



Research Report

on

Qualitative Study on Water Governance and Community Based Management in 9 Polders of Bangladesh

Polder: 3

Kaliganj and Debhata Upazila, Satkhira district

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1. INTRODUCTION

1.1. Aim of the report

This report aspires to generate a detailed situation analysis report of polder 3 in Kaliganj and Debhata sub-districts of Satkhira district based on Focus Group Discussions (FGD) and Key Informant Interviews (KII). It will do so by providing:

- i) A historical narrative of the polder from the time it was constructed to present;
- ii) Farming systems and livelihoods options;
- iii) Current state of the polder infrastructure;
- iv) Examining the results and process of the water management interventions of the BWDB
- v) Reviewing how maintenance of water management infrastructure takes place;
- vi) Reviewing how operation of sluice gates take place; and
- vii) Discussing main conflicts.

It will then conclude by discussing the main findings and implementable policy recommendations that came from the respondents for improving water management in the polder 3.

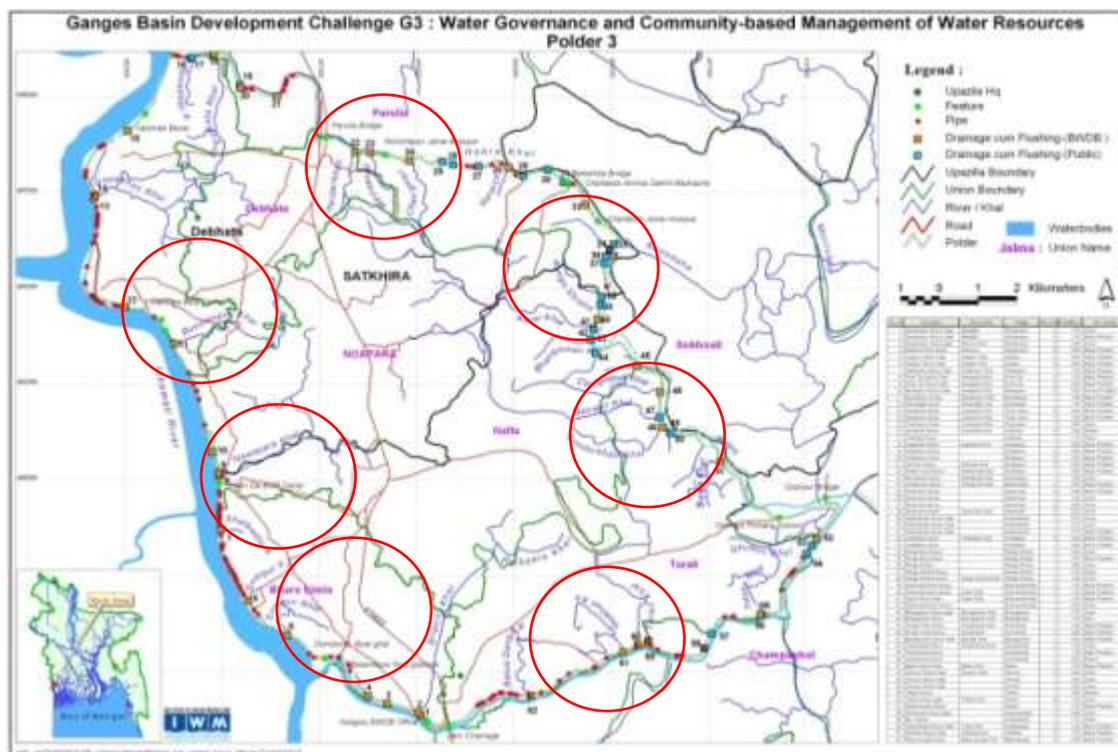
1.2. Methodology

Thirteen Focus Group Discussions and seventeen Key Informant Interviews (KIIs) were conducted by the Shushilan research team from 17th February to 14th March, 2012. The FGDs were held in 13 venues of 10 villages of Tarali and Varasimla Unions of Kaliganj Upazila and Parulia, Debhata sadar Unions of Debhata Upazila. The venue of the FGDs were selected based on IWM map, transect walk and consultation with the local people by considering various part of the union, distance from main rivers and sluice gates, the situation of the rivers, canals, gates and concentration of various types of farming in particular gher culture, paddy cultivation with or without aquaculture. The KIIs were selected through snowball and opportunity process. The KIIs with farmers, women headed households, LCS group members and gatemen were held at their village home and the KIIs with UP, WMC and BWDB officials were held at the respective offices in the UP and Upazila headquarters. Venues and time of KIIs were selected through consultation with interviewees. The map below describes where the FGDs have been conducted.

The map describes where the FGD have been conducted. The villages were selected according to their location, sluice gates condition and concentration. Salient features of the General FGD locations are described below:

- **Suelpur village of Vorasimla union** (adjoining sluice gates: numbers 5 & 6): Southwest side of the polder, by the side of Ichamati River and Suelpur canal, highest concentration of private pipe inlets, unauthorized cuts, sluice still active but has major problems, concentration of shrimp gher, agriculture with and without aquaculture.
- **Nichintapur village of Parulia union** (adjoining sluice gates: numbers 22 & 23): Northern side of the polder, near Sapmara, Chengmari, Moyna canals; polder managed by BWDB drainage cum flushing sluice gates, sluice gates active, not much problem, no adjoining unauthorized cuts.
- **Batuadanga village of Tarali UP** (adjoining sluice gates: numbers 59-62): Southern side of the polder, near Kaksiali River, canals -Tarali, Tuskhali, Kholisakhali, Kolkhali; BWDB sluice gates, unauthorized cuts, silted canals, concentration Shrimp Gher, aquaculture.
- **Rangashiha village of Parulia union** (adjoining sluice gates: numbers 34-37): Eastern side of polder, Banshdaha River, Rangashisa canal, private gates, unauthorized cuts, concentration of gher, the fastest and the largest gher existed, Only aquaculture, no agriculture farming, high salinity, very remote and acute drinking water crises.

- **Vorasimla vilgge of Vorasimla union** (adjoining sluice gates: numbers 4-6):Southwestern side of the polder, very near to Ichamoti River, many unauthorized cuts, silted canals, Gher culture, agriculture with and without aquaculture.
- **Tarali village of Tarali Union** (adjoining sluice gates: numbers 48-60): South and South-east part of the polder, near Kakshiali and Habra River, canals- Sundarkhali, Tetuliya, Bariya & Gushuri, gates no 59 and 60 are not in good condition, broken shutters, River erosion by the side of Kakshiali River, Tetuliya, Gushuri canals silted, unauthorized cuts, concentration of gher and very limited agriculture practices.



The list of FGD and KII is provided in Table 1 and 2.

Table 1: List of FGDs conducted in polder3

SL #	FGD Type	Numbers of Participants (Female)	Numbers of Participants (Male)	Total	Village (para)	Union Parishad	Relevant Sluice Gate Numbers	Adjoining Canals	Age	
									Max	Min
1	General	0	11	11	Suelpur,	Varasimla	5&6	Ichamati, Suelpur khal	65	40
2	General	3	11	14	Nichintopur	Parulia	22 & 23	Sapmara, Chengmari, Moyna, Haldar	55	25
3	General	0	10	10	Vorasimla	Vorasimla	4-6	Ichamoti, Kaksiali	69	35
4	General	0	10	10	Batuadanga	Tarali	59-62	Kaksiali, Tarali. Tuskhali, Kholisakhali, Kol khali	65	28

5	General	1	8	9	Bashi rabad	Parulia	59-62	Tuskhali, Kholisakhali, Kol khali	30	51
6	General	1	10	11	Rangashisha	Parulia	34-37	Banshdaha, Rangashisha	47	31
7	General	10	0	10	Adorshogam	Parulia	22-26	Sapmari river & Chengmari khal	25	32
8	LCS-female	9	0	9	Tarali	Tarali	48-54	Kaksiali, Tarali, Tuskhali, Kholisakhali & Golkhali	46	26
9	LCS-male	0	10	10	Nichintapur	Parulia	22-24	Sapmari, Chengmari, Moyna, Halda r khal	52	30
10	LCS-male	0	12	12	Rangashisha	Parulia	34-37	Banshdaha River, Rangashisha canal	60	25
11	Union Level WMC	1	8	9	Debhata		11-17	Ichamoti, Sapmari, Bosontopur, Gopakhali, Sonakhali, Goalma ri khal	72	30
12	Union Level WMC	2	8	10	Tarali	Tarali	48-62	Kaksiali, Tarali, Tuskhali, Kholisakhali & Golkhali	54	32
13	Gate committee	1	8	9	Boshontopur	Debhata UP	11-14	Ichamoti, Sapmari, Gopakhali, Sushilga ti	70	32

Table 2: List of KII conducted in Polder 3

SI #	Respondent Type	Village/ Venue
1	Affected person	Trali village, tarali
2	Paddy Farmer	Nalta UP
3	Mixed farmer	Chitra tetulpur, Tarali
4	Big shrimp farmer	Varasimla
5	Medium shrimp farmer	Batuadanga, tarali
6	Small shrimp farmer	Tarali
7	Female headed household	Batuadanga, Tarali
8	Female headed household	Tarali UP
9	President WMC, Debhata upazila	Parulia UP
10	Gateman, BWDB	Golkhali, Tarali Up
11	Gateman, private (gate committee)	Trali UP
12	Gateman, Parulia	Parulia UP
13	Illegal cutter/pipe inlet	Varasimla
14	Case hanging person	Tarali UP
15	UP member, male, Parulia	
16	UP member, female, Parulia	House of UP member, Parulia

1.3. An Overview of the Study Area

1.3.1. Location and accessibility

Location and Geographical Features

The southwest coastal region of Bangladesh is part of Ganges delta of which land is formed by the silt deposit over the past millennia and where formation of new island and char is still going on. The world's largest mangrove forest, Sundarbans is located in the south, between the vast plain land and the Bay of Bengal. The vast forest area protects the adjoining plain lands including this polder from the devastation of cyclone and tidal surges to a considerable extent. However, with the gradual rise of sea level and increasing occurrence of cyclones, this deltaic plain - hardly a few feet above the sea level - is severely affected by such natural calamities and the polder has been constructed to protect the area from tidal surge.

Polder 3 comprises the southern half of Debhata (three UP) and northern half of Kaliganj Upazilla (three UP) covering total area of 194 sq km. This area is encircled by 64 kms embankment along the two major rivers Ichamoti and Kakshiali in the west and south and two minor rivers Sapmara and Habra in the north and east. The polder area has 86 kms canals but two thirds of them are closed for having inadequate structures and gradual encroachment by the gher owners.

The land profile of the study polder is saucer shaped, the lands along the riverbanks are a bit higher elevated than the land in the middle of the polder and the land along the inner canals. Due to this topographic feature, the settlement area and the villages are located along the river banks and along major canals. Rural roads were also constructed along the river banks while inner side of the polder was agricultural area, now the bulk of which is converted to shrimp gher. Expansion of shrimp farming later encroached to a bit elevated land along the embankment taking advantage of the BWDB embankment, sluice gates and canals. For further expansion of shrimp area, private sluice gates have been constructed and pipe inlets set to bring brackish water from the river to the agriculture area.

Accessibility by road and waterways

Polder 3 has two major rivers, Ichamoti in the west and Kakshiali in the south. These two rivers are navigable round the year. Ichamoti is a border river between Bangladesh and India. As a result, traffic movement is restricted. Hence waterway transportation is very limited. River Kakshiali has considerable traffic and the rivers Bansbari and Habra in the east and Sapmara in the north have limited navigability depending on tide and monsoon water flows. In the past, water transport was important for both passenger and cargo movement. Presently, passenger boat service is totally abandoned due to improved road network. Goods transport is still continued but that too is gradually declining.

Polder 3 is connected to the district town Satkhira and divisional city Khulna by a regional highway. Distance of Satkhira town from the centre of the polder is about 30 kms in the north and Khulna city about 90 kms in the northeast. Dhaka city is about 400 kms northeast from polder 3. There is inter-district bus service from Khulna, Dhaka and Satkhira to the polder area. Travel time needed from Satkhira, Khulna and Dhaka to the polder area is one hour, three hours, and ten hours respectively.

On the highways, bus and lorry are the most frequent and convenient transport but in the short distance people use rickshaw van and engine van even on the highways. In the feeder roads and rural roads, most frequent transport is rickshaw van and engine van for both passenger and goods transportation.

In the past, bicycle service for passenger transport (called helicopter!) was very common. Now motorbike service has replaced it. Another type of transport now expanding is battery operated three-wheeler called easybike. In the rivers, main transport is mechanized boat which has almost

entirely replaced both country boat and motor launch. Country boats are still visible but on the decline.

1.3.2. Demographic features

Geographical area of polder 3 comprising six UPs of Debhata and Kaliganj Upazilla is 19,429 ha or about 194.29 sq km. Polder area population is 157,616 as per population census 2011. Population density per sq km is estimated 811.

A total of 37,990 households live in the study polder with average household size of 4.1. Sex Ratio (Male as percentage of female population) was 100.30 in the study polder as per population census 2011. In this polder Muslim population is 85%, Hindu and others 15%. Minority population is a bit higher than national average (10%).

Literacy rate of the population is 52.25% where male 56.05% and female 48.5%. Literacy rate is little bit less than national average.

Table 3 below shows basic demographic data of the polder area segregated to six UPs.

Table- 3: Area and Population of Polder 3 by Union Parishad

SL	Particulars	Debhata upazila			Kaliganj upazila			Total Polder 3
		Debhata up	Parulia UP	Noapara UP	Bharashimla UP	Nalta UP	Tarali UP	
1	Area (Sq km)	21.47	43.84	34.92	23.39	40.96	29.71	194.2915
2	Household	3,901	7,784	6,597	5,749	8,270	5,689	37,990
3	Population Total	16,036	32,179	27,943	24,621	34,719	22,118	157,616
4	Density	747	734	800	1053	848	745	811
5	Household Size	4.1	4.1	4.2	4.3	4.2	3.9	4.1
6	Male Population	7,831	16,115	13,900	12,312	17,433	11,096	78,687
7	Female Population	8,205	16,064	14,043	12,309	17,286	11,022	78,929
8	Sex Ratio	95	100	99	100	101	101	100
9	Religion Muslim %	85.6	84.6	82.0	87.9	90.0	77.8	85.0
10	Hindu %	14.4	15.4	18.0	12.1	10.0	22.2	15.0
11	Christian and others %	0	0.003	0.011	0.008	0.000	0.045	0.010
12	Literacy All	57.2	49.7	53.7	48.8	53.9	50.2	52.25
13	Literacy M	61.7	52.8	58	52.4	57.4	54	56.05
14	Literacy F	52.9	46.6	49.5	45.2	50.4	46.4	48.5

Source: BBS, Population Census 2011, Community Series for Satkhira district

Table 4 shows employment status of male and female population of age 7 and above not attending school. In polder 3, 83.5% of the males (of age 7+ not attending school) are “employed” in various income earning activities and 15% represented not working. Of the female of 7+ age group (not attending school), 7.6% are reported to be working in various economic activities, 74.9% reported to be engaged in household chores only and about 1.8% non working.

Table 4: Employment Status of Polder Area People (age 7+ not in school)

SL	Particulars	Debhata upazila			Kaliganj upazila			Total Polder 3
		Debhata up	Parulia UP	Noapara UP	Bharashimla UP	Nalta UP	Tarali UP	
1	Population age 7+ not in school	3,669	7,990	6,743	7,207	8,640	5,335	39,584
2	Male	1,513	3,386	2,773	3,121	3,663	2,232	16,688
3	Female	2,156	4,604	3,970	4,086	4,977	3,103	22,896
4	Employed Male	1,234	2,842	2,455	2,601	2,934	1,875	13,941
5	Employed Female	168	498	244	256	305	265	1,736
6	% employed Male	81.6	83.9	88.5	83.3	80.1	84.0	83.5
7	% employed Female	7.8	10.8	6.1	6.3	6.1	8.5	7.6
8	% Looking for Job Male	0.6	0.2	0.4	0.5	0.6	0.9	0.5
9	% Looking for Job Female	0.1	0.0	0.1	0.1	0.1	0.1	0.1
10	% in household work Male	0.5	0.5	1.4	1.1	1.6	2.1	1.2
11	% in household work Female	73.8	71.4	80.9	75.0	73.2	76.0	74.9
12	% not working Male	17.4	15.4	9.6	15.1	17.7	13.0	14.7
13	% not working Female	18.3	8.6	10.0	9.7	8.0	12.9	1.8

Source: BBS, Population Census 2011, Community Series for Satkhira district

Table 5 shows distribution of male and female working population by broad economic sectors. In polder 3, about three fourth (73.82%) of the male workers are engaged in the agriculture sector, only 3.5% in industries and near about one fourth (22.68%) in the service sectors. Besides, of the female workers, about 57.49% are engaged in the agriculture sector, about 39.17% in service sector and only 3.34% in industry sector. Many of women workers employed in service sectors such shrimp gher and shrimp processing.

Table 5: Employment of Working Population by Broad Sectors

SL	Particulars	Debhata upazila			Kaliganj upazila			Total Polder 3
		Debhata UP	Parulia UP	Noapara UP	Bharashimla UP	Nalta UP	Tarali UP	
1	Agriculture % of male worker	61.67	78.92	73.44	55.52	84.66	82.99	73.82
2	Agriculture % of female worker	41.67	69.88	58.61	42.97	67.21	46.04	57.49
3	Industry % of male worker	0.89	1.69	1.18	6.15	5.69	3.89	3.50
4	Industry % of female worker	1.19	1.00	2.87	5.47	9.18	0.75	3.34
5	Services % of male worker	37.44	19.39	25.38	38.33	9.65	13.12	22.68
6	Services % of female worker	57.14	29.12	38.52	51.56	23.61	53.21	39.17

Source: BBS, Population Census 2011, Community Series for Satkhira district

It is important to note that the population census data did not provide detailed categorization of occupations. It is however available in Population Census 2001. Table 6 shows occupation pattern of the working people of the Debhata and Kaliganj Upazilla where 48 and 55 percent respectively are engaged in agriculture (including fisheries and other sub sectors), 27 and 21 percent are engaged in various trading, and 16 and 15 percent are engaged in the miscellaneous sector.

Table 6: Occupation Pattern of the Working People in the two Upazila

Sector	Number		% of Working People	
	Debhata	Kaliganj	Debhata	Kaliganj
Agriculture	15,266	37,793	48.18	54.84
Industry	529	2,097	1.67	3.04
Construction	557	1,085	1.76	1.57
Transport	1,086	1,912	3.43	2.77
Hotel/Restaurant	83	108	0.26	0.16
Business	8,448	14,348	26.66	20.82
Services	526	1520	1.66	2.21
Others	5,192	10,047	16.39	14.58
All Working People	31,687	68,910	100.00	100.00

Source: Calculated on the basis of Census Data 2001. Community Series for Satkhira district

1.3.3. Basic Facilities Access

Table 7 below shows that about 94% of the households of polder 3 have access to water source such as tube-well or tape and the remaining of them collect drinking water from nearby deep tube-wells. In polder 3 about 36.3% households have water sealed latrines and about 39% have ring-slab latrine (sanitary but not water sealed). About 22% use non-sanitary latrine and about 2% do not have latrine. About 38% of the households of this polder have access to electricity.

Table 7: Availability of or Access to Basic Facilities

SL	Facilities	Debhata upazila			Kaliganj upazila			Total Polder 3
		Debhata up	Parulia UP	Noapara UP	Bharashimla UP	Nalta UP	Tarali UP	
1	Sanitary Toilet water sealed %	50.3	62.1	47.1	10.3	26.2	21.6	36.3
2	Sanitary not water sealed %	30.2	21.4	34.3	55.9	40	53.9	39.3
3	Non sanitary%	17.3	13.1	17.40	33.2	30.1	23.2	22.4
4	No latrine %	2.2	3.4	1.1	0.7	3.7	1.3	2.1
5	water source:TW/ piped supply %	97.6	96.6	91	93.2	90.2	98	94.4
6	Electricity Connected %	35.5	41.7	49.6	31.2	44.9	27.2	38.4

Source: BBS, Population Census 2011, Community Series for Satkhira district

1.3.4. History of the polder construction and physical Interventions

History of polder development

The polder area was at one time part of the Sundarbans. Still today, remains of Sundari and other trees found when ponds excavated. Along the marshy land near the riverbank or in the char, various species of mangrove trees and plants found such as gewa, goran, bain, kakra, kewra and goolpata. The mangrove trees are now decreasing inside of the polder for stopping natural flow and drainage. Instead, plantation of quick-growing trees is now visible along the highways, roads and embankment. Such trees include raintree, mehogoni, shishu, eucalyptus, chambul etc. In the past, fruit trees were abundant such as mango, and date palm plantation was very popular to make indigenous sugar from its juice. In the homestead area also, people now plant mainly quick growing timer trees such as raintree and mehogoni. Coconut plantation is popular and a new fruit, sofeda grow well in the salty soil.

Mainly to protect the agricultural crops and human settlements, the then Government of East Pakistan, through its Water and Power Development Board (WAPDA, now BWDB), with the assistance of the World Bank, took up a massive program in the 1960s of constructing embankment covering the entire coastal region under the Coastal Embankment Project (CEP). As part of the CEP, the BWDB constructed polder 3 constructed in the first half of 1960s.

Physical interventions

The polder 3 infrastructure constructed in the 1960s comprises about 64 kms embankment and 35 sluice gates. Initially, the polder served its main purpose of preventing entry of salt water inside of the polder and crop area, as well as yield increased in the mid sixties to seventies. At a later stage, siltation of canals and rivers created drainage problem in the eighties, which caused decrease of crop yield. As a result, people availed other opportunity, to increase aquaculture instead of cultivating aman paddy only in the 1980s. During this decade commercial aquaculture

expanded. It was partly to adapt to the changed hydrological condition and partly for changed market condition when shrimp became a high-value export commodity.

Economy

The economy of the region is still agricultural. Paddy, shrimp and fish are the main produces. However, paddy area and production decreased over the past three decades for rapid expansion of shrimp farming while shrimp area and production both expanded although shrimp yield remained low for not applying appropriate technology and good management practices. With shrimp farming, culture of fin fish is combined, particularly tilapia, carp, *parshe* and small shrimp including *harina* and chaka. *Golda* farming is rare as high salinity in the area and longer farming season made it less attractive.

Presently, the polder area economy comprises two main sub sectors- crop agriculture, mainly paddy farming and aquaculture, mainly *bagda* shrimp. Most economic activities in the area are shrimp based such as shrimp trading, shrimp fry trading, processing plants, ice making, shrimp packing, transportation, land leasing,

Current land use pattern shows that 29% of the area is used for crop production (mainly paddy), 47% is used for aquaculture (mainly *bagda* shrimp mixed with fin fish), 17% used for housing and settlement (including homestead garden, plantation), 5% area is under water bodies (rivers and canals) and 2% is used for urban housing and establishments (ICZM).

2. FARMING SYSTEMS AND LIVELIHOODS

2.1 Cropping pattern including aquaculture

2.1.1 Major crops and fishes produced

Polder development contributed to considerable changes in the cropping pattern as well as on aquaculture, open water fisheries, livestock rearing and other livelihoods in the area. Before 1960s, the was regularly inundated by tide water from the adjoining rivers and just one major crop, local variety aman paddy could be grown. Also for the local aman paddy, yield was very low, only about 6 mounds of 240 kg paddy per bigha (33 decimals) which is equivalent to 1,186 kg rice per ha. Crop failure was quite frequent, once in every few years and local people constructed narrow dykes in June to protect the crops and repaired the dykes several times in each season until November December when the paddy was harvested. Apart from local aman paddy, khsari (coarse grain pulse) produced in about 20% of the area where water receded earlier, in Late Oct-Nov. Jute was also cultivated in limited area. Vegetables, fruits and trees grew mainly in the homestead area.

Quite a large number of local varieties of paddy were cultivated; which include *aishpail*, *chinipail*, *chinikhani*, *patni*, *beguncchini*, *balamm*, *chinigura*, *jamaibabu*, *durgavog*, *lanti*, *koladi*, *kartiksail*, *nazirsail* and *pijam*. Although the local varieties had problem of low yield, they were more resilient to inundation by flooding of a few feet, as the stems were long. The fodder quality of the straw was good and the quantity of straw was quite high. The bottom part of the straw was good source of fuel and other domestic use.

After constructing polder, local variety aman continued to grown but yield increased to about 10 mounds per bigha, an increase of about 67 percent. The cropped area and crop diversification also increased. Cultivation of pulses like khesari and lentils, oilseeds like mustard, potato, sweet potato, vegetables, chili etc. increased considerably. Still, most area was single cropped but at least about one fourth of the area had double cropping, winter crops or vegetables etc. after aman or aman after jute.

From mid 1970s the high yielding varieties of aman started to replace the local varieties. The HYV aman introduced over the time include BR 10, BR 11, BR 23 and BR 30. HYV Boro is now cultivated in limited area but not so successfully. BR 47 as salinity tolerant variety introduced. But it still at experimental stage.

In the 19980s, water-logging started to increase as canals silted and shrimp farming began to expand. During the 1980s, aman yield decreased followed by increased shrimp farming which caused further increase of shrimp farming and then decrease of aman area. Vegetables and robi crops decreased too and economy transformed from local aman to aquaculture dominated farming system.

In the 1990s shrimp farming expanded further but its growth was limited for the dependence of shrimp fry collection from the rivers. In mid 1990s, the shrimp hatcheries enhance supply of shrimp fry and by 2000 bulk of the fry supply started to come from hatcheries rather than from natural catch. This contributed to faster growth of shrimp farming.



Ghere area in polder 3

But with shrimp fries from the hatcheries came shrimp virus initially in the mid 1990s when shrimp fry was imported from Thailand and later shrimp hatcheries flourished in Bangladesh (in the Cox's Bazaar seashore area) but the problem of shrimp virus continues mainly for the failure of the concerned government agencies to quality control. The result is increased risk of bagda farming. To cope with the risk of high mortality, farmers are following a strategy of higher stocking density (let at least 40-50 percent fry survive). To this is combined mixed culture of several brackish water fish species like parse and fresh water species Tilapia, Nilotika, grass carp, even ruhi and katla with bagda shrimp (if there is loss in bagda, production of other fish will somehow makeup the loss). Several brackish water species grow naturally in the gher such as bele, tengra, vetki and crabs.



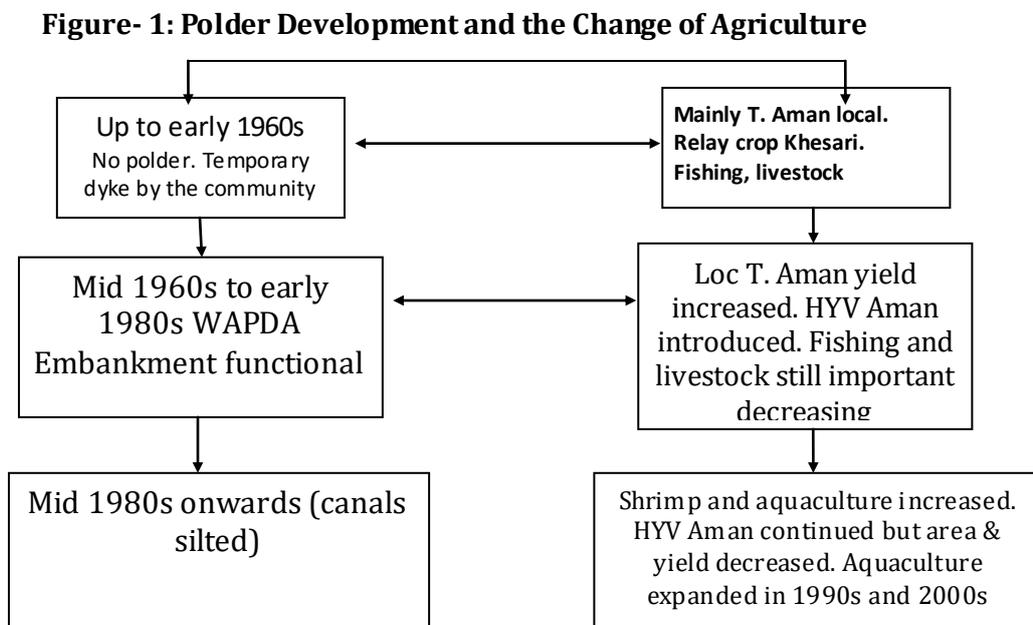
Unplanned gher. Limited access to water source but no drainage facility

The present farming system found in polder 3 are following:

- a. Bagda farming with a mix of brackish as well as fresh water fish throughout the year up to 10 to 11 months (Jan/Feb to Oct/Nov) and one or two months between two years utilized for drying and flushing with new water and land preparation (Dec-Jan). This system prevails around the villages Rangasisa (east), Nichintapur and Adarsogram (north) and Batuadanga (south) covering 90-95% area. In Vorasimla (southwest), this system prevails in about 70% area.
- b. Baggda and mixed fish farming combined with one season aman paddy (Aug Dec). Here also, fish kept in the paddy land during August to October and in each such gher outer area ditches maintained to keep reserve of fish. This prevails in limited area of Rangasisa, Nichintapur, Adorsagram and Batuadanga (only about 5-10% area) but more prominently in Tarali (south), Vorasimla (southwest) and Soelpur (northwest) in about 20% area.
- c. Aman HYV paddy followed by Boro HYV paddy: This cropping system is limited, only about 3-5% area and it prevails in Batuadanga, Nichintapur, Vorasimla and Soelpur areas.
- d. T. Aman combined with pulses, oils seed or followed by vegetables found in only 1-2% area.
- e. Betel leaves found in limited area of Soelpur in the northwest.

2.1.2 Changes in agriculture with the changed infrastructure

Figure 1 below shows a glance look of the changes in agriculture with the changed in polder infrastructure.



2.1.3 Crop Seasons

Figure 2 below shows growing seasons of crops, shrimp and fish now existing in polder 3 area.

Figure 2: Crop Seasons

Crop/ Fish		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Aman Paddy													
Fish and shrimp with Aman paddy	Shrimp & Fish												
	Paddy												
Fish/ Shrimp without paddy													
Boro HYV paddy													

2.1.4 Irrigation

Aman paddy is planted about the monsoon, hence is mainly rain fed. During the period salinity of water in the adjoining rivers decreases but still remain moderately high 4 to 6 PPT. But if there is good rainfall salinity decreases and paddy can be cultivated. Farmers rely on rainwater to plant aman paddy. Boro HYV is cultivated in very limited area and source of water is deep tube well. Water from the rivers and shallow tube wells cannot be used for HYV boro because the growing season coincides with high salinity season and ground water at shallow depth is saline. For aquaculture, source of water is river. Brackish water is taken in during Jan-Feb/June/July and even up to October November in case of year round aquaculture.

2.1.5 Cost of production and profitability of crop and shrimp farming

Table 8 below shows profitability or cost of production and return to farmers has been calculated for local Aman, HYV aman, HYV Boro and Khesari.

Table 8: Cost of production and return to farmers (Tk/acre)

Items of Cost/ Return	Local Aman	HYV Aman	HYV Boro	Khesari
Land preparation	1,000	1,000	2,000	
Seed/ Seedling	1,000	1,000	1,000	400
Sowing/ planting	2,400	2,400	2,400	300
Weeding/ crop care	1000	2,000	3,000	
Fertilizer/ pesticide	500	1,000	2,000	
Irrigation			3,000	
Harvesting	2,000	3,000	4,000	1,000
Total Cost	7,900	10,400	17,400	1,700
Yield (mound) or 40 kg paddy	24	30	45	12
Price Tk/unit	800	800	700	600
Total value of crop	19,200	24,000	31,500	7,200
Gross return	11,300	13,600	14,100	5,500
Imputed family lab	3,000	4,000	5,000	1,000
Imputed land rent	3,000	4,000	6,000	1,000
Net return to owner farmer	8,300	9,600	9,100	4,500
Net return to tenant farmer	5,300	5,600	3,100	3,500

Source: Calculations based on FGD, KI and follow up interviews

Table 9 below shows estimates cost of production and return from mixed shrimp and fish farming assuming year round shrimp (last column) which is dominant in polder three or one season shrimp which is more eco-friendly but is successful in years with good rainfall and in areas having better opportunity for leaching salinity by monsoon water.

Table 9: Cost of Production and Profitability of mixed bagda and fish farming		
Items of Cost & Return	Value Tk per acre of land	
	One season shrimp & fish	Year round shrimp & fish
Shrimp fry	16,000	16,000
Dyke repair	2,000	3,000
Guard	3,000	5,000
Other Lab cost (hired)	2,000	3,000
Fish fries	2,000	4,000
Irrigation	2,000	3,000
Others Bamboo, fishing trap	3,000	4,000
Rent	18,000	24,000
Total	48,000	62,000
Sale of shrimp 180-200 kg @ 400	72,000	80,000
Sale of other fish 400/800 kg @ 80	32,000	64,000
Total value of sale	104,000	144,000
Gross return	56,000	82,000
Family lab	20,000	30,000
Net return Tk.	36,000	52,000

Calculated on the basis of FGD, KII and follow up interviews

2.2 Other Livelihoods

In the pre embankment period, open water fishing was an important economic activity partly because crop farming could not provide livelihoods security to the poor and landless. They took fishing as a source of livelihoods as fishes were available abundantly in the rivers, canals and the beel. After constructing embankment, fish availability declined but still it was important occupation until late 1970s to early 1980s. Thereafter in the early 1980s, canals silted, the natural water exchange between the beel areas with the rivers dedined. Further, due to destructive fishing and overfishing caused destruction and depletion of the fisheries resources. Now many of the brackish water and fresh water natural fish species are getting extinct like koi, sing, magur, kakila, bele, puti, cheng, soil and boal. Even the brackish water species like kainmagur, datina, parse, tengra, bele, bhangan, topsi, small shrimp like horina and chaka dedined drastically.

With the increase of aquaculture, mainly bagda farming since 1980s, open water fishing declined but collection of shrimp fry from the rivers increased. This too has dedined now as destructive method of shrimp fry collection caused decline of the availability of not only other species of fish but also of the shrimp fry itself. Now shrimp fries have to come from the hatcheries to feed the growing need of the shrimp gher. Now only small Tilapia is abundantly available in the rivers, canals and the beel and it has become wild fish in the coastal area. Fishing as well as collection of shrimp fry declined as livelihoods opportunity. These two were good source of income to the poor and women. These two opportunities are lost by now.

Livelihoods opportunity in the livestock sector declined considerably. It was a dominant sector in the pre-embankment period and expanded in the 15-20 years after construction of the polder. Livestock rearing increased that time because of increased paddy farming and intensification of cropping contributed to increased availability of rice straw and khesari stem etc. Thereafter it decreased when water logging and increased aquaculture reduced seasonal grazing area and availability of rice straw. Many informants said that each farm households had five to ten pairs of cattle. It has now reduced to one or two cows and a pair of bullocks for some farmers and for others no cattle at all. Goat and backyard poultry rearing also declined. However, commercial poultry rearing increased in the recent past.

Many poor people including poor women work in crop farming and aquaculture as wage labour. These two are main livelihoods of the poor while the land owning as well as more enterprising landless and smallholder farmers, engaged in crop farming and aquaculture.

Several backward and forward linkage activities of aquaculture expanded like shrimp and fish trading, shrimp and fish fry nurseries, shrimp and fish depots, ice making, packing materials like bamboo baskets, bamboo made fishing traps (charo), fishing net etc. Transport sector expanded rapidly such as rickshaw van, engine van, easybike, motor cycle service, engine boat. Hence, the trading and transport sectors created increased employment opportunities for the poor as well as for the non-poor.

2.3 Source of Drinking Water

Scarcity of drinking water is a severe problem in this polder. In the past, about 85% people collected water from the pond for drinking purpose. Reserve ponds were maintained in the villages and water of such ponds was clean. At a later stage, government provided filtering tanks attached to each pond but such pond sand filtering facility is available in limited number of pond like one located in the premise of BWDB office near the Kalkiganj Upazila town. People come here to collect water walking up to 3 kms. Particularly, women and children (usually girls) have to walk long distance and spend several hours each day to fetch water.

Ground water at shallow depth is saline and not suitable for drinking. Also, there is problem of arsenic. Government (DPHE through UP) provided deep tube wells. But the number of DTW is far below the requirement. The UP Chairman of Tarali said that one tube well has to serve the need of about 100 households. Some respondents even said that, in areas like Adarsagram 100-200 (densely populated remote area) households depend on one tube well. LCS participants of village Tarali said that they have to fetch water from 3 miles away from the BWDB office at Kalkiganj. People have to queue up for water from morning to 11 am.

People from several villages collect water from a DTW located in the house of a college teacher. People can collect water from 8 am to 3 pm. The teacher's wife locks the tube well in other times to avoid disturbance. Many people collect drinking water from Delta Fish (a fish and shrimp processing factory) and spend 0.50 per litre as transport cost by rickshaw van.

NGO Ahsania Mission is supplying drinking water in 17 UP. This facility should be extended to other Ups, said the UP Chairman of Tarali.

A woman household head said that, in the past, they made holes under the root of hijal tree and collected fresh water from there during the dry season and in the monsoon they had fresh water in the ponds.

3. PHYSICAL CHARACTERISTICS OF THE POLDER

3.1 Condition of the embankment

The embankment constructed long ago in the 1960s. No rehabilitation project was implemented in polder 3 since construction. Thanks to former WAPDA (now BWDB) that the embankment is not yet destroyed and still functional subject to repair and maintenance. Good design and standard of construction kept it functional so long time. This section briefly describes present condition of the embankment, based on the information collected by FGDs and KIIs.

Respondents at village Adorsagram (north) said that the embankment not yet damaged and the condition is okay. However, the gher owners dug canal parallel to the embankment reducing its slope. This made the embankment narrow. The FGD participants reported that the embankment never broke in this area but the riverside eroded from time to time and inadequate repair and maintenance made it narrow. Respondents at village Batuadanga (south) said that the embankment did not damage over the past five years but became narrow for cutting the slopes by the gher owners.

Near Vorasimla along the bordering river Ichamoti, the embankment broke several times and new semi circular dyke had to be constructed. The reason is construction of spur on the Indian side of the river that diverted water to Bangladesh side. The inner dyke is narrower than the original embankment. In this area, embankment damaged also a year ago and the aman seedbeds were flooded.

The WMO participants in Debhata UP (north) said that the embankment did not break in the past ten years but cracks developed and water leaks. These have weakened the embankment. The embankment is vulnerable and can get damaged soon if not repaired. Near village Rangasisa (east), the embankment did not break but leakage developed and soil became loose. For such problems, the embankment was damaged two years ago but it took one year to convince BWDB to repair the damaged part.

Near village Suelpur (northwest) along the bordering river Ichamoti, lots of pipe inlets narrowed the embankment and also the height is reduced. During the monsoon in 2011 high tide overflowed the embankment. This part was also affected during AILKA in 2009 and because of the pipes, soil became loose. In this area a siphon system of lifting water from the river to the gher has been recently introduced. This system is called 90 degree kol. Three to five pieces of PVC pipes joined by 90 degree bends are used to make the system. The main pipe is placed on top of the embankment. One end is set on water in the river side and the other end on the gher side. In the gher end a hand pump is set to pump out air from the pipe during the high tides and then water comes in by gravity flow as tide water goes up the gher level. This system is suitable for small gher and can lift water without causing any damage to the embankment.



90 degree kol making use of siphon system is a good practice of lifting water.

LCS respondents at Adorsagram (north) informed that the embankment damaged near a number of gates at Sakra, Komoilpur and Debghata. Improper operation of the gates and pipe inlets caused such damage. Besides, heavy rains damaged upper part of the embankment reducing the height. Women LCS group at Tarali (South) said the embankment was damaged by AILA in 2009. The embankment became narrow and vulnerable, because of pipe inlets.

Chairman of Tarali UP (south) said that height of the embankment is drastically reduced and high tides in the monsoon can overflow. Further, some “stupid people” removes soil from the broken embankment (for personal benefit) further weakens the embankment.

Respondents at village Nichintapur (north) said that the embankment did not break in their area but another village (Town Shripur) was flooded. They demanded construction of parallel outer dyke to protect the main embankment.

3.2 Condition of the sluice gates

Only about one third of the old BWDB gates in good condition or have minor damage. The remaining two thirds have major damage. In contrast, about one third of the private gates have major problems and two thirds are in good condition or have minor problems. Most of the 133 pipe inlets are northwest, west, southwest and south. The east has more private gates as this part has longer history of shrimp farming and over the period many private gates constructed.



A private pipe inlet with wooden shutter



Broken sluice gate # 62 at Tarali. Shutter hangs on bamboo and rope.

A least destructive way of taking salt water inside of the polder was found in village Soelpur by siphon system called ninety degree pipe inlet (ninety degree kol). This is good for small gher but not so effective for large gher. And, such gher must be located near the river with drainage facility on the other side of the gher.

Besides the above general remarks, participants gave some examples of the condition of the structures. Respondents at village Rangasisa said that condition of the gate is poor. Respondents at Basantapur (Tarali UP) said that there is no cover plate in the gate therefore the gate committee made wooden shutter. WMC members at Tarali said that the gates are very old, vulnerable and are not functioning well.

BWDB proxy gateman (actually peon) said that 15-vent gate at Komorpur broken, BWDB tried to repair it by dumping brichchips and sand full of sacks but failed and then closed the gate. The nearby 5-vent gate is too inadequate to drain water. Private gateman at Golkhali said that the gate is weak while the gateman of Batuadanga said that the gate is broken gher owners made

wooden shutter for this. KII with individual farmers revealed that the gates are broken hence wooden shutters have to be made removing the broken steel shutter. A woman household head said that old steel shutters are difficult to operate as they break by getting rust and therefore farmers make wooden shutter which is easier to operate and repair by the farmers.

3.3 Condition of the canals

The polder area has about 87 kms of canals, estimated 0.5 km canal per sq km area. It was noted that almost all of the 35 BWDB structures have link canals and about 5 of the private structures also have link canals. However the canals are mostly silted.

In general, the canals became narrow for silt deposit on one side or both sides and depth reduced for silt deposit on the canal bed. Silt deposit is so massive that one a big river Sapmara has become a narrow canal and most canals became narrow like drain and many fully silted. Lack of re-excavation on regular basis and encroachment has aggravated the situation. This general picture is substantiated by the examples provided by both FGD and KII respondents.



Silted canal

- Entry of gate became narrow as canal silted. Some canals in this area were re-excavated 15-20 years ago. - (FGD, Tarali)
- In the past, canals were flowing, wide and deep. Now, canals silted making inner land lower elevated than canal beds. So, water cannot be drained out. – FGD, Nichintapur.
- All khal (correct statement would be most or majority of the khal) merged with the gher. – FGD, Rangasisa
- Rivers silted. Once upon a time present Shapmara khal was a big river. Landless settler village Adorsagram has been created on the silted part of the river. Also the Badsa khal and Rangasisa khal were rivers, now narrow khal. The canals overflow for not having side dykes. – FGD, Rangasisa
- Siltation blocked two thirds of the canals. Boalmari khal nearly dead and Sonakhali khal turned into agricultural land. Even the mighty river Kaksiali silted. – WMC, Debhata
- Canals became narrow and (many canals) merged with the gher. – FGD, Batuadanga.
- Canal from Kaksiali to Batuadanga blocked for siltation. – KII with Gateman, Golkhali
- Siddher khal re-excavated. – FGD, Rangasisa
- Kamila Beel khal re-excavated. – UP Member (male), Batuadanga, Tarali
- Dhopakhali khal silted, has little water flow. – KII with UP Mem (fem), Komorpur, Tarali
- Respondents at village Soelpur said that because of silt deposit, the shutter of some sluice gates has been blocked and canal closed, the gate cannot be opened or closed.

- Gateman Golkhali (actually peon of BWDB), Tarali said that Batuadanga khal closed as the gate broken but not repaired.

3.4 Canal lease and illegal occupation

Canal lease is a common problem in the whole coastal belt of Bangladesh and polder 3 is not an exception. To be specific, the LCS male members said that usually the gher owners get lease from the government. The leaseholders block the canal just after the gate or even close the gate entirely. Initiatives to re-excavate the canals often fail as the leaseholders resist and stop re-excavation work. It was found that the Upazila Chairman took initiative to re-excavate khal but failed because of strong opposition from the leaseholder side. Several other relevant responses are noted below:

- Wealthy people get lease and close the khal. – FGD, Rangasisa
- Gher owners occupy khal by encroachment. – KII with WMC President, Debhata
- Influential people got lease of Gopakhali khal, which was flowing. The leaseholders were able to manage local land office to submit false report showing it silted agricultural land.
- Canals occupied illegally or leased. The sluice gates are becoming useless for not having link canals. – Upazila Engineer, Kaliganj
- Dhopakhali khal and Sibramkhali khal occupied by Mannal Ukil (Lawyer) claiming to have leased from zaminder (feudal lord who left the area in 1940s).
- BWDB freed 65 bigha area of canal from the control of illegal occupants by legal action in 1980-81. – KII with Gateman, Golkali
- Landless settlers (on legal lease) made the canal narrow by encroachment, occupying part of the canal without lease. Many houses built closing the canals. – Woman household head, Tarali

4. LABOUR CONTRACTING SOCIETIES

4.1 Formation and characteristics of the LCS

Selection Process

The study team met two LCS groups of which one is a women group of LGED RREMP project and the other is a labour gang of 15 men doing any earth work in both public and private sectors.

The first group met comprised nine women of age 26 to 45. Of them, seven are widow, divorced or separated from the spouse and two are married. One of the nine is landless and others belong to households owning 08 to 33 decimals land. This group is contracted by LGED for five years. The selection process comprised a public announcement by the UP following which large number of women approached the UP members and Chairman. Seeing that too many women are applying, the UP Chairman asked the members to prepare priority list comprising those belonging to the female headed households such as widow, divorced, separated or otherwise “helpless” and willing to work as earthwork labour in rural roads and embankment. Based on the list, two women were selected from each village and from that a total of ten were selected from the whole UP by lottery. The final selection was approved by the Upazila Engineer of the LGED and the LGED staff, the Community Organizer and the Facilitator assisted in the whole process.

The second group interviewed comprised 12 men all wage labour aged 18-60 and each owned land 15 to 33 decimals. The group is very informal. It is simply a group of workers living in the same area and working together whenever and wherever they find some work. They have an informal leader called sarder who contacts the employer and arranges work for the whole group. Usually, the sarder gets double pay which means that each worker contributes 7 to 10% of the gross wage to the Sarder, for the service he is providing (getting contract be liaison and negotiation, his goodwill and relation with the employer, and taking responsibility of delivering the work). The second group has been working together for the last 10-15 years but the group composition changed over the time, some left, some joined. The last time it reconstituted a year ago comprised ten members.

Present work

The woman group is engaged in the repair of road and embankment which is used as road. This group widened the road by four feet, two feet each side so that vehicles like rickshaw van can move. The group enjoyed the work and is happy for improved mobility particularly of school going children and “less accident”. Before repair, vans would fall down for narrow road. Besides widening of road, the group planted trees along the road. But trees died for salinity and those survived were cut by local people, hence the result is zero. This group planted coconut tree along the embankment but the benefit now accrues to the landless settlers in that area.

The second group work most of the time constructing or repairing gher dykes and is employed on job contract basis by the gher individual owners. Occasionally they work for repairing BWDB embankment or roads or excavation of canals on contract with the contractors but not as a LCS group. When met, the group had no work. Before that they worked in the preparation of gher and previously in the brickfield. Some times when earth cutting work is not available, they work as gher labour or agricultural labour. Some time ago, this group worked for construction culvert on the embankment. They appreciate this work of the BWDB as it helped improving road connectivity.

Payment

Each LCS worker is paid monthly remuneration of Tk. 2,700 from which Tk. 1,080 deducted as savings. The accumulated savings is paid back after five years with interest so that the built up capital can be invested in some income earning activity to make the household self-reliant. In the group, there is a leader and a secretary. They receive cheque for the group, draw money and divide among the workers. There is no wage discrimination within project. But in some other project, REOPA of LGED wage rate is Tk. 180/day, about the double of RREMP. Male group is working there. The difference is due to different budget provision and projects prepared at different time and money coming from different source, rather than intentional gender bias.

The second group gets wage of Tk. 120 to 150 depending on work and even place of work. If working in or around the village, each worker gets Tk. 120 and if working away from the village wage is Tk 150. Still, working around the village is preferred to save travel cost and travel time.

Problems

Problem regarding payment is that, it is delayed by a couple of months. The workers lack access to senior officers as they are obstructed to go there by the junior ones. Another problem mentioned was that while measuring the work done, the staffs treat us as “thief”, meaning that we have not done the whole work assigned but claiming the bill. One serious complaint was that the savings deducted in the past seven months not deposited to account. At least, the workers have no information whether the money is deposited.

To the women group, the most frequently mentioned problem was drinking water. They have to fetch drinking water from a distance of 3 miles. Another problem mentioned was toilet, while working on the road. But they understand, government cannot build public toilet wherever road repair is done for a week or so. They have to use nearby “hiding place”. To them, it is no longer a problem to work outside of the house. The society has accepted it for the poor women.

The second group is not happy with the lottery system for selecting LCS workers. To them, making list by Chairman and members and then holding lottery on the basis of it leaves opportunity of nepotism. The reply could have valid point but still may have been motivated by the fact that they were not eligible to apply as they are not members of female-headed household or otherwise helpless.

The second group is aware that the women get lower wage in gher work (Tk 60 and men get 120). To them, women getting lower wage is a norm.

4.2 Livelihoods and changes in the standard of living

The LCS members in the women group received training from LGED on aquaculture, livestock, poultry and homestead gardening. Five of the nine are members of NGO groups and have loans from ASA, BRAC, IDEAL, NISSAN and Grameen Bank. Two have loans from multiple sources (ASA+BRAC and ASA+Grameen). One has loan of Tk. 5000 and another one Tk. 16,000. It is quite likely that their access to MFI improved for improved capacity to pay loan instalment. But still, the workers are not happy with the wage rate. Some said that this is too inadequate to meet the

need of the household. For one, the husband said, 54 taka cash income (after deduction for savings) not enough for two meals and what you eat is my income.

The second group do not have regular work. They work both within and outside village. They work in the gher, road or embankment and in the brick field, depending on seasonal demand. Some are going to work in other districts like Madaripur and Barisal for seasonal work.

The second group does not have access to any formal training in IGAs but some have received training to work as volunteer during festival like Durga Puja to maintain discipline when too many devotees assemble.

Members of this group (may be wife) have access to NGOs and they have loan from NGOs like BRAC, Uttarann and IDEAL. To, the NGO loan benefited them such as for repairing own house but paying weekly instalment of Tk. 300 from an income of Tk. 800 is difficult. This group is in difficulty mainly for not having work round the year.

5. MAINTENANCE OF EMBANKMENT, CANALS AND SLUICE GATES

5.1 Maintenance by the BWDB

Institutionally, the BWDB is responsible for maintenance of the embankment and the sluice gates and re-excavation of canals in polder 3 as it is a BWDB polder and no other institution like LGED has implemented any sub project in this polder. However BWDB is constrained to play its role properly and promptly. The BWDB Upazila level offices are effectively closed and the concerned engineers and staff work in the district office and budget allocated for maintenance is too inadequate. As a result, the BWDB executes repair work occasionally when fund is available. For such work the BWDB engages contractor by tender. But local people are not happy with for delayed work and inadequate work as stated for example by the FGD participants at village Soelpur.



Long ago, it was gateman's house. Proxy gateman built Tin house instead.

FGD participants at village Rangasisa said that embankment broke in their area two years ago. Local UP Chairman informed the BWDB but it took about a year for the BWDB to repair it as fund came late. Local community had to protect themselves by low cost repair work own initiative. FGD participants at Tarali UP said that sluice gate is vulnerable but the BWDB did not repair it.

A proxy gateman at Komorpur (claimed to be a peon of BWDB) said that the BWDB failed to do repair work and the closed a 15 vent gate as soil became loose and water leaking. The nearby 5 vent gate is too small to drain water of large areas. The BWDB tried to repair by dumping brick chips and sand but this was inadequate step. However, the BWDB made some repair of the embankment. BWDB tried to re-excavate some canals but could not execute the work when just one influential person, a lawyer resisted for personal benefit to keep the canal under his control.

5.2 Maintenance by the UP

FGD participants at Tarali said that the UP repairs embankment on emergency. Also the participants at village Nichintapur said that people inform UP if damage is found and the UP repairs. Last year embankment broke at near village Vorosimla. UP Chairman repaired it as reported by the FGD participants at Vorosimla. The chairman mobilized people and repaired by voluntary work. Participants of the Water Management Committee in Debhata also said that the UP repairs embankment often by voluntary work in which local people donate bamboo, timber and other materials. WMO participants also said that the UP utilized resources from 40 days

employment support and food for works programme for repair of embankment and re-excavation of canals. In some occasion, UNO provided fund to execute repair work by the BWDB.

The Sub Assistant Agriculture Officer of Nolta, Kaliganj said that the UP takes initiative for repair and re-excavation and UNO helps to get fund. UP Member of village Komorpur, Parulia said that the UP repaired damaged part of the embankment using 40 days employment support fund. The proxy gateman at Tarali (appointed by the Gate Committee) said that, the BWDB repaired embankment before 2000 but now they are neglecting it. The responsibility has shifted to the UP now and they have to do some repair work.

5.3 Maintenance by the Water Management Committee or Gate Committee

In polder 3 there is no formal Water Management Association as there has been no special project to promote formation of such organization. However there are gate committees in the local level and Upazila level water management committee has been formed in 2002. The gate committees are lead by the UP while the Upazila Committee has been formed by NGO Uttaran and they have higher level committee in each coastal district. The WMC Chairman of Debhata said that they inform district committee if there is damage in the embankment or sluice gates. The WMC has no maintenance fund and therefore cannot play any important role in maintenance. They do some voluntary work. Sometimes the WMC collects money from the gher owners, Tk. 50 to 100 per bigha and use it for repair work. In 2011 the Sakra gate near Susilgati was damaged and the Upazila Chairman repaired it. In 2007, the WMC implemented some repair work with the help of ActionAid. The work comprised improving drainage. The WMC has some plan to be implemented in 2012.

5.4 Maintenance by the Gher Owners and community

When shutter of BWDB gate broke at Rangasiusa, gher owners made wooden shutter to fix the problem. In the same area, community repaired the embankment instantly when it broke two years ago. It was done by bamboo piling and straw fencing and mud filling. Gher owners contributed money for the repair work. At village Soelpur also, the gher owners made wooden shutter to keep the sluice gate functional.

5.5 Emergency response

The embankment is vulnerable in several areas and many of the structures are in poor condition and hundreds of pipes and cuts weakened the embankment. Further to this, deferred maintenance increased the risk of damage by flood or tidal surge. Over the last few decades the frequency of cyclones increased and all these taken together creates emergency situation quite often. The polder community however has long tradition of facing such emergencies more on self-help basis and voluntary work rather than waiting for the government or other to help. To this is added the quick response by the local government, despite their limited capacity. A few examples of recent disaster response will make the point very clear.

- Adoresogram of Parulia UP (north) was affected by cyclone Sidr and AILA in 2007 and 2009. The same village was affected by flood caused by heavy rainfall a year ago and the village was submerged for about six months. During the disasters the villagers worked voluntarily to repair the breaches of embankment.
- Village Batuadanga (south) was flooded five years ago and people faced the situation by voluntary work.
- At village Suelpur (southwest), the embankment was damaged by AILA. The affected farmers repaired the part adjoining own land. This was the quickest response. Instantly, the risk of the damage to embankment was announced by loud speaker. The UP

Chairman and Members mobilized people and repaired the embankment preventing larger damage.

- Nichintapur village (north) was not affected by recent disasters. But neighbouring village town Shripur was flooded in the monsoon a year ago. The flood disrupted road connectivity and local people made bamboo footbridge to restore connectivity.
- In Tarali UP (south) emergency situation was announced by mike asking people to protect the area by voluntary work. The UP Chairman announced that he will give 100-200 Taka per volunteer after the work is done and when he will be able to manage fund. All men worked to repair the breach of embankment. Women did not go to this risky area and they moved to safer place with children. At a later stage UP repaired the damaged part more effectively.
- At village Rangasisa (east) embankment was damaged four years and people repaired it by voluntary work. The repair was done by dumping sand-filled sacks in the damaged part of the embankment.

5.6 How does maintenance take place

Table - 10 below shows institutional responsibilities or roles of various actors in the maintenance of polder specifically indicating who does what.

Table – 10: Institutional responsibilities or roles played by various actors in maintenance, Polder 3

Tasks	Who does	Whose mandate	Comment
Minor maintenance	UP, Gate Committee	Gate Committee	Main role played by the UP
Major maintenance	BWDB but inadequately	BWDB	Not regularly and not adequately
Emergency maintenance	UP, Gate Committee, Gher owners	UP and Gate Committee	Main role played by the UP
Excavation of canals	BWDB, UP, Upazila	BWDB	Canal leaseholders and encroachers create trouble

The main responsibility for gates, embankment and canals was seen as belonging to the BWDB. However the BWDB was found unable to play its role mainly because of budget constraint, low field presence and poor interaction with the communities. BWDB tends to wait for allocation of fund and it is rarely available unless some disaster takes place or minor maintenance becomes major and attracts attention of higher authority.

The Union Parishad was found quite active because they have to listen complaints of local people and the concerned GoB agency, BWDB can't help or takes too long time to help. Of course, their financial capacity as well as technical capacity is limited. Despite that, the UP executes minor repair and re-excavation on "emergency" basis. The UP tries to take help of the UNO and DC and such assistance comes, although not always. Very often than not, the UP mobilizes resources particularly from the gher owners and from common people in the form of materials like bamboo and voluntary labour. Very often the UP utilizes funds from the Food for Works, 40 days employment support and Cash for Work programmes.

Polder 3 does not have any formal WMA. What it has is Upazila level water management committee with linkage to district committee. This organization has been formed by the NGO Uttaran comprising mainly of civil society representatives like journalists, teachers, gher owners and businessmen but not ordinary people like landless and women. At least this is the impression

of local informants. The WMC states that it lacks funds to do any maintenance work, but occasionally takes up small inter like drainage. It received some fund from the NGO AtcionAid through Uttaran. Another water management organization found in polder 3 is localized gate committee or gher committee or beel committee- effectively same which comprises mainly gher owners and often the UP Chairman or Member lead such committee. Some recognized by the BWDB while others function informally.

Local gher owners usually contribute some fees for minor repairs to the gate committee or the UP. and maintenance. In Hoglabunia villagers collect money for khal excavation and private deep tubewell repairs.

5.7 Participation, exclusion and gender

5.7.1 Discourse on participation

The FGD and KII respondents saw participation as:

- Leadership within people and not the elite to be the leader always. This implies that capacity of common people to effectively participate in the decision making was felt important.
- Voluntary work- Local people are largely involved in voluntary work particularly to face emergencies. From this tradition, participation was seen as voluntary work rather than doing something for private benefit. Of course the common benefit does benefit individual participant like others in the community.
- Working together – It meant unity and emphasized that the community members must work together for common benefit. None should be left and everybody should be able to participate. Hence it meant inclusiveness.
- Giving opinion- This also meant that opinion are valued by the concerned authority.
- Getting involved- It meant that all should have opportunity to get involved, not left.
- Attending meeting- It meant that all have the right to attend meetings either individually or by sending representative.
- Membership in the committee- Many said that it may not be possible for all to participate directly. Therefore formation of committee is inevitable but such committees must include representatives of all stakeholders including the representatives of the marginalized groups like landless, poor and women.

5.7.2 Facts in participation

While the meaning of participation was reasonably clear to the participants, the reality was far from the above understanding or desire. Respondents at Adorsagram said that they were never able to participate in the WMC or gate committee as “nobody cares our opinion”. They stated that, “only the large gher owners can participate” in the decision making process. Particularly, women can’t participate. Respondents at village Batuadanga also said that nobody from that community were able to participate.

Responses of others concerning reality in participation are noted below:

- Nobody informs us – Vorasimla
- BWDB executes works without involving local people as hiding gives opportunity to make money- Vorasimla
- Poor and common people are excluded
- We go to UP only and not to the BWDB or other organization as “we do not know them”. – LCS Rangasisa
- Only the gher owners can participate.
- WAPDA does not keep us informed- WMC, Bosantapur, Debhata
- Women cannot participate

- The WMC comprises civil society activists rather than common people, no landless included- WMC, Debhata
- Government officers never share information with us- Rangasisa FGD
- Only the elites are informed and landless are not included- Soelpur FGD
- No LCS women were WMC member or even local gate committee, beel committee member
- Poor women's participation was limited to LCS work
- Women are not aware of the water management- UP FGD, Tarali
- The KII with paddy and shrimp farmers revealed that a seven bigha gher owner was member of gher committee but a woman household head, a paddy farmer (owning 14 bigha land) and a two bigha gher owner were not included as member. This information supports the general remark that only the large gher owners are members of gate committee, beel committee or gher committee.

5.7.3 How to improve participation

The improve participation the respondents at Adorsagramm said that representatives of the poor must be included in the committee and NGOs should be engaged to facilitate participation of the poor. Batuadanga respondents suggested that there should be unity to make sure that the poor are called to participate and tat all UP members must be involved in the WMC so that he can keep others informed and speak on behalf of them.

Other suggestions concerning improving participation are noted below:

- All households living in the area must be represented in the Beel Committee/ Gate Committee/ Gher Committee.
- Woman member of UP must have strong role in the water management committee so that she can speak for the women of the area.
- The committee must be formed with the support of the GoB agency (BWDB) to build effective partnership

5.7.4 Gender

Women outnumbered men in the polder with sex ratio (M/F*100) 99.7. Literacy rate in the polder 52% was close to national average. However, female literacy (49%) was 7 percentage points lower than male literacy (56%). This gap is a very clear indication of gender imbalance in the polder compared to the country as a whole. This also means that the women in polder 3 are socially staying behind the average women of the country. A number of statements of the FGD and KII participants detailed below provides example of the subordinate status of women in polder 3.

None of the nine LCS group members met was member of any water management committee and it was learnt that women are not included in such committees. The LCS group members however received training from the LGED on aquaculture, poultry and vegetable gardening so that they can be engaged in income earning activities besides LCS work and this is aimed help them becoming good income earner when the LCS contract will expire. Majority of the LCS members are members of various MFI groups and have loans from the MFIs. One has Grameen Bank loan for educating her daughter and others have IGA loans of Tk. 5,000 to 16,000. It seems that LCS membership improved their access to MFIs.

The LCS women have poultry and they sell eggs. One LCS woman has small business in eggs. She collects eggs from other women and sells them to small trader coming to the village. Many poor women work in the shrimp gher about 9 months a year. In the gher women clean weeds and wash fish for packing.

In gher work women's wage is Tk. 110 to 120/ day but men get Tk 180-200/ day. LCS male group members said that women paid less is a norm but some men also said that women work less in quantity. But the reality is that sometimes men and women do different work. For example men catch fish and women clean fish. Both men and women build dykes but only women clean grass in the gher. Wage discrimination is thus justified by differentiated type of work. In the case of six hours work from 8 am to 2 pm, women get Tk. 80 and men get Tk. 120. In REOPA project Male LCS group is working and each worker gets Tk 180/day but in the RREMP women LCS groups working and each worker gets Tk. 90/day.

KII with a woman household head provides a good case study showing that water management is quite relevant to the women but they are not able to participate in it due to wrong perception that women and landless are not impacted by water management hence should not have any say in the WMC or similar organizations.

The woman household head met for the KII belongs to Tarali UP. She is 42 years old, a widow and teacher of an NGO school. Her husband died six years ago. She has a son, now a college student. This household inherited 77 decimals land of which 66 decimals leased out to gher owner and 11 decimals used as homestead area. Long ago, the abovementioned 66 decimals land was used for paddy cultivation, now it is leased out for shrimp farming as all land around her one used for shrimp farming and seepage of water from other gher made her land unsuitable for paddy cultivation.

When husband alive, she had six cows. Now no paddy farming, no straw to feed the cows hence stopped cattle rearing. Still she has a calf. In the past cattle grazed in the beel area after the harvest of aman paddy and grass grew. Now all land under gher, no grazing area. Farmers have to keep the cattle confined in the homestead land, feed them straw. It is expensive and by eating straw only cows do not grow well and do not yield much milk.

In the homestead area she had many trees; most of the trees died because of salinity in the dry season and waterlogged condition in the monsoon. Still she has some mango, sofeda and guava trees. She tries to produce vegetables, turmeric and arum roots (kachur mukhi) in her homestead area. But salinity in the dry season and waterlogged condition in the monsoon damage her crops. For this condition, she cannot even rear poultry and goat. She can complain to the UP but this does not help as all owning large holdings have gher. But poor women like her owning only two bigha land have no other option than leasing out the land to gher owner.

She is not a member of any WMC. She is never called to attend meeting. She said, we are housewife, meaning woman, and we do not go there. Even she does not know whether there is any committee and who from her village are members. She is simply unaware of this matter despite she is an educated woman and her son is a college student.

6. OPERATION OF SLUICE GATES

6.1 Role of BWDB in operating sluice gates

BWDB is not much involved in operating gates as day to day operation is not their responsibility and they are not equipped with the needed manpower to take care of day to day operation particularly after withdrawing gatemen and closing recruitment of gatemen. Presently the BWDB has no gateman in the field level. Now the responsibility of operating gates rests on the local gate committees headed by UP Member or Chairman. But BWDB does have a role to monitor and oversight to ensure that gates are operated properly. Taking this advantage, the BWDB local staff, the SO controls the gates. He gives decision or intervenes on opening or closing of particular gate. Usually, the BWDB insists to keep the gates closed but the gher owners demand opening of the gates from time to time in the shrimp season. Also the paddy farmers want to open the gate when salinity decreases to drain out excess water or get in water during the paddy season. Although the BWDB insists to keep the gate closed, it can be opened any time if the interested person bribes the staff or gives tips to the proxy gateman.

FGD participants at village Nichintapur (north) said that the BWDB gives decision which gate to be closed and for what duration. Usually the BWDB does not give permission to open the gate but can be managed by bribing or paying tips. The gher owners often do this. FGD participants at Soelpur (southwest) said that the BWDB has been strict to remove “almost all pipes” but it was learnt from many others that still many pipes not removed.

6.2 Role of the UP in operating the sluice gates

In the absence of any formal and functional Water Management Organization and the inactivity of the BWDB, the UP has to play important role in operating the gates. FGD participants at Tarali (south) said that the BWDB puts pressure for not to open gate but gher owners demand opening of gates. The UP intervenes and gives decision on opening or closing of gate.

6.3 Role of WMC, Gate Committee and Gher Committee

In the absence of formal WMO, several committees exist in polder 3. One is the Water Management Committee formed by the NGO Uttaran. This committee comprises civil society activists as well as gher owners. But this committee is not very active in operating gates. It is rather involved in executing some petty initiatives when funds can be managed from international NGOs like ActionAid. They are also involved in advocacy type activities in the Upazila and district level patronized by the NGO Uttaran.

The gate committee is a semi formal organization recognized by the BWDB and they are involved in operating gates along with minor repair. The gate committees are lead by UP Chairman or Member. The beel committee or gher committee are informal organizations but active in the operation of gates at local level.

FGD participants at Tarali (south) said that the beel committee decides about the opening or closing of gates. Respondents of village Adarsogram (north) said that the adjoining gher owner has the upper hand to control gate, giving decision when to open or close. In this village name of a particular gher owner was mentioned who controls the gate.

6.4 How gate operation takes place

Gateman

For the operation of gates, the gate committee, beel committee or gher committee engages private gateman as there is no gateman from the BWDB. About the engagement of gateman the following pattern emerged:

- BWDB palace a peon to take care of a gate. This has been essential for on-going construction work, to guard construction materials. But the peon is also functioning as proxy gateman opening and closing by order of the SO (as stated by him). But also allowing opening when gher owners pay tips (Komarpur).
- In one instance, large gher owner Mr. J placed private gateman to control the gate in his interest (Adorsagram).
- WMO participants at Bosantapur, Debhata said that the gate committee headed by UP Chairman appoints gateman and the gher owners pay.
- Participants at village Rangasisa said that the gher owners recruit gateman and pay monthly salary of Tk. 3000 to 3200. In addition, the gateman fishes in the adjoining khal.
- In one instance there is volunteer gateman. It was not mentioned whether he holds right to fishing or enjoys other benefit. It appeared that getting better access to taking and draining water for his own gher is more important to him (Batudanga).

Authority of giving decision to open and close

It is always of most often the gateman opens or closes the gate. But order comes from varying authority. These are as under:

- BWDB SO orders the proxy gateman who is peon of BWDB. But the proxy gateman opens even without order if some gher owners pay tips.
- In several instances like Tarali, decision comes from UP Chairman, member or the gate committee headed by UP Chairman or Member.
- In many instances the Beel Committee or Gher Committee dominated by the gher owners or even private gher owners give decision.
- In some other instances the gher owners influence decision for having “good relation with the BWDB staff”.
- Adjoining gher owner controls the gate and gives instruction to the gateman.

When opened and closed

Responses varied. One KII information revealed that the gates are opened every alternate high and low tides (Paddy farmer Tarali). Gateman of Batudanga said that the gate is closed during high tides and opened during low tides for drainage. Gateman of Komarpur said that during the shrimp fry stocking season (March - April) gates are opened at high tides and in other monsoon gates are opened at low tide.

Table 11 below shows how gates are operated, detailing on various types of gate and decision making authority.

Table 11: Operation of sluice gates in Polder 3

Type of Gate	Formal authority as stated by respondent	Effective control	Gateman	Gateman's pay/ Cost & how paid	Operator's interest stated vs real
BWDB gate	Gate Committee, Beel Committee UP, Gher owners	BWDB UP Gher owners	BWDB (one case) Private Volunteer	BWDB Pay Cash paid by gher owners and fishing right	BWDB job+tips Cash payment, fishing right.
Private gate	Gher owner	Gher owner	Private or gher labour	Cash paid by gher owners	Cash payment
Pipes	Gher owner	Gher owner	Gher labour	Monthly salary	Monthly Salary

7. CONFLICTS

Various types of conflicts came up in the FGDs and KIIs held in polder 3. They are mostly related to paddy versus shrimp farming, accessing water source or drainage by the owners of land of varying elevation and the control of gates and canals. In polder 3 conflicts were found on land

titles and that lead to litigation and there was a conflicting situation between the local BWDB staff and shrimp farmers. The various types of conflicts and initiatives in conflict mitigation are discussed below.

7.1 Conflicts regarding paddy and shrimp farming

Respondents at Adorsagram (north) said that conflicts started in 1980s when influential people started bagda farming inside of the embankment. Before that (1970s) bagda farming was limited to the narrow strip of land between the river and the embankment. So, salt water did not enter inside of the polder and this did not create any conflict between the paddy and rice farmers. Entry of salt water inside of the polder increased salinity and flooded the surrounding land. This turned in to conflict particularly when aus could not be sown or planted (April-May) and aman seedbeds flooded (June-July). Seepage of salt water from the gher made paddy farming difficult and even impossible in the adjoining lands, often owned by the small farmers. LCS (Male) group members of Adorsagram said that they have seen quarrelling even between brother regarding shrimp vs. paddy farming. They have also seen 50 bigha gher owners encroached 5 bigha paddy land. In such a situation, the paddy farmer can either join shrimp farming jointly with the gher owner (if the gher owner agrees) or lease out the land to the gher owner which happens most often.

Two conflicting answers came from the FGD at Batuadanga (Tarali UP in the south). One view was that, “we all have gher in the beel” hence “there is no conflict”. Here “all” is not all households. It could be that all landowners and gher owners who can invest in shrimp farming. Definitely it does not include small farmers and landless. The other view was that “only gher owners benefit” and “paddy farmers and general people are affected”.

An affected paddy farmer at Tarali UP said in the KII that conflict arises between bagda and paddy farmers. Another farmer (mixed shrimp, fish and paddy farmer) said the conflict arises on the water use and drainage, how long brackish water will be taken in, when entry of fresh water should be allowed and when water should be drained out. As the gher owners control khal, paddy farmers do not get opportunity to drain water. This condition observed in August when paddy farmers want to drain out salt water or excess water in order to plant aman paddy.

7.2 Conflicts regarding high and low land elevation

The second type of conflict was mentioned by the FGD participants at village Soelpur (southwest). When gher located on highland continue taking in water, the low lands are flooded. They want to close the gate and highlanders want to keep open.

7.3 Conflicts regarding control of gate

Respondents at Adorsagram said that conflicts take place for water of canal. For instance, the owners of the gher located near canal want to close the gate after getting water but distant gher owners not yet got enough water. So, there is a dash among them. Influential people usually control the gates and canals and they operate them as they wish without seeing problem caused to others. Sometimes they threaten and create pressure (LCS-M)

Respondents at village Rangasisa said that canals cannot often be re-excavated even with the initiative of Union and Upazila Chairmen. The encroachers or canal leaseholders resist. The Upazila (sub-district) Chairman tried to re-excavate Khal, but failed.

7.4 Conflict regarding land and litigation

Respondents at village Rangasisa said that there are conflicts regarding land, meaning land title, occupancy and tenancy. Such conflicts are too complex and cannot be resolved by local salish

or the mediation of UP Chairman and ultimately goes in to the process of lengthy litigation. Attempt to arbitration also failed. This happens more because of huge investment, profit making and playing with money. In paddy farming, low financial transaction and less conflicts.

7.5 Conflicts between gher owner and the BWDB

So far we talked about conflict within community such as between paddy and shrimp farmers. Respondents at village Tarali gave an example of conflict between the local community and the institution responsible to help them in water management, the BWDB. They stated that conflicts take place between local people and WAPDA regarding opening and dosing sluice gates (UP FGD). The BWDB local staff creates pressure for not to take in water while local people (meaning gher owners) create pressure to UP for taking in water. Then UP has to intervene to open or close the gate to meet as per need of the moment. It was however reported that the SO restricts opening of sluice gate if he is not paid (meaning bribed) but if the gher owners can manage him, opening of the gate is possible. Sometimes, opening of gate becomes essential to drain out old water and take in new water from the river but keeping the gate closed for long period affects shrimp gher in particular.

7.6 Conflict mitigation

Respondents at Adorsagram said that the conflicts are resolved locally, meaning by salish, arbitration and often with the strong role of the UP. Conflicts relevant to operation of the gates are often resolved by making compromise where gher owners usually win. Still there are conflicts for getting access to Khas land between landless and influential persons. These conflicts are continuing. Respondents at village Batuadanga gave similar opinion as did the respondents of Adorsagram.

Respondents at Tarali UP clearly indicated that this is the duty of the UP to resolve conflicts and they usually do it. They have also said that litigation has reduced on the on the water use. Respondents at village Nichintapur remarked that the conflicts are resolved locally but the gher owners are usually benefited.

Respondents at village Rangasisa said that conflicts related to water use are resolved but the land related conflicts cannot be successfully resolved locally hence litigation is involved. If it happens so, both parties suffer for generations.

Sometimes conflicts are resolved in the Upazila level. The UNO, Upazila Chairman and Upazila Fishery Officer can play important role in gher related conflicts. Some approached UNO, Upazila Chairman is newly elected but surprisingly, there was no mention of Upazila Fishery Officer.

In 2010 after AILA in 2009 and the ruling of the High Court on the restriction of salt water entry to gher, plenty of cases against shrimp farmers were file. Now the trend of filing case declined possibly because when thing get old, attention diverted.

Some respondents mentioned that there are plenty of laws regarding regulation of shrimp farming such as signed agreement between local landowners and gher owners, the requirement of keeping side drain to give access to other farmers to the water sources and registration of gher. But, the enforcement of the laws remained weak and is getting weaker.

8. CONCLUSION

8.1 Summary of the study findings

The Context:

Polder 3 is located in the extreme southwest corner of the country, only about 20 kms north of the Sundarbans. The polder area comprises southern half of Debhata and northern half of Kaliganj Upazila of Sathhira district. The polder area is connected to the district town Satkhira and divisional city Khulna by a regional highway. Distance of Satkhira town from the centre of the polder is about 30 kms in the north and Khulna city about 90 kms in the northeast. Dhaka city is about 400 kms northeast from polder.

Geographical area of polder is 194 sq kms and it has total population of about 157,000 as per population census 2011. Population density per sq km is estimated 811. Literacy rate of the population is 52.25% where male 56% of the men and 49% of the women are literate. Literacy rate is close to national average. About 94% of the households of polder 3 drink water mainly from Deep Tube Well, 75% have access to sanitary latrine and 38% have access to electricity.

Farming System:

Before 1960s, the polder area was regularly inundated by tide water from the adjoining rivers and just one major crop, local variety aman paddy could be grown and for that too, yield was very low, only about 240 kg paddy per bigha (33 decimals) land. Although the local varieties had problem of low yield, they were quite resilient to inundation by flooding of a few feet, as the stems were long. The fodder quality of the straw was good and the quantity of straw was quite high. However, crop failure occurred in the event of sudden flood or cyclone or longer period of inundation. To reduce occurrence of crop damage and better protect the area from inundation by salt water, the WAPDA (now BWDB) constructed the polder in the first half of 1960.

After constructing polder, paddy yield increased to about 10 mounds per bigha, an increase of about 67 percent. The cropped area and crop diversification also increased. From mid 1970s the high yielding varieties of aman started to replace the local varieties. The HYV aman introduced over the time include BR 10, BR 11, BR 23 and BR 30. HYV Boro is now cultivated in limited area but not so successfully.

In the 19980s, water-logging started to increase as canals silted and shrimp farming began to expand. During the period, aman yield decreased followed by increased shrimp farming which caused further increase of shrimp farming. Vegetables and robi crops decreased too and the economy transformed from local aman to aquaculture dominated farming system. In the 1990s shrimp farming expanded but the growth was limited for the dependence of shrimp fry collection from the rivers. In 2000s shrimp fry coming from the hatcheries contributed to faster growth of shrimp farming.

Presently, three farming systems are dominant in the polder. The first one is bagda faming with a mix of brackish as well as fresh water fish throughout the year. The second one is bagda and mixed fish farming combined with one season aman paddy (Aug Dec). Here also, fish kept in the paddy land during August to October and in each such gher outer area ditches maintained to keep reserve of fish. The third one is aman HYV paddy followed by boro HYV paddy.

Irrigation:

Aman paddy is planted about the middle of monsoon, hence is mainly rain fed. During the period salinity of water in the adjoining rivers decreases but still remains moderately high 4 to 6 PPT. But if there is good rainfall salinity decreases and paddy can be cultivated. Farmers rely on rainwater to plant aman paddy. Boro HYV is cultivated in very limited area and source of water is deep tube

well. Water from the rivers and shallow tube wells cannot be used for HYV boro because the growing season coincides with high salinity season and ground water at shallow depth is saline. For aquaculture, source of water is river. Brackish water is taken in during Jan-Feb June/July and even up to October November in case of year round aquaculture.

Profitability of farming:

Net return to farmer per acre of land was around Tk. 9,000 in paddy cultivation against Tk. 36,000 in one season mixed farming of bagda and fish and all season fish and shrimp of Tk. 52,000. Probably this is the reason why aquaculture is expanding and crop farming declining. Environmental and social costs are different issues which do not come in to the mind of private entrepreneur interested in making profit.

Condition of the infrastructure:

The embankment was constructed long ago in the 1960s. No rehabilitation project was implemented in polder 3 since then. Thanks to former WAPDA (now BWDB) that the embankment is not yet destroyed and is still functional subject to repair and maintenance. Good design and standard of construction kept it functional so long time. However, in most part the embankment is narrowed and height reduced for the lack of maintenance. Further, digging of parallel canal or drain, cutting of slopes and setting of pipes by the gher owners made the embankment vulnerable. In many areas embankment did not break but leakage developed and soil became loose. Near the village Vorasimla, construction of spur on the Indian side of the river diverted flow to Bangladesh side that damaged the embankment several times and each time embankment had to be shifted further east. The new embankment is lower design than the original embankment of 1960 as acquiring new land is difficult.

Only about one third of the old BWDB gates in good condition or have minor damage. The remaining two thirds have major damage. In contrast, about one third of the private gates have major problems and two thirds are in good condition or have minor problems. Most of the 133 pipe inlets are northwest, west, southwest and south. The east has more private gates as this part has longer history of shrimp farming and over the period many private gates constructed.

A least destructive way of taking salt water inside of the polder was found in village Soelpur by siphon system called ninety degree pipe inlet (ninety degree kol). This is good for small gher but not so effective for large gher. And, such gher must be located near the river with drainage facility on the other side of the gher.

The polder area has about 87 kms of canals, estimated 0.5 km canal per sq km area. It was noted that almost all of the 35 BWDB structures have link canals and some of the private structures also have link canals. However the canals are mostly silted. Respondents at village Soelpur said that because of silt deposit, the shutter of some sluice gates has been blocked and canal closed. it cannot be opened or closed.

Canal lease:

Canal lease is a common problem in the whole coastal belt of Bangladesh and polder 3 is not an exception. To be specific, the LCS male members said that usually the gher owners get lease from the government. The leaseholders block the canal just after the gate or even close the gate entirely. Initiatives to re-excavate the canals often fail as the leaseholders resist and stop re-excavation work. It was found that the Upazila Chairman took initiative to re-excavate khal but failed because of strong opposition from the leaseholder side.

Maintenance:

The main responsibility of maintaining gates, embankment and re-excavation of canals felt assigned to the BWDB. However, the BWDB was found unable to play its role mainly because of budget constraint, low field presence and poor interaction with the communities. BWDB tends to wait for allocation of fund and it is rarely available unless some disaster takes place or minor maintenance becomes major and attracts attention of higher authority.

The Union Parishad was found quite active because they have to listen complaints of local people. Despite limited financial capacity and technical support, the UP executes minor repair and re-excavation on "emergency" basis. The UP tries to take help of the UNO and DC and such assistance comes, although not always. The UP utilizes funds from the Food for Works, 40 days employment support and Cash for Work programmes.

Polder 3 does not have any formal WMA. What it has is an Upazila level water management committee with linkage to district committee. The has no fund but occasionally received fund from the NGO AtcionAid through Uttaran.

The localized gate committee or gher committee or beel committee - effectively same and the gher owners carry out some minor repair

Participation:

Participation was seen as getting involved, giving opinion, working together, working voluntarily, attending meeting, having membership and even leadership in the relevant water management organizations.

But actual participation appeared low, not inclusive, landless and women almost always excluded, poor and women not called, not informed and their opinion not valued particularly by the concerned GoB agency. Even the NGO sponsored committee comprised civil society people like journalist and included elites like businessmen and gher owners but not the landless and women. At least people's perception was like this.

The suggestions concerning enhanced participation roamed around formation of committee, stronger role of the UP particularly of UP women members and taking general members from all households living in the polder area and the EC elected by general members.

Gender:

Women in the area are still in disadvantaged position as is evident from female literacy seven percentage points lower than male literacy in polder 3. Their work is not valued even today as revealed from the census data of only about 8% women employed in the income earning activities which is a gross methodological error.

It is important to note that none of the nine LCS women met in the FGD is member of any WMO. However they have good access to MFIs. Women are not included in the WMO with a wrong understanding that since they do not usually own gher or cultivable land they need not be included in the WMO.

The women household head met for the KII belongs to Tarali UP provides a good example showing that women do have stake in water management and they must be included in the relevant WMO. Her homestead agriculture comprising cultivation of fruits, vegetables and spices and rearing of livestock is severely impacted by water management. Also her two bigha paddy land had to be leased out to gher owner as paddy cannot be cultivated there for waterlogged condition and increased salinity.

Operation of the gates:

BWDB is not much involved in operating gates as day to day operation is not their responsibility and they are not equipped with the needed manpower to take care of day to day operation particularly after withdrawing gatemen and closing recruitment of gatemen. Presently the BWDB has no gateman in the field level. Now the responsibility of operating gates rests on the local gate committees headed by UP Member or Chairman. But BWDB does have a role to monitor and oversight to ensure that gates are operated properly. Taking this advantage, the BWDB local staff, the SO controls the gates and sometimes gives decision or intervenes on opening or dosing of particular gate. Although the BWDB insists to keep the gate dosed, it can be opened any time if the interested person, usually gher owner bribes the staff or gives tips to the proxy gateman.

In the absence of any formal and functional Water Management Organization and the inactivity of the BWDB, the UP Chairman and Members intervene and give decision on opening or closing of gate.

Although there is no formal WMO, several committees exist in polder 3. One is the Water Management Committee formed by the NGO Uttaran but this is financially weak and has not much role in gate operation. More active organization is the gate committee lead by UP Chairman or Member. The beel committee or gher committee are informal organizations but active in the operation of gates at local level. Most often, the decisions on the operation of gate come from the gate committee, beel committee or gher committee. The order is carried out by the gateman, most often recruited by the gate committee or gher committee. The gate man is paid by subscription collected from the gher owners and giving him a right to fish in the adjoining khal.

Conflicts:

Various types of conflicts came up in the FGDs and KIIs held in polder 3. They are mostly related to paddy versus shrimp farming, accessing water source or drainage by the owners of land of varying elevation and the control of gates and canals. In polder 3 conflicts were also found on land titles and that lead to litigation and there was a conflicting situation between the local BWDB staff and shrimp farmers.

Conflicts are resolved locally, meaning by salish, arbitration and often with the strong role of the UP. Conflicts relevant to operation of the gates are often resolved by making compromise where gher owners usually win. Still there are conflicts for getting access to Khas land between landless and influential persons. Sometimes conflicts are resolved in the Upazila level. It revealed that conflicts related to water use are resolved but the land related conflicts cannot be successfully resolved locally hence litigation is involved.

8.2 Problems highlighted

Several problems were highlighted in the FGDs and KIIs. These include:

- Due to increased shrimp farming salinity increased, trees dying, grass not growing, paddy cultivation declined, availability of straw declined. Therefore, livestock rearing declined.
- Salinity and water-logging caused decline of the cultivation and production of fruits and vegetables.
- Due to increased shrimp farming and intensification of agriculture, open water fishing opportunity declined. All land occupied by shrimp gher or crops simultaneously or one after another. Beel are no longer open for grazing animal or fishing. Also the canals blocked water flow between bell area and the river. So, natural fish are not finding breeding ground, hence declined drastically.

- Embankment became narrow and its height reduced and broke in many locations hence vulnerable to riverbank erosion. The structures damaged and developed leakage and closed in many places causing drainage congestion.
- About two thirds of the canals are silted, including many already closed. Canal lease and encroachment aggravated the situation.
- Fetching drinking water is a main problem. Women, accompanied by children have to carry water from up to 3 miles distance and the queue up for water several hours. The situation is aggravated by arsenic problem in part of the polder, particularly in Parulia UP.

8.3 Suggestions

Concerns:

Most respondents held pessimistic view of what will happen in the next few years if polder level water management does not improve. Most pessimistic view was that our area will be desert of salt water. Nothing will grow and people will starve. Another pessimistic view was that both salinity and drainage congestion will increase further and crop production will decrease and food security will decline. Some held optimistic view saying that water management will improve and there will be positive change. WMC participants in Debhata UP said that their UP will be a model one with good road link, electricity and education.

Suggestions:

A number of pertinent suggestions came from the respondents. The important ones are noted below:

1. All public canals to remain open and managed by responsible committees accountable to general people. Such canals must be freed of lease, illegal occupation and encroachment and re-excavated properly.
2. Re-excavate rivers and canals and de-silt on a regular basis.
3. Repair embankment and build it stronger with proper width, height, slope, compaction and maintain on a regular basis.
4. Construct more sluice gates of appropriate design to meet the changed needs, both crop farming and aquaculture.
5. Install more deep tube well for drinking water even if 1200 feet boring is needed.
6. Provide pond sand filters on the bank or reserve ponds.
7. Provide piped water supply for drinking purpose where deep tube wells are technically unfeasible and no reserve pond exist or can be excavated.
8. Provide facilities for rain water harvest and storage.
9. Shrimp farming should be planned and gher modernized so that surrounding area is not adversely affected. Making of unplanned gher must be stopped.
10. Instead of all season shrimp farming, one season shrimp and one season paddy should be practiced more widely.
11. All shrimp gher must have side drain (noyanjol) so that the land on the back have access to water source (canal and sluice gate) and can drain excess water.
12. Improve irrigation facility for cultivating paddy and other crops by installing STW where feasible.
13. The polder should have land use plan to determine where to locate shrimp gher, paddy and other crop farming, settlement area and infrastructure etc.
14. The "illegal" settlements that have closed the canals must be removed to free the canal and re-excavate.
15. All canals and rivers must flow naturally and obstructions created to that must be removed.

16. To establish green belt along the riverbank by plantation of salinity tolerant trees to protect embankment from strong waves and tides.
17. Remove “illegal” pipes – rather destructive structures, whether legal or illegal but with alternative arrangement to flushing and drainage, where necessary.

Institutions to take responsibility of water management:

Apart from the above suggestions, mostly of engineering, planning and administrative nature, the respondents offered a number of suggestions that concern institutional strengthening and reforms. These include:

1. BWDB to be responsive, proactive, enhance field presence and carry out overall responsibility of maintenance in a more participatory manner.
2. Existing laws and regulations concerning water management should be enforced such as gher registration, agreement among owners of land to culture shrimp (or not) and keeping provision of side drain (noyanjol) as condition to get registration.
3. UP to have stronger role in water management in the local level.
4. The polder should have well-functioning WMA and WMGs and in that UP to have oversight, advisory and coordinating role.

Some participants were so emotional to remark that we want to go back to past days of crop farming and open water fishing and livestock rearing and for that shrimp farming must be stopped. This could be extreme position but shrimp farming and water management must be regulated and there must be a land use plan for the polder.

A. ANNEX 1: INSTITUTIONS IN WATER GOVERNANCE

This section introduces the main actors in the polder relevant to the multiple uses of water and the polder infrastructure. Water management in this report meant mainly for agriculture, including aquaculture, through operation, i.e. the opening and closing of sluice gates, and maintenance of the infrastructure (polder, gates and canals).

i) Government Agencies

Bangladesh Water Development Board (BWDB)

The Bangladesh Water Development Board (BWDB) is the main implementing agency of water infrastructure projects in Bangladesh. As per the National Water Policy (Ministry of Water Resources, 1999) it is responsible for polders larger than 1000 ha. For this purpose, BWDB has special wing in the district level headed by senior engineer called Executive Engineer (Operation and Maintenance).

Poder 3 is a large polder and the BWDB is responsible for its improvement as well as operation and maintenance.

Local Government Engineering Department (LGED)

LGED is not involved in the maintenance of this polder as it belongs to the BWDB. However, they use relevant sections of the BWDB embankment to improve rural roads by brick pavement or bituminous carpeting.

Union Parishad: Grassroots Local Government Institution

Rural governance in Bangladesh comprises of a three tier local government system of which Union Parishad is the grassroots local government institution and its immediate upper tier is Upazila Parishad. Zila Parishad is practically non-existent. The polder area comprises six Union Parishads of Satkhira district, three belonging to Kaliganj Upazila and another three belonging to Debhata Upazila. The UPs are quite strongly involved in water management in this polder, particularly in operation and minor repair. In this polder UP involvement however appeared prominently in the discussion as a part of the Gate Committee and they occasionally supported repair of embankment, re-excavation of canals and in conflict mitigation. UP is strongly involved in providing tube wells for drinking water and ring slab latrines for sanitation. UP has good involvement in disaster response.

Role of Upazila Nirbahi Officer and District Committee

The role of the upper level local government institutions of Upazilas and Districts is to coordinate between different government agencies and projects active in their areas. They assist the Union Parishad for issues they cannot handle alone, as for instance funding required for various development activities (drinking water, emergency, road maintenance) and coordination at the higher levels. Since the Polder comprises six UPs hence there is need for coordination mainly in Upazila level by the UNO. The role of UNO came-up in the FGD and KII discussions. Their role seemed important to enhance better implementation of projects and enhancing participation of and benefits to the marginalized groups. DC's role came up in the discussion regarding canal lease.

Department of Agricultural Extension (DAE)

The Department of Agricultural Extension (DAE) is responsible for the dissemination of agricultural technology, information and relevant services to farmers and other stakeholders down to village level. It is the largest department under the Ministry of Agriculture having their extension officer down to village level (one extension officer called Sub Assistant Agriculture Officer for a cluster of villages called Block). In the polder area, the participants

did not mention much about the DAE and there is little interaction of the farmers with the DAE as the officers tend to stay in the Upazila rather than coming to the village.

Department of Fisheries (DoF)

The Department of Fisheries (DoF) is responsible for the dissemination of fisheries resource conservation and aquaculture technology and is placed under the Ministry of Fisheries and Livestock. DoF provides training on fisheries and teaches how to do combined cultivation of paddy and fish. They provide support to fish cultivators in the area and assist them if there are any problems. The DoF has no field staff and therefore has little interaction with the farmers.

Department of Public Health Engineering (DPHE)

The Department of Public Health Engineering (DPHE) is the national lead agency for provision of drinking water supply and waste management throughout the rural areas. Drinking water was identified as the most important use of water, yet respondents were not able to give any information of interactions with the DPHE. Rather, they would contact the Union Parishad and request for deep tube wells or piped water supply systems to access safe drinking water.

ii) NGOs

Active NGOs and MFIs in the polder include ASA, BRAC, Grameen Bank, Ideal, Uttaran and Shushila. All have microfinance as a main programme. In addition, BRAC is active in water supply and sanitation, Shushilan has agricultural technology dissemination (Eco-Demo farm, bee keeping) and Uttaran facilitated formation of Water Management Committee. Besides, all have provided relief during the disasters like AILA.

iii) Private actors:

Not active in this polder.

B. ANNEX 2: INSTITUTIONS

Authority/ Organization	Concerned Ministry	Field Presence	Relevant Functions	Constraints	Suggested remedial measures
Upazila Bureaucracy: UNO office headed by the UNO	Ministry of Establishment	Up to Upazila level.	* General administration * Development coordination * Conflict resolution	* Inadequate manpower * Low skills of staff * Bureaucratic orientation * Lacks public accountability * Political interference	* Reorientation * Freedom to act professionally, neutrally, guided by law * Enhanced public accountability
Bangladesh Water Development Board (BWDB)	Ministry of Water Resources	Effectively up to district level	* Develop and maintain polder infrastructure * Implement national water policy in the field level	* Upazilla level office non- functional * Gateman recruitment stopped but alternative measure to O&M by communities not yet functioning effectively	* Repair, reconstruct polder * Transform BWDB from just line ministry control to a people oriented institution
Local Government Engineering Department (LGED) (Not involved in water management in this polder)	Ministry of Local Government Rural Development and Cooperatives	Up to Upazila level.	* Plan, implement and maintain rural infrastructure (rural roads, bridge, culvert market, ghat etc) * Plan and implement small water sector projects up to 1000 ha in cooperation with local bodies and communities * Provide technical support (design, supervision, accounting) to local government bodies to develop, operate and maintain local infrastructure)	* Inadequate manpower if no project on-going * Political interference	* Freedom to act professionally, neutrally, guided by law * Enhanced public accountability * Local government strengthening
Upazila Land Office headed by the Assistant Commissioner, Land	Ministry of Land	Up to Upazila and Union level.	* Khas land and khas water bodies management * Leasing out of khas land, khas water bodies	* Inadequate manpower * Low skills of staff * Bureaucratic orientation * Lacks public accountability * Political interference	* Reorientation * Freedom to act professionally, neutrally, guided by law * Enhanced public accountability
Department of Agriculture Extension (DAE)	Ministry of Agriculture	Effectively up to Upazila level. Officially multi village block level below UP	* Provide technical advice * Assist distribution of input subsidies, agr loan etc.	* Sub Assistant Agriculture Officer rarely seen in the village/ UP * Low skills of employees * Political interference	* Establish Union based farmers information and service centre (FIAC) * Ensure presence of SAAOs at least in the UP on a regular basis * Ensure public accountability through

Authority/ Organization	Concerned Ministry	Field Presence	Relevant Functions	Constraints	Suggested remedial measures
				* Assigned many work by the government which are not related to agriculture sector	reporting to UP and Upazila Chairmen & UNO
Department of Fisheries (DoF)	Ministry of Fisheries and Livestock	Up to Upazila level	<ul style="list-style-type: none"> * Provide technical advice to fish/ shrimp farmers * Conserve fisheries resources * Inspect quality of shrimp fry supplied to farmers, * Promote hygienic condition of fish/shrimp landing centre/depots, quality of shrimp going to processing centre * Regulate shrimp farming so that it is not damaging environment * Khasjalmohal lease, management. * Report on fisheries/shrimp area production etc 	<ul style="list-style-type: none"> * Lack of manpower * Political interference * Lack transparency and public accountability 	<ul style="list-style-type: none"> * Introduce local extension agent in fisheries (LEAF) as recommended by the Fourth Fisheries Project (as a community managed but government supported extension system) * Ensure public accountability where UFO must report to Upazila chairman
Department of Public Health Engineering (DPHE)	Ministry of Local Government Rural Development and Cooperatives	Up to Upazila level.	Support water supply and sanitation <ul style="list-style-type: none"> - Tube Well - Pond sand filters - Rain water harvest - Ring slab latrine - piped water supply 	<ul style="list-style-type: none"> * Political interference * Lack transparency and public accountability * Low coordination with other departments 	<ul style="list-style-type: none"> * Inter agency coordination * Better interaction with the communities
Union Parishad (UP)	Ministry of Local Government	Nearest to people	38 functions <ul style="list-style-type: none"> - provision and maintenance of rural infrastructure include roads, canals, dykes, small scale water management) - provision and maintenance of water supply sources - prevent contamination of water sources - village police - village court, salish 	<ul style="list-style-type: none"> - Bureaucratic and political interference by DC/UNO and MP/minister -Lacks support of the government (financial & logistic) -Inability to mobilize financial resources internally - Elite domination 	<ul style="list-style-type: none"> - Local government strengthening by the government - Government to support not control local government. - Involve civil society organizations/NGOs to buildup capacity of the UP and raise public awareness