. Netrakona showed a high percentage, but Jamalpur had a low rate.

3) Number of animals per holding is important to assess the capacity of income generation of households. The number of animals per farm holdings had 1.50 heads of cattle, 0.56 heads of goats 5.04 heads of fowls and 1.43 heads of ducks in 1996. The number increased as the size of farm holdings increases. The number of goats was much smaller than cattle. Difference between the numbers of 1996 and 1983/84 was not large, but the number of 1996 decreased from 1983/84 in most of the cases. The number decreased in the large size of holdings. It implies that farmland size may largely affect on the number of animals per holding. High market value and resistance to flood damages may be more effective on livestock farming.

Difference in the number by district was not large in cattle. However, for goats, Mymensingh showed a high value, and Kishoreganj had the smallest. Tangail showed the highest value in fowls. For ducks, Netrakona and Kishoreganj had high values. 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. Comparison of the 1996 data with 1983/84 does not indicate a large difference. The data shows that the farming system does not change largely in a decade.

(3) Feed Supply

Land limitation and competition with crop cultivation causes a shortage of green fodder supply in Bangladesh. As observed in Kishoreganj, large haors, effect on feed supply in rainy seasons. In dry seasons, competitions between animal feeds and vegetables are also severe. Various chars along the 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.

(4) Animal Health

Veterinary services are key issues for the development of livestock farming. According to the DLS, 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.

Comparison of characteristics of cattle with goats

Cattle	Goats
High market-value	Mainly for domestic consumption
Resistant to flooding	Prone to flood damages
Long time for raising (Possibility of trading calf)	Short time for fund recovery
Long fund revolving time	Short fund revolving time
Low feed efficiency	High feed efficiency
Possible to obtain meat and milk	Possible to obtain meat and milk
	Possible to start with small initial funds
	Possible to manage by children and women

(5) Possible Approaches to Develop the Livestock Farming

- 1) Use limited farmland efficiently for commercial livestock and poultry farming.
Livestock is not basically land-use farming. Landless and small farmers can have a chance to manage livestock farming efficiently for improvement of their livelihood.
- 2) Expand feed efficient animals such as goats and poultry.
- 3) Develop veterinary services to specific areas and for animals, such as ducks in Mymensingh and Netrakona,
- 4) Develop grazing and pasturing lands along the banks of Jamuna and, the Old Brahmaputra Rivers.
- 5) Explore various promising aqua-animals, such as ducks, buffalos, geese and reptiles (Ex. Exportable Alligator breeding venture developed by a private entrepreneur at Bhaluka Upazila of Mymensingh district).
- 6) Develop and disseminate scientific / modern and appropriate technology on livestock farming.

ANNEX 4

ZONING OF THE STUDY AREA

ANNEX 4: ZONING OF THE STUDY AREA

TABLE OF CONTENTS

4.1	Zoning of the Study Area -----	A4 - 1
4.1.1	Zoning and Clusters of the District -----	A4 - 1
4.1.2	Zoning by Natural Conditions and Flooding -----	A4 - 1
4.1.3	Zoning by Socio-economic Conditions -----	A4 - 2
4.1.4	Zoning by Agriculture, Fisheries and Livestock Conditions -----	A4 - 2
4.1.5	Comprehensive Zoning of the Study Area -----	A4 - 4
4.2	Zones of the Study Area -----	A4 - 5
4.2.1	Area Zones Measured by GIS -----	A4 - 5
4.2.2	Union-wise Zones -----	A4 - 5
4.2.3	District and Upazila-wise Zones -----	A4 - 5

A 4: ZONING OF THE STUDY AREA

4.1 Zoning of the Study Area

4.1.1 Zoning and Clusters of the District

(1) Requirement of Zoning in the Study Area for the formulation of development strategy

In order to analyze the present conditions and to formulate the small scale water resources development master plan in the Study Area, firstly it is necessary to formulate the water resources development plan. The zoning of the Study Area for small scale water resources development needs different types of development plan. The approaches are 1) flooding; inundation depth and duration, 2) water resources availability; especially dry season including groundwater, 3) regional socio-economic conditions; industrial development, population and homesteads in the region, 4) agricultural conditions such as soils, climate, type of crops and cropping patterns.

Based on this zoning, a land use plan in the Study Area will be established considering crop cultivation plan and regional economy.

(2) Scale of Zoning

The small scale water resources development master plan is formulated at the district level. In the master plan, only a single strategy of development can not cover each district (with average 2,700 km²), because of the wide variation of natural, socioeconomic, agricultural and hydrological conditions in the District. For example, Sherpur District spread from the foot of high mountain to the easily flooded plain along the old Brahmaputra River.

The strategy of small scale water resources development plan shall be defer area by area and subprojects aiming to protect the flash flood or to retain the food water are needed in the former area and subprojects aiming to minimize the flood damages and to shorten the inundation period are needed for the later. Considering that the scale of subproject beneficiary area is less than 1,000 ha, government administration levels, etc., the scale of the strategy planning shall be upazilas, which cover the area of 290 km² and composed of 10 unions in this Study.

4.1.2 Zoning by Natural Conditions and Flooding

(1) Elevation and Slope

According to the digital elevation data as shown in Fig. 4.1.1, the Study Area is rather flat plain with elevation between 3 m to 40m. And the slope from northeastern border of Sherpur district to southeastern border of Kishoreganj district is 1 : 2,900, the river slope of the Brahmaputra river is 1 : 11,000, and flood plain is generally 1 : 6,000 in the Study Area. Therefore, elevation and slope factors might not be major cluster of the zoning in the Study Area except the Haor area which is topographically depression area with lower elevation at the eastern boundary and Char area on the western boundary of the Study Area.

As shown in Table 4.1.1, cropping pattern of the upazila can have a high correlation with elevation. Major crops in the higher elevation area are aman paddy, wheat and vegetable which have favorable dry conditions, and the major crops in the lower elevation area are boro and/or aus paddy which are cultivated during dry season; on the other word, aman paddy can not be cultivated during monsoon season.

From the hydrological view points, even at high elevation area, it is inundated based on the hydraulic conditions except Madhupur Tract area which is an uplifted area and free from inundation damage but having the risk of drought.

(2) Type of Floods and Hydrological Zone

Two hydrological regions of North East region and North Central divide the Study Area; North East region cover the northern part of Sherpur and Mymensingh and almost of all Netrokona and

Kishoreganj districts. Based on the hydrological region, NWMP set the development strategy and plan.

Flood proofing is the major issue on water resources development in Bangladesh. The Study Area can be categorized by the degree of inundation which is determined mostly based on the regional elevation and flooding scales. And water resources strategy of the region can be categorized by degree of inundation, as shown in Fig. 4.1.2. As far as duration of flood inundation is concerned, it is possible to consider the deep inundation area having longer period except small scale depression area.

As far as the flood type such as flash flood and normal flood is concerned, the damage of flash flood is big, but the duration of damages is short. Even when the flash flood washes out the paddy before harvesting, it is possible to replant aman paddy if the field damage by flash flood is not severe. In case of normal flood, not only the depth of inundation but also duration of the inundation is the major issue, because the replanting aman paddy becomes crucial. It is possible that the countermeasures of flood damage will be differing by the type of floods.

(3) Groundwater Availability, Arsenic Contamination and Drought Prone Area

Groundwater is not directly related to the flood damages, but it is a major issue in the dry season irrigation for agriculture. Also the arsenic contamination of groundwater, as shown in Fig. 4.1.3, is a major factor on the domestic and irrigation water supply. In these areas, retaining the flood water for the dry season and domestic usage of water is the major issue. Retention of the water during monsoon season is also a major issue in the drought prone area which is shown in Fig. 4.1.4

4.1.3 Zoning by Socio-economic Conditions

(1) Degree of Industrial Development

Considering the flood damages caused by inundation, the present development conditions shall be accounted. It is easy to understand that the damage amount will be bigger for the industrial factories, social infrastructure such as road, bridge, power stations, etc., after the life of human beings. There is no major industrial centers in the Study Area, and it is regarded not to be a major factor for zoning.

(2) Population and its Density and the Vulnerabilities

Population density shall be one of major scale to measure the flood damages. In the Study Area, population density distribution is rather homogeneous at 200 to 400 persons/km², with the exception of Mymensingh and Kishoreganj municipality area, where population density is higher.

High concentration areas of population below the lower poverty line are along the Jamuna river, and north eastern part. Distribution of poverty is an important issue in developing the strategies for the Master Plan, which aims at the alleviation of poverty. However, the category does not necessarily affect the contents of water resources development activities (ex. flood management, drainage improvement, etc.), and therefore will be regarded with emphasis in the prioritization of development activities.

4.1.4 Zoning by Agriculture, Fisheries and Livestock Conditions

(1) Major Issues to be considered for the Agriculture, Fishery and Livestock Development

Agricultural development depends on i) climatic conditions, ii) social conditions, iii) land-use and topographic conditions, iv) surface water and groundwater availability, and v) soil conditions. In case of the Study Area, the flood plain except Madhupur tract and northern mountain foot areas, i) there is no significant difference of climate within the Study Area, ii) social conditions in the Study Area is rather homogeneous and it does not influence on agriculture. Therefore, the zoning by agricultural will be classified mainly based on 1) inundation land type, 2) soil conditions, 3) topographic conditions on the slope and drainage.

(2) Land type

The current land type is classified into 5 groups: High, Medium High, Medium Low, Low and Very

Low. The Land types are basically decided by the elevation of farm land and depth of inundation by water flow. Therefore, agricultural factors on crop production are also different by the land types. The main important agricultural factors are soil type, appropriate crops, necessity of drainage, constraints and opportunity. Farmers have good knowledge on soil characteristics and crop suitability by their field experiences and better results are attained by selecting suitable crops. In highland and medium highland, rice can be cultivated by preparing ridge and puddling. If farm lands which are located close to markets or major roads, farmers can develop strategic producing areas. Though Sakhipur, of Tangail District is located in a medium highland area and is not suitable to rice production, due to its good access to Dhaka, it became a large banana producing area. This is a successful case of appropriate use of land type.

Characteristics of Land Types and Suitable Crops

Items	Land types				
	Highland	Medium Highland	Medium Lowland	Lowland	Very Lowland
Soil	Silt loam	Silt, Clay loam	Silty clay	Clay	Heavy clay
Crop	Aus, T. Aman, wheat, pulses, sugarcane, spices, vegetables	Aus, T. Aman, HYV Boro, jute, spices vegetables wheat, pulses oil seeds,	Aus, T. Aman, DWR, HYV Boro, pulses, oilseeds, vegetables, spices	DWR, HYV Boro, Local Boro	Local Boro
Drainage	Well drained	Shallow	Shallow to moderate	Moderate to deep	Deep
Constraints	Low moisture, drought, salinity in dry season	Drought water logging, salinity in dry season	Flooding slow drainage, drought, salinity in dry season	Flooding, late drainage, salinity in dry season	Deep flooding, salinity in dry season
Opportunity	Irrigation	Drainage improvement irrigation	Flood control, Drainage improvement irrigation	Flood control, Drainage improvement	Flood control

Source: LGED Document (2004)

(3) Agro-ecological zone (AEZ), ref. Fig. 4.1.5

AEZ is composed of various factors such as land elevation, soil type, floods, droughts and soil fertility. It is a good indicator for crop production/ biomass. It is used for

- identification of crop suitability
- estimation of crop yields
- examination of farming system
- information for agricultural extension
- improvement of food security through “Right place, right crop”.

However, agricultural production in the future will be focused on the economic view point such as cash income and poverty alleviation in rural areas. Profitability will be a major target which can not be achieved by AEZ only. In addition, extension of fertilizer application and water management technology compensate the defects of farm land conditions. Consideration to human welfare is also an important factor to be considered. Farmers usually do not use AEZ as additional information to the Land type.

In the future, diversification of agricultural production to more profitable crops under the same AEZ and development of agricultural technology will be advanced. Agricultural zoning requires natural and socio-economic factors. Some of the important items are as follows:

- mapping with 0.5 m contour,
- major soil type (Clay, silt, loam, sandy, etc.),
- vegetation,
- current major crops,
- irrigation, drainage facilities and recipient areas,

- hazard areas,
- road net work,
- markets/ growth centers
- major agricultural processing companies,
- public offices,
- water bodies with regions in summer and winter.

More practical land classification which the farmers can easily use for their daily farming is needed.

4.1.5 Comprehensive Zoning of the Study Area

(1) Comprehensive Zoning

Comparison of factors discussed above with the three approaches for zoning, along with the importance of the categories among zoning of the Study Area is summarized in the following:

Factor	Natural Condition & Flood	Socio-economy	Agriculture	Importance among zoning of the Study Area
Elevation & Slope				Low: The terrain of the Study Area is generally flat and will not effect the strategies for SSWRD
Type of Flood and Hydrological Zone				High: Strategies should be established based on actual flood conditions of the Study Area
Groundwater				Medium: Availability of groundwater should be considered in regard of retaining surface water
Industrialization				Low: There are no major industrial centers in the Study Area
Population density				Low: The population density is regarded to be rather homogeneous with the exception of major municipalities
Poverty Distribution				-: Though considered important, the factor will be regarded in the prioritization of development activities
Land Type				High: Directly effects agricultural production after the realization of effective water resources management
Agroecological Zone				High: Directly effects agricultural production after the realization of effective water resources management

Land classification by land type and flood inundation type is almost similar, because the elevated area has less opportunity of inundation by flood except flush flood area. As shown in Fig. 4.1.5, the agroecological zone is overlapped with land type and flooding conditions, because the Agroecological zoning includes the land type and flooding conditions which is a dominant factor in ecological zoning and effect on agricultural patterns.

(2) Zoning for Water Resources Development in the Study Area

As a result of the comprehensive comparison, upazilas in the Study Area will be categorized by the Agroecological and flood inundation type zoning as shown below:

Zones	Degree of inundation	Agroecological Zone	Typical Area in the Study Area
Highland	Less than 30 cm	Madhupur Tract	Madhupur tract in Tangail and Mymensingh districts
Medium High Land	30 to 90 cm	Old Brahmaputra Floodplain	Area adjacent to Madhupur tract and river terrace of the old Brahmaputra River left bank
Medium Lowland	90 to 180 cm	Young Brahmaputra and Jamuna Floodplain	Along the old Brahmaputra Rivers and out of active Jamuna floodplain
Lowland	180 to 300 cm	Sylhet Basin and Active Brahmaputra-Jamuna Floodplain	Outside of Haor area in Kishoreganj and Netrakona Districts and along the Jamuna River
Very Lowland	More than 300 cm	Old Meghna Estuarine Floodplain	Haor area in eastern part of Kishoreganj and Netrakona Districts

4.2 Zones of the Study Area

4.2.1 Area Zones Measured by GIS

Agroecological regions inundation land type boundaries are overlapped on the administrative boundaries on the GIS, then the area of zones are able to be measured. Union-wise and Upazila and District-wise area of each zone was shown below/

4.2.2 Union-wise Zones

Union-wise area of zones is summarized by the district as shown in Table 4.2.1 to 4.2.6.

4.2.3 District and Upazila-wise Zones

Zoning, applying the agroecological region and inundation type land classification, was conducted in the Study Area. Location and area of each zone are estimated based on the GIS and district wise areas by zone are summarized as follows:

Agroecological Zone	Inundation Land Type	Jamalpur		Kishoreganj		Mymensingh		Nerakona		Sherpur		Tangail		Study Area	
		Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)	Area (ha)	Share (%)
Active Brahmaputra-Jamuna	F1	27,818	14.6%									24,784	7.6%	52,602	3.3%
Young Brahmaputra and Jamuna	F1	90,314	47.5%	71,428	29.5%	78,574	18.3%	155	0.1%	9,823	6.5%	138,837	42.6%	389,131	24.1%
Old Brahmaputra Floodplain	F0	16,247	8.6%			10,550	2.5%			28,189	18.6%			54,986	3.4%
	F1	45,819	24.1%			188,433	44.0%	62,125	22.4%	34,342	22.7%	36,240	11.1%	366,958	22.7%
	F2			10,613	4.4%	33,608	7.8%	76,170	27.4%			21,531	6.6%	141,922	8.8%
	F3			33,395	13.8%	21	0.0%	9,311	3.4%					42,728	2.6%
Middle Meghna River Floodplain	F2			11,064	4.6%									11,064	0.7%
Old Meghna Estuarine Floodplain	F2			1,612	0.7%									1,612	0.1%
	F3			40,555	16.8%									40,555	2.5%
Sylhet Basin	F3			72,759	30.1%			67,786	24.4%					140,544	8.7%
North-western Plains and Basins	F1	3,014	1.6%			21,890	5.1%	15,710	5.7%	53,853	35.5%			94,467	5.8%
Northern and Eastern Piedmont	F0					18,618	4.3%	42,559	15.3%	93	0.1%			61,270	3.8%
Northern and Eastern Basins	F3					5,308	1.2%	2,227	0.8%	8,582	5.7%			16,116	1.0%
Madhupur Tract	F0	4,990	2.6%	566	0.2%	71,388	16.7%					104,189	32.0%	181,134	11.2%
Northern and Eastern Hills	F0	1,797	0.9%			198	0.0%	1,642	0.6%	16,702	11.0%			20,339	1.3%
Total Area		189,999		241,992		428,390		277,685		151,583		325,580		1,615,229	

Most major zones in the Study Area are Young Brahmaputra and Jamuna Floodplain F1 and Old Brahmaputra Floodplain F1 covering 24.1% and 22.7%, of total Study Area, respectively.

Table 4.1.1 Characteristic of Upazila in Greater Mymensingh

Zone	Name of District with geo-code	Name of Upazila and geo-code	Elevation	Number of SP-2				H/H	Population	Total Area (in sq. km)	Population Density (in sq. km)	No. of Unions	No. of Mauzas		Farm Holdings										Gross Cropped Area								Crops other than Rice and Wheat			
				Proposed	PRA Passed	Appraisal In Process	Appraisal Passed						Total	Populat ed	Tenant Holdings	Agri. Labour HH	Owned Area (Small)	Owned Area (Large)	Literacy Rate	Aus	Aman	Boro	Wheat	Pulses	Oil Seeds	Vegetabl es	Cash Crops	Spices	No.1 Crop	No.2 Crop	No.3 Crop	Others				
																																	Aus	Aman	Boro	Wheat
Wheat/Cash Crops	39. Jamalpur	15. Dewangonj Upazila	15-20m	1	1	0	0	44,000	217,000	266.59	813.98	8	47	45	19.0%	37.3%	38.4%	19.4%	32.3%	8.7%	31.1%	17.1%	15.2%	3.2%	5.8%	1.9%	14.7%	1.7%	Jute	Rape & mustard	Sugarcane	Lentil				
Wheat/Cash Crops	39. Jamalpur	07. Bakshigonj Upazila	15-40m	0	0	0	0	37,000	178,000	204.30	871.27	7	25	25	12.1%	37.5%	38.8%	16.1%	26.9%	16.9%	32.8%	18.9%	9.2%	1.3%	4.6%	4.3%	8.8%	3.0%	Jute	Rape & mustard	Potato	Sugarcane				
Wheat/Cash Crops	39. Jamalpur	29. Islampur Upazila	15-20m	16	2	1	1	60,000	302,000	343.02	880.42	12	86	74	18.0%	34.3%	41.9%	16.0%	24.5%	8.2%	23.3%	21.5%	10.9%	1.5%	7.8%	3.1%	15.8%	7.4%	Jute	Rape & mustards	Sugarcane	Potato				
Wheat/Cash Crops	39. Jamalpur	58. Madargonj Upazila	15-20m	0	0	0	0	47,000	227,000	225.38	1,007.19	7	108	103	12.6%	33.3%	46.7%	10.4%	26.7%	3.4%	26.4%	24.2%	9.3%	1.1%	5.9%	3.1%	14.3%	10.9%	Jute	Chillies	Rape & mustard	Onion, Brinjal				
Wheat/Cash Crops	39. Jamalpur	85. Sharishabari Upazila	12-20m	4	0	0	0	66,000	326,000	263.48	1,237.29	8	119	115	8.7%	26.2%	50.5%	9.5%	37.7%	2.6%	30.1%	30.5%	7.8%	0.6%	8.2%	2.5%	11.5%	5.4%	Jute	Rape & mustard	Chillies	Potato				
Wheat/Cash Crops	93. Tangail	19. Bhuapur Upazila	10-15m	4	2	0	1	36,000	199,000	225.02	884.37	6	89	85	10.9%	24.8%	30.1%	32.1%	38.7%	8.6%	24.0%	18.8%	10.7%	6.7%	11.8%	1.9%	11.7%	3.7%	Jute	Rape & mustard	Chickling vetch	Sugarcane, Lentil				
Wheat/Cash Crops	93. Tangail	95. Tangail Sadar Upazila	10-15m	1	0	0	0	79,000	427,000	334.26	1,277.45	11	255	242	8.2%	24.5%	53.0%	10.7%	47.2%	10.4%	17.1%	20.5%	11.0%	5.3%	14.6%	3.5%	15.6%	1.6%	Rape & mustard	Jute	Lentil	Sugarcane				
Wheat/Cash Crops	93. Tangail	76. Nagarpur Upazila	6-10m	8	0	0	0	51,000	268,000	262.70	1,020.18	11	217	211	6.0%	25.4%	52.1%	9.0%	35.5%	10.8%	16.8%	23.6%	8.1%	5.7%	21.2%	3.1%	8.6%	1.6%	Rape & mustard	Jute	Chickling vetch	Lentil, Potato				
				34	5	1	2	420,000	2,144,000	2,124.75	1,009.06	70	946	900																						
Aman/Vegetables	89. Sherpur	90. Sreebardi Upazila	15-40m	0	0	0	0	54,000	257,000	270.34	950.65	10	81	81	11.0%	34.7%	42.0%	14.5%	27.2%	18.3%	41.7%	25.5%	4.7%	0.5%	0.6%	3.0%	3.2%	2.5%	Jute	Potato	Chillies					
Aman/Vegetables	39. Jamalpur	61. Melandah Upazila	15-40m	8	1	1	0	64,000	296,000	239.65	1,235.13	10	142	140	9.1%	34.6%	52.4%	10.7%	26.9%	2.0%	32.9%	36.2%	4.6%	0.4%	5.9%	2.8%	9.3%	5.8%	Jute	Rape & mustard	Chillies	Potato				
Aman/Vegetables	89. Sherpur	88. Sherpur Sadar Upazila	15-20m	4	1	0	0	90,000	429,000	360.01	1,191.63	13	94	94	7.6%	35.5%	47.8%	11.5%	28.6%	16.0%	33.2%	27.2%	5.6%	0.5%	3.4%	5.1%	9.3%	3.1%	Jute	Rape & mustard	Brinjal	Potato, Chillies				
Aman/Vegetables	39. Jamalpur	36. Jamalpur Sadar Upazila	15-20m	2	1	1	0	118,000	565,000	489.56	1,154.10	15	230	224	7.7%	33.0%	50.3%	10.3%	42.6%	6.7%	37.1%	33.5%	3.0%	0.6%	8.0%	3.0%	5.4%	2.6%	Rape & mustard	Jute	Potato	Brinjal				
Aman/Vegetables	89. Sherpur	67. Nakla Upazila	12-20m	5	0	0	0	37,000	183,000	174.80	1,046.91	9	88	88	10.8%	33.8%	43.9%	13.1%	32.9%	3.4%	36.2%	36.7%	2.5%	1.0%	8.7%	3.9%	5.4%	2.1%	Rape & mustard	Jute	Potato					
Aman/Vegetables	61. Mymensingh	52. Mymensingh Sadar Upazila	10-15m	6	0	0	0	112,000	637,000	388.45	1,639.85	13	119	118	11.0%	30.2%	46.5%	12.0%	54.3%	15.5%	34.2%	25.4%	3.8%	2.2%	4.3%	3.6%	7.9%	2.9%	Jute	Rape & mustard	Chillies	Potato				
Aman/Vegetables	61. Mymensingh	23. Gauripur Upazila	10-15m	3	0	0	0	51,000	279,000	274.07	1,017.99	10	241	239	6.0%	29.7%	43.8%	12.1%	38.8%	18.3%	40.6%	28.2%	2.1%	0.5%	0.7%	3.0%	4.6%	1.9%	Jute	Potato	Chillies					
				28	3	2	0	526,000	2,646,000	2,196.88	1,204.44	80	995	984																						
Aman	89. Sherpur	37. Jenaigati Upazila	15-40m	0	0	0	0	33,000	156,000	231.00	675.32	7	75	75	16.3%	38.5%	37.0%	20.1%	26.3%	19.6%	47.3%	28.5%	1.1%	0.1%	0.2%	1.9%	0.3%	1.0%	Potato	Chillies	Beans					
Aman	89. Sherpur	70. Nalitabari Upazila	15-40m	3	1	0	1	48,000	254,000	327.61	775.31	12	108	107	14.8%	36.8%	32.1%	26.8%	28.7%	22.5%	45.6%	26.2%	1.0%	0.1%	1.0%	1.5%	0.5%	1.5%	Chillies	Rape & mustard	Potato					
Aman	61. Mymensingh	24. Haluaghat Upazila	10-20m	34	2	2	0	53,000	273,000	356.07	766.70	12	145	145	13.7%	33.9%	34.7%	21.5%	33.5%	17.3%	47.3%	27.2%	2.1%	0.2%	1.8%	2.0%	1.0%	1.0%	Rape & mustard	Jute	Potato					
Aman	61. Mymensingh	16. Dhobaura Upazila	10-20m	25	0	0	0	32,000	177,000	251.05	705.04	7	99	99	19.4%	44.7%	30.6%	28.3%	27.4%	19.7%	47.0%	27.4%	1.4%	0.2%	0.9%	1.5%	0.8%	1.0%	Potato	Chillies	Jute	Rape & mustard				
Aman	61. Mymensingh	81. Phulpur Upazila	10-15m	0	0	0	0	95,000	516,000	580.21	889.33	20	377	377	8.6%	33.8%	37.6%	16.5%	30.7%	6.6%	43.1%	36.4%	2.0%	0.5%	2.5%	2.0%	5.0%	1.9%	Jute	Rape & mustard	Potato	Chillies				
Aman	61. Mymensingh	65. Muktagachha Upazila	10-15m	0	0	0	0	68,000	361,000	314.71	1,147.09	10	252	249	8.2%	30.7%	50.5%	10.3%	33.6%	17.5%	39.9%	27.1%	3.0%	0.8%	3.7%	1.9%	4.5%	1.5%	Rape & mustard	Jute	Potato	Chillies				
Aman	72. Netrakona	18. Durgapur Upazila	10-15m	14	2	1	1	36,000	189,000	293.42	644.13	7	134	133	14.7%	34.4%	30.8%	40.4%	33.7%	16.5%	45.1%	29.6%	1.9%	0.1%	1.2%	1.8%	1.5%	2.3%	Chillies	Jute	Rape & mustard	Potato				
Aman	72. Netrakona	83. Purbadhala Upazila	9-15m	0	0	0	0	50,000	264,000	312.30	845.34	11	223	221	9.2%	32.7%	38.4%	17.4%	33.7%	5.5%	45.2%	37.9%	1.3%	0.4%	2.3%	2.2%	3.5%	1.5%	Jute	Rape & mustard	Potato	Chillies				
Aman	72. Netrakona	74. Netrakona Sadar Upazila	6-10m	41	3	0	3	57,000	297,000	340.35	872.63	12	267	267	9.5%	30.5%	34.1%	20.9%	41.7%	15.3%	43.3%	31.0%	1.2%	0.4%	1.4%	1.5%	4.6%	1.2%	Jute	Rape & mustard	Potato	Chillies				
				117	8	3	5	472,000	2,487,000	3,006.72	827.15	98	1,680	1,673																						
Mustard/Cash Crops	93. Tangail	57. Madhupur Upazila	10-15m	0	0	0	0	84,000	421,000	500.67	840.87	11	244	243	9.5%	31.2%	50.5%	11.5%	32.8%	7.6%	38.7%	32.7%	3.1%	0.4%	8.5%	2.9%	4.6%	1.5%	Rape & mustard	Jute	Potato	Sugarcane				
Mustard/Cash Crops	93. Tangail	38. Gopalpur Upazila	10-15m	1	0	0	0	56,000	284,000	193.37	1,468.69	7	110	109	7.6%	30.5%	61.1%	5.1%	36.7%	0.7%	33.2%	37.4%	3.2%	0.2%	17.0%	2.0%	4.5%	1.7%	Rape & mustard	Jute	Potato	Chillies				
Mustard/Cash Crops	93. Tangail	28. Ghatail Upazila	10-20m	5	1	0	1	76,000	382,000	451.30	846.44	11	305	301	8.3%	29.2%	49.7%	12.9%	35.5%	10.6%	33.5%	32.1%	2.2%	1.5%	11.3%	2.1%	4.6%	2.0%	Rape & mustard	Jute	Chillies					
Mustard/Cash Crops	93. Tangail	47. Kalihati Upazila	6-10m	2	1	0	1	73,000	399,000	301.22	1,324.61	12	270	260	8.8%	26.4%	59.2%	8.8%	35.6%	4.5%	26.4%	34.8%	6.1%	1.7%	15.8%	1.6%	7.7%	1.1%	Rape & mustard	Jute	Chickling vetch	Potato				
Mustard/Cash Crops	93. Tangail	09. Basail Upazila	6-10m	0	0	0	0	31,000	168,000	157.78	1,064.77	6	73	72	5.9%	19.5%	61.0%	6.9%	42.5%	2.8%	12.2%	44.4%	2.1%	1.6%	30.3%	1.6%	4.5%	0.4%	Rape & mustard	Jute	Chickling vetch	Potato, Sugarcane				
Mustard/Cash Crops	93. Tangail	23. Delduar Upazila	6-10m	0	0	0	0	37,000	197,000	184.54	1,067.52	8	123	122	6.0%	19.8%	59.1%	5.2%	44.1%	5.4%	20.9%	26.3%	6.9%	5.7%	14.4%	4.7%	14.8%	0.7%	Rape & mustard	Jute	Sugarcane	Potato, Lentil				
Mustard/Cash Crops	93. Tangail	66. Mirzapur Upazila	6-10m	3	1	1	0	68,000	379,000	373.89	1,013.67	13	207	206	6.1%	21.4%	53.8%	8.6%	42.6%	8.7%	15.5%	35.1%	4.1%	3.2%	19.4%	3.7%	8.9%	1.3%	Rape & mustard	Jute	Sugarcane	Chickling vetch, Potato				
				11	3	1	2	425,000	2,230,000	2,162.77	1,031.09	68	1,332	1,313																						
Aus/Aman	93. Tangail	85. Sakhipur Upazila	10-20m	0	0	0	0	50,000	247,000	429.63	574.91	6	61	61	11.6%	27.1%	42.5%	13.5%	28.1%	27.9%	35.0%	18.8%	1.7%	2.0%	4.4%	3.4%	3.7%	3.1%	Rape & mustard	Jute	Chillies	Brinjal				
Aus/Aman	61. Mymensingh	13. Bhaluka Upazila	6-10m	1	0	0	0	56,000	298,000	444.05	671.10	11	87	87	11.4%	33.3%	41.4%	14.6%	35.4%	27.0%	35.9%	20.0%	2.2%	2.9%	0.8%											

Table 4.2.1 Zoning of Unions in Jamalpur District (1/1)

Upazila	Union	Active Brahmaputra-Jamuna (7)	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (901, 902)		North-western Plains and Basins (2201)	Madhupur Tract (2800)	Northern and Eastern Hills (2900)	Total
		F1	F1	F0	F1	F1	F0	F0	
Bakshiganj	Bagar Char		536	2,904					3,440
	Bakshiganj			2,754		321			3,075
	Battajore			653		1,890			2,543
	Dhanua			687		391		1,797	2,875
	Merur Char		2,388	356					2,744
	Nilakshmia		725	963		411			2,099
	Sadhu Para		1,022	1,423					2,445
	Upazila Total	0	4,670	9,740	0	3,014	0	1,797	19,221
Share	0.0%	24.3%	50.7%	0.0%	15.7%	0.0%	9.3%	100.0%	
Dewanganj	Bahadurabad	176	2,930	437					3,543
	Char Aomkhaoa	1,660	1,708						3,367
	Chikajani	1,500	338	832					2,671
	Chukaibari	1,376	28	732	109				2,245
	Dangdhara	2,715	535						3,251
	Dewanganj		1,991	139					2,130
	Hatebhanga	2	1,818						1,819
	Par Ramrampur		3,361	380					3,741
	Upazila Total	7,428	12,710	2,520	109	0	0	0	22,767
	Share	32.6%	55.8%	11.1%	0.5%	0.0%	0.0%	0.0%	100.0%
Islampur	Belgachha	2,062	266		546				2,874
	Char Goolini		2,785		0				2,785
	Char Putimari		2,084	652					2,736
	Chinadulli		628	1,695					2,323
	Gaibandha		2,590	496					3,087
	Goaler Char		1,708						1,708
	Islampur		217	164	1,774				2,155
	Kulkandi	756	59	1	894				1,710
	Noapara	743	1,585		1,168				3,496
	Palbandha		1,411	264	13				1,688
	Patharsi		9	1,465	685				2,160
	Sapdhari	995	1,065		158				2,217
	Upazila Total	4,556	14,409	3,042	6,933	0	0	0	28,939
	Share	15.7%	49.8%	10.5%	24.0%	0.0%	0.0%	0.0%	100.0%
Jamalpur Sodar	Banshchara		490		1,415		1,696		3,601
	Digpaith				2,775				2,775
	Ghoradhap		2,227		703		0		2,929
	Itail		2,491		58				2,550
	Kendua		2,203		1,026				3,230
	Lakshmir Char		2,351						2,351
	Meshta		1,814		570				2,384
	Narundi		2,333						2,333
	Paurashava		2,581		2,065				4,646
	Ranagachha		1,164		1,270		154		2,589
	Rashidpur				2,637		179		2,816
	Sahabajpur		61		3,063		466		3,590
	Sharifpur		933		2,348		95		3,376
	Sreepur				599		2,400		2,998
	Titpalla		679		2,293				2,972
	Tulsir Char		3,148	80					3,228
	Upazila Total	0	22,476	80	20,822	0	4,990	0	48,368
Share	0.0%	46.5%	0.2%	43.0%	0.0%	10.3%	0.0%	100.0%	
Madarganj	Adarbhita	74	2,864						2,938
	Balijuri	1,281	1,845						3,126
	Char Pakerdaha	2,059	1,232						3,291
	Gunaritala		3,203						3,203
	Jorekhali	933	2,689						3,622
	Karaichara		2,762		329				3,091
	Sidhli	1,280	643						1,923
	Upazila Total	5,628	15,236	0	329	0	0	0	21,193
Share	26.6%	71.9%	0.0%	1.6%	0.0%	0.0%	0.0%	100.0%	
Melandaha	Adra				1,740				1,740
	Char Banipakuri		1,431		882				2,313
	Durmut		784	547	338				1,670
	Fulkocho		90		1,822				1,912
	Ghosher Para		1,903		1,139				3,042
	Jhaugara		1,820		283				2,103
	Kulia		184	318	1,711				2,213
	Mahmudpur		908		2,561				3,469
	Nangla		45		2,354				2,399
	Nayanagar		1,203		1,839				3,042
	Upazila Total	0	8,368	865	14,668	0	0	0	23,902
Share	0.0%	35.0%	3.6%	61.4%	0.0%	0.0%	0.0%	100.0%	
Sarishabari	Aona	704	2,196						2,900
	Bhatara	504	1,316		1,023				2,843
	Doail		3,388		16				3,404
	Kamrabad	1,685							1,685
	Mahadan		687		1,919				2,607
	Paurashava	364	1,017						1,381
	Pingna	1,290	1,640						2,930
	Pogaldigha	1,661	2,199						3,860
	Satpoa	3,998	3						4,001
	Upazila Total	10,206	12,446	0	2,958	0	0	0	25,610
	Share	39.9%	48.6%	0.0%	11.6%	0.0%	0.0%	0.0%	100.0%
District Total	27,818	90,314	16,247	45,819	3,014	4,990	1,797	189,999	
Share	14.6%	47.5%	8.6%	24.1%	1.6%	2.6%	0.9%	100.0%	

Table 4.2.2 Zoning of Unions in Kishoreganj District (1/2)

Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (903, 904)		Middle Meghna River Floodplain (16)	Old Meghna Estuarine Floodplain (1903, 1908)		Sylhet Basin (2101, 2102)	Madhupur Tract (2801)	Total
	F1	F2	F3	F2	F2	F3	F3	F0	
Adampur						976	2,679		3,655
Austagram						4,722	268		4,990
Bangal Para				1		30	2,197		2,228
Deoghar						2,838	1,760		4,598
Kalma						131	2,458		2,589
Kastail						4,239			4,239
Khayerpur Abdullahpur						80	5,132		5,212
Upazila Total	0	0	0	1	0	13,017	14,493	0	27,512
Share	0.0%	0.0%	0.0%	0.0%	0.0%	47.3%	52.7%	0.0%	100.0%
Baliardi				462		197			659
Dighirpar			630	398		851			1,880
Dilalpur	6			891					897
Gazir Char	462			199					661
Halimpur	1,027		288						1,315
Hilachia	398		2,005				8		2,410
Humaipur							2,731		2,731
Maij Char				864		810			1,674
Paurashava	416		199	459					1,074
Pirijpur	2,296								2,296
Sarar Char	1,199		111						1,310
Upazila Total	5,804	0	3,233	3,273	0	4,597	0	0	16,907
Share	34.3%	0.0%	19.1%	19.4%	0.0%	27.2%	0.0%	0.0%	100.0%
Aganagar				1,732					1,732
Gazaria	74			1,301					1,375
Kalika Prasad	1,186			27					1,213
Paurashava	854			602					1,456
Sadakpur				2,065					2,065
Shibpur	642			36					678
Shimulkandi	75			1,087					1,162
Upazila Total	2,830	0	0	6,850	0	0	0	0	9,680
Share	29.2%	0.0%	0.0%	70.8%	0.0%	0.0%	0.0%	0.0%	100.0%
Araibaria	1,211								1,211
Gobindapur	1,471	1,106							2,577
Jinari	2,304								2,304
Pumdi	1,579	417							1,996
Sahedal	1,200								1,200
Sidhla	2,473								2,473
Upazila Total	10,238	1,523	0	0	0	0	0	0	11,762
Share	87.0%	13.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Badla							5,449		5,449
Baribari			6				4,276		4,282
Dhanpur						968	5,778		6,745
Elongjuri						235	3,077		3,312
Itna						2,729	1,548		4,278
Joy Siddhi					87	338	3,328		3,754
Mriga						2,065	2,619		4,684
Raituti							4,475		4,475
Upazila Total	0	0	6	0	87	6,336	30,549	0	36,978
Share	0.0%	0.0%	0.0%	0.0%	0.2%	17.1%	82.6%	0.0%	100.0%
Baragharia	82		1,070				34		1,186
Dehunda		328	621						949
Gujadia		2,569	158						2,727
Gundhar			1,734				923		2,656
Jafarabad	806	236	3						1,045
Joyka	601		1,049				1,001		2,651
Kadir Jangal	276	1,946							2,222
Karimganj		418	781						1,199
Niamatpur			1,105				38		1,142
Noabad	1,000		177						1,177
Sutar Para			442				2,274		2,716
Upazila Total	2,765	5,498	7,139	0	0	0	4,270	0	19,672
Share	14.1%	27.9%	36.3%	0.0%	0.0%	0.0%	21.7%	0.0%	53.2%

Table 4.2.2 Zoning of Unions in Kishoreganj District (2/2)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (903, 904)		Middle Meghna River Floodplain (16)	Old Meghna Estuarine Floodplain (1903, 1908)		Sylhet Basin (2101, 2102)	Madhupur Tract (2801)	Total
		F1	F2	F3	F2	F2	F3	F3	F0	
Katiadi	Achmita	1,686		488						2,174
	Banagram	1,167		1,423						2,590
	Chandpur	626		1,838						2,464
	Jalalpur	1,180								1,180
	Kargaon			1,866				1,560		3,426
	Katiadi	2,055								2,055
	Lohajuri	1,222								1,222
	Masua	1,943								1,943
	Mumurdia	793		1,406						2,199
	Shahasram Dhuldia			1,641				961		2,602
Upazila Total	10,671	0	8,662	0	0	0	2,521	0	21,854	
Share	48.8%	0.0%	39.6%	0.0%	0.0%	0.0%	11.5%	0.0%	100.0%	
Kishoreganj Sadar	Baulai	1,755	54							1,810
	Binnati	1,320								1,320
	Chauddasata	1,106		1,193						2,299
	Dana Patali	389		798			269			1,456
	Jasodal	1,104		249						1,354
	Korsha Kariail	597		543						1,140
	Latibabad	1,101								1,101
	Mahinanda	1,194	11							1,205
	Maij Khapan	1,042	547							1,589
	Maria	1,173		149						1,322
	Paurashava	1,722	4							1,726
	Rashidabad	1,182	548							1,731
	Upazila Total	13,685	1,165	2,933	0	0	0	269	0	18,052
	Share	75.8%	6.5%	16.2%	0.0%	0.0%	0.0%	1.5%	0.0%	100.0%
Kuliar Char	Chhaysuti	1,909			146					2,055
	Faridpur	645								645
	Gobaria Abdullahpur	2,033								2,033
	Kuliar Char	470			327					797
	Osmanpur	553			466					1,019
	Ramdi	2,012								2,012
	Salua	1,482								1,482
	Upazila Total	9,104	0	0	940	0	0	0	0	10,044
Share	90.6%	0.0%	0.0%	9.4%	0.0%	0.0%	0.0%	0.0%	100.0%	
Mithamain	Dhaki					1,059	1,127	2,071		4,257
	Ghagra						2,681	290		2,972
	Gopedighi						1,090	2,654		3,744
	Keorjori						1,957	937		2,894
	Khatkhal					466	1	3,239		3,707
	Mithamain						2,551	832		3,383
	Upazila Total	0	0	0	0	1,525	9,407	10,024	0	20,956
	Share	0.0%	0.0%	0.0%	0.0%	7.3%	44.9%	47.8%	0.0%	100.0%
Nikli	Dampara			55			1,193	1,424		2,673
	Gurai			686			3,273			3,960
	Jaraitala	14		2,178			40			2,233
	Karpasha			3				1,796		1,799
	Nikli			384			1,791	147		2,322
	Singpur						900	3,522		4,422
	Upazila Total	14	0	3,307	0	0	7,198	6,889	0	17,409
Share	0.1%	0.0%	19.0%	0.0%	0.0%	41.3%	39.6%	0.0%	100.0%	
Pakundia	Barudia	1,957								1,957
	Chandi Pasha	1,321								1,321
	Char Faradi	1,189								1,189
	Egarasindur	2,112						566		2,678
	Hosendi	1,211								1,211
	Jangalia	2,415								2,415
	Narandi	1,402								1,402
	Pakundia	929								929
	Patuabhangra	2,490								2,490
	Sukhia	1,289								1,289
Upazila Total	16,314	0	0	0	0	0	0	566	16,880	
Share	96.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	100.0%	
Tarail	Damiha			657				2,035		2,692
	Dhala			1,700				218		1,918
	Digdair		354	1,495				156		2,005
	Jawar			490				1,335		1,825
	Rauti		724	1,752						2,477
	Talganga		1,331	497						1,828
	Tarail Sachail		18	1,523						1,541
	Upazila Total	0	2,427	8,116	0	0	0	3,743	0	14,286
	Share	0.0%	17.0%	56.8%	0.0%	0.0%	0.0%	26.2%	0.0%	100.0%
District Total	71,428	10,613	33,395	11,064	1,612	40,555	72,759	566	241,992	
Share	29.5%	4.4%	13.8%	4.6%	0.7%	16.8%	30.1%	0.2%	100.0%	

Table 4.2.3 Zoning of Unions in Mymensingh District (1/3)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (901, 902, 903, 904)				North-western Plains and Basins (2202)	Northern and Eastern Piedmont (2201)	Northern and Eastern Basins (2204)	Madhupur Tract (2801)	Northern and Eastern Hills (2901)	Total	
		F1	F0	F1	F2	F3	F1	F0	F3	F0	F0		
Bhaluka	Bhaluka			399						2,795		3,195	
	Bharadoba			20						2,341		2,361	
	Birunia			1,506						1,200		2,706	
	Dakatia									6,526		6,526	
	Dhitpur			602						1,697		2,299	
	Habirbari									6,036		6,036	
	Kachina									5,649		5,649	
	Mallikbari									4,516		4,516	
	Meduary									3,447		3,447	
	Rajai			45							3,294		3,339
	Uthura										4,321		4,321
Upazila Total	0	0	2,572	0	0	0	0	0	41,823	0	44,395		
Share	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	0.0%	0.0%	94.2%	0.0%	100.0%		
Dhobaura	Baghber			504			1,007	2,742				4,253	
	Dakshin Maji Para						3,382	865				4,247	
	Dobaura			1,097			223	2,734				4,054	
	Gamaritala						1,246	2,219				3,465	
	Ghoshgaon						2,307	421				2,728	
	Guatala			2,440						647		3,087	
	Pora Kandulia			520						2,849		3,368	
	Upazila Total	0	0	4,560	0	0	8,166	12,476	0	0	0	25,202	
Share	0.0%	0.0%	18.1%	0.0%	0.0%	32.4%	49.5%	0.0%	0.0%	0.0%	100.0%		
Fulbaria	Achim Patuli			2,066						1,421		3,487	
	Bakta			1,040						2,125		3,165	
	Balian			2,592								2,592	
	Bhabanipur			1,346						1,700		3,045	
	Deokhola			1,351								1,351	
	Enayetpur			1,015						3,058		4,073	
	Fulbaria			3,542								3,542	
	Kaladaha			1,172						1,514		2,686	
	Kushmail			2,656						454		3,110	
	Naogaon			1,330						1,587		2,917	
	Putijana			2,424						528		2,952	
	Radhakanai			2,853						970		3,823	
	Rangamatia			1,942						1,710		3,651	
	Upazila Total	0	0	25,329	0	0	0	0	0	15,066	0	40,395	
Share	0.0%	0.0%	62.7%	0.0%	0.0%	0.0%	0.0%	0.0%	37.3%	0.0%	100.0%		
Gaffargaon	Barabaria	439		801								1,240	
	Char Algi	2,431										2,431	
	Datter Bazar	569		2,231						285		3,085	
	Gaffargaon	923		1,320								2,243	
	Jessora			2,200								2,200	
	Langair	26		2,517						158		2,701	
	Mashakhali			2,078						808		2,886	
	Nigair			550						3,189		3,739	
	Paithal			800						1,777		2,577	
	Panchbhag	2,319										2,319	
	Raona			3,078								3,078	
	Rasulpur	0		2,172								2,173	
	Saltia	1,543		748								2,291	
	Tengaba	1,107		9						1,998		3,114	
	Usthi	1,756		143								1,899	
	Upazila Total	11,115	0	18,648	0	0	0	0	0	8,215	0	37,978	
Share	29.3%	0.0%	49.1%	0.0%	0.0%	0.0%	0.0%	0.0%	21.6%	0.0%	100.0%		

Table 4.2.3 Zoning of Unions in Mymensingh District (2/3)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (901, 902, 903, 904)					North-western Plains and Basins (2202)	Northern and Eastern Piedmont (2201)	Northern and Eastern Basins (2204)	Madhupur Tract (2801)	Northern and Eastern Hills (2901)	Total
		F1	F0	F1	F2	F3	F1	F0	F3	F0	F0		
Gauripur	Achintapur	616		2,408									3,024
	Bhangnamari	2,389											2,389
	Bokainagar	2,827											2,827
	Dhakakhala	2,488											2,488
	Gauripur	436		1,958									2,394
	Mailakanda			2,479									2,479
	Maoha			2,771									2,771
	Paurashava	504		307									811
	Ramgopalpur	2,812											2,812
	Sahanati	1,687		1,074	10								2,771
	Sidhla			2,792									2,792
Upazila Total	13,758	0	13,790	10	0	0	0	0	0	0	0	27,558	
Share	49.9%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Halughat	Amtail			1,201						873			2,074
	Bhubankura						2,884				198		3,082
	Bildora			2,185					711				2,896
	Dhara			2,420					181				2,601
	Dhurail			1,133				182	16	1,495			2,827
	Gazir Bhita						2,858	219					3,077
	Haluaghat						3,103	1,157					4,261
	Jugli						3,497	26					3,523
	Kaichapur			19			1,199	1,385					2,603
	Narail			1,221				2,446					3,668
	Sakuai			2,080						42			2,121
Swadeshi			2,438						328			2,765	
Upazila Total	0	0	12,696	0	0	13,724	6,141	2,738	0	198		35,497	
Share	0.0%	0.0%	35.8%	0.0%	0.0%	38.7%	17.3%	7.7%	0.0%	0.6%		100.0%	
Ishwarganj	Atharabari	602				1,354							1,956
	Barahit	1,030				1,307							2,337
	Ishwarganj	2,408				169							2,576
	Jatia	392				1,882							2,274
	Magtala	716				1,558							2,274
	Maijbagh	277				2,576							2,853
	Rajibpur	2,320				258							2,578
	Sarisha	1,977				94							2,071
	Sohagi	1,864				99							1,962
	Tarundia	2,531				17							2,549
	Uchakhila	1,918				636							2,554
Upazila Total	16,035	0	0	9,949	0	0	0	0	0	0	0	25,984	
Share	61.7%	0.0%	0.0%	38.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Muktagachhia	Baragram	973		1,852									2,825
	Basati	488		2,530									3,018
	Daogaon			2,904						357			3,261
	Dulla	15		2,887					1,390				4,293
	Ghoga			2,125					590				2,715
	Kashimpur			2,997									2,997
	Kherujani			2,723									2,723
	Kumarghata	51		2,667									2,718
	Mankon	1,376		1,751									3,127
	Paurashava	473		85									558
	Tarati	2,602		880									3,481
Upazila Total	5,978	0	23,401	0	0	0	0	0	2,337	0		31,717	
Share	18.8%	0.0%	73.8%	0.0%	0.0%	0.0%	0.0%	0.0%	7.4%	0.0%		100.0%	
Mymensingh Sadar	Akua			1,330									1,330
	Ashtadhar	2,509											2,509
	Baera (Kewatkhal)	194		385									579
	Bhabkhali	1,020		2,094									3,114
	Borar Char	1,175	1,458	402									3,035
	Char Ishwardia	2,163	683										2,846
	Char Nilakshmia	3,162	92										3,254
	Dapunia			2,839									2,839
	Ghagra			3,391									3,391
	Khagdahar	935		1,770									2,705
	Kushtia	1,892		534									2,426
Paranganj	641	1,841	390									2,873	
Paurashava	607		1,537									2,144	
Sirta	658	2,311										2,969	
Upazila Total	14,956	6,385	14,673	0	0	0	0	0	0	0	0	36,014	
Share	41.5%	17.7%	40.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	

Table 4.2.3 Zoning of Unions in Mymensingh District (3/3)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (901, 902, 903, 904)					North-western Plains and Basins (2202)	Northern and Eastern Piedmont (2201)	Northern and Eastern Basins (2204)	Madhupur Tract (2801)	Northern and Eastern Hills (2901)	Total
		F1	F0	F1	F2	F3	F1	F0	F3	F0	F0		
Nandail	Achargaon	801			1,994								2,796
	Betagair	3,526			268								3,795
	Chandipasha				3,016								3,016
	Gangail				2,832	21							2,854
	Jahangirpur	3,144			56								3,201
	Kharua	1,664			772								2,436
	Moazzempur	89			2,770								2,859
	Musuli	103			2,626								2,729
	Nandail	9			3,096								3,105
	Rajgati				2,310								2,310
	Sherpur	270			1,674								1,944
	Singrail	200			2,233								2,433
	Upazila Total	9,806	0	0	23,650	21	0	0	0	0	0	0	33,477
Share	29.3%	0.0%	0.0%	70.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Phulpur	Balia			2,639									2,639
	Balikhana		534	2,244									2,778
	Banihala			2,491									2,491
	Baola			2,825									2,825
	Bhaitkandi		1,101	1,348									2,448
	Bishka	681		2,842									3,523
	Dhakuia			2,815									2,815
	Galagaon			3,022									3,022
	Kakni			2,598									2,598
	Kamargaon			2,612									2,612
	Kamaria	1,026		1,970									2,996
	Payari		108	2,567									2,674
	Phulpur			2,163					769				2,932
	Rahinganj			3,019									3,019
	Rambhadrapur	96	2,142	827									3,065
	Rampur			2,591									2,591
	Rupasi			2,764									2,764
	Sawdhara			2,269					257				2,527
	Singheshwar			2,188					1,543				3,731
Tarakanda	260	280	2,103									2,644	
Upazila Total	2,063	4,165	47,896	0	0	0	0	2,570	0	0	0	56,694	
Share	3.6%	7.3%	84.5%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	168.3%	
Trishal	Amirabari			1,217						821			2,038
	Bailar			2,571									2,571
	Bali Para	2,563		411									2,974
	Dhanikhola			3,369									3,369
	Harirampur			2,304						19			2,323
	Kanihari	1,367		1,820									3,187
	Kanthal	932		1,450									2,382
	Mathbari			3,199						605			3,805
	Mokshapur			1,098						1,647			2,745
	Rampur			2,857									2,857
	Sakhua			1,753									1,753
	Trishal			2,818							855		3,673
	Upazila Total	4,862	0	24,868	0	0	0	0	0	3,947	0	0	33,677
Share	14.4%	0.0%	73.8%	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	0.0%	0.0%	100.0%	
District Total	78,574	10,550	188,433	33,608	21	21,890	18,618	5,308	71,388	198	0	428,588	
Share	18.3%	2.5%	44.0%	7.8%	0.0%	5.1%	4.3%	1.2%	16.7%	0.0%	0.0%	100.0%	

Table 4.2.4 Zoning of Unions in Netrokona District (1/2)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (902, 903, 904)			Sylhet Basin (2104)	North-western Plains and Basins (2201)	Northern and Eastern Piedmont (2202)	Northern and Eastern Basins (2204)	Northern and Eastern Hills (2902)	Total
			F1	F1	F2	F3	F3	F1	F0	F3	
Name	Name	F1	F1	F2	F3	F3	F1	F0	F3	F0	
Apara	Baniajan			2,480							2,480
	Duaz			2,499							2,499
	Loneshwar			3,237							3,237
	Sarmaisa		1,598	1,507							3,105
	Sonai			2,609							2,609
	Sukhari			2,194		708					2,902
	Teligati			2,732							2,732
	Upazila Total	0	1,598	17,259	0	708	0	0	0	0	19,564
Share	0.0%	8.2%	88.2%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	100.0%	
Barhata	Asma			2,455		406		10			2,871
	Barhata			3,455							3,455
	Bausi		1,607	895				529			3,031
	Chhiram			1,339		1,580					2,919
	Roypur		1,246					1,743			2,988
	Sahata		735	2,801							3,536
	Singdha			2,696		279					2,976
	Upazila Total	0	3,588	13,641	0	2,265	0	2,281	0	0	21,775
Share	0.0%	16.5%	62.6%	0.0%	10.4%	0.0%	10.5%	0.0%	0.0%	100.0%	
Durgapur	Bakaljora						762	2,930			3,692
	Birisiri						2,346	0			2,347
	Chandigarh						1,820	3,044			4,863
	Durgapur						2,021	987		700	3,708
	Gaokandia						820	3,516			4,336
	Kakaigara		446				1,143	2,517			4,105
	Kullagora						2,985	591		486	4,062
	Upazila Total	0	446	0	0	0	11,897	13,586	0	1,185	27,114
Share	0.0%	1.6%	0.0%	0.0%	0.0%	43.9%	50.1%	0.0%	4.4%	100.0%	
Kalmakanda	Bara Kharpan					4,040		123			4,163
	Kailati						3	5,480			5,483
	Kalmakanda					4,457		1,689	212		6,358
	Kharnai						618	3,615			4,232
	Lengura						2,456	565		457	3,478
	Nazirpur						737	3,838			4,575
	Pogla		62	0		1,747		2,729			4,539
	Rangchhati					544		3,174	2,015		5,733
Upazila Total	0	62	0	0	10,788	3,813	21,213	2,227	457	38,562	
Share	0.0%	0.2%	0.0%	0.0%	28.0%	9.9%	55.0%	5.8%	1.2%	100.0%	
Kendua	Asujia		136	2,195							2,331
	Balashimul			2,912							2,912
	Chirang			40	2,060						2,100
	Dalpa		1,546	746							2,292
	Ganda	140		1,709							1,849
	Garadoba	15	150	2,450							2,616
	Kandiura			914	1,533						2,447
	Mashka			2,015	631						2,646
	Muzaffarpur			185	2,394						2,580
	Noapara			1,900	273						2,173
	Paikura			1,492	977						2,469
	Roailbari			1,443	969						2,412
	Sandikona			2,067	121						2,188
Upazila Total	155	1,832	20,068	8,959	0	0	0	0	0	31,014	
Share	0.5%	5.9%	64.7%	28.9%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	
Khaliajuri	Chakua					7,022					7,022
	Gazipur					4,739					4,739
	Khaliajuri					5,090					5,090
	Krishnapur					2,367					2,367
	Mendipur			59		4,775					4,835
	Nagar					3,676					3,676
	Upazila Total	0	0	59	0	27,668	0	0	0	0	27,727
Share	0.0%	0.0%	0.2%	0.0%	99.8%	0.0%	0.0%	0.0%	0.0%	100.0%	

Table 4.2.4 Zoning of Unions in Netrokona District (2/2)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (902, 903, 904)			Sylhet Basin (2104)	North-western Plains and Basins (2201)	Northern and Eastern Piedmont (2202)	Northern and Eastern Basins (2204)	Northern and Eastern Hills (2902)	Total
			F1	F1	F2	F3	F3	F1	F0	F3	
Madan	Fatehpur			894	7	2,694					3,594
	Gobindasree					3,598					3,598
	Jahangirpur			1,440		285					1,725
	Kaitail			3,169	164						3,333
	Madan			1,110		1,599					2,709
	Maghan					3,335					3,335
	Nayekpur			2,317	181	101					2,600
	Tiasree			977		1,273					2,250
	Upazila Total	0	0	9,907	352	12,885	0	0	0	0	23,145
Share	0.0%	0.0%	42.8%	1.5%	55.7%	0.0%	0.0%	0.0%	0.0%	100.0%	
Mohanganj	Bakshia Birampur			2,189							2,189
	Baratali Banihari			2,149		525					2,674
	Gaglajore					4,706					4,706
	Maghan Siadhar			981		2,628					3,609
	Paurashava			751							751
	Samaj Sahildeo			3,240							3,240
	Suair			1,381		1,769					3,150
	Tentulia			15		3,844					3,859
	Upazila Total	0	0	10,705	0	13,473	0	0	0	0	24,178
Share	0.0%	0.0%	44.3%	0.0%	55.7%	0.0%	0.0%	0.0%	0.0%	100.0%	
Netrokona Sadar	Amtala		621	2,003							2,624
	Challisha		2,591								2,591
	Dakshin Bishiura		2,220								2,220
	Kailati		2,655	65							2,719
	Kaliara Gabragat		1,317				2,499				3,816
	Lakshmiganj		2,197								2,197
	Madanpur		1,602	638							2,240
	Maugati		2,644								2,644
	Medni		2,448	55							2,503
	Paurashava		656	700							1,356
	Rauha		2,600								2,600
	Singhar Bangla		1,449	1,069							2,518
	Thakurakona		2,968								2,968
	Upazila Total	0	25,968	4,530	0	0	0	2,499	0	0	32,997
Share	0.0%	78.7%	13.7%	0.0%	0.0%	0.0%	7.6%	0.0%	0.0%	100.0%	
Purbadhala	Agia		2,696								2,696
	Bairati		2,428								2,428
	Bishkakuni		2,856								2,856
	Dhala Mulgaon		3,147				359				3,506
	Ghagra		2,704				919				3,623
	Gohalakanda		2,477								2,477
	Hogla		3,419								3,419
	Jaria		1,302				1,702				3,003
	Khalishaur		2,927								2,927
	Narandia		2,217								2,217
	Purbadhala		2,458								2,458
	Upazila Total	0	28,631	0	0	0	0	2,979	0	0	31,610
	Share	0.0%	90.6%	0.0%	0.0%	0.0%	0.0%	9.4%	0.0%	0.0%	100.0%
	District Total	155	62,125	76,170	9,311	67,786	15,710	42,559	2,227	1,642	277,685
Share	0.1%	22.4%	27.4%	3.4%	24.4%	5.7%	15.3%	0.8%	0.6%	100.0%	

Table 4.2.5 Zoning of Unions in Sherpur District (1/1)

Upazila	Union	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (901, 902)		North-western Plains and Basins (2202)	Northern and Eastern Piedmont (2201)	Northern and Eastern Basins (2204)	Northern and Eastern Hills (2901)	Total
			F0	F1					
Jhenaigati	Hatibandha Malijhikanda			2,061	601		721		3,383
	Jhenaigati			824	2,364				3,187
	Kangsa Dhansail			427	3,517			4,144	8,088
	Nalkura Gauripur				4,570			1,403	5,973
	Upazila Total	0	0	3,311	11,052	0	721	5,547	20,632
	Share	0.0%	0.0%	16.0%	53.6%	0.0%	3.5%	26.9%	100.0%
Nakla	Baneshwardi		1,308	535					1,843
	Chandrakona	247	1,722	80					2,049
	Char Ashtadhar	996	1,038						2,034
	Ganapaddi		8	2,057					2,065
	Kursa Badagair		86	1,772					1,858
	Nakla			1,793			365		2,157
	Pathakata		1,395	345					1,740
	Talki		527	939					1,465
	Urpha			1,175			785		1,960
	Upazila Total	1,243	6,084	8,694	0	0	1,150	0	17,171
Share	7.2%	35.4%	50.6%	0.0%	0.0%	6.7%	0.0%	100.0%	
Nalitabari	Baghber Kalaspar			2,264	2,582		1,783		6,629
	Jogania			622	453		1,893		2,967
	Nalitabari Kakarkandi				4,938				4,938
	Nunni Poragaon				3,414			1,828	5,242
	Rajnnagar				1,778		828		2,607
	Ramchandrakura Mandali				4,596			1,137	5,732
	Upnarayanakura Marichpu			27	2,938	93	1,484		4,542
	Upazila Total	0	0	2,912	20,699	93	5,989	2,964	32,657
Share	0.0%	0.0%	8.9%	63.4%	0.3%	18.3%	9.1%	100.0%	
Sherpur Sadar	Bajitkhila			1,551					1,551
	Balair Char	87	2,313						2,400
	Bhatsala		1,344	1,133					2,477
	Char Mucharia	1,528	1,018						2,546
	Char Pakshimari	2,422	376	0					2,798
	Char Sherpur	3	2,929	48					2,980
	Dhala			1,666					1,666
	Ghazir Khamar			1,636					1,636
	Kamarer Char	982	1,549						2,531
	Kamaria		2,220	732					2,952
	Lakshmanpur	608	1,324						1,932
	Pakuria			2,763					2,763
	Paurashava		1,441	1,034					2,475
	Rauha Betmari	2,950	1,251						4,201
Upazila Total	8,580	15,765	10,563	0	0	0	0	34,908	
Share	24.6%	45.2%	30.3%	0.0%	0.0%	0.0%	0.0%	100.0%	
Sreebardi	Bhelua		2,685						2,685
	Garjaripa			1,557					1,557
	Gosaipur			1,307	608				1,915
	Kakilakura		732		1,899				2,632
	Kharia Kazir Char		1,036	940	280				2,256
	Kurikahania			1,745	12				1,757
	Rani Shimul				3,632		477		4,109
	Singa Baruna				1,437		2,166		3,603
	Sreebardi		1,673		650				2,324
	Tantihati		214		2,530				2,744
	Upazila Total	0	6,341	5,549	11,050	0	0	2,643	25,583
Share	0.0%	24.8%	21.7%	43.2%	0.0%	0.0%	10.3%	100.0%	
District Total		9,823	28,189	31,030	42,801	93	7,860	11,154	130,950
Share		7.5%	21.5%	23.7%	32.7%	0.1%	6.0%	8.5%	100.0%

Table 4.2.6 Zoning of Unions in Tangail District (1/2)

Upazila	Union	Active Brahmaputra-Jamuna (7)	Young Brahmaputra and Jamuna (802)	Old Brahmaputra Floodplain (902, 903)		Madhupur Tract (2801)	Total
				F1	F2		
Name	Name	F1	F1	F1	F2	F0	
Basail	Basail				2,544		2,544
	Fulki		1,130		1,637		2,767
	Habla		2,512		103		2,615
	Kanchanpur		206		2,757		2,963
	Kaoaljani				2,130		2,130
	Kashil		1,453		923		2,376
	Upazila Total	0	5,301	0	10,094	0	15,395
	Share	0.0%	34.4%	0.0%	65.6%	0.0%	100.0%
Bhuapur	Arjuna	1,737	1,654				3,391
	Birhati		2,398				2,398
	Falda		2,277				2,277
	Gabsara	4,308	1,199				5,508
	Gobindasi	26	2,225				2,251
	Nikrail	1,770	933				2,703
	Upazila Total	7,842	10,686	0	0	0	18,528
	Share	42.3%	57.7%	0.0%	0.0%	0.0%	100.0%
Delduar	Atia		2,326				2,326
	Delduar		2,408				2,408
	Deoli	7	1,526				1,533
	Dubail		2,110				2,110
	Elasin		2,259				2,259
	Fazilhati		1,970				1,970
	Lauhati		2,755				2,755
	Pathrail		1,753				1,753
	Upazila Total	7	17,107	0	0	0	17,114
Share	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	
Ghatail	Anehola		2,325				2,325
	Deopara			1,029	297	2,615	3,941
	Deulabari		1	2,513		119	2,633
	Dhala Para			1,972		5,581	7,553
	Digalkandi		2,102	603			2,705
	Digar		16	1,912	424	504	2,856
	Ghatail		76	2,183		210	2,470
	Jamuria		723	1,580		128	2,432
	Lakher Para		1,787	94			1,881
	Rasulpur			601		8,591	9,191
	Sandhanpur			1,836		5,625	7,461
	Upazila Total	0	7,030	14,322	721	23,374	45,449
Share	0.0%	15.5%	31.5%	1.6%	51.4%	100.0%	
Gopalpur	Alamnagar		1,934				1,934
	Dhopakandi		328	1,953			2,281
	Hadira		1,877	694			2,571
	Hemnagar		2,195				2,195
	Jhaoil		2,772				2,772
	Mirzapur		2,136	20			2,156
	Nagda Simla		2,626	22			2,648
	Paurashava		2,016	236			2,252
	Upazila Total	0	15,883	2,926	0	0	18,808
Share	0.0%	84.4%	15.6%	0.0%	0.0%	100.0%	
Kalihati	Balla		87		1,340		1,428
	Bangra		2,012				2,012
	Bir Basunda			1,523	1,859	138	3,520
	Durgapur	2,403	2,097				4,499
	Elenga		2,123				2,123
	Kalihati		1,182	131	206		1,519
	Kok Dahara		1,433		664		2,097
	Nagbari			430	1,845	131	2,405
	Narandia		2,574				2,574
	Paikara		1,730		234		1,964
	Sahadebpur		1,915				1,915
	Salla		2,653				2,653
	Upazila Total	2,403	17,806	2,084	6,147	269	28,709
Share	8.4%	62.0%	7.3%	21.4%	0.9%	100.0%	

Table 4.2.6 Zoning of Unions in Tangail District (2/2)

Upa zila	Union	Active Brahmaputr a-Jamuna (7)	Young Brahmaputr a and Jamuna (802)	Old Brahmaputra Floodplain (902, 903)		Madhupur Tract (2801)	Total	
				F1	F2			F0
Na me	Name	F1	F1	F1	F2	F0		
Madhupur	Alokdia			2,203		1,571	3,774	
	Arankhola			353		19,188	19,541	
	Ausnara			1,558		5,381	6,940	
	Birtara		1,569	1,260			2,829	
	Dhanbari		30	3,441		198	3,669	
	Dhopakhali			1,579			1,579	
	Golabari			59	2,537		2,596	
	Madhupur			2,498		770	3,268	
	Musuddi			2,338			2,338	
	Paiska			1,817	850		2,667	
	Upazila Total		0	5,814	16,278	0	27,108	49,199
	Share		0.0%	11.8%	33.1%	0.0%	55.1%	100.0%
Mirzapur	Ajgana		446		153	4,852	5,452	
	Anaitara		2,405				2,405	
	Bahuria		2,862				2,862	
	Banail		2,360				2,360	
	Banshtail					4,782	4,782	
	Bhatgram		1,957				1,957	
	Fatehpur		1,442		990		2,431	
	Gorai		1,677			1,240	2,917	
	Jamurki		2,111				2,111	
	Mahera		1,823		0		1,823	
	Mirzapur		1,569		65		1,634	
	Tarafpur				647	2,621	3,268	
Uarsi			2,812			2,812		
Upazila Total		0	21,462	0	1,856	13,495	36,812	
Share		0.0%	58.3%	0.0%	5.0%	36.7%	100.0%	
Nagarapur	Bhadra		2,159				2,159	
	Bhara	2,461	792				3,253	
	Dhubaria	6	1,265				1,271	
	Duptiair	199	2,350				2,548	
	Gayhata	551	1,639				2,190	
	Mamudnagar		3,277				3,277	
	Mokhna		2,263				2,263	
	Nagarapur		2,065				2,065	
	Pakutia		1,673				1,673	
	Sahabatpur		1,965				1,965	
	Salimabad	790	1,310				2,100	
	Upazila Total	4,007	20,758	0	0	0	24,765	
Share	16.2%	83.8%	0.0%	0.0%	0.0%	100.0%		
Sakhipur	Baheratail			579		3,820	4,399	
	Gazaria			495		7,274	7,769	
	Hatibandha			1,179		5,174	6,353	
	Jadabpur			379		10,805	11,184	
	Kakrajan			630	81	5,778	6,488	
	Kalia					7,093	7,093	
	Upazila Total	0	0	630	2,713	39,943	43,286	
Share	0.0%	0.0%	1.5%	6.3%	92.3%	100.0%		
Tangail Sadar	Baghil	47	1,923				1,971	
	Danya	66	1,713				1,779	
	Gala		1,656				1,656	
	Gharinda		1,994				1,994	
	Hugra	2,528	122				2,649	
	Kakua	3,245	49				3,294	
	Karatia		1,937				1,937	
	Katuli	4,083	84				4,167	
	Magra	133	2,001				2,133	
	Paurashava		2,854				2,854	
	Porabari	285	1,124				1,409	
	Silimpur	139	1,533				1,672	
Upazila Total	10,525	16,990	0	0	0	27,515		
Share	38.3%	61.7%	0.0%	0.0%	0.0%	100.0%		
District Total	24,784	138,837	36,240	21,531	104,189	325,580		
Share	7.6%	42.6%	11.1%	6.6%	32.0%	100.0%		



Fig. 4.1.1 Elevation Map of the Study Area

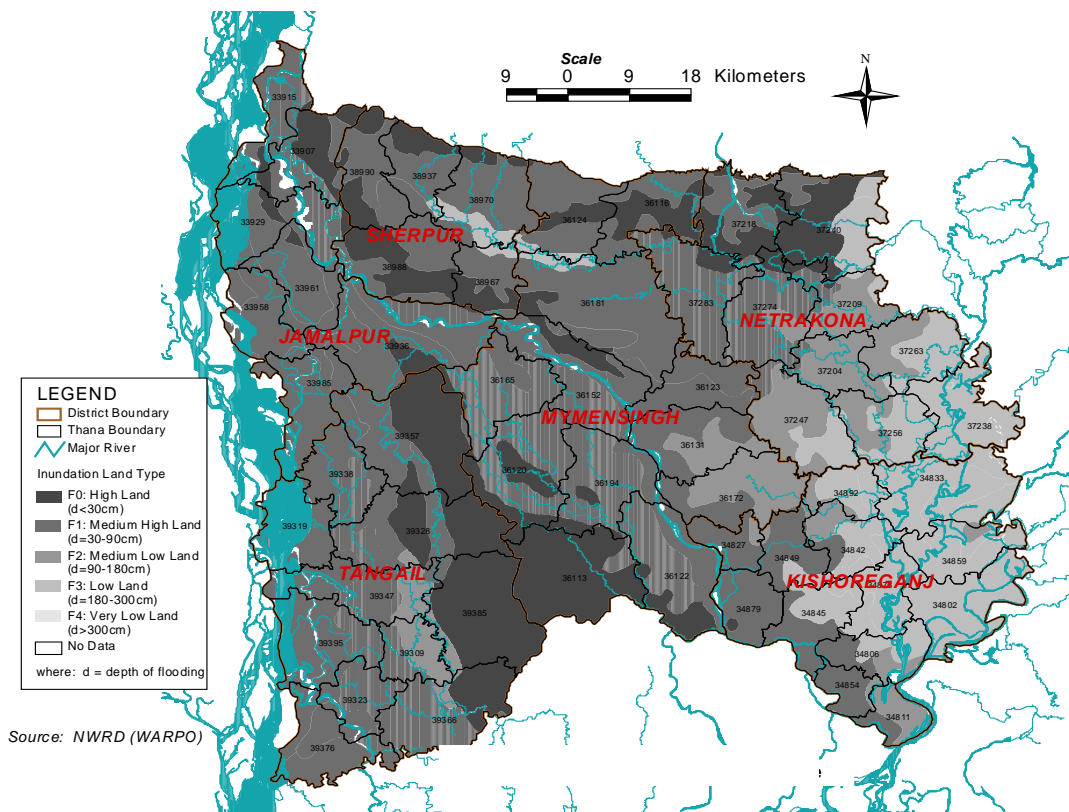


Fig. 4.1.2 Inundation Land Classification

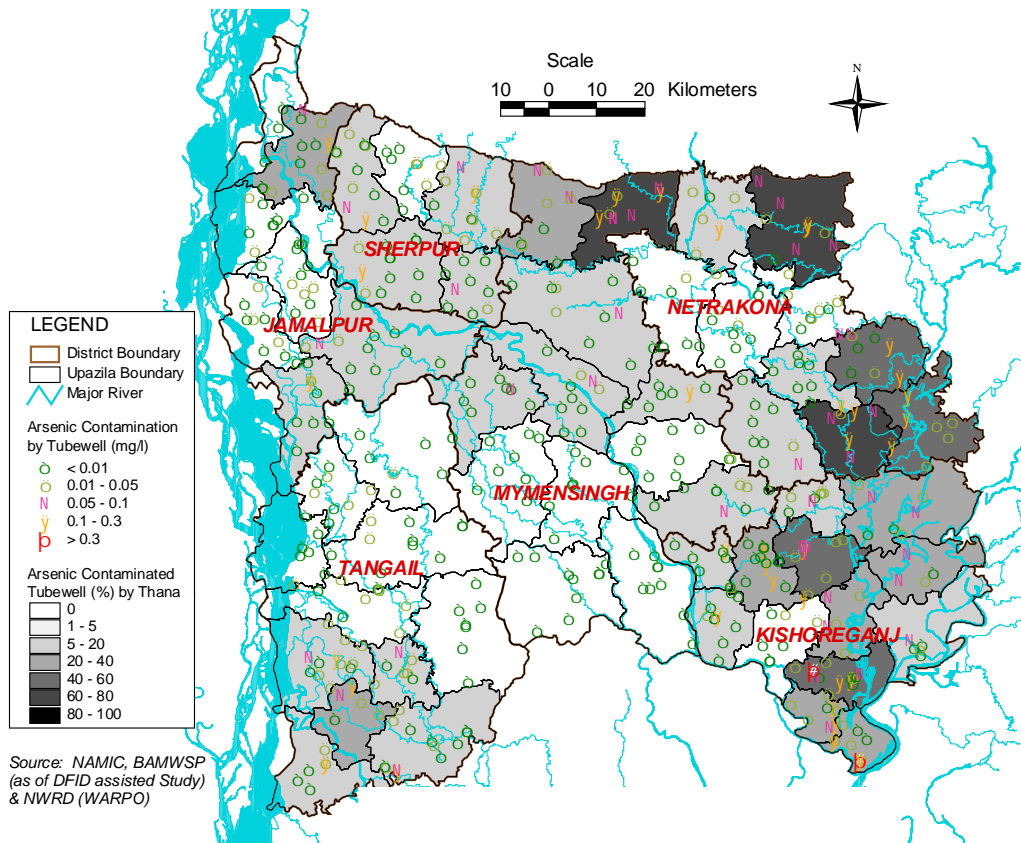


Fig. 4.1.3 Arsenic Contamination Upazilas in the Study Area

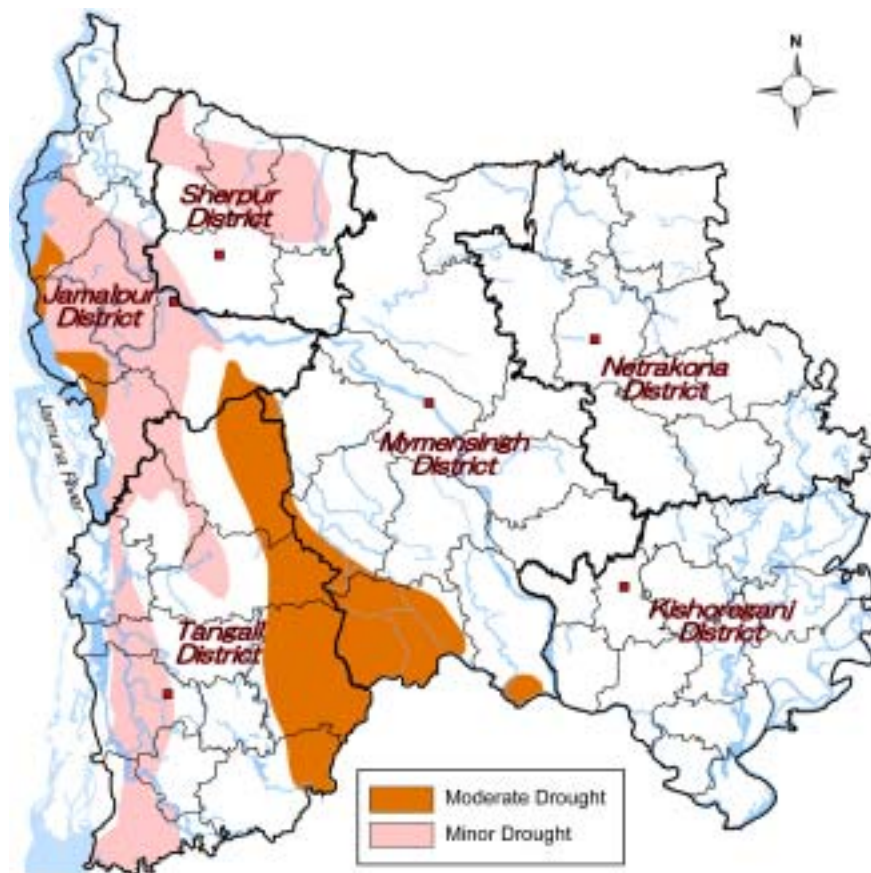


Fig. 4.1.4 Drought Prone Area in the Study Area



Fig. 4.1.5 Agroecological Zones in the Study Area



Fig. 4.1.6 Zones of the Study Area

ANNEX 5

**PROBLEM ANALYSIS AND UNION
QUESTIONNAIRE SURVEY**

ANNEX 5: PROBLEM ANALYSIS AND UNION QUESTIONNAIRE SURVEY

TABLE OF CONTENTS

5.1	Problems Identified through the Workshops / Interviews in the Study Area -----	A5 - 1
5.1.1	Problems Identification Workshops of Government Officials -----	A5 - 1
5.1.2	Problem Identification Workshops of Subproject Areas -----	A5 - 3
5.1.3	Interview Survey in the Study Area -----	A5 - 14
5.1.4	Summary of Problems Identified through Workshops and Interviews-----	A5 - 20
5.2	Union Questionnaire Survey -----	A5 - 22
5.2.1	Objectives and Methodology -----	A5 - 22
5.2.2	Questionnaire -----	A5 - 22
5.2.3	Agricultural Problems in Union Questionnaire -----	A5 - 23
5.3	Questionnaire Survey to Upazila Engineers -----	A5 - 30
5.3.1	Distribution -----	A5 - 30
5.3.2	Summary of Answers to the Questionnaires -----	A5 - 30

A 5 PROBLEM ANALYSES AND UNION QUESTIONNAIRE SURVEY

5.1 Problem Identified through the Workshops/Interviews in the Study Area

5.1.1 Problem Identification Workshops of Government Officials

District-level workshops were held at each of six districts in Greater Mymensingh from August 29 to 7 September 2004. Each workshop took about two hours with the participation of Executive Engineer, Assistant Engineer-SSWRDSP-2, Socio-economist-SSWRDSP-2, Upazila Engineers, some Community Organizers and related Union Parishad (UP) Chairmen.

(1) Problem Analysis at Tangail District

Date: 29 August 2004 Sunday
Participants:
Direct causes: Agricultural production is low.
Many villagers cannot get job.
Income opportunity for village women is low.
Many villagers don't have land.
Low opportunity for alternative income sources
Villagers cannot sell their crops at good price.
People are not getting based on their profession.
Specific problems: Villagers' illiterate rate is low.
Many villagers grow same crops.



(2) Problem Analysis at Mymensingh District

Date: 31 August 2004 Tuesday
Participants:
Direct causes: Little job opportunity for villagers.
Farmers do not get good price for crops.
Agricultural production is low.
Farm labors do not get proper wage.
Specific problems: Land is not adequately used. / Low level of diversified usages of land.
Land is not fertile.
Farmers are not organized.



(3) Problem Analysis at Sherpur District

Date: 1 September 2004 Wednesday
Participants:
Direct causes: Landless farmers have difficulty in finding farming jobs.
Agricultural production is low.
Farmers cannot get good price of agricultural products.
Fishery production is low.
Villagers' job opportunity other than farming sector is low.
Opportunity of income generating activities for village women is low.
Specific problems: Land is not fully utilized.
Many water bodies are not fully utilized.
Many villagers suffer from malnutrition.



(4) Problem Analysis at Netrakona District

Date: 4 September 2004 Saturday

Participants:

Direct causes:

1. (50%) Villagers' job opportunity is low.
2. (30%) Agricultural production is low.
3. (20%) Villagers can't sell their products at good prices.



Many villagers are not willing to work.
Village population is too high. (Not fully discussed.)

Specific problems: Cultivable land is not enough.
Land fertility is low.
Villagers are not using high yield variety seeds.
Crop nursing such as weeding is not enough.
Villagers cannot store the produced crops.

(5) Problem Analysis at Kishoreganj District

Date: 5 September 2004 Sunday

Participants:

Direct causes:

- 1 (50%) Agricultural production is low.
- 2 (20%) Villagers do not have enough jobs available.
3. (10%) Fishery production is low.

Production cost of rice is high.
Lack of knowledge of income.



Specific problems: Canals are not dug.
Availability of fertilizer is inadequate.
Availability of pesticide is inadequate.
Villagers cannot store their produced crops.
Quality of products is low.

(6) Problem Analysis at Jamalpur District

Date: 7 September 2004 Tuesday

Participants:

Direct causes:

1. (50%) Agricultural production is low.
2. (30%) Not many income generating activities in the village.
3. (10%) Fish production is low.

Villagers do not get good price of their produce.
Villagers do not get job other than agriculture.

Specific problems: Use of agrochemicals for agriculture damages fishes.
Fishermen use current-net.
Land per capita is small.
Land fertility is reducing.
Farmers are not using manure.
Farmers cannot get high yield variety seeds.
Steal of products.

5.1.2 Problem Identification Workshops of Subproject Areas

Union- and WMCA-level workshops were held at 13 unions and WMCAs from 9 September to 26 September 2004. Each workshop took about three hours to four hours. Arrangement of the workshops was kindly made by the UP Chairman or WMCA Chairman through Upazila Engineer and District Socio-economist. Since the intention of the Study Team was not conveyed fully, there were no women in some workshops and also there were more than 600 participants, which were a little too many, in some workshops.

Selection of the workshop sites was done through zoning of the Upazilas in Greater Mymensingh using elevation data and gross cropped area data of *Census of Agriculture-1996* so that each site not only represent the district but also a zone.

(1) Problem Analysis at Ratanganj Village, Nagbari Union, Kalihati Upazila, Tangail District (Ratanganj Subproject: passed)

Date: 9 September 2004 Thursday
Participants: 50-60 (no woman) including WMCA Chairman

Socio-economist (Tangail), Assistant Engineer- SSWRDSP-2 (Tangail), Team Leader, Rural sociologist- participatory planning, Gender specialist, and Participatory workshop specialist.



Direct causes: 1. (50%) Agricultural production is low.
2. (20%) Low work opportunity in this area.
Few women can find jobs / work.
People cannot find good job other than agriculture.
3. (5%) Low fishery production.
Low working opportunity in rainy season.
They cannot work at night on tant.
Expenditure is large.
Villagers cannot do livestock in flood.

Specific problems: Farmers can cultivate only one crop a year.
Female are not aware of their rights.
No electricity in 3 villages.
Lack of training in fish production.
Grassland is small especially in flood.

Observations:

- 3 tantis stated that they can increase their income if they can work a night.
- Farmers perceived that sand in the farmland is a big problem they are facing every year, especially during *boro*.
- As sand comes with the flood water flow, many lands get sandy and cannot be cultivated, and also land preparation cost gets high even if some farmland could be cultivated.
- The participants in the workshop have opined that the project (SSWRDSP-2) would benefit them to a great extent, especially in agriculture.

(2) Problem Analysis at Rasulpur Community School, Rasulpur Union, Ghatail Upazila, Tangail District (Doli Beel – Atarochura Subproject: failed by reconnaissance)

Date: 10 September 2004 Friday
Participants: 600-700 (40-50 women) including UP Chairman

Socio-economist (Tangail), Assistant Engineer-SSWRDPSP-2 (Tangail), Upazila Engineer-Ghatail, Team Leader, Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist



Direct causes: 1. Villagers cannot market their crop products.
2. Agricultural production is low.
3. It is difficult to find jobs / work in the area.
It is difficult to drive van and rickshaw in rainy season.
Villagers cannot work hard.
Family size is big.
Fishery production is low.
Women cannot earn.
Know little about different income sources.
Nobody in the family to earn (no adult male).
Expenditure is large.

Specific problems: Labors in the area are excess.
Villagers are suffering from malnutrition.
Villagers do not have good knowledge of family planning.
No space to keep poultries in the house.

Observations:

- People, sitting or standing in the different corners in the meeting were asked several times, but no significant participation from them was observed.
- It seems like that the UP Chairman tried to use this workshop for his own political interests.
- Among the participants, limited people discussed and talked about problems. Others were mostly listening.

(3) Problem Analysis at Char Mohua Danga Government Primary School, Kendua Union, Jamalpur Sadar Upazila, Jamalpur District (Tetulia – Sadarbari Subproject: passed)

Date: 11 September 2004 Saturday
Participants: 100-110 (30-40 women) including UP Chairman

Assistant Engineer-SSWRDPSP-2 (Jamalpur), Team Leader, Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist



Direct causes: Agricultural production is low.
Villagers cannot get good profit for products.
Fish production is low.
Works are not available in flood.
Livestock production is low.
Livestock need to be sold at cheap price.
Lack of employment opportunities in village.
Expenditure is large.
No income generating person in the family.

Specific problems: Homestead trees / vegetables die.
Vegetables get rotten.
Fishes go away from the ponds.
Houses need to be repaired every year.
Large amount of dowry. (Tk. 20,000-30,000)
NGOs' interest rate for loan is high.
Villagers are taking multiple loans.

Observation:

- Among the participants, limited number of people discussed and talked about problems and others were mostly listening.
- Many of the participants were not clear about the proposed interventions as well as the WMCA. Some of them also heard little about the contribution money that to be collected from the beneficiaries. (About 5-6 people wanted to know about the contribution money issue; and some also wanted to know about their monthly amount to be deposited to WMCA. They added that they know about the total amount to be given.)
- One participant from *Jalali Para* raised his voice and said that many landless live on the *khas (government)* land; and if the project is implemented, these people will be forced to leave their homes.
- One of the participants has stated that the project might have negative impacts to some areas as some other lands might be water logged if a drainage canal is not dug.
- As many people started to ask questions about the proposed subproject and raised related confusions, the AE (SSWRDSP-2, Jamalpur) came to the board and sketched the design of the proposed interventions. He talked about the interventions and also a little bit about the WMCA. The people were complaining that they had not discussed detail about the project. He answered many of the questions about the project to the participants.

(4) Problem Analysis at Birhalka Government Primary Shool, Chukaibari Union, Dewanganj Upazila, Jamalpur District (Bagid Beel Subproject: PRA failed)

Date: 12 September 2004 Sunday
Participants: 600-700 (40-50 women) including UP Chairman
Assistant Engineer- SSWRDSP-2 (Jamalpur), Team Leader, Rural Sociologist -Participatory Planning, Gender specialist, and Participatory Workshop Specialist



Direct causes:

1. Agricultural production is low.
2. Fish production is low.
3. Villagers cannot find jobs / work.
4. Livestock production is low.
5. Family expenditure is large.

Villagers cannot market agricultural and fishery products.
Villagers cannot get good price of agricultural Products.
Villagers cannot sell timber.

Specific problems: Flood water causes diseases of fish.
There are not enough grassland.
Erosion often occurs.
Need to pay agricultural Labor ASAP.
Safe drinking water is not available.
Dowry is expensive. (Tk. 20,000-100,000)

Large expenditure for judicial matters.

Observations:

- Though a few people were taking part in discussing problems; there were also some voices from different corners, of different groups, among the participants.
- One woman said “selling timbers could increase our income, if we are able to plant trees and protect the trees from damages.”
- An old man said “we have too many water related diseases.” “Also sanitation is not good and that is raising family medical expenditure high”, later he added.
- A middle-age farmer (supported by a few others sitting next to him) said “Legal matters and related dealings are expensive. We take many loans and cannot pay back in time. So we have to deal with the legal affairs to avoid going to jail. We pay money to layers and to relevant departments.”
- A few young participants (4-5 together) stated “Dowry is very significant and a big problem in the area”. They added “We understand that it is bad, but we give and accept it anyway”.

(5) Problem Analysis at Char Hossainpur Government Primary Shool, Iswanganj Union, Iswanganj Upazila, Mymensingh District (Goria Beel Subproject: passed)

Date: 16 September 2004 Thursday

Participants: 100-120 (25-30 women) including WMCA Chairman but not UP Chairman
Assistant Engineer-SSWRDPSP-2 (Mymensingh), Sub-Assistant Engineer (Iswanganj), Facilitator (Iswanganj), Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist



Direct causes: 1. It is difficult to find jobs / work.
2. Agricultural production is low.
Family expenditure is large.
Per capita cultivable land is small.
100% women do not have work to earn.

Specific problems: Electricity does not cover all the villages.
Heavy rain often occurs.
Insects break out.
No water in the canal from 3rd week of Feb. to 3rd week of Apr.
No water in shallow tube wells from 3rd week of Feb. to 3rd week of Apr.
Early childhood marriage.
Many people get married many times.
Villagers are building houses in agricultural land.

Observations:

- The participants were not that much aware of the terms and conditions of the WMCA. Especially, the case is true more for the women.
- One participant from outside of the window stated “Rain trees are damaging the crops and reducing soil fertility”.
- An aged farmer said “People are building houses in the agricultural land as the number of the households is increasing”.
- One woman stood up and said “Women do not have work to earn, because they do not have land to cultivate”. (She was asked that if there is land for her would she cultivate; she replied “Yes”.)

- One woman said “Many people get married many times and it is contributing in large family where expenditure is larger”.
- Few participants stated that they are vulnerable to the distance of the medical treatment facilities from their village.

(6) Problem Analysis at Jatia UP Office, Jatia Union, Iswanganj Upazila, Mymensingh District (Digha Beel Subproject: appraisal failed)

Date: 17 September 2004 Friday

Participants: 45-50 (1 woman) but no UP Chairman and UP members

Assistant Engineer-SSWRDPSP-2 (Mymensingh), Sub-Assistant Engineer (Iswanganj), Facilitator (Iswanganj), Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist

Direct causes: 1. Agricultural production is low. (13 persons)

2. About a half of the villagers can't find jobs / work (8 persons).

Women cannot earn.

Family expenditure is large.

Specific problems: Many villagers are landless.

Supply of developed seeds is low.

Family members are increasing.



Observations:

- A few *shomaj* elders took part in the workshop. Presence of young participants was significant. There was only one woman among the participants and she happened to be a UP member.
- A consensus could not be reached about their most priority problem among the direct causes discussed in the workshop, and the same could be referred to the 2nd level problem priorities.
- At the end of the workshop, one fisherman joined the workshop and said “If the project is implemented, it will cause suffering to many poor fishermen. It will have negative impact to their livelihood”.
- There were arguments both for and against the project at the end of the workshop; and was very significant.
- Two landless farmers said “We are seasonally unemployed. We work as farm labors, but we have no work to do other than planting and harvesting seasons”.
- Many people supported the subproject, but some opposed at the same time. It seems like that people had confusion about the subproject and scared of the conflict that might happen if the subproject would be implemented.
- One person added that people living around the *beel* area would be adversely affected if LGED implements the subproject. In that case, they will not be able to fish anymore in the *beel* (*Khas* land). Their source of income is fishing and they also consume fishes. These people are the poorer section of the area.

(7) Problem Analysis at Pubro Para, Pakuria Village, Pakuria Union, Sherpur Sadar Upazila, Sherpur District (Gaowa Beel – Dhurungi Beel Subproject: appraisal failed)

Date: 18 September 2004 Saturday

Participants: 40-50 (2 women) including UP Chairman Socio-economist (Sherpur), Assistant Engineer-SSWRDPSP-2 (Shepur), Rural Sociologist-Participatory Planning,



- Gender Specialist, and Participatory Workshop Specialist
- Direct causes: 1. Agricultural production is low.
2. Fish production is low.
3. Villagers cannot make money from trees.
It is difficult to take agri-fish products to market.
Women cannot make money from poultry.
Women cannot work.
- Specific problems: Heavy rain occurs.
Flash flood comes from hill.
Villagers catch fingerlings.
Seedbeds of trees are washed away.
Many fruits are damaged before ripened.
Women cannot go to distance (1 hour) place.
- Observations:
- Many people among the participants were able to participate in discussing the problems.
 - "Flash flood from hills" is perceived to be one of the major problems in the workshop. Many participants have talked about it. The participants seem to be vulnerable to "Flash flood".
 - Though women were few in numbers among the participants, they took active part about women work related problems.
 - Both the women said "It is very difficult for us to go to distant places for work. When they were asked that what distance, they replied about one hour distance.
 - A participant said "It is difficult for women to do poultry. Ducks swim in the *beel* water polluted by flash floods and they get diseases. Many of them eventually die". (Present women agreed to that participant.)
 - A participant said "Many of our fishes die in the area because of the red water, which comes from the hills during flash floods, and is poisonous. This also responsible for damages of the fish eggs."
 - UP Chairman added "Many of us catch fingerlings and that is one of the main reasons for low fish production in the area".

(8) Problem Analysis at Marichpuran Union, Nalitabari Upazila, Sherpur District (Hushikhali Khal Subproject: passed)

Date: 19 September 2004 Sunday
Participants: 120-150 (1 woman) including UP Chairman and a UP member (woman) Socio-economist (Sherpur), Upazila Engineer (Nalitabari), Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist



- Direct causes: Villagers of the area do not have work.
Agricultural production is low.
Fish production is low.
Low income from livestock.
Family expenditure is large.
- Specific problems: Electricity does not cover all the area.
Many villagers cannot pull rickshaw-van.
River erosion often occurs.
Cultivable land is decreasing.
Many villagers are landless.
Villagers cannot get proper med-care for livestock.
Villagers cannot get enough rice from sharecropping.

Observations:

- Only few participants took active part in the discussion; the rest were mostly listening.
- One of the participants, who would lose land if the subproject is implemented, stated that no satisfactory compensation would be given to him. He said “The proposed structure of the subproject will take place on my land and I am going to lose the land”. The SoE told him that SSWRDSP-2 personnel had talked to him about the compensation issue before, but he replied “I can somehow manage the food from my land for my family every year. The compensation money, however, will be finished soon, then what I do and how do I live? The local price of the land is not enough for compensation”. The UE added “Government will do this subproject for the betterment of the area and government is stronger than public”.

(9) Problem Analysis at Noya Beel Union, Nalitabari Upazila, Sherpur District (Dudkura Khal Subproject: reconnaissance failed)

Date: 19 September 2004 Sunday

Participants: 50-60 (4 women) including UP Chairman, Socio-economist (Sherpur), Upazila Engineer (Nalitabari), Rural Sociologist-Participatory Planning, Gender Specialist, and Participatory Workshop Specialist



Direct causes:

1. (80%) Agricultural production is low.
2. (30%) Agriculture is the only income source in the area.
3. (5%) Villagers cannot get good price of products. (Agri, fish and livestock)
4. (3%) Villagers cannot make money from livestock. Fish production is low.

Specific problems:

- River erosion often occurs.
- Flash flood comes from hills.
- There are stones within 15-20 feet. (Farmers cannot use deep tube wells.)
- Embankment of river breaks.
- Digging pond is costly in the area.
- The quality of boro rice is not good.
- Villagers cannot do irrigation.
- Livestock cannot get treatment.
- Family members are either too young or too old.

Observations:

- One woman took part very actively in the workshop. She happened to be an NGO (World Vision) worker.
- There were a few indigenous people took part in the problem discussion.
- There were also several *shomaj* elders and teachers took part in the problem discussion.
- An indigenous man said “I am the only person in my family to earn and I have old parents and kids who are depending on my earnings. In this context, it is difficult for me to provide necessities to them”.
- The NGO worker said “Many villagers do not have good health as there is arsenic contamination in the water of the area. As a result, they remain ill and cannot work hard”.
- A farmer said “It is difficult for us to drill deep tube wells. This is hilly area and there are stones within 15-20 ft”.
- An indigenous man said “We do not have many ponds in the highland

area. Since it takes a lot of work to dig a pond, the cost gets higher”.

(10) Problem Analysis at Krishna Govinda High School, Sinher Bangla Union, Netrokona Sadar Upazila, Netrokona District (Fazal Ali Khal (Rupsha Beel) Subproject: passed)

Date: 23 September 2004 Thursday

Participants: 40-50 (12 women) including UP Chairman and a UP member (woman)

Socio-economist (Netrakona), Rural Sociologist-Participatory Planning, and Participatory Workshop Specialist

Direct causes: M-1, F-3 Agricultural production is low. M-2, F-2 Villagers cannot get work other than agriculture.

M-3, F-1 Family expenditure is large.

Villagers' wage is low.

Share croppers have to get many loans from money lenders.

Farmers do not get good prices for their crops.

Specific problems: Villagers' wage is low.

Villagers need to use tractors. (Tk. 50/khata)

Sharecroppers do not own cows.

Cost of irrigation is high. (Tk. 100+Tk. 126[fuel]/khata)

Insects eat crops.

Heavy rain often occurs.

Water level in the area is below 20-25ft. (Cannot get water for irrigation.)

Farmers have to pay back their loans.

Family pays large amount of dowry. (Tk. 10,000-500,000)

Water contains arsenic.

Observations:

- Most of the male participants were farmers and many of them were share croppers, who have very small or no land, and farm labors. There were also two rickshaw pullers, and four or five teachers of which two were female.
- Two persons from local NGO named NIDP were present at the workshop as observers.
- The card that was discussed the most was “Villagers do not have inspiration / will to work”. At the beginning of the discussion, one participant said “Villagers are lazy”. When asked about which people he is trying to refer, he replied that generally it is the farmers. (*The backbencher share croppers opposed very strongly to what he said.*) They said “Laziness is not a problem, rather sometimes, we do not have work to do”. “We work hard to get the best from whatever we have”, they added. A few local elites (e.g. UP member, school teachers, headmaster etc.), however, were pressing “People are lazy and they do not want to work”. Lastly, the *lazy* card was discarded. People said that it would be more appropriate and acceptable to say “Villagers do not have inspiration / will to work”. This is one of the causes of “Villagers wage is low” and again “Villagers wage is low” is one of the causes of “Villagers do not have inspiration / will to work”.
- A female participant stated “Childhood marriage is malice in our local society and is causing many risks to one’s health (delivery problem etc.).
- Dowry is a major problem that causes “High expenditure in the family”. “The amount would be Tk10,000 to 500,000”, the UP Chairman added when asked.



- The share croppers group said “Middlemen exploit farmers a lot, and we are the biggest sufferer in this context”. They also added “We have to get many loans with high interest from money lenders and they are middlemen in many cases too”.

(11) Problem Analysis at F.S. Narayanpur Registered Government Primary School, Sinher Bangla Union, Netrokona Sadar Upazila, Netrokona District (Ghagotia Khal Subproject: reconnaissance failed)

Date: 24 September 2004 Friday
 Participants: 40-45 (no woman) including two young UP members but no UP Chairman
 Socio-economist (Netrakona), Rural Sociologist-Participatory Planning, and Participatory Workshop Specialist



Direct causes: 1. Agricultural production is low.
 2. Villagers have little job opportunity.
 3. Family expenditure is large.
 Villagers cannot make money from fishery.
 Farmers have to sell their crops at low price.
 Labor wage is low.
 It is difficult to drive van / rickshaw.
 Livestock production is low.

Specific problems: Water level is low. (20-30 ft)
 Heavy rain often occurs.
 Insects eat crops.
 Not enough places for fish culture.
 Female don't go out of house for wok.
 Villagers cannot get livestock which grow faster.
Labor wage is low.
 Labors are more than required.
 It is difficult to pull van/rickshaw

Observations:

- Participants were mostly farmers, but there were two teachers, a few farm labors and youngsters took part.
- There were no women in the workshop.
- “Villagers cannot buy livestock” was mentioned as one of the causes for “Little job opportunity”. The participants were asked, in this context, if this is contributing to low livestock production. Participants replied “Scarcity of good (which means grow faster) livestock is one of the reasons for low livestock production.
- An old farmer said “We have to pay back our loans and that is why we have to sell our crops as soon as possible instead of waiting for a good price. We have no other options to that at present”.

(12) Problem Analysis at Joyka WMCA Office, Joyka Union, Karimanj Upazila, Kishoregonj District (Joyka Subproject: passed)

Date: 25 September 2004 Saturday
 Participants: 100-120 (7 women) including acting WMCA Chairman
 Socio-economist (Kishoregonj), Assistant Engineer- SSWRDSP-2 (Kishoregonj), Rural Sociologist-Participatory Planning, and Participatory Workshop Specialist



Direct causes: 1. Agricultural production is low.
 2. Fish production is low.

Agriculture production cost is high.
Businessman cannot work long at shop.
 Family expenditure is large.
Farm labors cannot get work.
 Women cannot have income generating activities.
Villagers cannot make money from trees.

Specific problems: Farmers cannot plant seeds in time.
 Ground water level is low (20-30ft).
 Gas comes from deep tube wells.
 Hailstorm (aman and boro: planting and pre-harvesting).
 It is costly for farmers to bring crops home.
 It takes long time to go far for merchandising.
 A surplus of farm labors.
 Need to build/fix house every year.

Observations:

- Most of the participants were farmers. Some of them also have other side business (i.e. grocery store, clothing business, fish-pond business etc.). There are also people, who depend on the business for their livelihood such as seed business, cosmetic business etc. There are also students and teachers present.
- One woman said “Flood damages our houses every year. We need to rebuild / repair the houses accordingly and it is very expensive. So the savings we kept for buying sewing machines disappear”.
- One shop owner stated “I cannot spend long time at my shop. It takes long to go for merchandising due to bad road conditions”. “I need to go twice or three times a week”, he added.
- There are natural gases in the ground of the area. One of the farmers said “We have problems in doing irrigation. Water level is low (20-30ft) here and sometimes gases are coming from the deep tube wells”, and everybody agreed.
- One of the fishermen who were present said “There is a shortage of supply of good fingerlings, which grow faster, in the market. The price of fish feed is also expensive”. “Transportation cost of fish by boat is also high and that is a disincentive for higher fishery production”, another fisherman added.
- A few students were saying “Daily transportation cost is high in this area. We need to pay Tk4 to 8 for using boat to school and that is also one of the reasons for high family expenditure”.

(13) Problem Analysis at Verontola Village, Tarail Union, Tarail Upazila, Kishoregonj District (Bherantala Subproject: PRA failed)

Date: 26 September 2004 Sunday
 Participants: 100-120 (1 woman) including UP Chairman
 Socio-economist (Kishoregonj), Community Organizer, Upazila Engineer (Tarail), Rural Sociologist-Participatory Planning, and Participatory Workshop Specialist

Direct causes: 1. Agricultural production is low.
 2. Villagers have to sell agricultural products at low price.
 3. Villagers have little opportunity for non-agricultural work.
80% of the villagers are landless.
 Fish production is low.
 Women do not have any work.
 Family expenditure is large.



Specific problems: Hailstorm comes. (early May)
Water level is low. (60 ft)
Farmers can cultivate only one crop a year.
Many villagers catch fingerlings.
Fish eggs are damaged.
No space for homestead gardening.
Childhood marriage. (delivery etc.)
Lack of safe drinking water.

Observations:

- Most of the participants were farmers and farm labors. Many participants were landless and some of them are doing both fishing and farming.
- There was only one woman, who is Head Mistress of the primary school, present in the workshop and she left in the middle.
- Participants said “About 80% of the villagers are landless and that is a direct cause for low income of these villager areas”. One landless farmer said “I had to sell my land gradually to pay back my multiple loans (government, local money lenders and NGOs)”.
- Farmers said “We can cultivate only one crop a year here due to water logging. *Boro* crops are also often damaged by flood, hailstorm etc.”
- Head Mistress of the primary school, which is adjoining to the workshop venue, said “Many children cannot come to school as flood occurs”.
- One fisherman said “Many villagers catch fingerlings and that is why we cannot catch many fishes”.
- A participant said “Poultry get diseases and many of them die so that women cannot make money from poultry”. Another participant added “Many women cannot do homestead gardening because they have no space around home. Also whatever they try to do is often damaged by flood”.
- On way back from the workshop, UP Chairman of Tarail was saying “When the PRA team came here for appraisal, they only sat in my house-yard, called the people here and did a public meeting. They visited only few houses.” “If I could try to influence the project by political leaders or through other agencies, it would have passed as a project; but I did not do that”.

5.1.3 Interview Survey in the Study Area

Interviews were conducted at each workshop site to listen to the voices of villagers and to prepare for the problem analysis. To avoid the influence of local leaders and politicians such as UP Chairman and WMCA Chairman, the workshop team tried to visit medium or rather shabby farm houses.

Also additional interviews were conducted at two sites to find out the reasons for failure and success; 1) Digha Beel Subproject, Jatia Union, Iswanganj Upazila, Mymensingh District where many villagers opposed to the subproject, and 2) Mutbari Khal Khonnon, Mesta Union, Jamalpur Sadar Upazila, Jamalpur District.

(1) Findings on Livelihood



A farmer in Tangail, who is 45 years old and has 56 decimals (1 decimal = 0.01 acre) of own land, said that he usually can harvest 4-4.5 *mons* of oil seeds and 48 *mons* of *boro*. He paid about 12 *mons* of *boro* for pump and irrigation water. He said usually rice is self-sufficient. Another farmer in Tangail, who is a share cropper at age 65 and cultivating 82 decimals (100 decimals before he became old) said rice is not enough for his family. A farmer in Jamalpur owns 150-180 decimals (1.5-1.8 acres or 0.6-0.7 ha) but also cultivates another 150

decimals (0.6 ha) by share cropping because his family is big (12 members). A farmer in Jamalpur rents 52 decimals and produces enough rice for a family of four. He has other cash income to buy seeds and fertilizer. A farmer in Mymensingh owns 70 decimals of land, but the rice lasts only for 7 months and needs to buy 30-35 *mons* because his family is big (19 members). A farmer in Netrakona said he owns 15 decimals but he also does share cropping of 40 decimals.

Finding 1-1 50-60 decimals (1/2 acre or 0.2 ha) might be large enough to produce sufficient rice for a small family (4-5) if he owns the land, but 100 decimals (1 acre or 0.4 ha) might be necessary if he is a share cropper. It would be 200 decimals (2 acre or 0.8 ha) if he can harvest only one crop a year. Also, if his land is much smaller than 50 decimals, he needs to do share cropping (or other work) for self-sufficiency.

A farmer in Mymensingh said he sells *aman* when they don't have enough cash. He also said they usually eat *boro*. A farmer in Tangail said he sells oil seeds at the local market (around TK500/*mon*), but the money solely goes to seeds and fertilizer for *boro*. Another farmer in Tangail said he plants oil seeds (mustard) instead of *aman* if flood is severe. It takes four months to harvest *aman*, but it takes three months for mustard. He also added that he can harvest *aman* 10kg / decimal [2.5t / ha] and the price is Tk50, and he can harvest mustard 2kg / decimal [0.5t / ha] and the price at the local market is Tk42-45.



A sharecropper in Tangail who is cultivating 82 decimals of land said he always has to buy rice and he has to borrow money to buy food and input. Sometimes he cannot pay back in the next year. He also said that his two sons working at the mill in Tangail Sadar are bringing home Tk. 400-500 every month. A farmer in Netrakona said his son, who is a construction worker in Dhaka, is sending him Tk. 1,000-1,200 every month. Another farmer in Netrakona said his son works as farm labor during planting and harvest seasons.

Finding 1-2 Boro is usually the staple food and is more productive in the area. Cash by selling *aman* / cash crops / oil seeds (e.g. mustard) is used for buying seeds and fertilizer of boro. If they cannot get enough cash from crops, they need to have other income sources.

A farmer in Jamalpur said he owns homestead land, but he rents 52 decimals of land in char area at Tk. 4,000 per year, and 18 decimal near home at Tk. 1,800 per year. A farmer in Netrokona said he owns 15 decimals of farmland but also does share cropping at 40 decimals of land.

Finding 1-3 A few farmers own some land but that is not enough at all to support themselves. Those who are not landless but marginal farmers are of overriding importance.

(2) Findings on Farming

A farmer in Tangail said flooding is not a big problem because he can plant oil seeds (mustard) if water logging is longer. It takes four months to harvest *aman*, but it takes three months for mustard.

Finding 2-1 Farmers must have several countermeasures to minimize the negative impact of floods.



A farmer in Sherpur who has more than 200 decimals said he doesn't grow any vegetables because it is lowland and water logging is not good for vegetables. Many farmers in the area seem to think that way and that probably is the reason why they don't talk much about vegetable growing. They grow vegetables at homestead gardens, but they are sometimes not enough for home consumption.

Finding 2-2 Some farmers said they do not plant vegetables because it is low land. Also it is difficult for share croppers to plant vegetables in their farmland probably because income from vegetables is not as stable as that from crops.

A farmer in Netrakona said he can get more money farm labor than share cropping, but workload for share cropping is less, it is better to cultivate his own land, and age is also a factor.

Finding 2-3 Farmers can get more money from farm labor than share cropping if they can get enough work in planting and harvesting seasons.

(3) Finding on Fishing



The workshop team could visit only one fulltime fishermen village, which is a Hindu community, at Begid Beel Subproject area in Jamalpur and they said their income is 100% from fishing. They don't work as labors either for construction or farming. Their wives are housewives and do not do handicraft or any similar activities. They make and repair fishing nets only. They do not have livestock either. They usually go for fishing at 10 miles down of the Jamuna River. It takes about 5 hours to go down and 6 to 7 hours to come back. They

start at 2-2:30 pm and come back at around 5 am next day. They have been fishing at around the same place yet they lived in the different villages. Peak season for fishing is Bhadra (mid August to mid September). In Bhadra, they can make 300kg/month, sometimes even 500 kg/month [Approximately Tk. 50,000/month]. They can sell one hachka of fish at about Tk. 500 (= about Tk. 100/kg). Lean season for fishing is Poush and Magh (mid December to mid February), which are winter season, and they can get only Tk. 50-60/day.

Finding 3-1 Most of 500 fulltime Hindu fishermen in the benefited area of Begid Beel Subproject fish in Jamuna River, and not at the embankment where part-time fishermen would be negatively affected.

The workshop team met a dozen of villagers fishing on a bridge in Mymensingh, but they said all of them who came to fish are farmers and they do fishing only for their family consumption. They just catch several fishes everyday, they added.

Finding 3-2 Except serious fishermen and fish pond owners / fish businessmen, villagers mainly fish for family consumption. Many villagers fish when they are not so busy such as early morning or dusk, and between planting and harvesting seasons.

Villagers of Joyka Subproject in Kishoregonj said some fish pond owners, who live outside of the

villages, are trying to influence WMCA members, and that is one of the reasons for the social conflict. A villager of Digha Beel Subproject said poor landless fishermen of about 150 will be affected and those are the one who are strongly opposing the subproject.

Finding 3-3 “Benefited farmers vs. negatively affected fishermen” is a typical structure of social conflicts regarding SSWRDSP-2

(4) Findings about Gender Issues

Unfortunately, no women participated in two workshops, the women’s participation in 13 workshops at union- and WMCA-level in September 2004 are as follows:



Also one woman in Sadar Upazila of Netrokona District said she quit 3 month NGO’s training course of cottage industry after 15 days because her children were small. It was 8 AM-5 PM work everyday



and it took more than 30 minutes to go there, and sometimes even 1 hr if it rains. Another woman said she couldn’t attend because she was not in the target group.

And of course, “Families don’t encourage women to work outside (Tangail)” and “Women can’t go to distant (1hr) places

Women’s participation to workshop	
Women participant	No. of Workshop
0	2
1	3
2	1
4	1
7	1
More then 7	5

(Sherpur)” are major social issues of women.

Finding 4-1 To get active participation of women, meetings, workshops, training and courses etc. need to be done at para-, village- and multi-village level

Women in a village in Iswanganj Upazila of Mymensingh District and a village in Sadar Upazila of Netrokona District said they cannot do handicraft because they cannot access any loans and no NGOs are active in the area.



Finding 4-2 Some women cannot access to loans and benefit from NGO’s activities even if they live in Sadar Upazila.

Vegetable cultivation and poultry / livestock are the income generating fields where women are playing major roles. “No space to keep poultry in the house / homestead area” was one of the problems discussed at Rasulpur Union, Ghatail Upazila, Tangail District and Pakuria Union, Sadar Upazila, Sherpur District. “Ducks go away during flood” was a problem card at Knedua Union, Sadar Upazila, Jamalpur District, “Ducks swim in polluted *beel*-water” and “Poultry die from diseases” were the problems at Pakuria Union, Sadar Upazila, Sherpur District. “Many livestock die” was a problem related to women at Noya Beel Union, Nalitabari Upazila, Sherpur District. “No space for homestead gardening” was a reason for no income generating activities by women at Iswanganj Union, Iswanganj Upazila, Mymensingh District and at Tarail Union, Tarail Upazila, Kishoregonj District.

Finding 4-3 Limitation of homestead land is one of the constraints for income generating activities for women especially in vegetable cultivation, poultry and other livestock keeping.

“Nobody in the family to earn (no adult male)” or “No income generating person in the family” was a problem discussed in the workshops at Rasulpur Union, Ghatail Upazila, Tangail District and at Kendua Union, Sadar Upazira, Jamalpur District. A 14-15 years old woman said at the workshop in Tangail District that she got married young, but her husband passed away. “I have a child, but there is

nobody who earns in the family. I am helpless and I want to work”, she added.

“Only one or few members of the family earn” and “Family members either too young or old” were the cards in the workshop at Noya Beel Union, Nalitabari Upazila, Sherpur District. “No income generating person in the family” was a problem mentioned at Kendua Union, Sadar Upazila, Jamalpur District and “Only one person earns in the family” at Sinher Bangla Union, Sadar Upazila, Netrokona District.

Finding 4-4 No adult male in the family automatically means the hardships of life in rural area.

Many villagers remarked that large amount of dowry during marriage is a big problem. They said that the dowry is normally in the range of Tk. 20,000-30,000 at Kendua Union, Sadar Upazila, Jamalpur District, Tk. 20,000-100,000 at Chukaibari Union, Dewanganj Upazila, Jamalpur District, Tk. 20,000-70,000 at Iswanganj Union, Iswanganj Upazila, Mymensingh District, Tk. 15,000-50,000 at Pakuria Union, Sadar Upazila, Sherpur District and Tk. 10,000-500,000 at Sinhaer Bangla Union, Sadar Upazila, Netrakona District.

Finding 4-5 Dowry still is a heavy burden for villagers despite government’s campaign.

“Families don't encourage women do work outside” “Females are not educated” and “Females are not aware of their rights” were among the problems discussed at Nagbari Union, Kalihati Upazila, Tangail District. “Women do not have enough education” was mentioned at Rasulpur Union, Ghatail Upazila, Tangail District, Iswanganj Union, Iswanganj Upazila, Mymensingh District. “Women can’t go to distance (1hr) place” was a card at Pakuria Union, Sadar Upazila, Shepur District and “Early marriage (more problems of delivery etc.) at Sinher Bangal Union, Sadar Upazila, Netrokona District.

Finding 4-6 Women in rural area are still facing a lot of social problems such as access to education, early marriage, dowry and decision making to go out or to spend money.

(5) Findings about PRA and Subprojects

In a Hindu fishermen village of Begid Beel Subproject area in Jamalpur, where opposition of fishermen is one of the issues, it seems that PRA team of SSWRDSP-2 have not visited the village. UP Chairman of Tarail said “When the PRA team came here for appraisal, they only sat in my house-yard, called the people here and did a public meeting. They visited only a few houses”. Also an Assistant Engineer-SSWRDPSP-2 said that PRA team stayed in the villages only for two or three days where they were supposed to stay for a longer time.

Finding 5-1 In some cases, PRA teams might not be conducting enough interviews or real bottom-up workshops / meetings.

Villagers of a proposed subproject area in Mymensingh said there were only a series of meetings at the beginning before UP Chairman submitted the proposal. They also said nobody opposes the subproject this much, if *consensus was made through shomaj*.

A Socio-economist said “I think that local people are not that much aware and involved in the subproject initiation. I have also experienced that people are not well discussed about the proposal. So we, the field level project people, face problems while implementing the subproject”.

Finding 5-2 In some cases, UP Chairmen did not get a consensus at village- and para-level.

At a proposed subproject area in Netrokona, villagers didn’t know the change of basic design of the subproject. Embankment to surround the beel was changed to road embankment at the center of the beel. A villager of Netrokona said angrily that “UP Chairman knows nothing about what is happening on the ground, because he is working in the building”.

At the problem analysis workshop for Tetulia – Sadarbari Subproject:, which passed the appraisal, many people started to ask questions about the proposed subproject and raised related



confusions, so that the AE (SSWRDSP-2, Jamalpur) came to the board and sketched the design of the proposed interventions. He talked about the interventions and also a little bit about the WMCA. The people were complaining that they were not discussed in detail about the project. He answered many of the questions about the project to the participants.

A Socio-economist said “I have experienced that conflict takes place about site selection for structural interventions; and also many people oppose without understanding the project or its benefit in details. The project also gives training to the chairmen; but they lack something to involve local people in all the phases of the subproject”, he added.

Finding 5-3 Explanation of the outline of the proposed subproject to the villagers might not be good enough. Accountability and villagers’ participation for decision making are at stake.

(6) Findings about Digha Beel Subproject (appraisal failed)

There is a community-based earth dam project for many years in the proposed area of Digha Beel Subproject. The idea came through *shomaj* meetings and decided to make a dam. The service area is about 80 ha and about 1,000 households contribute Tk. 10-50. *Shomaj* elders decided who pays how much and some people are exempted. Poor people are mainly assigned by *shomaj* for earthwork and are paid Tk. 40-50 / day for 10 to 15 days. They started to use 200 – 300 sandbags from two years ago. The size of the dam is 8ft x 20 ft x 6 ft. Some villagers said they don't need a permanent structure because of the earth dam and also due to the fear of social conflict.



Finding 6-1 There is a purely community-based project of an earth dam in the subproject area and six villages are working together every year. At least some villagers do not feel the necessity of a permanent structure and that might be one of the reasons why so many villagers opposed the subproject.

There was a conflict over a small earth dam in 1974. Villagers in the area constructed a dam which was too high, so that some houses upstream were in danger of flood. A villager, who is a *shomaj* elder, was a UP member that time. He told us that the *shomaj* elders of six villages around the *beel* sat together, discussed and decided to destruct the dam. Almost 1,000 farmers with wood sticks and bamboo sticks went there. Some villagers said that this experience causes villagers to oppose the subproject.

Finding 6-2 There was a social conflict in the subproject area in 1974 and as many as 1,000 villagers took a direct action. A fear for social conflict like this might be another reason for opposition.

Some villagers said one UP member made a speech not to support the subproject in the PRA meeting. They said he is opposing the subproject probably because: (1) his brothers occupy *khas* (public) land in the *beel*, (2) his relatives are fishing, and (3) they also do fish business. One of his uncles is a landowner and he owns land in *khas* land, he added. The uncle originally supported the subproject, but now opposes to it. He also added *shomaj* must be involved not only at the beginning but at every step of decision making process.

Finding 6-3 Some influential villagers including UP member and fish businessmen are opposing the subproject and the main reason behind seems to be illegal occupation of the *khas* (public) land.

(7) Findings about Mutabari Khal Khonon

It was at the time when Mr. Ziaur Rahman was the President and there was a campaign called “*Shonirbhor Gram Sharkar* (Dig a canal and get more production)”. So the project was identified by UP Chairman (father of present UP Chairman) and 9 UP members, not by people. 37 villages contributed 50-60 villagers for 1.5 to 2 months for desiltation.

Finding 7-1 There was a project where 37 villagers contributed 50-60 villagers each for earthwork and dug a canal.

Villagers had to contribute 95% and LGRD was to contribute 5% by wheat. When UP Chairman announced to the people at general assembly, the first response of 37 village headmen (they existed only in 1978–1982) was “why this project with such a heavy work?” The reply from UP Chairman was 40 pumps from other fund (BDAC: Bangladesh Agriculture Development Corporation by IDB). This was not part of the project and actually 8 mother pumps and 12 small pumps were provided.



Finding 7-2 5 % of wheat + 8 mother pumps / 12 small pumps (about 10% of the project cost) by the government and 95 % of contribution for construction by villagers.

To build consensus, all the 37 villages were involved and decision was made at each village. Then it was approved at union-level committee. (37 village headmen and other *shomaj* elders attended.) They said Upazila Engineers, UP Chairman and community were working more for the people at that time. They discussed who get benefits and who get affected or other things. They decided about compensation also. Benefited people gave compensation to the affected, and union funds were also used. They also said everybody was motivated that time. Government officers also stayed there and joined the earthwork. Villagers were competing for which village worked better.

Finding 7-3 Though the project was initiated by the government and UP Chairmen, village headmen (gram sharkar) and shomaj elders were involved and consensus of 37 villages was reached.

5.1.4 Summary of Problems Identified through Workshops and Interviews

(1) Findings from Interviews and Statements at the Workshops

The individual findings from the interviews at workshop sites and workshop statements are summarized in Table 5.1.1. However, it must be noted that these findings are indications of limited information sources. Still yet, the information is regarded valuable in regard that the voices of the local stakeholders do reflect the real situations of the area in many cases, but often missed. The findings will therefore be reflected to the Master Plan after closer examinations in the course of the Study.

(2) Other Issues

1) PRA used in SSWRDSP-2

The PRA used in SSWRDSP is a step of a project appraisal process by LGED. Therefore the PRA starts from the proposed project, not from the needs of the villagers or the future image of the area.

If it is just an appraisal process, the objective of PRA is to decide the pass or fail of the subproject. However, if it is part of participatory planning, PRA is to get consensus of the stakeholders and to improve the design of the subproject.

➤ The Study Team expects the PRA workshops to become the venue to talk about the development of the area, to get better consensus among the stakeholders and to improve the design of the subproject.

Then one of the questions is how to connect top-down approach from macro level point of view and bottom-up approach from micro level point of view. Both are important, but there is always a need to reach a compromise. The venues are needed for district, upazila, union and people to participate and it seems that there is miscommunication between decision making at union level and decision making at village- and *para*- level.



Also from the experiences of problem analysis workshops, the Study Team found that not so many women can attend the workshops at union-level. There were no woman participants in two problem analysis workshops, only one woman participant in three workshops and only two to four woman participants in two workshops. About 1/3 of the participants were women only at two workshops out of 13 workshops.

Several women said it is difficult for them to go to distant places (say 1 hr distance) at the workshops. Also a *shomaj* elder of Jamalpur said 3-4 villages are the maximum for community-based activities in *char* area because of the distances among settlements. 5-6 villages are possible in *beel* area, and also combination of *char* and *beel* area, he added.

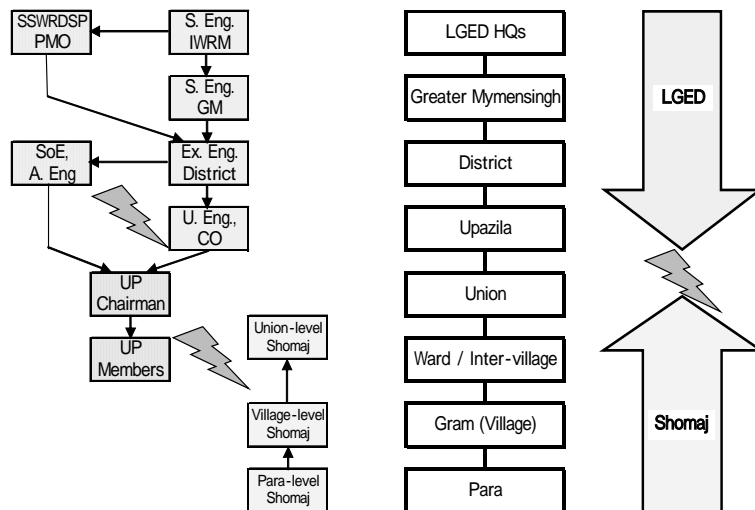
➤ The Study Team is planning to have PRA workshops at village- or multi-village (2, 3 to 5,6 villages)-level.

2) Communication Gap

There seems to be two major communication gaps in the planning of the subprojects. One gap is between Union level and village / *para* level, and the other is 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.

An Assistant Engineer SSWRDSP-2 said “Community Organizer of Upazila does not support much; where he / she could play a big role in different aspects of the project, and where it is important to deal with the community. The beneficiaries do not get support from the Upazila; so they have to directly contact the district office. The project does not have any staff at the upazila-level, even though Upazila LGED officers get training from the project.”

A Socio-economist said that “While working, I sometime face a problem of “technical vs. non technical”. At times engineers see things from rigid technical or engineering point of views and they do not seem like appreciating the non-technical professionals in the project”. “If I am told to improve the process, I would do the design-discussion meeting before the appraisal phase. It also helps to collect the contribution money more easily”; he added.



➤ More participation of Upazila Engineer and Community Organizer to design-discussion meeting seems to be necessary.

The Study Team did extra interviews at Mutbari Khal Khonon in Mesta Union, Sadar Upazila, Jamalpur District, and found that there were little gaps 20-25 years ago and the village headmen, *shomaj* elders of 37 villages, and *Upazila* Officers worked together.

➤ Consensus of *shomaj* elders at village-level and para-level should be reached before finalizing the proposal of subproject.

5.2 Union Questionnaire Survey

5.2.1 Objectives and Methodology

(1) Objectives

Local Government Engineering Department (LGED) started the SSWRDSP-II, and its rapid and effective implementation is of vital importance. From the reasons that the project is carried out in Union level, and that Unions are positioned at a front line of the local government, shouldering the development of agriculture and rural welfare, the Unions are the most appropriate organization for the collection of necessary information on current situations of agricultural production, problems farmers now face, possible countermeasures, and so on. The survey was conducted to collect and analyze baseline data to formulate master-plans of agricultural and rural development, and study usefulness of the SSWRDSP in cooperation with all the Union Chairpersons in the survey areas. Especially, stresses were put on the fundamental ideas that Union Chairpersons have in their minds on existing situation and future development of agricultural and rural development, as a leader of grass-root level at a turning point of agricultural development.

Great appreciation would be given, first of all, to the Union Chairmen, all the staff of LGED and its Districts and Upazila Offices, the staff of Department of Agricultural Extension (DAE), Ministry of Agriculture, and other related organizations.

(2) Methodology

1) Distribution of the questionnaires to the Union Chairmen.

The JICA survey team sent the questionnaires to upazila offices and requested to distribute them to the Union Chairmen and collect and transfer the replied questionnaires to the second District WSs.

2) Collection rate of the questionnaires

As of 14, Jan. 2005, 529 questionnaires were collected. The collection rate was 94% which is unusually high for questionnaire survey by distribution. It was attributed to the deep interests of the Union Chairmen in the agricultural development and cooperation of the Union office, in addition, various efforts by all the staff of LGED, Districts and Upazilas and the requests at WS by the JICA team.

The great contribution from the Block Supervisors (BS) in filling the questionnaires in agricultural fields was appreciated.

5.2.2 Questionnaire

(1) Preparation of the questionnaires

First questionnaires were drafted by the JICA survey team in cooperation with Counter parts (CP) of LGED. The drafts were preliminary tested by the cooperation with and Ajjana Unions of Mirzapur, Tangail. Later on the revised drafts were studied by Upazila Engineers and Socio-economists at each District Work Shops (DWS). The drafts were finalized by revision with comments from the WS.

2) Contents of the Questionnaires.

Questionnaire to UP Chairpersons consists of 1) General outline (location, population, social infrastructures, 2.) present Agriculture, fisheries and livestock, and 3) water related conditions with damages of flood.

3) Distribution of the questionnaires to the Union Chairmen.

The JICA survey team sent the questionnaires to upazila offices and requested to distribute them to the Union Chairmen and collect and transfer the replied questionnaires to the second District Workshops.

5.2.3 Agricultural Problems in Union Questionnaire

(1) Current situation of farming system

1) Basic farming systems

The cropping intensity is as high as 177%-179% in Bangladesh. To increase agricultural income, triple cropping a year is explored in various aspects. Two to three times of cropping is practiced generally, except cropping of Boro in dry seasons in Haor areas and perennial crops such as banana and sugarcane in high land areas where no irrigation facilities are installed.

Large difference is observed in cropping among Unions and the Agro-Ecological Zone. There are 3 basic different cropping types:

- i. The most common type (dominant) was Boro (Dec.- Feb.) ~ Fallow ~ T/B Aman (July-Nov.). This type had a share of 60% in cropped area. Boro and Aman are staple food, and a major source of cash income.
- ii. Another cropping pattern is wheat (Dec.-Mar.) ~ jute (May-Sept.) ~ vegetable (Nov.-Feb.) with about 20-30% of the share.
- iii. The third cropping type was Vegetables (Oct.-Dec.) ~ Fallow ~ Vegetables (Oct. – Dec.) with 10% of the share.
- iv. In the specific areas, in Haor area, due to deep flooding in summer, Boro ~ Fallow ~ Fallow and Vegetables ~ Fallow ~ Fallow are most frequently observed.

2) High profitable farming system

Based on the Boro-fallow-Aman system, there are many modified cropping patterns with a view to practicing profitable farming, adaptable to the Agro-ecological zones, and integrated farming systems with livestock and fisheries.

- i. Mustard has a short cultivation period, about 2-3 months, and is a major oil crop in rural areas. For triple cropping, mustard and other crops are introduced between Aman and Boro. In existing situations by many farmers the growing period of mustard is too long to cultivate Boro afterwards. Therefore, it is often observed that farmers are forced to cultivate other crops of shorter growth duration.
- ii. Instead of Boro, potato and maize are cultivated as profitable land-use crops.
- iii. In Lowland area and char areas DWR is often grown. But after the SSWRDSP, HYV can be introduced.
- iv. Integrated farming with livestock, fish and duck is practiced during rainy seasons. Data in detail are described in Chapter 5.

(2) Constraints on agricultural development

In this survey the constraints on agricultural and rural development were asked on the following 10 major items. Each item was asked on importance: Serious, Medium and Low. The answers were rearranged by an order of larger number of the ratio of “Serious”. There are not much differences in answers among the 6 districts.

1) Flood damages

As high as 85% of the total Unions said “Serious” to the flood damages. Sherpur indicated 94% for “Serious”, and Mymensingh indicated 74%, respectively. In Sherpur flash floods cause large damages. In 2004, Bangladesh experienced similar types of two of the most severe floods in 1987 & 1988, and a vast area of standing crop was damaged by inundation, washing away seedlings. In addition, after the loss of crops, farmers could not re-plant crops due to the shortage of good quality seeds. The damages at this stage were one of the most serious obstacles to a profitable farming system; therefore, it brought a serious anxiety to farmers. Besides, deterioration of products by lodging of rice plants, washing away of fish and so on caused serious damaged to farmers. Three fourth of the total water flows from India and other foreign countries, which makes countermeasures difficult.

2) Diversification of crops

Tangail showed 82%, the highest ratio, and Kishoreganj had 51%, the lowest ratio. The present farming system is dominated by rice production. Farming system with higher value added crops, livestock and fisheries are keenly explored. Under the current situation with balanced supply and demand, the issue is to improve income. Thus analysis of high benefiting farming and selection of high profitable crops are required.

3) Mechanization of agriculture

As the Diversification of crop mentioned above, Tangail had the highest and Kishoreganj had the lowest ratio. The reason is not clear, but developing commercialization can be one of the reasons in Tangail. Power tillers are the main machines introduced to the study area. The necessity for power tillers is high, as power tillers are also used as rural transportation, carrying people and goods. Number of water buffalos is decreasing.

4) Marketing

Kishoreganj was the highest, and Sherpur was the lowest. Haor can be a major obstacle in marketing. In Sherpur stable and variety of production will be the dominant problems. Cash income in rural villages is mainly obtained through sales of agricultural products in markets. Marketing is important for cash generating from agricultural products and collection/wholesale functions towards urban areas.

5) Irrigation water supply

Irrigation in the study area consists of supplementary irrigation for *Aman*, and general irrigation for *Boro* and vegetables. The rank of securing of irrigation water is the lowest in Tangail, and the highest in Jamalpur. Though irrigation is indispensable for crop production in the dry season, its rank was low in Tangail where perennial crops such as bananas are grown.

6) Agricultural technology

DAE is working on agricultural extension, and designates 2 to 3 Block Supervisors in each Union to support farmers from the technical aspect. The constraints of agricultural technology were ranked rather low as these activities cope with the problems of farmers and Unions. However, agricultural extension still play an important role, because improvement of profitability and specialization of agricultural production is achieved through the activities.

7) Insufficient agricultural input

Taking into account that except high percolating sandy soils, there are no specific constraints in soil. Inundation of land maintains the fertility of the agricultural lands and supplies micro-nutrients for plants. Since rice production has improved under such circumstances, the necessity of additional agricultural input is not well understood. In order to increase agricultural productivity and profitability further, additional input such as N fertilizers is necessary.

8) Land Improvement

In Bangladesh, land improvement is running behind due to factors such as shortage of resource easiness of cultivation due to flat terrain, and limited performance of land improvement due to frequent flooding in the rainy season. The survey results indicate that the farmers do not have strong interest in land improvement. However, it is expected that more attention will be paid to land improvement, because effective use of surface water will require leveling of land, and construction of embankments and gates.

9) Securing of improved and high-quality seeds

Access of farmers to high-quality seeds is improved by programs such as the Seed Exchange Program (SEP) in premise that no natural disaster is occurring. The Block Supervisors (BS) are constantly in touch with the farmers through extension activities, and is expected to understand the problems that the farmers have. Improved varieties of rice are diffused, and by farmers experience they can collect well ripened hills for seeds in their fields. However, if farmers try to harvest quality rice, they need quality seeds.

Constraints in agricultural production							(%)
Items	Jamarpur	Kishor.	Mymen.	Netra.	Sharpur	Tangail	Average
1 Flood damages							
Serious	88	83	74	90	94	82	85
Medium	12	16	22	7	6	13	13
Low	0	1	4	2	0	5	2
2 Crop diversification							
Serious	62	51	70	71	66	82	67
Medium	32	27	21	12	20	15	21
Low	6	21	9	13	14	3	11
3 Mechanization							
Serious	72	54	65	62	66	71	65
Medium	22	35	22	28	28	19	26
Low	6	11	13	10	6	11	9
4 Constraints in marketing							
Serious	19	32	23	21	10	15	20
Medium	62	55	60	64	62	74	63
Low	19	13	17	15	29	11	17
5 Irrigation water supply							
Serious	26	15	18	17	13	12	17
Medium	53	67	70	75	63	80	68
Low	21	18	12	8	23	8	15
6 Agricultural technology							
Serious	6	13	8	2	2	2	6
Medium	30	29	32	21	31	29	29
Low	64	58	60	76	67	69	66
7 Low inputs (Ex. fertilizer)							
Serious	9	14	4	4	2	3	6
Medium	36	28	23	19	27	23	26
Low	55	59	72	78	71	74	68
8 Land preparation							
Serious	4	8	5	7	6	1	5
Medium	79	68	78	69	73	81	75
Low	16	24	18	23	21	18	20
9 Distribution of improved s							
Serious	0	12	5	1	4	5	4
Medium	40	29	27	28	25	21	28
Low	60	59	68	71	71	75	67
10 Limitation of agricultural land							
Serious	4	4	1	0	2	0	2
Medium	28	28	17	23	23	26	24
Low	68	69	82	77	75	74	74

Source: JICA Questionnaire Survey to Union Chairpersons (2004)

10) Land Holdings

Though the number of landless/small farmers is large, constraints of land holdings were considered low in the ranking. The reason for this is not clear, but the followings may be concerned: 1) the voices of poor villagers do not necessarily reach the Union Parishad in areas where there is a large gap between the rich and the poor,

- limited capability of land cultivation due to insufficient mechanization, and
- resignation of poor farmers for enlarging the scale of their farming activities.

3) Requests for field projects in water resources development.

There are several fundamental problems in the water resources development: flood control, irrigation and drainage. In this survey, the embankments for flood control was the highest in priority among various water management works, followed by irrigation and excavation (Drainage). The 3 items were almost at the same level in importance in water resources development. In the irrigation efficient use of water, reduction of water loss and lowering of cost were mentioned to be highly aware of. In several areas electricity for irrigation was also serious constraints. Water control gates, sluice gates,

Ranks of importance in water resources development. (%)

NO. Works	Jamarpur	Kishor.	Mymen.	Netra.	Sherpur	Tamgail	Average
1 Embankment, equipment	28.9	27.9	23.4	34.0	27.1	31.9	28.8
2 Irrigation canal	21.4	22.4	23.4	24.0	24.8	27.6	23.9
3 (Re)Excavation	28.4	26.6	21.5	16.8	24.8	23.2	23.5
4 Drainage canal	2.5	4.5	17.6	14.1	0.0	6.7	7.6
5 Sluice gate	1.0	3.8	2.8	1.5	6.8	1.2	2.9
6 Electricity for irrigation	1.0	1.6	1.1	2.7	8.3	2.0	2.8
7 Road, bridge	2.5	1.9	0.2	0.0	1.5	0.8	1.2
8 Pucca dam, rubber dam	0.0	1.0	1.5	1.9	0.8	0.0	0.9
9 Shelter	4.5	0.0	0.0	0.0	0.0	0.0	0.7
10 Surface water use	0.0	1.6	0.0	1.1	0.0	0.0	0.5
11 River-ponds	0.5	0.0	0.0	0.0	0.0	0.0	0.1
12 Agricultural technology	4.5	7.4	6.1	0.8	3.8	5.5	4.7
13 HRD	3.5	1.0	0.4	0.8	0.8	0.4	1.1
14 Pavement	1.0	0.0	0.0	0.0	0.0	0.0	0.2
15 Loan	0.5	0.0	0.4	0.0	0.0	0.0	0.2
16 Others	0.0	0.3	1.5	2.3	1.5	0.8	1.1
Total	100	100	100	100	100	100	100

Source: JICA Questionnaire Survey to Union Chairpersons (2004)

4) Nutrition intake

Due to continuous increasing of rice production, calorie intake on average of the nation exceeded 2000 Cal, and the nutrition conditions have been improved. However, the child nutrition in which the national nutrition conditions are most clearly revealed was not in appropriate conditions. In the child nutrition survey the children below 5 years old indicated that the ratio of wasting was 31% on average, the stunting was 12% and the underweight was 57%, on average of the 6 Districts. The underweight is mainly caused by insufficient calorie intake. It indicates that food supply, especially cereal supply, is not enough in rural areas, and that about a half of the children are in mal-nutrition. Stunting is a retarded physical status in height. It is caused from insufficiency not only in calories but also proteins and minerals. In food supply uneven distribution need to be corrected urgently.

Malnutrition children under 5 years old.

Items	Unit	Jamarpur	Kishor.	Mymen.	Netra.	Sharpur	Tangail	Average
Wasting	Number	2,388	1,345	1,855	1,911	1,993	2,308	1,967
	%	30	29	38	29	31	28	31
Stunting	Number	714	375	604	632	686	657	611
	%	9	13	12	11	12	12	12
Underweight	Number	4,564	2,573	3,853	3,991	4,898	4,891	4,128
	%	60	55	54	56	59	58	57

Source: JICA Questionnaire Survey to Union Chairpersons (2004)

5) Production cost

Production costs of crops vary by cultivation conditions and yields; therefore, the costs should be analyzed in comparison with returns. The production costs of major crops were compared in this section. The breakdown of the costs and yields were not surveyed, but these data are useful for indicative data of production of the survey areas.

Production cost of selected crops.

Items	Jamarpur	Kishoreganj	Mymensingh	Netrakona	Sharpur	Tangail	Average
Rice	7,603	8,888	7,432	7,814	6,924	7,436	7,683
Jute	3,722	5,447	4,223	3,349	4,546	3,367	4,109
Wheat	3,931	4,897	4,035	7,879	3,947	3,817	4,751
Vegetables	11,327	13,788	12,811	14,449	11,031	14,643	13,008
Oilseeds	3,859	3,891	3,786	3,481	2,970	3,665	3,609
Pulses	2,588	2,710	3,420	3,361	2,958	2,715	2,959

Source: JICA Union Questionnaire Survey (2004)

The cost-return of several different farming systems will be shown in Chapter 5. To develop profitable farming it is important to develop the awareness of cost-return of products.

(6) Current situation of income and expenditure of farming households.

Cash income, expenditure and balance are fundamental factors to develop economic conditions of individual farmers, and explore possible approaches of poverty alleviation. Deficit is the first step toward poverty, and surplus is the first step toward prosperity.

1) Income

Although the food supply is improved, cash income is still low and the rural poverty is still a serious problem. In order to develop the modernization of irrigated farming stably, it is indispensable to secure necessary inputs to farming and obtain income to cover all the costs. To collect fundamental data and information for the purpose of studying feasibility and effectiveness of the SSWRDSP-II, income by source was surveyed.

The total cash income was Tk 35,237 on average of the 6 Districts, with 6.3% of CV% by Districts. The highest was Tk 38,399 of Kishoreganj, and the lowest was Tk 32,995.

- 1) Major income source is rice in the survey areas. The share of the rice was 57%, and among that major varieties were Aman and Boro. In income from Boro was slightly higher than Aman.
- 2) Vegetables had a share of 14%, following rice.
- 3) Jute was estimated to have a share of 5-10%. It is an important traditional cash crop, but its share was not high.
- 4) The shares of both livestock and fish were 9%, which was not so high as expected. The share of the total amount of livestock and poultry was 13%, similar to the vegetables. The livestock and poultry are widely grown by small and landless farmers. They are important income source for non-land use type farming. Aquaculture is not widely practiced; therefore, its share was small in the entire income of Union. However, there are profit-earning aqua-cultures in the areas, and hence aquaculture produces good incentives to rural development.
- 5) Bangladesh imports a great amount of edible oil, and it is also promising commodity in the world markets. However, in spite of such a high market needs, oil crop production had a small share in cash income. Mustard and oil crops are widely grown in the same cropping rotation area as rice.
- 6) Income by the non-agricultural work, including the sale of own labor, amounted to 20%. It plays an important role in household economy.
- 7) Mustard is harvested in December, Boro is harvested in April and May., and Aman is harvested in October and November. In addition, income from vegetables in winter and other miscellaneous sources can be obtained. Therefore, farming households have several times of obtaining cash income through the year.

2) Expenditure

Marketing of agricultural products in rural areas is limited in scale but active. It is important to examine the farm household economy, whether it can afford the necessary expenditure to support and develop small scale irrigated farming. Total amount of yearly expenditure was estimated to be Tk 33,027, with 8.5% of CV%, ranging from Tk 28,481 of Tangail to Tk 36,135 of Mymensingh. The large amount of expenditure caused large deficit in the balance of household economy as shown in the next section.

- i) The largest expenditure item was food which amounted to about Tk 18,677, 57% in the share.
- ii) Expenditure to agricultural inputs followed the food: Tk 6,470, 20% in the share.

3) Balance of income and expenditure

The balance is a useful indicator to improve household economy, and cultivate awareness to profitable farming. The balance was Tk 3,813 on average, changing from Tk -1,178 of Netrakona to Tk 4,889. Netrakona and Sherpur had deficits in the balance, although the amount was small, and the ratios to the cash income were as low as 2.4% to 3.5%. The reason of the deficit was the cash income was low.

Cash income and expenditure of family per year.

Items	Tk/family/year							Average	<%>
	Jamarpur	Kishor.	Mymen.	Netra.	Sharpur	Tangail			
Cash income									
Aus	3,577	5,079	2,314	3,436	2,985	2,125	3,253	9	
Aman	7,171	7,501	7,018	7,743	6,950	8,151	7,423	21	
Boro	8,227	12,640	9,022	9,383	8,254	10,114	9,607	27	
Jute	4,364	2,600	1,553	2,151	2,012	2,644	2,554	7	
Vegetables	5,315	4,595	5,566	4,234	4,815	4,891	4,903	14	
Livestock	2,973	3,805	3,394	2,894	2,278	2,976	3,053	9	
Non agricultural work	3,947	3,856	4,727	4,231	3,898	4,127	4,131	12	
Fish	3,254	4,539	3,265	4,513	1,330	2,621	3,254	9	
Pulses	517	1,100	709	741	258	795	687	2	
Oil seeds	1,490	1,268	475	1,112	691	1,107	1,024	3	
Poultry	1,666	1,604	1,588	1,747	1,463	1,212	1,547	4	
Sale of self labour	3,187	2,808	3,072	3,125	2,650	2,278	2,853	8	
Total	34,892	38,399	38,128	33,834	32,995	33,175	35,237	100	
Expenditure									
Food	18,215	18,586	19,810	20,137	17,425	17,890	18,677	57	
Housing	3,248	3,074	2,229	3,956	2,104	2,593	2,867	9	
Clothes	4,374	3,604	4,950	4,749	3,988	4,179	4,307	13	
Health	1,971	2,152	2,525	2,455	2,048	2,105	2,209	7	
Child education	2,181	2,020	2,677	2,629	2,450	2,506	2,410	7	
Entertainment	1,443	1,405	1,427	1,317	1,194	1,246	1,338	4	
Credit Refund	1,144	3,464	1,930	3,908	3,824	1,288	2,593	8	
Agriculture	5,732	7,338	6,970	6,019	6,988	5,773	6,470	20	
Total	30,003	34,725	36,135	35,012	33,804	28,481	33,027	100	
Difference	4,889	3,674	1,993	-1,178	-808	4,694	3,813	11	

Source: JICA Questionnaire Survey to Union Chairpersons (2004)

(10) Conclusions

1) Questionnaire survey to the Union Chairpersons.

To understand the current situation of agricultural development and rural societies, the questionnaire survey was conducted to every Union Chairperson in the survey areas by mail, and collected almost all the answer sheets.

2) Constraints in agricultural and rural development.

- i. Flood damage was regarded as the most serious constraints in almost all of the Unions
- ii. This was followed by diversification of agriculture (including crop, livestock and fisheries) and mechanization. These agricultural practices will be supported by well managed water use conditions.
- iii. Constraints of availability of irrigation water were also ranked as high importance.
- iv. It is estimated that improvement of breed, limitation of land holding, agricultural extension and insufficiency of agricultural inputs were more or less worked out by various projects, and hence they were regarded as “Low importance”.
- v. From these situation the water resources management by SSWRDSP is urgently needed as a demand-led projects.

3) Farm household economy

- More than half of farm household income depends on rice. Rice has the function of supporting farm household economy as well as supply of nutrition
- There are two crops of rice per year, and vegetables also produce income. There is a possibility of obtaining income throughout the year.
- Currently rice is the most important crop for farm income and production depends on utilization of water and land resources. Thus maintenance of irrigation and other infrastructures is important.

4) Other collected data.

The various data collected in the survey are useful to understand the current situation of Union activities and directions of future development. These data will be compiled and used according to necessity.

5) Collection of Questionnaires

- High rate of collection was realized owing to good cooperation of relevant officers
- However, partial follow-up is necessary for issues such as missing data, misunderstanding of unit, and to further clarify some of the ideas of the union parishad chairpersons.

6) Agricultural System

- Modernization of agricultural system through diversification and specialization of rice based agriculture is required.
- The common agriculture system in the Study Area is Mustard-Boro-Aman, followed by wheat-jute-vegetables. Vegetables-fallow-vegetables were seen for about 10%.
- Patterns such as *boro*-fallow-fallow and Vegetables-fallow-fallow were seen in haor areas

7) Crop Damage

- Flood damage in the rainy season is the largest constraint (washing away of crop, seedlings and seeds)
- Damage due to issues such as pests (nematode, rats, etc.) and weeds are small compared to flood, because the land is exposed to periodical inundation and dryness (Moreover, this pattern rather works to control these damages).

8) Marketing and Distribution

- Transportation to markets are mainly done by man power
- Markets are common in rural areas, and the distance to markets (1 - 7 km) is not a major constraint. However, the road conditions are regarded as a major constraint

9) Food Consumption

- Most of the meals are prepared at homes
- More than half of the infants under 5 years of age are underweight. Nutrition to infants is insufficient and stable production of crops is still an issue

10) Farm Household Economy

- About half of farm income depends on rice. Rice has the function of farm household economy as well as supply of nutrition
- There are two crops of rice per year, and vegetables also bear income. Thus there is a possibility of obtaining income throughout the year.
- Currently rice is the most important crop for farm income and production depends on utilization of water and land resources. Thus maintenance of irrigation and other infrastructures is important.
- Since irrigation of boro is currently done by groundwater, investment is high and the net profit may be lower than that of aman. Examination of revenue and expenditure by variety is necessary.

11) Constraints in Agriculture

- Flood damage was regarded as the most serious constraints in almost all of the upazilas
- This was followed by diversification of agriculture (including crop, livestock and fisheries) and mechanization
- Constraints of irrigation, distribution and land improvement was regarded as of medium importance
- It is estimated that improvement of breed, limitation of land holding, agricultural extension and insufficiency of agricultural inputs were more or less worked out by various projects, and hence they were regarded as “ Low importance”.

5.3 Questionnaire Survey to Upazila Engineers

5.3.1 Distribution

Questionnaires to Upazila Engineers were distributed at the District discussion Meeting held between March 5 and 10, 2005. And they were answered at the Meeting.

5.3.2 Summary of Answers to the Questionnaires

(1) General

1) Period of service of the Upazila Engineers:

The average period of service of the Upazila Engineers (UEs) is 24 months (2 years), i.e. about 2 years, as found in the study. Some UEs have just joined and started working for about a week only. The longest service period was found in Netrokona, 77 months (6.4 year) at Mohongonj. In Kishoregonj, Mymensingh and Netrokona some UEs were found less than 1 month of service period at the present Upazilas.

2) Number of Unions:

The total number of unions of the 6 districts of greater Mymensingh is 562 and the average number, as found in the study, is 9.69. The maximum number of unions was found under Phulpur Upazila of Mymensingh district and that is 20, and the minimum number of union possessing Upazila is Khaliajuri under Netrokona district and the number is 5. There are a few recent changes in the number of unions in 3 Upazilas, namely Dewangonj, Itna and Mirzapur under Jamaplrur, Kishoregonj and Tangail district, respectively. The changes are as in the followings.

- 1) In Dewangonj, an UP name was absent in the UP list and that was added later
- 2) In Itna, Gazipur union has been transferred to Netrokona district
- 3) In Mirzapur, the Sadar union has been abolished and 3 unions have been made namely, Bohuria, Bhatgram and Aaigana

3) Frequency of visit and discussion with UP Chairman and members:

Out of the 58 UEs 56 UEs answered:

26 (46%) informed that the Chairmen and members come to their offices

- 1) 16 informed that they go to visit once (28%)
- 2) 10 informed that they visit weekly (18%)
- 3) 29 informed that they visit more in a month (52%)

Almost in all the Upazilas, it was found that the UP Chairmen and members come to UE office and the UEs also go to visit to their places.

(2) Water Bodies in the Upazila

1) Knowledge on existing water bodies in the Upazila:

Out of the 58 UEs

- Only 11 (27%) UEs informed that they have full knowledge on the names and numbers of waterbodies present in their Upazilas
- 46 (79%) UEs informed that they have partial knowledge
- One (2%) UE informed that he has no knowledge as he just has joined

2) Most serious problems on water resources development:

There were different types of problems in different Upazilas. The problem have been listed and summarized below.

Out of the 58 UEs, 49 UEs answered:

- 11 (22%) informed that flood is the main problem
- 5 (10%) informed flush flood
- 3 (6%) informed early flood
- 13 (26%) informed water logging
- 4 (8%) informed construction of embankment and sluice gate
- 2 (4%) informed erosion
- 15 (30%) informed siltation
- 13 (27%) informed drought and irrigation

The rest 16 (32%) informed of other problems like lack of awareness of people, totally a haor area, financial problem, lack of technical equipments, lack of coordination, no infrastructure present for removal of excess water and catching the water, the khash lands of government are illegally occupied by public, some big farmers are reluctant for possessing small area in the target places, construction works must be finished within November to April, people's interest is less, objections of BWDB, sudden hilly falls, etc.

3) Identifying the potential of water resources development:

Out of the 58 UEs 48 UEs answered:

- 41 (85%) informed that they do identify the potential of water resources development
- 5 (10%) informed that they do not

Identified areas of water resources development by the 41 UEs

- ✓ Excavating and re-excavating khals and beels
- ✓ Dredging and re-dredging the rivers, haors and baors
- ✓ Constructing water controlling structures like embankment, sluice gates, regulators, etc.
- ✓ Re-sanctioning and re-constructing embankment
- ✓ Digging khals
- ✓ Constructing rubber dams

They identify these discussing with UP Chairmen, members and local people.

(3) Subproject of SSWRDSP-2

1) Number Sub-projects for SSWRDSP-2:

- Total 359 sub-projects have been submitted the proposal for SSWRDSP-2
- 29 UEs informed that none of their sub-projects has been approved
- 19 Upazilas informed that only one sub-project has been approved
- Two informed that 2 sub-projects have been approved
- Only one upazila informed that more than 3 have been approved
- One informed that as a newly assigned, then he could not submit any but 3 sub-project proposals are under process of submission

2) Screening out the sub-project proposals:

- ✓ Three UEs did not screen out
- ✓ Thirty Eight screened out following some criteria
- ✓ Seventeen did not answer to this question

3) Where the screened-out proposals are kept:

- ✓ Twenty four UEs informed that those are kept in the Upazila LGED office
- ✓ Four UEs informed that those are kept in the Union level

- ✓ Twenty eight informed that those are kept in the district LGED office
- ✓ Twenty two informed that those are kept in the LGED Headquarter at Dhaka

4) Potential Sub-projects:

- Thirty Four UEs informed that there are potential sub-projects in their Upazilas
- Ten informed that there was none
- Two informed of their not being concerned
- Twelve UEs did not answer to this question

Specification of the potential sub-projects:

- ✓ Construction of embankment, regulators
- ✓ FMD
- ✓ Dredging the khals and rivers
- ✓ CAD
- ✓ Construction of *Pucca* irrigation drain
- ✓ Rubber dam

5) WMCA Formulation:

- In 15 Upazilas WMCAs were formulated
- In 37 Upazilas WMCA was not formulated
- Six UEs did not answer to this question

Problems in WMCA formulation are as follows:

- ✓ There was lack of coordination in Bajitpur Upazila of Kishoreganj District
- ✓ There was a conflict among the members of the WMCA and out of association local people at Kuliarchar of Kishoreganj District
- ✓ Selection of Chairman and Secretary was difficult at Haluaghat Upazila of Mymensingh District
- ✓ No problem faced in any other area

6) Level of understanding of the UP Chairman about SSWRDSP-2:

- Seven (12%) UP Chairman understands fully
- Forty Six (81%) understands partially
- Four (7%) do not understand

7) Difficulties faced after disqualifying the project:

- Forty Three (12%) UEs faced difficulties
- Eight UEs (33%) faced no difficulty

8) Suggestion on poverty alleviation and gender issues in SSWRDSP-2

- Thirty Nine provided with suggestions
- Twelve did not suggest any
- Seven did not answer to the question

Poverty alleviation and addressing gender issues:

- ✓ They urged for agricultural fisheries and livestock production, micro credit program, involving poor and marginal farmers and other poor group, awareness build-up, forming groups with target people and providing them with training, supplying different equipments and agricultural inputs, including people in WMCA, crop diversification, creating job opportunity for both male and female and ensuring women's participation in project activities. association local people at Kuliarchar of Kishoreganj District

9) Suggestions for prioritization of sub-projects:

- Forty six provided with suggestions
- Twelve did not provide with any suggestion

The suggestions were:

- ✓ Agriculture, Fisheries and Livestock production
- ✓ Detailed survey and feasibility study
- ✓ Participatory survey including UP Chairman, members and local people
- ✓ Participatory meeting at Upazila and Union level to identify and accept sub-projects
- ✓ Identifying the water management systems such as irrigation, drainage, embankment construction and holding up the water, CAD, FMD
- ✓ Dredging and re-dredging the rivers and khals
- ✓ Cost-Benefit Ratio
- ✓ Small, marginal and landless farmers should have the top priority
- ✓ Prioritizing the area where communication is good

(4) Union Questionnaire

1) Time allocation for reviewing the UP Questionnaire:

- Thirty Three UEs informed that they did not have enough time
- Thirteen informed that they had enough time
- Five informed that they had no time
- Seven did not answer to this question

2) Whether the UP Questionnaire hampered the regular work:

- Nine answered yes, that is, hampered
- Forty five informed as did not hamper
- Four did not provide with any answer

How did hamper:

- ✓ Hampered a little
- ✓ Hampered due to lack of cooperation of the UP Chairman
- ✓ Needed one more technical staff member
- ✓ Had to engage one SAE for about a week
- ✓ Public representatives did not provide with time, they are very busy

3) Whether there was any difficult question to answer:

- 13 (26%) UEs informed that there were difficulties
- 36 (74%) UEs informed as no difficulties found

Specification:

- ✓ Statistics on area, yield and production of agricultural crops are not available at Union level even at Upazila level
- ✓ Many questions were not clear to them, that is why they are not sure whether they answered to those correctly or not
- ✓ They have no idea about the catchment area and other information
- ✓ Water logging, flash flood

(5) Upazila Office

1) Upazila LGED staff members:

- On an average, as received information from 55 UEs (3 did not answer), there are 17.3, that is, 17 staff members employed in each Upazila Engineer's Office
- On an average there are 1 UE, 2.3 SAE, 1 Draftsman, 1 Accountant, 1 Assistant Accountant, 1.4 Office Assistant, 3.7 Work Assistant, 1.1 Community Organizer, 1 CCT, 1 Electrician, 1.7 Office Attendant, 2.2 MLSS and 1.8 Night Guards.

Positions:

- ✓ Upazila Engineer, Sub Assistant Engineer, Surveyor, Accountant, Accounts Assistant, Computer Operator, Community Organizer, Office Assistant, Work Assistant, Office Attendant, Draftsman, MLSS, Night Guard

2) Whether the number of present staff members at Upazila LGED office is sufficient:

- Thirty three UEs informed that the number of staff members were sufficient
- Eighteen UEs answered that the number was not sufficient

Explanation:

- ✓ Huge load of work at present
- ✓ Work load is increasing day by day
- ✓ Some positions are vacant
- ✓ Shortage of technical staff members

3) Main responsibilities of the Upazila Engineer:

- Construction, operation and maintenance of rural road, growth centers, ferry terminal, public offices, schools, embankment, sluice gates, etc
- Supervision of irrigation
- Staff supervision, Office management
- All LGED related and Upazila level development works
- Discussing with public representatives about different information in relation to project
- Supervision of SSWRDSP-2, SAIP, RDP-21 and other maintenance programme
- Surveying, proposing right projects
- Ensuring the quality of works

4) Collaboration with water relevant agencies:

Forty one UEs collaborate with water relevant agencies, 9 do not collaborate and 8 did not answer to this question

How do collaborate:

- ✓ Goes physically to the relevant offices
- ✓ Talking over telephone and mobile
- ✓ Issuing official letters
- ✓ Discussing in the Upazila Coordination Committee meetings, workshops and seminars
- ✓ While implementing water resources schemes

5) Working environment:

- Twenty Eight UEs informed that they had no problem with the working environment
- Twenty Four UEs urged about their problems
- Six UEs did not answer to this question

Problems:

- ✓ Little working space in the office
- ✓ Accommodation problem, needs more rooms
- ✓ Insufficient vehicles and other equipments
- ✓ Insufficient electricity and vehicle maintenance
- ✓ Insufficient staff members
- ✓ Poor educational qualification of the Computer Operators
- ✓ Office contingency is very poor
- ✓ Lack of sufficient computers and photocopier
- ✓ Lack of leveler stand, plan table, video computer, duplicating machine and other surveying equipments
- ✓ Transportation cost is higher in the haor area, only transport is boat or trawler

6) Service related issues:

- Thirty Eight UEs informed that they had no problem
- Fifteen UEs urged about their problems
- Five UEs did not answer to this question

Problems:

- ✓ Fund for plan estimation is not enough
- ✓ Little working space in the office
- ✓ Lack of sufficient computers
- ✓ Accommodation problem, needs more rooms
- ✓ Insufficient vehicles and other equipments
- ✓ Insufficient electricity and vehicle maintenance
- ✓ Insufficient contingency fund
- ✓ Both the UNO office and UE office is situated in the same building. Therefore, there remains a very little space in the crowded area to work satisfactorily
- ✓ Many staff positions are vacant resulting problem in regular duties
- ✓ It is always a problem to express own views and ideas with the administrative officers

Table A5.1.1 Summary of Findings from Interviews and Statements at the Workshops

Livelihood	<ul style="list-style-type: none"> • 50-60 decimals (1/2 acre or 0.2 ha) might be large enough to produce sufficient rice for a small family (4-5) if he owns the land, but 100 decimals (1 acre or 0.4 ha) might be necessary if he is a share cropper. It would be 200 decimals (2 acre or 0.8 ha) if he can harvest only one crop a year. Also if his land is much smaller than 50 decimals, he needs to do share cropping (or other work) for self-sufficiency. • <i>Boro</i> is usually the staple food and is more productive in the area. Cash by selling <i>aman</i> / cash crops / oil seeds (e.g. mustard) is used for buying seeds and fertilizer of <i>boro</i>. If they cannot get enough cash from crops, they need to have other income sources. • Not a few farmers own some land but that is not enough at all to support themselves. Those who are not landless but marginal farmers are of overriding importance.
Farming	<ul style="list-style-type: none"> • Farmers must have several countermeasures to minimize the negative impact of floods. • Some farmers said they do not plant vegetables because it is low land. Also it is difficult for share croppers to plant vegetables in their farmland probably because income from vegetables is not as stable as that from crops. • Farmers can get more money from farm labor than share cropping if they can get enough work in planting and harvesting seasons.
Fishing	<ul style="list-style-type: none"> • Most of 500 fulltime Hindu fishermen in the benefited area of Begid Beel Subproject fish in Jamuna River, not at the embankment where part-time fishermen would be negatively affected. • Except serious fishermen and fish pond owners / fish businessmen, villagers mainly fish for family consumption. Many villagers fish when they are not so busy such as early morning or dusk, and between planting and harvesting seasons. • “Benefited farmers vs. negatively affected fishermen” is a typical structure of social conflicts regarding SSWRDSP-2
Gender Issues	<ul style="list-style-type: none"> • To get active participation of women, meetings, workshops, training and courses etc. need to be done at <i>para</i>-, village- and multi-village level • Some women cannot access to loans and benefit from NGO’s activities even if they live in Sadar Upazila. • Limitation of homestead land is one of the constraints for income generating activities for women especially in vegetable cultivation, poultry and other livestock keeping. • No adult male in the family automatically means the hardships of life in rural area. • Dowry still is a heavy burden for villagers despite government’s campaign. • Women in rural area are still facing a lot of social problems such as access to education, early marriage, dowry and decision making to go out or to spend money.
PRA and Subprojects	<ul style="list-style-type: none"> • In some cases, PRA teams might not be conducting enough interviews or real bottom-up workshops / meetings. • In some cases, UP Chairmen did not get a consensus at village- and <i>para</i>-level. • Explanation of the outline of the proposed subproject to the villagers might not be good enough. Accountability and villagers’ participation for decision making are at stake.
Digha Beel Subproject (appraisal failed)	<ul style="list-style-type: none"> • There is a purely community-based project of an earth dam in the subproject area and six villages are working together every year. At least some villagers do not feel the necessity of a permanent structure and that might be one of the reasons why so many villagers opposed the subproject. • There was a social conflict in the subproject area in 1974 and as many as 1,000 villagers took a direct action. A fear for social conflict like this might be another reason for opposition. • Some influential villagers including UP member and fish businessmen are opposing the subproject and the main reason behind seems to be illegal occupation of the <i>khas</i> land.
Mutabari Khal Khonon	<ul style="list-style-type: none"> • There was a project where 37 villagers contributed 50-60 villagers each for earthwork and dug a canal. • % of wheat + 8 mother pumps / 12 small pumps (about 10% of the project cost) by the government and 95 % of contribution for construction by villagers. • Though the project was initiated by the government and UP Chairmen, village headmen (gram sharkar) and shomaj elders were involved and consensus of 37 villages was reached.

Table A5.1.2 Record of Workshop

Date	District	Upazila	Union	Proposed SSWRDSP-2	Participants	(women)	Result as of August 2004
9 Sept. 04 Th	Tangail	Kalihati	Nagbari	Ratanganj	50 - 60	(0)	Passed
10 Sept. 04 Fr		Ghatail	Rasulpur	Doli Beel - Atarochura	600 - 700	(40 - 50)	Reconnaissance Failed
11 Sept. 04 Sa	Jamalpur	Sadar	Kendua	Tetulia - Sadarbari	100 - 120	(25 - 30)	Passed
12 Sept. 04 Su		Dewarganj	Chukaibari	Begid Beel	600 - 700	(40 - 50)	PRA Failed
16 Sept. 04 Th	Mymensingh	Ishwarganj	Iswardanj	Goria Beel	100 - 120	(25 - 30)	Passed
17 Sept. 04 Fr			Jatia	Digha Beel	45 - 50	(1)	Appraisal Failed
18 Sept. 04 Sa	Sherpur	Sadar	Pakuria	Gaowa Beel - Dhurungi Beel	40 - 50	(2)	Appraisal Failed
19 Sept. 04 Su		Nalitabari	Marichpuran	Hushikhali Khal	120 - 150	(1)	Passed
			Noya Beel	Dudkura Khal	50 - 60	(4)	Reconnaissance Failed
23 Sept. 04 Th	Netrakona	Sadar	Sinher Bangla	Fazar Ali Khal (Rupsha Beel)	40 - 50	(12)	Passed
24 Sept. 04 Fr				Ghagotia Khal	40 - 45	(0)	Reconnaissance Failed
25 Sept. 04 Sa	Kishoregonj	Karimganj	Joyka	Joyka	100 - 120	(7)	Passed
26 Sept. 04 Su		Tarail	Tarail	Bherantala	100 - 120	(1)	PRA Failed
Total	6	10	11	13	2,000 - 2,250	(160 - 190)	

Table 5.1.3 Results of Problem Analysis

Name of District / Upazila / Union	Cropss	Direct Cause 1.	Direct Cause 2.	Direct Cause 3.	Direct Cause 4.	Direct Cause 5.
Tangail District		Agricultural production is low.	Villagers can't find jobs / work in the area.	Many villageres don't have land.	Villagers can't get good price of products.	
Nagbari Union, Kalihati Upazila (Passed)	Mustard / cash crops	1. Agricultural production is low.	2. Villagers can't find jobs / work in the area.	3. Fishery production is low.	Expenditure is large.	Villagers can't do livestock in flood.
Rasulpur union, Ghatail Upazila (Reconn. failed)	Mustard / cash crops	1. Villagers can't market their crop products.	2. Agricultural production is low.	3. Villagers can't find jobs / work in the area.	Women can't earn.	Expenditure is large.
Jamalpur District		1. Agricultural production is low.	2. Villagers can't find jobs / work in the area.	3. Fishery production is low.		
Kendua Union, Sadar Upazila (Passed)	Aman / vegetables	Agricultural production is low.	Villagers can't get good price of products.	Fishery production is low.	Livestock production is low.	Villagers can't find jobs / work in the area.
Chukaibari Union, Dewanganj Upazila (PRA failed)	Wheat / cash crops	1. Agricultural production is low.	2. Fishery production is low.	3. Villagers can't find jobs / work in the area.	4. Livestock production is low.	5. Family expenditure is large.
Mymensingh District		Villagers can't find jobs / work in the area.	Farmers can't get good price of products.	Agricultural production is low.	Villagers' wage is low.	
Iswanganj Union, Iswanganj Upazila (Passed)	Aus / aman	1. Villagers can't find jobs / work in the area.	2. Agricultural production is low.	Family expenditure is large.	Per capita cultivable land is small.	Women can't earn.
Jatia Union, Iswanganj Upazila (App.failed)	Aus / aman	1. Agricultural production is low.	1. Villagers can't find jobs / work in the area.	Women can't earn.	Family expenditure is large.	
Sherpur District		Landless farmers can't find farming jobs.	Agricultural production is low.	Farmers can't get good price of products.	Fishery production is low.	Villagers can't find jobs / work in the area.
Pakuria Union, Sadar Upazila (Reconn. failed)	Aman / vegetables	1. Agricultural production is low.	2. Fishery production is low.	3. Villagers can't make money from trees.	Women can't make money from poultry.	Women can't earn.
Marichpuran Union, Nalitabari Upazila (Passed)	Aman	Agricultural production is low.	Villagers can't find jobs / work in the area.	Fishery production is low.	Livestock production is low.	Family expenditure is large.
Noya Beel Union, Nalitabari Upazila (Reconn. failed)	Aman	1. Agricultural production is low.	2. Villagers can't find jobs / work in the area.	3. Villagers can't get good price of products.	4. Villagers can't make money from livestock.	Fishery production is low.
Netrakona District		1. Villagers can't find jobs / work in the area.	2. Agricultural production is low.	3. Villagers can't get good price of products.		
Sinher Bangla Union, Sadar Upazila (Passed)	Aman	M-1,F-3 Agricultural production is low.	F-1,M-3 Villagers can't find jobs / work in the area.	M-2,F-2 Family expenditure is large.	Villagers' wage is low.	Villagers can't get good price of products
Sinher Bangla Union, Sadar Upazila (Reconn. failed)	Aman	1. Agricultural production is low.	2. Villagers can't find jobs / work in the area.	3. Family expenditure is large.	Fishery production is low.	Villagers can't get good price of products
Kishoregonj District		1. Agricultural production is low.	2. Villagers can't find jobs / work in the area.	3. Fishery production is low.		
Joyka Union, Karimganj Upazila (Passed)	Boro	1. Agricultural production is low.	2. Fishery production is low.	Agriculture production cost is high.	Family expenditure is large.	Women can't earn.
Tarail Union, Tarail Upazila (PRA failed)	Boro	1. Agricultural production is low.	2. Villagers can't get good price of products.	3. Villagers can't find jobs / work in the area.	Women can't earn.	Family expenditure is large.

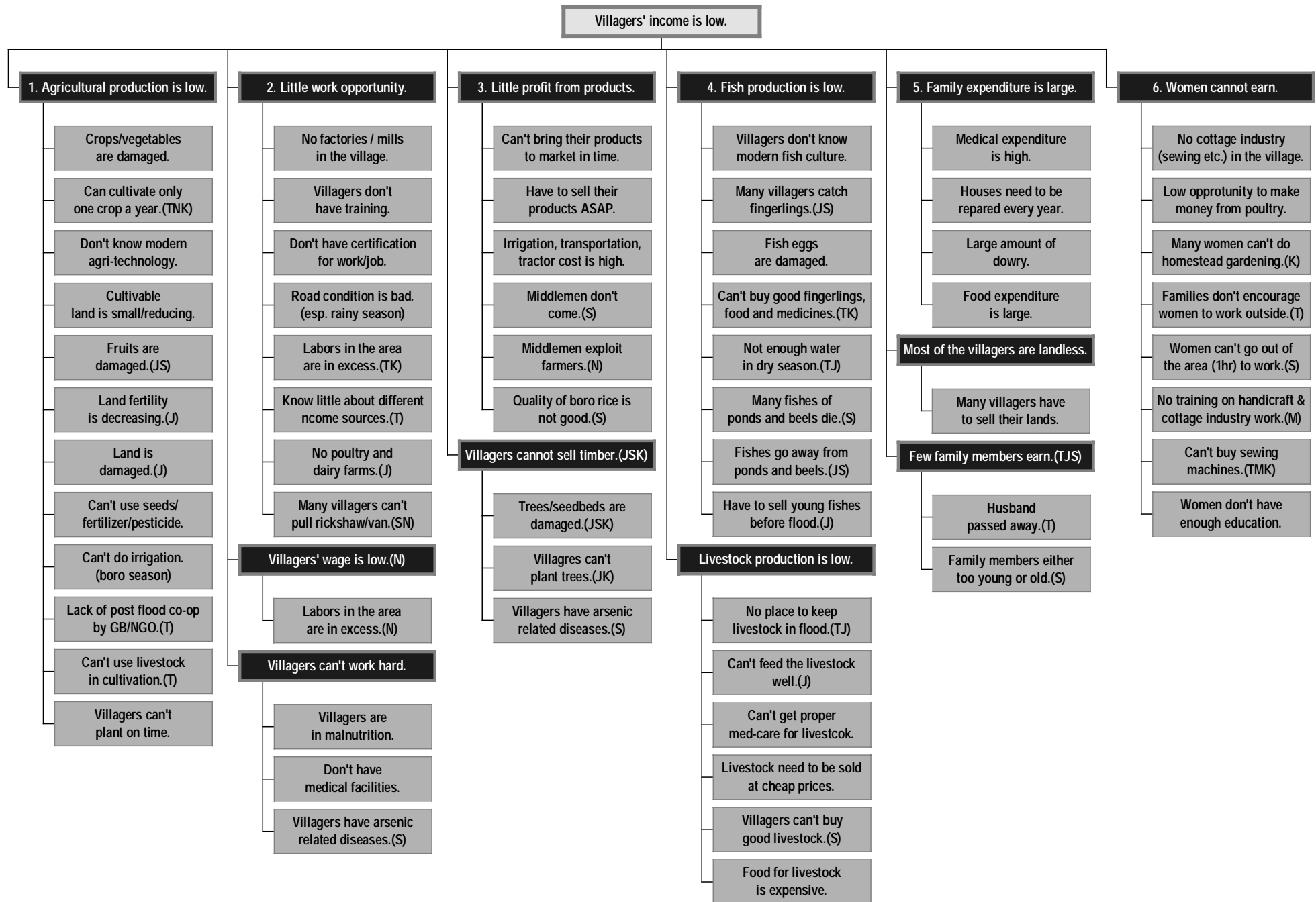


Fig. 5.1.1 Problem Analysis Model for Greater Mymensingh (simplified)

ATTACHMENT: UNION QUESTIONNAIRE FORM

Questionnaire On Small Scale Water Resources Development In Union (1/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

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

বাংলাদেশের বৃহত্তর ময়মনসিংহ জেলার ভূপরিষ্ক পানির যথাযথ ব্যবহারের মাধ্যমে দারিদ্রতা বিমোচনের উদ্দেশ্যে ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন প্রকল্প প্রণয়নের মহা-পরিকল্পনা তৈরীর সমীক্ষা

QUESTIONNAIRE ON SMALL SCALE WATER RESOURCES DEVELOPMENT IN UNION

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র

Union ইউনিয়ন	Code No. কোড	Upazila উপ-জেলা	Zila জেলা	Date তারিখ
	Name নাম			

Agro-ecological Zone কৃষি পরিবেশ অঞ্চল	
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1. OUTLINE OF FIELD CONDITION (Expected to be answered by Upazila Engineer):

মাঠ পর্যায়ের অবস্থা (উপ-জেলা প্রকৌশলী কর্তৃক পূরণ করতে হবে)

1.1. Geographical and social condition of Union ইউনিয়নের ভৌগোলিক এবং সামাজিক অবস্থা

1.1.1 Hydro Geographical Conditions ভূ-তত্ত্ব বিষয়ক অবস্থা

a Name of Watershed/River Basin জলাশয়ের নাম/নদীর
অববাহিকার নাম

b Altitude (PWD: Public Works Department) at UP Office (মিটার)
সমুদ্র পৃষ্ঠ থেকে ইউনিয়ন পরিষদ অফিসের উচ্চতা (পি, ডব্লিউ, ডি)

1.1.2 Location অবস্থান

a. Distance of UP from Upazila Headquarters (কিঃ মিঃ)
উপ-জেলা প্রধান কার্যালয় থেকে ইউনিয়ন পরিষদের দূরত্ব

b1 Distance of National Highway from UP Office (কিঃ মিঃ)
ইউনিয়ন পরিষদ অফিস থেকে জাতীয় সড়কের দূরত্ব

b2 Distance of District roads from UP Office (কিঃ মিঃ)
ইউনিয়ন পরিষদ অফিস থেকে জেলা পরিষদের রাস্তার দূরত্ব

b3 Distance of Upazila roads from UP Office (কিঃ মিঃ)
ইউনিয়ন পরিষদ অফিস থেকে উপ-জেলা পরিষদের রাস্তার দূরত্ব

1.2. Land and Land Use

ভূমি এবং ভূমির ব্যবহার

1.2.1 Total Area of Union (একর)
ইউনিয়নের মোট ভূমির পরিমাণ

1.2.2 Total Forest Area (একর)
মোট বনভূমির পরিমাণ

Government reserve forests

ক. সরকার নিয়ন্ত্রিত বনভূমির পরিমাণ (একর)

Homestead forests

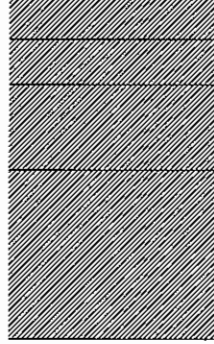
খ. বসত-বাড়ীর আশ-পাশের বনের পরিমাণ (একর)

Wet lands

1.2.3 জলা ভূমির পরিমাণ (একর)

1.3. Demography (2001) জন সংখ্যা- (২০০১)

- 1.3.1 Total Population (মোট জন সংখ্যা) persons (ব্যক্তি)
 1.3.2 Male/Female Ratio (পুরুষ/ মহিলা হার) %
 1.3.3 Population more than 18 years old (অষ্টার বছর বয়সের উর্ধ্বে জন সংখ্যা) persons (ব্যক্তি)
 1.3.4 Annual Growth Rate (বাৎসরিক জনসংখ্যা বৃদ্ধির হার) %
 1.3.5 Literacy (%) (শিক্ষার হার)



1.4 Social Infrastructure
সামাজিক অবকাঠামো

- 1.4.1 Number of Primary Schools/Madrassas
প্রাইমারী স্কুল /মাদ্রাসার সংখ্যা
 1.4.2 Number of Primary Health Care Centers
প্রাইমারী স্বাস্থ্য সেবা কেন্দ্রের সংখ্যা

প্রাইমারী স্কুল	(সংখ্যা)
মাদ্রাসা	(সংখ্যা)

- 1.4.2 Number of Primary Health Care Centers
প্রাইমারী স্বাস্থ্য সেবা কেন্দ্রের সংখ্যা

- 1.4.3 Rural Water Supply
গ্রামীণ পানি সরবরাহ

a. Number of Community Wells

কমিউনিটি/সরকারী টিউবওয়েলের/নলকূপের এবং পাতকুয়ার মোট সংখ্যা

(সংখ্যা)

- b. Quality of domestic water such as arsenic contamination
গৃহস্থালিতে ব্যবহৃত পানির গুণগত মান (আরসেনিক অথবা অন্য কোনো প্রকার দূষণ যুক্ত কিনাঃ হ্যাঁ/না (✓ দিন) হ্যাঁ হলে % উল্লেখ করুন

না / হ্যাঁ (%)

- 1.4.4 Total Household (Nos.) মোট বসতবাড়ীর সংখ্যা

(সংখ্যা)

- 1.4.5 % of electricity installed household

শতকরা কতটি বাড়িতে বিদ্যুৎ সংযোগ আছে

%

- 1.5 Is there any BWDB Project in your Union ?

(Yes/No)

পানি উন্নয়ন বোর্ডের কোন প্রকল্প এই ইউনিয়নে আছে কি না ?

(হ্যাঁ / না)

Questionnaire On Small Scale Water Resources Development In Union (3/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2. Farm Management Development (to be answered by UP chairman, Secretary and Agricultural Extension Officials) **খামার ব্যবস্থাপনা উন্নয়ন (ইউনিয়ন পরিষদ চেয়ারম্যান, সচিব এবং কৃষি সম্প্রসারণ কর্মকর্তা কর্তৃক পূরণ করতে হবে)**

2.1 General idea of agricultural development

কৃষি উন্নয়নের উপর অভিমত এবং উপদেশ

2.1.1 Cropping Pattern

শস্য বিন্যাস/ফসল বিন্যাস

Considering the favorable natural and agro-ecological conditions of Bangladesh, establishment of <Rice + alpha> as a farming system is recommended: rice for food supply and alpha (Vegetables, fish and livestock) for cash income. Do you think this type of farming system is also applicable and useful in Bangladesh?

বাংলাদেশের অনুকূল প্রাকৃতিক এবং কৃষি পরিবেশ অঞ্চলের অবস্থা বিবেচনা করে ধান + অন্যান্য কৃষিপণ্য চাষ পদ্ধতির সুপারিশ : খাওয়ার জন্যে ধান এবং নগদ আয়ের জন্যে অন্যান্য কৃষিপণ্য (সবজি, মাছ ও পশু সম্পদ)। আপনি কি মনে করেন, ধান ভিত্তিক এ ধরনের কৃষি পদ্ধতি বাংলাদেশের জন্য উপযোগী এবং অনুসরণ যোগ্য হবে?

Yes হ্যাঁ
No না

Please briefly write your own idea for the agricultural development of your Union.

সংক্ষেপে আপনার ইউনিয়নের কৃষি উন্নয়নে আপনার নিজস্ব চিন্তাধারা নিম্নে উল্লেখ করুন :

- a. _____
b. _____
c. _____

2.1.2 There are various constraints in the development of agriculture in Bangladesh. Please assess the constraints farmers are facing in your Union by the following items in your opinion.

বাংলাদেশের কৃষি উন্নয়নে বহুমুখী প্রতিবন্ধকতা বিদ্যমান : আপনার ইউনিয়নের কৃষকেরা যে সকল প্রতিবন্ধকতার সম্মুখীন সে

ব্যাপারে নিম্নে বর্ণিত বিষয় গুলোর আলোকে আপনার মতামত (✓) দিন

	Constraints প্রতিবন্ধকতা /সীমাবদ্ধতা	Serious মারাত্মক	Medium মাঝারী	Little কম
(1)	Limitation of agricultural land কৃষি জমির প্রাপ্ততার সীমাবদ্ধতা			
(2)	Improved rice seeds অপরিষ্কৃত এবং গুণগত মানের বীজ			
(3)	Irrigation Water supply in dry season শুষ্ক মৌসুমে সেচের পানি সরবরাহ			
(4)	Flood damages in monsoon season বর্ষা মৌসুমে বন্যায় ক্ষতি			
(5)	Less development of land preparation অনুন্নত জমি তৈরী			
(6)	Less development of agricultural technology অনুন্নত কৃষি প্রযুক্তি			
(7)	Low inputs (fertilizer, chemicals, capital, labour) অপরিষ্কৃত কৃষি উপকরণ যেমন সার, কীটনাশক, মূলধন/, শ্রমিক ইত্যাদি			
(8)	Constraints in marketing বাজারজাতকরণে সমস্যা			
(9)	Less crop diversification অনুন্নত ফসল বহুমুখী করণ			
(10)	Mechanization অপরিষ্কৃত যান্ত্রিক চাষাবাদ			
(11)	Your own view আপনার নিজস্ব মতামত _____ _____ _____	_____	_____	_____

Questionnaire On Small Scale Water Resources Development In Union (4/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.2. Collection of data on agricultural fields including processing, preservation and marketing.

(কৃষি পণ্য প্রক্রিয়াজাতকরণ, সংরক্ষণ এবং বাজারজাতকরণ বিষয়ে DcvE/Z_ ... সংগ্রহ)

2.2.1 Breakdown of farm holdings by size by the same category as Upazila in percentage.

(উপ-জেলার নিয়মে জমির মালিকানার শ্রেণী বিন্যাস করুন)

Area in acre জমির পরিমাণ (একর)	Land- less (ভূমিহীন)	0.05- 0.49 (০.০৫ - ০.৪৯)	0.50- 0.99 (০.৫০- ০.৯৯)	1.00- 1.49 (১.০০- ১.৪৯)	1.50- 2.49 (১.৫০- ২.৪৯)	2.50- 7.49 (২.৫০- ৭.৪৯)	7.50 – 14.99 (৭.৫০- ১৪.৯৯)	15.00 - 24.99 (১৫.০০ - ২৪.৯৯)	25.00 & above (২৫.০০ এবং উর্ধ্বে)
in % জমির মালিক (%)									

2.2.2 Classification of area and crops of farm land জমির শ্রেণী এবং জমির ফসল আবাদের বিবরণ

Type of land জমির শ্রেণী (Depth of water/পানির গভীরতা)	Highland উর্ধ্ব জমি (০-৩০)	Med. highland মাঝারী উর্ধ্ব জমি (৩০-৯০)	Med. lowland মাঝারী নিচু জমি (৯০-১৮০)	Lowland নীচু জমি (১৮০ এর উর্ধ্বে :বর্ষা মৌসুমে বি. আমনের উপযোগী)	Very lowland অতিব নীচু জমি (১৮০ এর উর্ধ্বে :বর্ষা মৌসুমে বি. আমনের উপযোগী নয়)	মোট
Area (%) জমির পরিমাণ (%)						১০০%
Cultivated crops আবাদকৃত ফসলের নাম						

2.2.3 Type of major crop rotation প্রধান প্রধান ফসলের রোটেশন

Type ফসলের রোটেশন	Crop-I (Date of operation) শস্য -১ : ফসলের নাম এবং ফসল রোপণ ও ফসল কর্তনের মাসের নাম	Crop-II (Do.) শস্য -২ : ফসলের নাম এবং ফসল রোপণ ও ফসল কর্তনের মাসের নাম	Crop-III (Do.) শস্য -৩ : ফসলের নাম এবং ফসল রোপণ ও ফসল কর্তনের মাসের নাম	Share(%) ফসলের রোটেশন অনুযায়ী আণ্ডত্বীয় জমির শেয়ার (%)
Type A ধরণ-ক				
Type B ধরণ-খ				
Type C ধরণ-গ				
Total মোট				১০০%

Questionnaire On Small Scale Water Resources Development In Union (5/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.2.4 Rice production and processing methods (ধান উৎপাদন এবং প্রক্রিয়াজাতকরণ পদ্ধতি)

Operation (কার্যক্রম)	Machines (যান্ত্রিক পদ্ধতির যন্ত্রের নাম)	Manual (সনাতন পদ্ধতি এবং ব্যবহৃত যন্ত্রপাতির নাম)	House labor (বাসার শ্রমিক)		Hired labor (ভাড়াটে শ্রমিক)	
			Men (পুরুষ)	Women (মহিলা)	Men (পুরুষ)	Women (মহিলা)
Land preparation (জমি তৈরী)						
Sowing (বীজ বপন)						
Transplanting (চারা রোপন)						
Weeding (আগাছা দমন)						
Irrigation (সেচ)						
Fertilizer/Chemicals (সার/ কীটনাশক)						
Harvesting (ফসল কর্তন)						
Transportation (পরিবহন)						
Threshing (ফসলমাড়াই)						
Drying (ফসল শুকানো)						
Cleaning & Grading (ফসল ঝাড়াই- বাছাই এবং পরিষ্কার করা)						
Milling (ভাংগানো)						
Par-boiling/boiling (বাস্পী পদ্ধতিতে/ গরম পানিতে সিদ্ধকরণ)						
Storage (শুদামজাতকরণ)						
Marketing (বাজারজাতকরণ)						

2.2.5 Services of extension workers কৃষি সম্প্রসারণ কর্মীর অবদান

(1)	Number of agricultural extension workers designated to your Union: আপনার ইউনিয়নে কত জন ব্লক সুপারভাইজার কর্মরত আছে	সংখ্যা (No)
(2)	Frequency of visit to farmers ব্লক সুপারভাইজার কতবার কৃষকের সাথে মাসে কতবার দেখা করে	সময়/মাস (Times/Months)
(3)	What type of problems do you discuss with Block Supervisors (BS)? ব্লক সুপারভাইজারের সাথে কি ধরনের বিষয় সমাধান কল্পে আপনি আলোচনা করেন, সে সম্পর্কে আপনার মতামত দিন	

Questionnaire On Small Scale Water Resources Development In Union (6/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.2.6 Crop damages শস্য হানি/ ফসলের ক্ষতি (২০০২ - ২০০৩)

Causes ক্ষতির কারণ	Crops শস্য/ফসলের নাম	Estimated damages of crops আনুমানিক ফসল ক্ষতির জমির পরিমাণ	Decrease in yield: % or yield level ফলন কম হওয়া : শতকরা হার (%)
(1) Flood (বন্যা)		:	
(2) Drought (খরা)		:	
(3) Diseses (রোগ- বলাই)		:	
(4) Insect (পোকা)			
(5) Rat (ইদুর)			
(6) Birds (পাখি)			
(7) Social conflict (সামাজিক দন্দ)			
(8) Others (অন্যান্য)			

2.2.7 Cooperative Activities সমবায় কার্যক্রম

সমবায়ের ধরন	Farmers' cooperatives কৃষক সমবায় সমিতি	Credit group ঋণ সমিতি	Water management association পানি ব্যবস্থাপনা সমিতি	Fishery Cooperative Association মৎস্য সমবায় সমিতি	Others অন্যান্য	Total মোট
Number সমবায়ের সংখ্যা						
Organization Ratio by house holding (%) ইউনিয়নের মোট পরিবারের শতকরা কতটি পরিবার সমিতির অন্তর্ভুক্ত (%)						

Questionnaire On Small Scale Water Resources Development In Union (7/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.2.8 Production cost উৎপাদন খরচ

Are there any survey data on production cost of major crops? If there are, please specify the name of survey প্রধান প্রধান ফসলের উৎপাদন খরচ বিষয়ে কোনো জরিপ তথ্য/উপাত্ত আছে কিনা? যদি থাকে তাহলে জরিপের নাম এবং একর প্রতি খরচের পরিমাণ (টাকায়) উল্লেখ করুন

Rice ধান	Jute পাট	Wheat গম	Vegetables শাক-সবজি	Oil crops তৈল বীজ	Pulses ডাল

2.2.9 Livestock পশু সম্পদ

(1) Number of animals and source of feed in your Union (2002 – 03)

আপনার ইউনিয়নে পশু-পাখির সংখ্যা ও খাদ্যের উৎস (২০০২ - ০৩)

Name of animals পশু-পাখির নাম	Number of animals পশু-পাখির সংখ্যা	Source of animal food (✓ yes) পশু-পাখির খাদ্যের উৎস (থাকলে ✓ দিন)				
		Rice straw ধানের খড়	Green Fodder সবুজ ঘাস	Waste of human food মানুষের খাবারের অতিরিক্ত খাদ্য দ্রব্য	Farmer's own produced cereal feed কৃষকের নিজের উৎপাদিত দানাদার খাদ্য	Procured cereal feed ক্রয়কৃত দানাদার খাদ্য
Cattle গরু						
Buffalo মহিষ						
Goat / sheep ছাগল/ভেড়া						
Fowls মোরগ-মুরগী/ পশু-পাখি						
Ducks হাঁস						

Questionnaire On Small Scale Water Resources Development In Union (8/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

(2) Seriousness of major problems in animal production in terms of the following items:

পশু সম্পদ উৎপাদনে wb ঙ gœ বর্গিত প্রতিবন্ধকতার গুরুত্ব বিষয় গুলি সম্পর্কে মতামত (√ দিন)।

Items বিষয়	High উঁচু	Medium মধ্যম	Low কম	Countermeasures প্রতিরোধ মূলক ব্যবস্থা
1 Feed supply খাদ্য সরবরাহ				
2 Water supply in dry season শুষ্ক মৌসুমে পানির সরবরাহ				
3 Vaccination টিকাদান				
4 Shelter at flooding বন্যায় আশ্রয়				
5 Easiness of access to Veterinary Surgeon সহজে পশু চিকিৎসকের সহযোগিতা পাওয়া যায় কিনা				

(3) Livestock Development (পশুসম্পদ উন্নয়ন)

1) What is your plan to develop the livestock in your Union ?

আপনার ইউনিয়নের পশুসম্পদ উন্নয়নে পরিকল্পনা কি ?

2) What is constraint for the development?

পশুসম্পদ উন্নয়নের প্রতিবন্ধকতা কি ?

3) How do you plan to solve the problems?

সমস্যা সমাধানে আপনার পরিকল্পনা কি

4) What kind of requests do you make to Upazila and District in the agricultural development?

আপনার ইউনিয়নের পশুসম্পদ উন্নয়নে জেলা এবং উপজেলা পর্যায়ে থেকে আপনি কি ধরনের সহযোগিতা চান ?

Questionnaire On Small Scale Water Resources Development In Union (9/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.2.10 Fisheries (মৎস্য)

(1) How many farmers with fisheries and specialized fishers are working in your Union ?

আপনার ইউনিয়নে মাছ চাষে সাধারণ মৎস্য চাষী এবং মৎস্যজীবী/ জেলের সংখ্যা কত ?

Description (বিবরণ)	Open water fisheries (মুক্ত জলাশয়ে মাছ চাষ)	Aquaculture (বিশেষ পদ্ধতিতে মাছ চাষ)	Others (Fish processing and fish dealers) অন্যান্য (মাছ প্রক্রিয়াকরণ এবং মাছের ডিলার)
(i) Farmers with fisheries (মৎস্য চাষী)			
(ii) Specialized fishers (মৎস্যজীবী/ জেলের সংখ্যা)			

(2) Open water fisheries (মুক্ত জলাশয়ে মাছ)

1) Species (মাছের প্রজাতি)

Major species মাছের প্রধান প্রধান প্রজাতির নাম	Fishing place মাছ চাষের স্থান	Total Catch/year (kg) প্রতি বছর মাছ আহরনে পরিমাণ (কেজি)	Sold fish /production (%) উৎপাদনের কত ভাগ মাছ বিক্রি (%)	Selling price (Tk/kg) প্রতি কেজি বিক্রয় মূল্য (টাকা)	Change (গত কয়েক বছরে মাছ উৎপাদনে পরিবর্তন)		
					Increase বৃদ্ধি (%)	Constant অপরিবর্তিত (%)	Decrease হ্রাস (%)
1							
2							
3							

2) Future fisheries development (ভবিষ্যৎ মৎস্যসম্পদ উন্নয়ন)

a) What kind of problems does your Union have in fisheries? (মৎস্য বিষয়ে আপনার ইউনিয়নে সমস্যা সমূহ কি)

b) What is your major problems in fishing due to implementation of the proposed sub-project (Such as FMD and Drainage sub-projects) ?

প্রস্তাবিত উপ-প্রকল্প (যেমন এফ এম ডি এবং পানি নিষ্কাশন উপ-প্রকল্প) বাস্তবায়নে মৎস্য আহরনে আপনার প্রধান প্রধান সমস্যা কি ?

c) What kind of mitigation measures do you plan to the problems ?

(এ সকল সমস্যা প্রশমনে আপনি কি ধরনের পরিকল্পনা করেছেন?)

i) How do you plan to solve the problems ?

(এ সকল সমস্যা সমাধানে আপনার পরিকল্পনা কি)

ii) What kind of requests do you make to Upazila and District in the fisheries development?

(উপ-জেলা এবং জেলা পর্যায়ে থেকে আপনি আপনার ইউনিয়নে মৎস্য উন্নয়নে আপনি কি ধরনের সহযোগিতা চান)

Questionnaire On Small Scale Water Resources Development In Union (10/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

(3) Aquaculture (একুয়াকালচার)

1) Species (মাছের প্রজাতি)

Major species (মাছের প্রধান প্রধান প্রজাতির নাম)	Culturing year period (বছরে মাছ চাষের সময়)	Source of fingerling (মাছের পোনার উৎস)	Type of water body (জলাশয়ের ধরণ)	Sold fish/ production(%) উৎপাদনের কত ভাগ মাছ বিক্রি (%)	Selling price (Tk/kg) প্রতি কেজি বিক্রয় মূল্য (টাকা)	Change (গত কয়েক বছরে মাছ উৎপাদনে পরিবর্তন)	
						Start (শুরু) কেজি	End (শেষ) কেজি
1							
2							
3							

2) Number of nurseries / hatcheries (নার্সারীর / হ্যাচারীর সংখ্যা)

How many in your Union ? (আপনার ইউনিয়নে কতগুলো নার্সারী / হ্যাচারী আছে ?)	By government (সরকারি)	By private (বেসরকারি)
Nurseries (in Nos.) নার্সারীর সংখ্যা		
Hatcheries (in Nos.) হ্যাচারীর সংখ্যা		

3) Seriousness of damages in aquaculture

(একুয়াকালচার - ক্ষতির গুরুত্ব)

	Damages (✓ ক্ষতি)			Mitigation measure (ক্ষতি প্রশমনের পদক্ষেপ)
	Serious (মারাত্মক)	Medium (মাঝারী)	Little (কম)	
1 Fish diseases (মাছের রোগ)				
2 Loss by flooding (বন্যায় ক্ষতি)				
3 Shortage of water (পানির অভাব)				
4 Shortage of fingerling supply (মাছের পোনার অভাব)				
5 পানি দূষিত				
6 Others (Please specify) অন্যান্য (যদি থাকে, উল্লেখ করুন)				

4) Future development (ভবিষ্যৎ উন্নয়ন)

i. How do you plan to solve the problems ? (উপরোক্ত সমস্যা সমাধানে আপনার পরিকল্পনা কি ?)

ii. What is your major problems in aquaculture due to implementation of the proposed sub-project (Such as FMD and Drainage sub-projects) ? প্রস্তাবিত উপ-প্রকল্প (যেমন এফ এম ডি এবং পানি নিষ্কাশন উপ-প্রকল্প) বাস্তবায়নে একুয়াকালচারে আপনার প্রধান প্রধান সমস্যা কি?

iii. What kind of mitigation measures do you plan to the problems ?
এ সকল সমস্যা প্রশমনে কি ধরনের পদ্ধতিগত ব্যবস্থা আপনি পরিকল্পনা করছেন?

iv. What kind of requests do you make to Upazila and District in the aquaculture development?
(আপনার ইউনিয়নে একুয়াকালচার উন্নয়ন উপ-জেলা এবং জেলা পর্যায় থেকে কি ধরনের সহযোগিতা চেয়েছেন ?)

Questionnaire On Small Scale Water Resources Development In Union (11/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

(4) Is there any facility of fish storage in your Union ? Yes/No
 আপনার ইউনিয়নে মৎস্য সংরক্ষণের সুবিধা কি আছে ? হ্যাঁ/না

4.1 How many Ice factory and storage capacity in your Union ------(No.)
----- (MT)

কয়টি বরফ কল আছে এবং ধারণ ক্ষমতা সংখ্যা
মেঃ টন

4.2 How many refrigerated/ Ice van and capacity ------(No.)
----- (MT)

তাপ নিয়ন্ত্রিত/বরফায়িত ভ্যানের সংখ্যা এবং ধারণ ক্ষমতা সংখ্যা
মেঃ টন

2.2.11 Marketing (বাজারজাতকরণ)

1. How many markets in your Union ? (Nos)

আপনার ইউনিয়নে কত গুলি বাজার আছে?

- Number of daily markets (Nos)
- প্রতি দিন খোলা থাকে কতগুলি
- Number of 1 – 3 markets in a week (No)
- সপ্তাহে এক থেকে তিন দিন খোলা থাকে কতগুলি
- Total (No)
- মোট

2. Which organization is responsible for market management?

মার্কেট ব্যবস্থাপনার দায়িত্ব কোন সংস্থার উপর ন্যাস্ত?

- Registration by: Union Parishad or other organization (Please specify)
- রেজিস্ট্রেশনের দায়িত্ব : ইউনিয়ন পরিষদ অথবা অন্যান্য যদি থাকে (উল্লেখ করুন)
- Management by : Union Parishad or other organization (please specify)
- ব্যবস্থাপনার দায়িত্ব : ইউনিয়ন পরিষদ অথবা অন্যান্য যদি থাকে (উল্লেখ করুন)

3. (কৃষকদের বিক্রয় পদ্ধতি)

Selling to (in %) যার মাধ্যমে বিক্রি (%)	Self (নিজে)	Through middlemen (মিডল ম্যানের মাধ্যমে)	Contract (চুক্তি বদ্ধ)	through cooperatives (সমবায়ের মাধ্যমে)	Others (অন্যান্য)

Selling by (in%) কি ভাবে বিক্রি (%)	Independently (স্বাধীন ভাবে)	Jointly (মৌখ ভাবে)

Questionnaire On Small Scale Water Resources Development In Union (12/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

4. যাতায়াতের জন্য প্রধান প্রধান মাধ্যম

Major product (প্রধান প্রধান পণ্য)	Major transportation tools (%) বাজারজাতকরনের জন্য প্রধান প্রধান যাবাহনের ধরণ (%)							Distance to markets farmers usually sell products (km) বিক্রির জন্যে কৃষকের খামার থেকে বাজারের দূরত্ব কত ? (কিঃ মিঃ)
	Walking (পেয়ে হেটে)	Cart (গরুর গাড়ীতে)	Richshaw (রিকশায়)	Van (ভ্যানে)	Refrigerated/ Ice van (তাপনিয়ন্ত্রিত/ বরফায়িত ভ্যান)	Truck (ট্রাকে)	Boat (নৌকা)	
1)								
2)								
3)								
4)								
5)								

5. What type of complains raised by the farmers in your Union (✓ yes)

আপনার ইউনিয়নের কৃষকরা কি কি ধরনের অভিযোগ করে (✓ দিন)

- Distance of market বাজারের দুরত্ব বেশী
- Poor condition of rural road রাস্তাঘাটের দুরাবস্থা
- Lack of market information বাজার সম্পর্কে তথ্যের অভাব
- Others অন্যান্য (উল্লেখ করুন)

6. What do you plan for future improvement in the marketing system in your Union ?

আপনার ইউনিয়নে বাজারজাত করনের ভবিষ্যৎ উন্নয়নের জন্য আপনার পরিকল্পনা কি ?

- 1.
- 2.
- 3.
- 4.

2.3 Collection of data on food consumption and human security in rural areas

গ্রামীণ এলাকায় মানুষের খাদ্য এবং মানুষের w b i v c E v বিষয়ক D c v E

2.3.1 Food consumption and nutrition problems

খাদ্য এবং পুষ্টি বিষয়ক সমস্যা

Major food consumptions
(প্রধান প্রধান খাবারের ধরন)

	Not take (অনাহার)	Yes (হ্যাঁ)
	%	Type of Food (খাবারের ধরন)
Breakfast (সকালের নাছা)		
Lunch (দুপুরের খাবার)		
Diner (রাতের খাবার)		

Child nutrition: Number and
ratio of under-nutrition by
শিশু পুষ্টি : সংখ্যা এবং পুষ্টি হীনতার হার

Wasting কম শক্তি	Stunting কম উচ্চতা	Underweight: Percent in perso মোট শিশুর মধ্যে কতজন শিশু ওজন কম তার শতকরা হার (%)

Questionnaire On Small Scale Water Resources Development In Union (13/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/১৩)

2.3.2 Sufficiency of items in human security in your union (please answer by ✓)

আপনার ইউনিয়নে মানুষের wbiycEv মূলক যথেষ্ট ব্যবস্থা আছে কি না (সঠিক ঘরে টিক চিহ্ন দিন ✓)

(1) Sufficiency of drinking water
(পর্যাপ্ত পরিমাণে খাবার পানি)

Sufficient	Insufficient
(পর্যাপ্ত)	(অপর্যাপ্ত)

(2) Source of drinking water(%)
(খাবার পানির উৎসহ)

Well	river	pond	others
(টিউবয়েল)	(নদী)	(পুকুর)	(অন্যান্য)

(3) Services of first aide
(প্রাথমিক চিকিৎসা সেবা)

Yes (হ্যাঁ)	No (না)	If yes, what type of organizations provides the services (যদি হ্যাঁ হয়, কি ধরনের সংস্থা সেবা দিয়ে থাকে)

(4) Access to electricity by house(%) (বাড়ীতে বিদ্যুৎ সুবিধা) (%)

Public electricity (সরকারি)	Other sources (please specify) (অন্যান্য উৎস (উল্লেখ করুন))	No electricity (বিদ্যুৎ বিহীন)

(5) Housing (বাড়ী ঘর)

Sufficient (পর্যাপ্ত)	Insufficient (অপর্যাপ্ত)

(6) Percentage of primary school /Madrassa attendance

প্রাইমারী স্কুল / মাদ্রাসায় পড়াশুনার হার (%)

	Boy (বালক)	Girl (বালিকা)
a. Primary school (%) ক. প্রাইমারী স্কুলে পড়াশুনার হার (%)		
b. Madrassa (%) খ. মাদ্রাসায় পড়াশুনার হার (%)		

Questionnaire On Small Scale Water Resources Development In Union (14/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

2.3.3 Household economy in rural area. (পল্লী অঞ্চলের পারিবারিক অর্থনৈতিক অবস্থা)

Please estimate and write the weight of income by source.

অনুগ্রহ পূর্বক উৎসে wfwEK আয়ের আনুমানিক তথ্য wb \$ gœ উল্লেখ করুন

(1) Major sources of cash income (Tk/house/year) (অর্থ আয়ের প্রধান উৎস (প্রতি পরিবার/ প্রতি বছর/ টাকা))	
1) Rice (ধান)	
Aus (আউশ)	
Aman (আমন)	
Boro (বোরো)	
2) Jute (পাট)	
3) Vegetables (শাক- সবজি)	
4) Livestock (পশুসম্পদ)	
5) Non agricultural work and others (কৃষি বহির্ভূত কাজ এবং অন্যান্য)	
6) Fish (মাছ)	
7) Pulses (ডাল)	
8) Oil seeds (তৈল বীজ)	
9) Poultry (হাঁস - মুরগী)	
10) Sales of self labor (নিজের শ্রম বিক্রি)	
Total (মোট)	

(2) Major expenditure items (Tk/house/year) প্রধান প্রধান ব্যয়ের খাত টাকা/ প্রতি পরিবার/ প্রতি বছর	
1) Food (খাদ্য)	
2) Housing (বাসস্থান)	
3) Clothes (কাপড়)	
4) Health (স্বাস্থ্য)	
5) Child education (শিশু শিক্ষা)	
6) Entertainment (আপ্যায়ন)	
7) Agriculture (কৃষিকার্য)	
Total (মোট)	

2.4 Future development (ভবিষ্যৎ DbœqY)

(1) What do you plan to do for the development of your Union in the fields of agriculture, fisheries, livestock, agro-processing, marketing, transportation, etc? (আপনি আপনার ইউনিয়নের কৃষি, মৎস্য, পশুসম্পদ, কৃষিপণ্য প্রক্রিয়াজাতকরণ, বাজারজাতকরণ এবং পরিবহন, ইত্যাদি Dbœq \$ b কি ধরনের পরিকল্পনা করেছেন?)

(2) What do you suggest to farmers for the agricultural development in you Union? (আপনার ইউনিয়নের কৃষকদের কৃষি Dbœq \$ b আপনি কি ধরনের পরামর্শ দিয়ে থাকেন?)

(3) What requests do you make to upazila and district for the development of agriculture in you Union? (আপনার ইউনিয়নের কৃষি Dbœq \$ b উপ- জেলা এবং জেলা পর্যায় থেকে কি ধরনের সহযোগিতা চান?)

Questionnaire On Small Scale Water Resources Development In Union (15/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

3 WATER RESOURCES (to be answered by UP Chairman and Secretary with Upazila Engineers assistance)

পানি সম্পদ (উপজেলা প্রকৌশলী সহযোগীতায় ইউনিয়ন পরিষদ চেয়ারম্যান এবং সচিব সেই সাথে উত্তর দিতে হবে)

3.1 What are the water related problems in your union and when do they occur?

আপনার ইউনিয়নে পানি বিষয়ক কি কি সমস্যা আছে এবং কখন এই সমস্যা দেখা দেয় ?

Water related problems পানি বিষয়ক সমস্যা	When do the problems occur? সমস্যা কখন দেখা দেয়

3.2 Problem Occurrences সমস্যা সংগঠন সম্পর্কে

3.2.1 Describe the water related problems that occur in your union in a normal year.

স্বাভাবিক বছরে আপনার ইউনিয়নে পানির সম্পর্কিত সমস্যা সম্পর্কে বিবরণ দিন

(Please identify the problematic areas on as many maps as needed)

অনুগ্রহ পূর্বক সমস্যা বিষয়ক এলাকা যতগুলো ম্যাপ দরকার ততগুলো ম্যাপে চিহ্নিত করুন

Problem সমস্যা Type ধরণ	Area অঞ্চল		Depth (feet) / গভীরতা (ফুট) Length (km) দৈর্ঘ্য (কিঃ মিঃ)	Duration স্থায়িত্ব (months) কত মাস	Month of the year বছরের কোন মাসে
	Name of mouza / village মৌজা / গ্রামের নাম	Area (acre) পরিমাণ (একর)			
Flood (বন্যা)					
Drought (ক্ষরা)					
Irrigation Water shortage (কৃষি কাজে পানির অভাব)					
Erosion মাটির ক্ষয়					
Water logging জলাবদ্ধতা					
Domestic water supply গৃহস্থলীতে পানি সরবরাহ					
Water quality / Arsenic problem পানির গুণগতমান/আর্সেনিক জনিত সমস্যা					
Other problems (please specify) অন্যান্য সমস্যা (যদি থাকে উল্লেখ করুন)					

Questionnaire On Small Scale Water Resources Development In Union (16/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

3.2.2 Describe the water related problems that occur in your union in extreme year.

আপনার ইউনিয়নে সর্বোচ্চ পানির সম্পর্কিত সমস্যা সম্পর্কে বিবরণ দিন

(Please identify the problematic areas on as many maps as needed)

অনুগ্রহ পূর্বক সমস্যা বিষয়ক এলাকা যতগুলো ম্যাপ দরকার ততগুলো ম্যাপে চিহ্নিত করুন

Problem সমস্যা Type ধরণ	Area অঞ্চল		Depth (feet) / গভীরতা (ফুট) Length (km) দৈর্ঘ্য (কিঃ মিঃ)	Duration স্থায়িত্ব (months) কত মাস	Month of the year বছরের কোন মাসে
	Name of mouza / village মৌজা / গ্রামের নাম	Area (acre) পরিমাণ (একর)			
Flood (বন্যা)					
Drought (ক্ষরা)					
Irrigation Water shortage (কৃষি কাজে পানির অভাব)					
Erosion মাটির ক্ষয়					
Water logging জলাবদ্ধতা					
Domestic water supply গৃহস্থলীতে পানি সরবরাহ					
Water quality / Arsenic problem পানির গুণগতমান/আর্সেনিক জনিত সমস্যা					
Other problems (please specify) অন্যান্য সমস্যা (যদি থাকে উল্লেখ করুন)					

3.3 Water Related Problems

পানি সম্পর্কিত সমস্যা

3.3.1 : How does the water related problems affect your union in a normal year?

স্বাভাবিক বছরে পানি সম্পর্কিত সমস্যা আপনার ইউনিয়নে কিরূপ ক্ষতি করে ?

Item বিষয়	Number affected ক্ষতি গ্রস্তের সংখ্যা	Name / Type নাম/ধরণ	Area (acre) / Length (km) পরিমাণ (একর)/দৈর্ঘ্য (কিঃ মিঃ)	Estimated Quantity affected ক্ষতি গ্রস্তের আনুমানিক পরিমাণ (টাকা)
Human মানুষ				
Houses বাড়ী ঘর				
Crops ফসল				
Livestock পশু সম্পদ				
Road রাস্তাঘাট				
Embankment বাঁধ				
Bridge ব্রীজ				
Culvert কালভার্ট				
Regulator রেগুলেটর				
Others অন্যান্য				

Questionnaire On Small Scale Water Resources Development In Union (17/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

3.3.2 : How did the water related problems affected your union in extreme year?

সর্বোচ্চ অবস্থায় পানি সম্পর্কিত সমস্যা আপনার ইউনিয়নে কিরূপ ক্ষতি করেছে ?

Item বিষয়	Number affected ক্ষতি গ্রস্তের সংখ্যা	Name / Type নাম/ধরণ	Area (acre) / Length (km) পরিমাণ (একর)/দৈর্ঘ্য (কিঃ মিঃ)	Affected year ক্ষতি গ্রস্তের বছর
Human মানুষ				
Houses বাড়ী ঘর				
Crops ফসল				
Livestock পশু সম্পদ				
Road রাস্তাঘাট				
Embankment বাঁধ				
Bridge ব্রীজ				
Culvert কালভার্ট				
Regulator রেগুলেটর				
Others অন্যান্য				

3.4 Describe the water bodies lying inside or flowing through your union.

আপনার ইউনিয়নের মধ্যে অথবা মধ্য দিয়ে প্রবাহিত জলাশয়ের বর্ণনা দিন

(Please identify the water bodies on as many maps as needed)

অনুগ্রহ পূর্বক যতগুলো ম্যাপ দরকার সে মোতাবেক সমস্যা বিষয়ক এলাকা চিহ্নিত করুন

Type ধরণ	Name নাম	Area (acre) পরিমাণ (একর)	Width (feet) চওড়া (ফুট)	Depth (feet) গভীরতা (ফুট)	Perennial / Seasonal প্রতি বছর / মৌসুমী	Length of water stay(months) পানি অবস্থানের সময় (কত মাস)	Month of the year বছরের কোন মাসে
River নদী							
Khal খাল							
Large water body হাওড়, বাওড়, বিল							
Small water body পুকুর, দীঘি							

Questionnaire On Small Scale Water Resources Development In Union (18/19)

ইউনিয়নের ক্ষুদ্রাকার পানি সম্পদ উন্নয়ন বিষয়ক প্রশ্ন পত্র (১/ ১৩)

3.5 Describe the water supply sources and associated problems in your union

পানি সরবরাহের উৎস এবং এতদঃ সম্পর্কিত সমস্যা সম্পর্কে বিবরণ

(Please identify the water supply sources on as many maps as needed)

অনুগ্রহ পূর্বক যত গুলো ম্যাপ দরকার সে মোতাবেক সমস্যা বিষয়ক এলাকা চিহ্নিত করুন

Surface Water ভূ-পরিষ্ক পানি :

Type of water supply source পানি সরবরাহের উৎসের ধরণ	Name of source উৎসের নাম		
	River, Khal নদী, খাল	Large water body হাওড়, বাওড়, বিল	Small water body পুকুর, দিঘী
Surface water ভূ-উপরিষ্ক পানি			

Ground Water ভূ-গর্ভস্থ পানি :

Type of water supply source পানি সরবরাহের উৎসের ধরণ	Number of well by type টিউবয়েলের ধরণ ও সংখ্যা			Is there any lowering Groundwater table? ভূ-গর্ভস্থ পানির স্তর কমে গেছে কিনা	
	Hand TW হস্ত চালিত টিউবয়েল	Shallow TW শ্যালো টিউবয়েল	Deep TW ডিপ টিউবয়েল	Yes হ্যাঁ কতটুকু কমে গেছে: ফুট	No না/ অপরিবর্তিত
Ground water ভূ-গর্ভস্থ পানি					

3.6 Describe the water related projects and structures lying in your union

পানি বিষয়ক প্রকল্প এবং কাঠামো সম্পর্কিত বিবরণ

(Please identify the water related structures on as many maps as needed)

অনুগ্রহ পূর্বক যত গুলো ম্যাপ দরকার সে মোতাবেক সমস্যা বিষয়ক এলাকা চিহ্নিত করুন

Item বিবরণ	Name নাম	Agency in charge দায়িত্বে নিয়োজিত সংস্থা	Covered area (acre) / length (km) আওতাধীন এলাকা (একর)/দৈর্ঘ্য (কিঃ মিঃ)	Construction year নির্মানের বছর	Problems associated এতদঃ সম্পর্কিত সমস্যা	Any suggestion কোন উপদেশ যদি থাকে
Existing project বিদ্যমান প্রকল্প						
Embankment বাঁধ						
Sluice gate স্লুইস গেইট						
Others অন্যান্য						

3.7 Describe the reasons and how you manage and how to improve water related problems of your union?

আপনার ইউনিয়নের পানির সম্পর্কিত সমস্যার কারণ এবং কি ভাবে উক্ত সমস্যা সমাধান কল্পে কি ধরনের ব্যবস্থা গ্রহণ করা প্রয়োজন বলে আপনি মনে করেন

Problem Type সমস্যার ধরণ	What is the reason of problem সমস্যার কারণ	How does it affect কি ভাবে ক্ষতি করে	How do you manage the problem now? উক্ত সমস্যা সমাধানে বর্তমানে কি ব্যবস্থা নিয়েছেন	How to improve / solve the problem কি ভাবে সমস্যা উত্তরণ এবং সমাধান করা যাবে
Flood (বন্যা)				
Drought (ক্ষরা)				
Irrigation Water shortage (কৃষি কাজে পানির অভাব)				
Erosion মাটির ক্ষয়				
Water logging জলাবদ্ধতা				
Domestic water supply গৃহস্থলীতে পানি সরবরাহ				
Water quality / Arsenic problem পানির গুণগতমান/আর্সেনিক জনিত সমস্যা				
Other problems (please specify) অন্যান্য সমস্যা (যদি থাকে উল্লেখ করুন)				