THE USE OF SLUICE GATES FOR STOCK ENHANCEMENT AND DIVERSIFICATION OF LIVELIHOODS

Final Sociological Report

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CONTENTS

EXECUTIVE SUMMARY

The Economic Role of Fish and Fishing in the Community

The population of the two study sites is 6,850 in PIRDP and 2,986 in CPP. Village size varies between 943 and 2,060 people. 51.7 of the total population are male. The average household size is 5.7 in PIRDP villages and 5.5 in CPP villages. Both of these figures are larger than the national rural average household size of 4.9.

Respondents identified their own household wealth categories. In the two CPP study villages, 79% of households said they were poor or very poor. In the two PIRDP study villages, 55% of households said they were poor or very poor. Only 1% of households are rich in PIRDP, and only 6% are rich or very rich in CPP. One of the study villages in CPP (Kathua Jugini) has about 160 new families (38% of the total number of households) who migrated here from the Jamuna riverbank area after their land and properties were lost to bank erosion and floods.

The dominant natural capital asset of the villagers is land. Land holding size determines people's wealth and social status. An average of 54% of households in PIRDP study villages are effectively landless. This figure is 68% for CPP villages. Very few households own over 500 decimals of land in any study villages.

Standards of education are low in all study villages. In PIRDP, some 36% of household heads are illiterate and about 21% can only sign their name. However, education is improving, and better literacy levels mean that livelihood opportunities are increasing.

Many householders have multiple livelihoods. These provide income but also reduce household expenses or maintain family and socio-cultural needs. Livelihoods include agriculture (people who cultivate their own land, sharecrop in and out land, mortgage or lease in and out land, cultivate vegetables or work as a wage labourer on land), fishing (full-time, part-time or for subsistence purposes), wage labour, business, vehicle driving/pulling, professional skills, household work, service and other non-agricultural occupations.

Over the last few decades, agricultural productivity has increased as a result of high yield variety rice cultivation, the adoption of modern agricultural technologies, rural infrastructure development, marketing networks and other modern forms of communication. Irrigation is also common. Before sluice gate construction, the PIRDP beel area was underwater for seven to eight months a year and people cultivated a single rice crop (deep water aman paddy). Crop production was uncertain and floodwater often damaged the aman rice. These days, two or three crops are grown each year (including high yield rice varieties), and many different crop types are cultivated using irrigation. Onions are a particularly important cash crop. In CPP, vegetable cultivation has increased since sluice gate construction, but many other crops are no longer cultivated. High yield rice variety cultivation has increased, thus increasing food security. It is, however, harder to attribute changes in cropping patterns to sluice gate construction.

In PIRDP, the most common primary occupation of household heads is agriculture (at 48.9%) followed by fishing (at 17.5%). In CPP, the most common primary occupation of household heads is agriculture (at 21.8%), with only 7.7% having fishing as their primary occupation. In PIRDP, the most common secondary occupation of household heads is wage labour (30.4%), followed by fishing (29.4%). In CPP, agriculture is also the most common secondary occupation of household heads. Fishing is comparatively less important as secondary occupation.

Some 37% of households sampled in CPP rely on fishing to some degree, and 27% of these rely on fish for 80% to 100% of their family income. The remaining 73% only rely on fishing to provide 20% or less of their total family income. In PIRDP, about 27% of households rely on fishing to some degree for income, and of these, about 22% rely on fishing to provide 80% to 100% of household income.

In PIRDP and CPP villages, crop cultivators, service holders and those involved in business (as their primary household head occupation) have more valuable household assets than other occupational groups such as fishers, wage labourers, rickshaw pullers, household workers and carpenters. Poorer groups (mainly wage labourers, sharecroppers and small farmers) often engaged in fishing for both consumption and livelihood purposes.

Many people have shifted from their traditional livelihoods to new ones. In the past, people were primarily dependent on agriculture, business and fishing in the floodplain. More recently, people have become involved in business, pulling rickshaws, vegetable cultivation etc.

Seasonal variation is also observed, especially where rural livelihoods depend on agricultural activities. However, recent increases in irrigation mean that livelihood insecurity resulting from seasonal changes in demand for agricultural labour is reduced, as crops can be planted almost all year round. Diversification of livelihoods has also helped reduce seasonal vulnerability.

Recent construction of road networks has increased diversification opportunities, as has the installation of a power supply and other development initiatives. Local people felt that since sluice gate construction, income levels are generally higher and poverty has been reduced. Communications development, better marketing systems for agricultural goods, new employment opportunities at national and international levels, introduction of modern agricultural systems, and NGO programmes to eradicate poverty and enhance livelihoods have also all helped improve livelihoods.

Local people felt fishing had decreased in recent years, whereas livelihoods from farming, business, pulling rickshaws or vans, service provision and skilled labour had increased. Several professional fishers have migrated from villages in the PIRDP area to India, and subsistence fishing is almost redundant for most months in CPP. Many fishers have adopted alternative livelihoods such as pulling rickshaws or running small businesses.

Before sluice gate construction, fishers used larger meshed nets made from cotton thread. These days, fishers use nylon nets with a smaller mesh size. Some of these damage small fish. Dewatering (excavation of ponds and then pumping water out to collect fish) has also increased. This damages brood fish stocks and results in low fish production.

Where the primary occupation of the household head is agriculture or service holder, PIRDP households show the greatest increases in household assets since sluice gate construction (at 69%). Only 10% of these households claimed a decrease in household assets. The assets of households where the primary occupation of the household head is fishing show the largest reductions, except those of housework. In CCP, household assets have increased most where the primary occupation of the household head is business or ‘other occupations’. Household assets have decreased most where the primary occupation of the household head is weaving or fishing.

Where the primary occupation of household heads is fishing, dependence on this one source of income tends to be higher than where household heads rely primarily on other livelihood sources. Fishers tend to be very dependent on fishing as their sole income source. This might make them more vulnerable than those who rely primarily on other occupations.

Rice and fish are traditionally the staple food for Bengali people, but households now consume less fish compared to the past. Fewer fish are caught in the open water, and if they can afford it, most people must therefore buy fish to eat from the market. Before sluice gate construction there was a shortage of rice, but this is no longer a problem. People also consume more meat and vegetables than previously.

The Social/Institutional Framework of Fisheries, Farming and Water Control

Sluice gate management committees exist at Talimnagar sluice gate in PIRDP and Jugini sluice gate in CPP. No committee exists at Bawlakhola sluice gate in PIRDP, where farmers send written applications to the Union Chairman, who forwards these to the Upazila Water Development Board office, which instructs the gate operator.

In PIRDP, fishers or farmers sometimes bribe or force the gate operator to open the sluice gate. Powerful local people also create pressure to operate the sluice gate. The gate operator does not always follow decisions made by the Upazila Nirbahi Officer (UNO) who chairs the sluice gate management committee, and who receives written applications for gate operation and chairs a meeting to make decisions on gate operation. A lack of coordination between committees also results in poor water management decision-making. Cooperation within the sluice gate management committee is inadequate and committee members do not supervise gate operation well. Some sluice gate management committee meetings are attended by few of the government committee members. Meetings are hard to get to for some committee members, and travel costs are considerable. Many committee members are overworked and cannot attend all meetings. The committee does not represent all relevant stakeholders, and only has one representative from the farming and one from the fishing community. The current fisher's representative has been absent for many months.

Bangladesh Water Development Board officials at Tangail usually instruct the Jugini sluice gate operator. Applications from, or consultation with the community on gate operation does not occur.

Many different formal and informal institutions operate in study villages. In CPP, an average of 60% of study village inhabitants were involved in at least one organization. Many households were involved in more than one. In addition, nearly all village households are involved with non-government organisations, which provide credit and savings facilities. About 93% of households received credit and some 7% of households were involved in money saving schemes. Loans are used to construct houses, sink tube wells or raise household income from different livelihood activities.

Changing Sluice Gate Operations: Community Hopes and Suggestions

Local people felt that water management problems resulting from sluice gate operation included: gate operation according to farmers' needs, which reduces fish recruitment and disadvantages fishers; local elites influencing gate operation; individuals benefiting at the expense of farmers and fishers; faulty gates; farmers at different elevations having different water needs; crops in different seasons having different water needs; and local people in different areas having different water needs.

Local people felt that bottlenecks for improved sluice gate management included: poor cooperation within the sluice gate committee; poor coordination of government, community and other stakeholders; inadequate fisher representation on the committee; decision-making without field verification or monitoring; pressure groups influencing gate operation; inadequate gate operation guidelines; unavailability of government officials at key times; no supervision/monitoring of sluice gate management; low local awareness levels; and faulty sluice gate structures.

The most popular suggestion for increasing fish production without damaging rice production included opening the sluice gate during the first tide and early rising floodwater. Other suggestions included: law enforcement, particularly banning spawn and fish fry collection in rivers, dewatering and using fine mesh nets; a government programme releasing fingerlings in the beel; preventing fishing in certain months; banning certain fishing gear; establishing fish sanctuaries; re-excavating rivers, canals and beels to improve water flow and provide permanent water bodies; and controlling use of chemical pesticides and fertilizers.

Suggestions for future institutional involvement included: government implementation of suggested solutions; and involvement of different groups (government and non-government) in sluice gate issues.

Following a successful well-attended Upazila level workshop, the value of an annual general meeting near the sluice gate to discuss when the gate should be opened was recognised.

Additional suggestions by local government officials for improving water management and reducing poverty included: paying more attention to the needs of fishers in sluice gate management; paying less attention to the needs of fishers in sluice gate management; providing alternative livelihood opportunities for fishers if fishing becomes regulated seasonally; and improved direction and management of the sluice gate management committee.

Communities living outside the empoldered areas have suffered in recent years. These villages are significant in size, with about 18,000 people living outside CPP, and 12,000 in three villages outside CPP. This is more than three times as many people as those living inside the empoldered study areas. Fishers have suffered as perennial water bodies have become seasonal, and as traditional Hindu fishing practices, such as avoiding fishing in certain seasons, and using large mesh sizes also no longer occur. Sluice gate and embankment construction has increased sand deposition which means land is less fertile. It has also reduced rice and jute crop production due to flooding. Such flooding occurs when rising floodwater cannot enter the empoldered area, or when water is suddenly released from the empoldered area. Historically floodwater used to disperse more rapidly into the wider floodplain, but now it stays for longer thus increasing crop damage. Non-scheduled sluice gate operation is also problematic. As is construction of infrastructure such as bridges and culverts, which may also impede water flow, and thus increase flooding. Currently all benefits accrue to those living inside the embankment. The fact that water cannot access the floodplain in the early flood period means that rivers are losing depth due to siltation. This then means that water overflows into nearby villages and fields. Suggestions for improved water management and poverty reduction include: giving people outside the empoldered area more say in sluice gate management; supervision by government and involvement of non-government organisations (for example with implementing development projects) and the army (for example with embankment construction); more regular opening of the sluice gate; new embankments and raised river banks to protect villages from flooding; river dredging and channel construction; plantations on river banks to reduce erosion; and repairing existing embankments and roads.

INTRODUCTION

This report describes results from the sociological components of research conducted under the United Kingdom's Department for International Development (DFID) funded project 'The use of Sluice Gates for Stock Enhancement and Diversification of Livelihoods.' The objectives of this sociological research were as follows:

- Understand the economic role of fish and fishing in the community.
- Understand the social/institutional framework of fisheries, farming and water control.
- Understand the social effects of altered sluice gate operation.
- Understand community expectations/views/hopes for fishing and farming.

The two research sites were the Pabna Flood control and Irrigation System (PIRDP) and the Compartmentalisation Pilot Project (CPP) in Tangail. The methodologies used to conduct this sociological research are described in more detail in 'Methodologies for Understanding Institutional, Economic and Social Aspects of Sluice Gate Management.' In summary, however, the following methodologies were used:

- Rapid rural appraisal
- Household census
- Household survey
- Focus group discussions
- Open-ended interviews
- Case studies
- Workshops

This final sociological report is part of a set of reports relating to this project. The following documents are available on request from project personnel:

- Literature Review, BCAS and IIED, September 2004
- Methodologies for Understanding Institutional, Economic and Social Aspects of Sluice Gate Management, BCAS and IIED, September 2003
- Fisheries Assessment and Data Collection Methodologies, MRAG Ltd, April 2003
- Final Sociological Report, BCAS and IIED, January 2005
- Fisheries Assessment Report, MRAG Ltd, January 2005
- Protocol for Sluice Gate Management, IIED, BCAS and MRAG, January 2005

THE ECONOMIC ROLE OF FISH AND FISHING IN THE COMMUNITY

Community and Household Size

Household census data in PIRDP and CPP revealed that there are over 9,800 people living in the six villages in these two study areas. The population in PIRDP is 6,850 and in the Jugini area it is 2,986. Sharirbhta in PIRDP has the highest population (2,060) of all six villages, while Chaubaria in the Jugini area, has the smallest with only 943 people.

Table 1: Population, Household Size and Gender by Village and by Site

Village	Number of households	Population	Total male	Total female	Percentage of male	Percentage of female	Average family size
Sarirbhita	348	2060	1089	971	52.9	47.1	5.9
Badai	232	1302	680	622	52.2	47.8	5.6
Dari Malanchi	333	1829	995	834	54.4	45.6	5.5
Krishnapur	330	1659	880	779	53.0	47.0	5.0
Sub Totals/Average	***1243***	***6850***	***3644***	***3206***	***53.2***	***46.8***	***5.7***
Kathua Jugini	413	2043	1049	994	51.3	48.7	4.9
Chaubaria	170	943	494	449	52.4	47.6	5.55
Sub Totals/Average	***583***	***2986***	***1543***	***1443***	***51.7***	***48.3***	***5.1***
National Rural Average	***1826***	***9836***	***5187***	***4649***			***4.9***

Source: BCAS Household Census

There are 1,826 households in the six selected villages in the two study areas.

There have been slow but steady changes in the social, economic and political organisations as well as in rural social structure over the past few decades. There have also been changes in the population structure. Although the total population has increased, the fertility rate and population growth rate have declined.

The average household size is 5.7 in PIRDP villages and 5.5 in CPP villages. Both of these figures are larger than the national rural average household size of 4.9 (according to a 2001 population census). Table 1 shows that the average PIRDP household size in four villages varies from 5.0 to 5.9, whereas in CPP villages it varies between 4.9 and 5.5. The largest average household size of 5.9 was in Sharirbhita in PIDRP, and the smallest average household size was 4.9 in Kathua Jugini in CPP.

Household Wealth

Household wealth is in part determined by land ownership (or control over land), but also income from livelihood activities. Some households also benefit from cash sent by relatives who work in other districts or foreign countries.

Household census data reveals that there are five household wealth categories in four villages in PIRDP and four wealth categories in two villages in CPP. Under the household census, respondents identified their own household wealth categories.

Table 2 and figures 1 and 2 show that about 22% of households are very poor and 33% are poor in PIRDP villages. This means that about 55% of households in these villages are poor. About 39% of households are

in the madham (middle) wealth category, 6% of households are rich, and 1% of households are very rich in PIRDP villages.

Figure 1: Household Wealth Categories in Four Villages in PIRDP

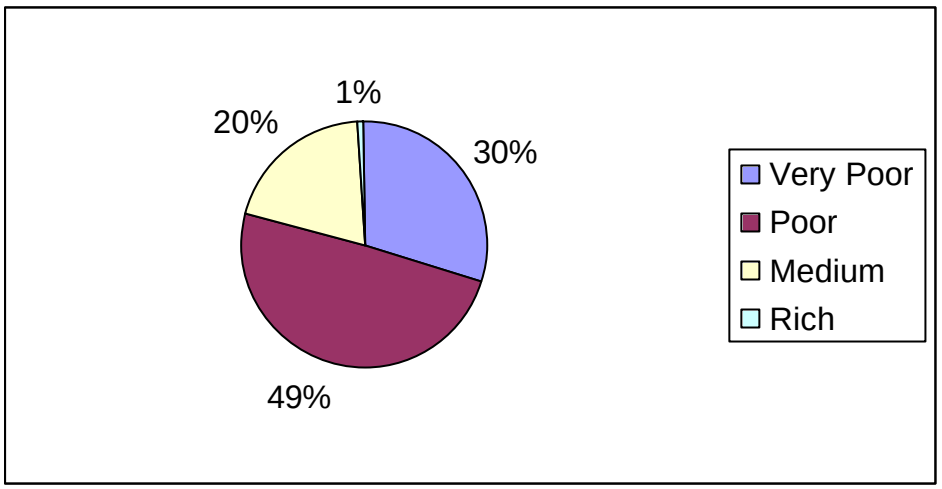

Figure 2: Household Wealth Categories in CPP Villages

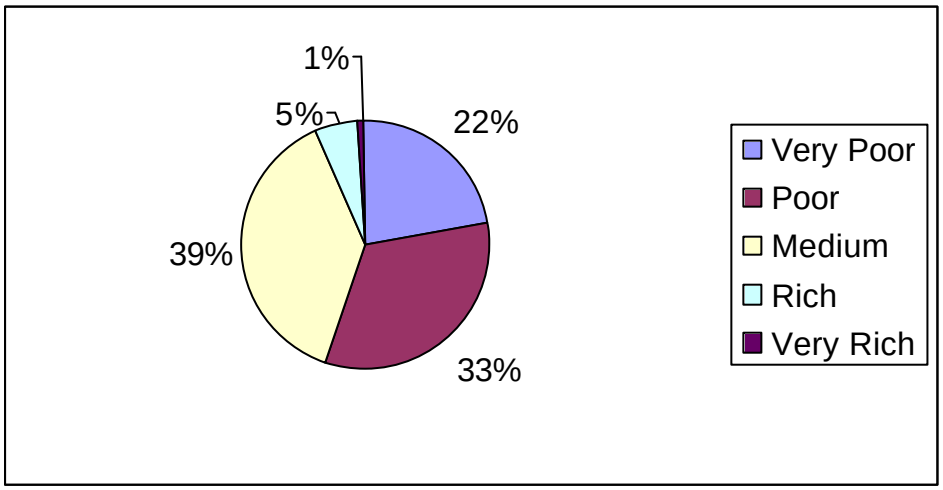

Table 2: Distribution of households in numbers (and percentages) by wealth categories in selected villages

Wealth categories	PIRDP					CPP		
	Households by village				Total of four villages	Households by village		Total of two villages
	Sarirbhita N = 348	Badai N = 232	Dari Malanchi N = 333	Krishnapur N = 331		Kathua Jugini N = 413	Chaubaria N = 170	
Very poor	91 (26)	105 (45)	78 (23)	3 (1)	**277 (22.3)**	142 (34)	33 (19)	**175 (30.1)**
Poor	129 (37)	38 (16)	110 (33)	129 (39)	**405 (32.6)**	212 (51)	72 (42)	**284 (48.8)**
Madhom	97 (28)	64 (28)	134 (40)	188 (57)	**483 (38.9)**	57 (14)	61 (36)	**118 (20.3)**
Rich	30 (9)	17 (7)	10 (5)	11 (9)	**68 (5.5)**	1	4 (2)	**5 (0.9)**
Very rich	1	8 (4)	1	-	**10 (0.8)**	-	-	
Total					**1243**			**582**

Source: BCAS, Household Census 2004

In CPP, about 30% of households are very poor and 49% are poor. In other words, about 79% of households are poor in these two study villages. Most of the households (515) are poor in Kathua Jugini village, where there is only one rich household. It is worth noting here that one of the study villages in CPP (Kathua Jugini) has about 160 new families (38% of the total number of households) who migrated here

from the Jamuna riverbank area after their land and properties were lost to bank erosion and floods. Only 20% households are Madham and 1% is very rich.

Table 3: Wealth category characteristics, as described by Rapid Rural Appraisal (RRA) respondents

Wealth category	Wealth category characteristics
Very poor	Landless/some of them have land below 50 decimals No homestead/some of them live on other peoples homesteads People are helpless or depend on others for help Wage labourers Have no savings No male earning family members Begging for their living Fishing for their livelihoods
Poor	Landless/a few of them have land up to 150 decimals per household Have only their own homestead Small farm holdings Cultivate other peoples land/sharecropper Wage labour is the major livelihood source Many people in this group depend on fishing for their livelihood Pulls a rickshaw/rickshaw van Small business owner Income is inadequate for maintaining their livelihood
Madham (middle/medium)	Land holding size 150 to 500 decimals Cultivates theirown land Service holder in family Involved in a small business Sufficient food crops are grown on their own land/no need to buy food crops Mortgages out land Lends money Have their own fishing pond Usually no need to receive credit
Rich	Landholding size 500 to 750 decimals per household Cultivate their own land Service holder in family/someone has a big job No need to buy food crops Get huge crops from own land Have savings Use modern crop cultivation techniques Have their own fishing pond Sharecrop out of land
Very Rich	Have a big business Landholding size is more than 750 decimals per household Sharecrop out of land Have a very large amount of savings Have their own fishing pond Have a big job Get huge remittances Engineers/doctors in the family

Household Land Holding Patterns

The dominant natural capital asset of the villagers is land. Land holding size is used to determine the people's wealth and social status, and is typically unevenly distributed in rural households. Generally, wealthy people have large landholdings and poorer people own less land. In this context, the villagers of Kathua Jugini and Chaubaria (both in CPP) are mostly poor (see Table 4).

However, control over land does not necessarily match with land ownership. This is because people can control other people's land under different land tenure schemes. These include sharecropping in and sharecropping out land, mortgaging in and mortgaging out land, and leasing in and leasing out land.

Local people described how the land use pattern of the villagers has changed over the last decade. Construction of new homesteads has seriously reduced the area of cultivable land. During and after the devastating flood of 1998, many households moved to project study areas and built homesteads because the Jamuna River had washed their homes away. These immigrants have caused Kathua Jugini village to expand dramatically. In addition, newly married couples have also built many new homesteads. The result is a decline in the area of cropland available to the village.

Table 4: Percentage of households by Total Landholding Class by Village

Sites	Village	Total Land <50 decimals	Total Land 50-249 decimals	Total Land 250-499 decimals	Total Land 500-749 decimals	Total Land >749
PIRDP	Saribhita	36	40	11	8	5
	Badhai	42	31	11	7	9
	Dari Malonchi	51	29	12	4	4
	Krishnapur	82	10	4	1	2
	Average	**54**	**28**	**9**	**5**	**4**
CPP Tangail	Kathua Jugini	83	15	1	1	0
	Chaubaria	33	54	13	0	0
	Average	**68**	**26**	**5**	**1**	**0**

Source: Household Census, BCAS

Land holding patterns vary between the two study sites. In PIRDP, an average of 54% of households are landless. Table 4 shows that Krishnapur village has the largest number of landless households (at 82%) out of the four villages in studied in PIRDP. About 28% of households in PIRDP own between 50 and 249 decimals of land, and very few households own over 500 decimals of land. Table 4 shows that a higher proportion of people in CPP have less than 50 decimals of land. In Kathua Jugini Village, 83% of households fall into this category. About 26% of households in CPP villages studied own between 50 and 249 decimals of land. And as in PIRDP, a very small percentage of households own more than 500 decimals of land. Unlike PIRDP villages studied, no households own more than 749 decimals of land. Comparing PIRDP with CPP shows that the land holding size is larger in PIRDP households than in CPP households.

Household Head Educational Status

Household Survey

The educational status of household members was revealed through the household survey. Table 5 shows that in PIRDP a large proportion (36%) of household heads are illiterate and about 21% can only sign their name. Only 42% of households can read and have a background involving schooling. Very few household heads (3%) have a degree standard (or higher) educational qualification in the villages surveyed in PIRDP.

Table 5: Percentage Distribution of Household Heads by Educational Qualification and by Study Sites

Educational Qualification	PIRDP- Pabna (N=204)	CPP- Tangail (N=100)
No schooling	36.3	10.2
Can only sign name	21.1	30.6
Can read	16.7	14.3
Up to primary (class V)	10.8	34.7
Up to HSC or equivalent	11.8	7.1
Degree or above	3.4	3.1
Total	**100**	**100**

Source: BCAS, Household Survey Data

Households in CPP are better educated than those in PIRDP. About 31% of household heads in CPP villages surveyed can sign their names, and 34% are educated up to primary school level. However, as at PIRDP, very few households hold a degree or qualification above this.

Focus Group Discussions

Focus group discussion participants in the area are more educated than they were seven years ago. This may be due to increased government and non-government organization emphasis on education. Villages have several formal and informal schools where young people learn during the daytime and illiterate adults learn at night after their daily livelihood activities have ended. Most people can now read a Bengali newspaper and several also regularly read daily news. This informs them about national and global events. Improved literacy means that many people in the study sites can understand their status and adopt new ideas to improve their livelihoods.

Livelihoods

People in the study areas tend not to depend solely on any single livelihood activity. They engage in different livelihood activities to meet their household needs and earn enough income.

People in the study villages earned their livelihoods in various different ways. Household heads were questioned about their primary, secondary and tertiary livelihood activities. RRA respondents said that men and women undertook different livelihood activities in their daily lives. Some of these activities are directly linked to primary production or generating income for the family but other activities are geared towards reducing household expenses or maintaining family and socio-cultural needs.

Livelihoods of the villagers can be classified as agriculture, fishing, wage labour, business, vehicle driving/pulling, professional skills, household work, service and other non-agricultural occupations. Those involved in agriculture include people who cultivate their own land, sharecrop in and out land, mortgage or lease in and out land, cultivate vegetables and work as a wage labourer on the land.

Driving an auto rickshaw, and pulling a rickshaw or rickshaw van are the main means of vehicular transport. Metal roads pass through many villages in both project areas, and these connect remote areas to district towns. Roads and embankments also connect many parts of the locality, thus significantly increasing peoples' mobility and creating opportunities for driving or pulling different types of rickshaw. It is usually people from the labouring classes or poor male household members who conduct these employment activities. A few financially solvent people also invest capital in the transport sector. Some buy rickshaws or rickshaw vans to rent out to poor people for extra income. One recent trend has been the conversion of rickshaw vans into mechanized vans. This may negatively impact the livelihoods of certain poor people, particularly those whose families depended on pulling rickshaws.

People involved in fishing in the beel, river and khal have been identified as fishers. This group may be further divided according to whether their involvement in fishing is full-time, part-time or for subsistence purposes. Full-time fishers may also be called professional fishers. Both full-time and part-time fishers catch fish collectively and use boats and nets. Poor fishers and subsistence fishers use smaller nets and boats. Only professional fishers are involved in fisher's societies. Some people also depend on making fishing gear for their livelihoods.

People involved in business in the area run small shops, sell groceries or cattle or are involved in vending. Some professional skill related activities have been newly adopted in the region following the introduction of modern agricultural equipment. These include repairing power tillers, shallow tube well engines, pesticide spray machines and automobile rickshaws. Tailoring activities are also increasing in the study villages following the provision of skills development and training for some villagers.

Household work is the most common livelihood activity for women in the study villages. However, most women have to perform many other duties in addition to household work. This category of profession dominates amongst female household heads. Activities at the homestead level include cooking, washing clothes, washing dishes, rearing babies, caring for other family members, collecting drinking water, distributing food to all family members, gardening and processing agriculture products. Other household activities include rearing cattle and poultry to help maintain livelihoods.

Table 6: Main Occupation of Household Heads in numbers (and percentages) in Selected Villages

Main occupation of household heads	**PIRDP**					**CPP**		
	Household heads by village				Four Villages Total	Household heads by village		Two Villages Total
	Sarirbhita N = 348	Badai N = 231	Dari Malanchi N = 334	Krishnapur N = 330		Kathua Jugini N = 413	Chaubaria N = 170	
Agriculture	264 (77)	133 (57)	163 (49)	47 (14)	**607 (48.9)**	31 (8)	96 (57)	**127 (21.8)**
Fishing	31 (10)	34 (15)	60 (18)	93 (28)	**218 (17.5)**	40 (10)	5 (3)	**45 (7.7)**
Wage labour	10 (3)	26 (11)	53 (16)	42 (13)	**131 (10.8)**	33 (8)	2 (1)	**35 (6.0)**
Business	5 (1)	10 (4)	23 (7)	73 (22)	**111 (9.0)**	81 (20)	18 (11)	**99 (17.0)**
Housework	5 (1)	2 (1)	3 (1)	18 (5)	**28 (2.3)**	7 (2)	3 (2)	**10 (1.7)**
Service	20 (6)	18 (8)	27 (8)	16 (5)	**81 (6.5)**	18 (4)	21 (12)	**39 (6.7)**
Rickshaw/van puller	-	1	5 (2)	32 (10)	**38 (3.1)**	45 (11)	8 (5)	**53 (9.1)**
Weaving	-	4 (2)	-	2 (1)	**6 (0)**	88 (21)	-	**88 (15.1)**
Others (carpenter/ mason/ weaving labour etc.)	9 (3)	4 (2)	-	6 (3)	**19 (2.0)**	70 (17)	16 (9)	**86 (14.8)**
	PIRDP Total				**1239 (100)**	**CPP Total**		**582 (99.9)**

Source: BCAS, Household Census 2004

Table 7: Secondary Occupation of Household Heads in numbers (and percentages) in Selected Villages

Second major occupation of household heads	PIRDP					CPP		
	Household heads by village				Four Villages Total	**Household heads by vill**		Two Villages Total
	Sarirbhita N = 348	Badai N = 232	Dari Malanchi N = 334	Krishnapur N = 334		Kathua Jugini N = 413	Chaubaria N = 170	
Agriculture	18 (5)	18 (8)	7 (2)	21 (6)	**64 (10.6)**	94 (23)	31 (18)	**125 (64.4)**
Fishing	119 (34)	7 (3)	30 (9)	22 (7)	**178 29.4)**	4 (1)	2 (1)	**6 (3.1)**
Wage labour	25 (7)	63 (27)	25 (8)	71 (22)	**184 (30.4)**	8 (2)	2 (1)	**10 (5.1)**
Business	26 (8)	21 (9)	56 (17)	4 (1)	**107 (17.6)**	14 (3)	11 (7)	**25 (12.9)**
Housework	-	-	-	1	**1 (0)**	-	-	
Service	13 (4)	1	23 (7)	-	**37 (6.1)**	1	2 (1)	**3 (1.5)**
Rickshaw/van puller	4 (1)	6 (3)	2 (1)	6 (2)	**18 (3.0)**	1	2 (1)	**3 (1.5)**
Others (imam/ doctor/weaver)	5 (1)	5 (2)	7 (2)	-	**17 (2.8)**	13 (3)	9 (5)	**22 (11.3)**
	PIRDP Total				**606 (99.9)**	**CPP Total**		**194 (99.8)**

Source: BCAS, Household Census 2004

Table 6 shows the distribution of household heads according to their main occupation. The table shows that in PIRDP, the most common primary occupation of household heads is agriculture (at 48.9%) followed by fishing (at 17.5%), wage labour (10.8%), business (9.0%), service (6.5%) and housework

(2.3%). In CPP, the most common primary occupation of household heads is agriculture (at 21.8%), followed by business/professional work (17%), weaving (15.1%), fishing (7.7%), and wage labour (6%).

Table 7 shows the distribution of household heads according to their secondary occupation. The table shows that in PIRDP, the most common secondary occupation of household heads is wage labour (30.4%), followed by fishing (29.4%), business (17.6%) and service (6.1 %). In CPP, agriculture is also the most common secondary occupation of household heads. This is followed by business, others (weavers, imam and non-agricultural activities) and wage labour. Fishing is comparatively less important as secondary occupation in CPP than it is in PIRDP.

Livelihoods Training

Many villagers are also undertaking training to improve their livelihood options. For example, young men are learning engineering, how to drive auto rickshaws and how to repair automobiles, shallow tube well engines and other machines. People are also getting training on tailoring, homestead gardening, poultry and livestock raising, fish culture, tree plantation, and newly introduced agricultural technologies. Both government agencies and non-government organisations arrange and conduct training. Focus group discussion participants felt that this training really helped people to develop their capacity to undertake alternative livelihood options.

Household Head Occupation in Relation to Assets

Information on household capital assets was revealed through the household survey. Survey findings show that land is the main capital asset of respondents, followed by houses, livestock, furniture, agricultural equipments, fishing gear and other possessions.

Tables 8 and 9 show how the total value of household assets varies according to the primary occupation of the household head. In PIRDP and CPP villages, crop cultivators, service holders and those involved in business have more valuable assets than other occupational groups (such as fishers, wage labourers, rickshaw pullers, household workers, carpenters and other groups).

Table 8: Percentage Distribution of Household Heads in PIRDP according to their Main Occupation and the Total Value of their Household Assets

Major occupation of household head	Total value of household assets						Total (%)
	Through 30000 (US$500)	30001-60000	60001-90000	90001-120000	120001-150000	150001 and above	
Crops cultivator (N=92)	4.0	5.0	10.0	5.0	15.0	61.0	100
Wage labour (N=23)	43.0	26.0	4.0	4.0	13.0	9.0	99
Fishing (N= 39)	32.0	32.0	21.0		12.0	3.0	100
Business (N=19)	16.0	21.0	26.0	11.0		26.0	100
Rickshaw pulling/ boat/ cart driving (N= 7)	71.0	29.0					100
Service (N= 12)	9.0	18.0		9.0		64.0	100
Household works (N=5)	80.0	20.0					100
Weaving (N= 2)	50.0					50.0	100
Others (Artisan /Carpenter) (N= 3)	66.0					33.0	100

Source: Household Census, BCAS

Table 9: Percentage Distribution of Household Heads in CPP according to their Main Occupation and the Total Value of their Household Assets

Major occupation of household head	Total value of household assets						Total (%)
	Through 30000 (US$500)	30001-60000	60001-90000	90001-120000	120001-150000	150001 and above	
Crops cultivator (N=18)		5.6	5.6	5.6	5.6	77.8	100
Wage labour (N=10)	20	10	0	40	0	30	100
Fishing (N= 8)	12.5	25	0	37.5	25	0	100
Business (N=31)	32.3	9.7	9.7	3.2	3.2	41.9	100
Carpenter/Mason (N=4)						100	100
Rickshaw pulling/ boat/ cart driving (N=8)		37.5	12.5	25	0	25	100
Transport worker (N=10)	0	30	10	10	10	40	100
Service (N= 6)		16.7				83.3	100
Household works (N=3)	33.3			33.3		33.3	100
Others (N=2)	50		50				100

Source: Household Census, BCAS

Livelihood Changes

Many people have already shifted from their traditional livelihoods to new ones. In the past, people were primarily dependent on agriculture, business and fishing in the floodplain. More recently, a significant number of people have become involved in business, pulling rickshaws, vegetable cultivation etc. Importantly, people from different wealth categories are now involved in similar work. This was rarely observed in the past. For instance, people from all wealth categories are now involved in organizing social and cultural events. However, variations do exist between different religious groups.

Seasonal variation does not necessarily negatively affect the livelihoods of the poor people. Rural livelihoods depend primarily on agricultural activities, but this is subject to seasonal changes in demand for labour. This can create livelihood insecurity. However, these seasonal changes have recently been reduced, leading to greater stability and security in village employment opportunities. This is due to the introduction of irrigation, which allows farmers to cultivate different types of crops and vegetables throughout the year.

To cope with the seasonal scarcity of labour demand, many agriculture labourers and other professional groups engage in pulling rickshaws or travelling to the nearest district town for business purposes. Women also raise poultry and livestock and engage in tailoring and food preparation activities. Sometimes they receive credit from non-government organisations or other sources to support them with this. This also helps reduce seasonal vulnerability.

Rural infrastructure development has played an important role in changing available livelihood options. In the last two decades the government, with assistance from donors and development partners, has established a road communication network in the area. This has facilitated the overall rural development process and expanded emerging opportunities to benefit from engagement in national and global market forces.

Rapid Rural Appraisal in PIRDP

Respondents in 34 villages said that both fishers and wage labourers had been reduced in 29 and 25 villages respectively. On the other hand, the number of farmers, sharecroppers, businessmen, rickshaw/van pullers, service providers and skilled labour cultivators has increased in almost all villages.

Household Survey

The household survey revealed that many different types of business activities are emerging within the villages. Many people are now involved in business, which was historically less common as people were idle or underemployed. One survey respondent compared his childhood with the present situation. He said that there are three times as many households now compared to when Bangladesh was East Pakistan. He said people used to depend on crop cultivation, but that now people are engaged in many income-generating activities to secure their livelihoods.

Household survey respondents mentioned that due to the recent reduction in area of the open water fishery and consequent decline in fish resources, several professional fishers have migrated from villages in the PIRDP area to India. Subsistence fishing continues in PIRDP, but is almost redundant for most months of the year in the CPP area. Fishers have also changed occupations, and some now pull rickshaws, run small businesses, work as wage labourers or work in the fish culture industry. In the CPP area, some professional fishers are trying commercial fish culture by taking on the leases for private ponds.

Focus Group Discussions in PIRDP and CPP revealed that before sluice gate construction, lower levels of income and high levels of poverty meant that it was more difficult to maintain livelihoods. Since sluice gate construction, these livelihood related problems have decreased in both areas.

Focus Group Discussions in PIRDP

Much occupational mobility has occurred in PIRDP since sluice gate construction. Prior to construction there were farmers, fishers, weavers, wage labourers, fish drying workers, country boat makers and service providers in the area. Weavers and boat makers are no longer active. But rickshaw/van pullers, transport workers, masonry workers, women wage labourers and brick breakers are now common occupations.

The number of professional fishers has fallen in all traditional fishing villages. Before sluice gate construction, fishers and fish traders were mainly dependant on fishing for their livelihoods. Professional fishers worked in many villages, but many professional fishers have now left their homestead for various reasons including a lack of fish in water bodies. In the past, most croplands were inundated with floodwater. Poorer groups (mainly wage labourers, sharecroppers and small farmers) were also engaged in fishing for both consumption and livelihoods. Nowadays, cultivators, agricultural wage labourers and landowners are still engaged in fishing to earn some income.

In the past, most villagers communicated using country boats. Recently, road construction has facilitated communication and mobility. The road network has also provided employment opportunities pulling rickshaws, or working in the transport sector or as a wage labourer in crop fields.

New employment opportunities have arisen due to the increase in cultivable land and crop production, and installation of a power supply. Positive changes to livelihoods are therefore due to a combination of development initiatives. FGD participants identified floodwater control, communications development, better marketing systems for agricultural goods, new employment opportunities at national and international levels, introduction of modern agricultural systems, and NGO programmes to eradicate poverty and enhance livelihoods as probable reasons of livelihood improvements.

Farmers are using fertilizers and pesticides on their crops to maximize yields. Many businessmen benefit from the sale of these fertilizers and pesticides. But fishers are not catching enough fish to earn an adequate income. Although fishers are habituated to their profession, and traditionally dislike alternative activities to fishing, many have had to take up new livelihoods such as pulling rickshaws.

Focus Group Discussions in CPP

Occupational diversification has also been observed in the CPP. New professions include rickshaw/van pullers, businessmen, transport labourers, brick breaking labourers and goldsmiths. The number of people employed in these professions has increased due to the development of rural road networks, the increasing population and increasing demand.

Changes in Household Assets

Household census data

The household census provided information on how household assets have changed since sluice gate construction. Household heads (or another adult respondent from the household) described whether their assets had changed following sluice gate construction, and if so, how. Findings were divided up according to the primary occupation of the household head.

Findings for PIRDP are presented in Table 10. This shows that household assets have shown the largest increases following sluice gate construction where the primary occupation of household heads is agriculture or service holder. Indeed, about 69% of households whose household head's primary source of income was agriculture showed an increase in assets following sluice gate construction, whereas only 10% of these households claimed a decrease in household assets.

The assets of households where the primary occupation of the household head is fishing, show greater reductions in household assets than any other occupation, except that of housework. Key informant interviews revealed that many fishers have already migrated to other districts or to India, so these people have not been included in this study. However, the trend remains clear: the assets of households which reply on agriculture and service have increased, while the assets of households which rely on fishing have decreased since construction of the Talimnagar sluice gate.

Table 10: Changes in Household Assets (Number and Percentages in brackets) Following Sluice Gate Construction According to Occupation in PIRDP villages

Main Occupation	Status of household assets after sluice gate construction		
	Assets reduced	Assets remain the same	Assets increased
Agriculture (N=611)	62 (10.1)	130 (21.3)	419 (68.6)
Fishing (N=218)	40 (18.3)	147 (67.4)	31 (14.2)
Wage labour (N=131)	8 (6.1)	102 (77.9)	21 (16.0)
Business (N=11)	3 (2.7)	75 (67.6)	33 (29.7)
Housework (N=32)	8 (25 .0)	19 (59.4)	5 (15.6)
Service (N=81)	1 (1.2)	25 (30.9)	55 (57.9)
Rickshaw van puller (N=37)		35 (94.6)	2 (5.4)
Others (N=24)	1 ( )	10 (41.7)	13 (54.2)
Total	**119 (9.6)**	**543 (43.8)**	**579 (46.6)**

Source: BCAS, Household Census, 2004

Findings for CPP are presented in Table 11. This shows that household assets have increased most where the primary occupation of the household head is business or other occupations. Household assets have decreased most where the primary occupation of the household head is weaving or fishing. Interviews with key informants revealed that most weaving households are recent immigrants to the study villages. These people lost their land and other property by the Jamuna River when the riverbank suffered serious erosion during the 1998 floods. Fishers showed a decrease in household assets due to reduced open water fish and fishing opportunities following sluice gate construction in the CPP area. Many fishers therefore had to sell their household assets.

Table 11: Changes in Household Assets (Number and Percentages in brackets) Following Sluice Gate Construction According to Occupation in CPP villages

Main Occupation	Status of household assets after sluice gate construction		
	Assets reduced	Assets remained the same	Assets increased
Agriculture (N=127)	26 (20)	62 (49)	39 (31)
Fishing (N=45)	25 (56)	10 (22)	10 (22)
Wage labour (N=35)	10 (29)	13 (37)	12 (34)
Business (N=99)	35 (35)	22 (22)	42 (42)
Housework (N=10)	3 (30)	3 (30)	4 (40)
Service (N=39)	6 (15)	18 (46)	15 (38)
Rickshaw van puller (N=53)	21 (40)	15 (28)	17 (32)
Weaving (N=88)	69 (78)	11 (13)	8 (9)
Others (N=86)	30 (35)	18 (21)	38 (44)
Total	**225 (39)**	**172 (30)**	**185 (32)**

Source: BCAS, Household Census, 2004

Changing Land Use Patterns

Over the last few decades, agricultural productivity has increased as a result of high yield variety rice cultivation, the adoption of modern agricultural technologies, and the development of rural infrastructure, marketing networks and other modern forms of communication. At the same time, poor households must compete for survival through seeking different land and non-land related livelihood opportunities. The socio-economic and physical environment of the rural areas, from which local people derive their livelihood, has also been changed substantially in recent times due to changes in technologies and cropping patterns.

Household surveys revealed that cropping patterns have changed remarkably in all villages. People are using irrigation and new agricultural technologies to maximise outputs. Different types of Robi crops (onion and mustard), vegetables and rice varieties are being cultivated using irrigation. Before construction of the sluice gate most land was left fallow in both the Robi and borrow season in PIRDP.

Focus Group Discussions in both sites reveal that cropping patterns have undergone remarkable changes in both project sites since sluice gate construction.

Focus Group Discussions in PIRDP

Land use patterns have changed considerably in the PIRDP since sluice gate construction. Before construction, the beel area was under water for about seven to eight months a year. Then a single rice crop (deep water Aman paddy) was cultivated. Crop production was uncertain. Floodwater often inundated crop fields and damaged the Aman rice, as no system existed to control floodwater at the time. Farmers used to cultivate robi crops including pulses, mastered and winter season crops.

Since sluice gate construction, land has been used to grow two or three crops each year. Much land is now dry in October and is therefore used to cultivate peaj (onion), rashun (garlic) and marich (chillies). Onions are an important cash crop in PIRDP. The Government agricultural department has introduced a number of vegetables into the area to encourage crop diversification. Winter vegetables include kofi (cauliflower, cabbage), mula (radish), tomato (tomato), lal shak (red spinach), gol alu (potato), palung shak (beet leaf) and dhaniya (coriander). These are cultivated on a commercial basis to provide farmers with cash income.

Several types of cereal used to be cultivated in PIRDP, including broad cast aush rice, china, joab and paira. Khashari (chikling vetch), bout, mator kalai (pea) and mushur (lentil) were also grown in winter season. Till (sesame) and tisi (linseed) were cultivated as oil seeds. These crops are now rarely available due to their reduced value compared to that of new crops. During the dry winter months from January to May, cultivators are more interested in growing High Yield Variety (HYV) rice (irri) and different new crops like peaj (onion), marich (chillies) and vegetables. The beel sites and crop fields are mostly used for

cultivation of HYV irri, boro rice. Irri rice cultivation areas remain fallow during June to December when the land is inundated with river water and rainfall. The agriculture department has undertaken several projects in the area to promote crop diversification by introducing high yielding varieties. The Department of Agricultural Extension (DAE) also organizes training for farmers' representatives in modern farming techniques. Farmers' awareness on how to increase agriculture production through new techniques and new crops is increasing. Several key informants and FGD participants emphasised government initiatives such as the crop diversification programme. New crops can be cultivated due controlled flooding following sluice gate and embankment construction. All FGD participants and local community members believe that road communication has established access to urban markets and high demands for farmers' crops. Farmers are getting good prices for products like onion, chillies and vegetables.

Besides agriculture, the area of land used for new roads, embankments and homestead areas has increased in the PIRDP. Changes in land use have occurred due to various government development projects including construction of the embankment and sluice gate to reduce the size of wetland areas, increase rice production, improve communication systems etc.

Focus Group Discussions in CPP

Vegetable cultivation has increased in the CPP after sluice gate construction. But many crops including pulses such as musur (lentil) and kalai, paira, china, misti alu (sweet potato), sola/bout, ground nut, till and tishi have not been cultivated since sluice gate construction. Irri rice cultivation has increased in recent years. FGD participants believed that the introduction of HYV rice (irri) provided more food security than that from previous crops. So farmers have changed their cropping patterns accordingly. Changes in cropping patterns began after the liberation war in 1971, so it is difficult to establish any relationship between sluice gate construction and the introduction of new crops to the CPP. Furthermore, the CPP sluice gate was only constructed in early 1994.

In Jugini village, several farmers converted their croplands into timber, fruit and bamboo gardens. Vegetable cultivation and horticulture have also markedly increased in the last five or six years. Many people felt that new crops provided them with more income, along with new agricultural technologies and improved water management systems.

Changing Fishing Patterns

Focus Group Discussions in PIRDP and CPP

Before sluice gate construction, fishers used larger meshed nets made from cotton thread. Fishers used gill nets, moi jal, tana jal, khara jal, doary, dharma jal, kachal jal, tata, polo, aqkra, jhaki jal and bamboo traps.

These days, fishers use nylon nets with a smaller mesh size. These include ber jal, current jal, veshal jal, kantha jal, mashari jal, katha ber jal, and kahow jal. The smaller mesh size of ber jal and current jal damages small fish.

Before sluice gate construction, professional fisher groups used to catch fish for their livelihoods. Recently, many poor farmers and wage labourers are also engaged in fishing for their livelihoods and are using all sorts of harmful fishing gear. Many farmers have excavated kua or ditches on their crop fields and collected fish by dewatering these excavations using low lift pumps. This practice is also common in government kash water bodies like the Badhai and old Atrai rivers, canals and beels. This type of fishing damages brood fish stocks of all floodplain species and results in low fish production.

Changing Food Consumption Patterns

Focus Group Discussions

Rice and fish are the staple food for Bengali people. There is a proverb, "Machea -Bhatea Bengali" (Bengali like rice with fish). In the past there were plenty of fish for consumption in almost every household. But all focus group discussion participants said that they now consume less fish compared to the past. Historically huge amounts of fish were available and poor people caught them regularly for consumption. However, at present open water fish catch quantities are insufficient. Most people therefore have to buy fish from the market for consumption. Many people cannot afford to buy fish and therefore eat less fish.

Focus Group Discussions in PIRDP

Most discussions focused on the consumption of different cereals before sluice gate construction. Before sluice gate construction there was a shortage of rice. Rice availability was often uncertain due to lower levels of crop production. Traditional rice yields were much lower than those of the more recent cultivated HYV rice. Before sluice gate construction, rice fields were inundated and crops were damaged most years by floodwater. People struggled to get food due to insufficient quantities of rice and cereals. Many people ate cina, paira, kawon, gamer jaow, dhap, water lily, kaler thor, grass seeds and eram roots etc. to meet their food requirements. Many people had barely enough food. But people had a more than sufficient amount of fish.

Food consumption patterns changed after sluice gate construction. Farmers in the PIRDP can now grow two or three crops in the same fields each year, including HYV rice. People now take meals three times each day. They consume more meat and vegetables than before sluice gate construction.

Income from Fishing

Sample household survey data shows how much different families in the two study sites depend on fishing. This dependence includes income earned by selling fish catches, and also use of fish to feed family members. Table 12 shows that 37% of households sampled in CPP rely on fishing, and that 27% of these households rely on fish for 80 to 100% of their family income. The remaining 73% of households only rely on fishing to provide 20% or less of their total family income. In PIRDP, about 27% of households rely to some degree on fishing for income, and of these, about 22% rely on fishing to provide 80 to 100% of household income.

Table 12: Percentage Distribution of households by Proportion of Total Annual Family Income through Fishing

Percent of total family income from fishing	Study sites	
	PIRDP	CPP
Total sample households	204	100
Total number (and percentage) of these households depending on fishing	55 (26.9)	37 (37.0)
20% or less	7 (12.7)	27 (73.0)
21-40%	6 (10.9)	
41-60%	13 (23.6)	
61-80%	17 (30.9)	
80-100%	12 (21.8)	10 (27.0)

Source: Household survey, BCAS

Table 13 shows that a higher percentage of total annual family income comes from fishing in households where few other livelihood activities take place (and dependence on fishing is therefore high). Field observations show that the families of many small farmers, wage labourers and small businessmen also engage in fishing to increase seasonal livelihood income levels. This explains why families which depend on farming, wage labour and business (as the household head's primary occupation) obtain a lower percentage of total family income than families which rely on fishing, as seen in Table 13.

Table 13: Distribution of PIRDP Households According to Main Income and Reliance on This Income

Percent of total family income	**Main Occupation of Household Head, PIRDP**				
	Agriculture (N=10)	Selling wages (N=5)	Fishing (N=36)	Business (N=1)	Others - pulling rickshaws and housework (N=3)
Up to 20 %	5			1	1
21-40 %	1	1	3		1
41-60 %	4	3	6		
61-80 %		1	15		1
80-100 %			12		

Table 14: Distribution of CPP Households According to Main Income and Reliance on This Income

Percent of total family income	**Main Occupation of Household Head, CPP**				
	Cultivating crops (N=7)	Selling wages (N=2)	Fishing (N=8)	Business (N=10)	Others - carpenter/pulling rickshaws/ transport worker/artisan (N=10)
Up to 20 %	6	2		10	9
21-40 %					
41-60 %					
61-80 %			2		
80-100 %	1		6		1

Water Management Decision-Making

Rapid rural appraisal results reveal that decision-making processes surrounding water management varied. The local sluice gate operator must follow instructions from the head of the sluice gate committee. But observations show that operators sometimes open gates or keep them closed according to verbal requests from local fishers or farmers.

Focus Group Discussions in PIRDP

Groups of fishers reported that the gate operator sometimes takes bribe money from those representing fishers to open the sluice gate. The gate operator does not always follow decisions made by the Upazila Nirbahi Officer (UNO). Sometimes, the gate operator opens the sluice gate at night and closes it in the morning with no written order from the UNO. Farmers' groups also visit the sluice gate to lodge requests regarding opening and closing. Sometimes the farmers force the gate operator to open or close the sluice gate. The gate operator then telephones the UNO or a senior Bangladesh Water Development Board (BWBD) officer in Pabna to get the order regarding Talimnagar sluice gate operation.

There is no formal committee for operation of the Bawlakhola sluice gate. Farmers send written applications to the Union Chairman with their demands for water for agriculture. The Union Chairman forwards these applications to the Upazila Water Development Board (WDB) office, which gives orders to the gate operator regarding gate operation.

Focus Group Discussions in CPP

BWDB officials at Tangail usually instruct the Jugini sluice gate operator to operate the Jugini main sluice gate. The BWDB officials never collect any formal applications or hold discussions with the local community regarding gate operation.

However, there is a small water management committee for the operation of a small sluice gate (at Dithpur village on Dayna canal). The committee members operate the gate after informing the Union Parishod Member on the Dayna Union. BWDB officers never get involved in the operation of this small sluice gate.

Sluice Gate Management Committees

Interviews with institutional representatives did not point to too many water management related problems. However, several institutional representatives pointed out that sometime powerful local people create pressure to operate the Talimnagar sluice gate. They usually do this by generating popularity from a larger constituency. Sometimes a lack of coordination between committees results in poor water management decision-making. Institutional representatives felt that bi-lateral discussions or committee meetings at the Upazila level could resolve most of these problems.

Cooperation within the sluice gate management committee is generally inadequate and needs to be improved. Committee members also need to play a more active supervisory role regarding sluice gate operation.

The local gate operator must follow instructions from the head of the sluice gate management committee. But observations reveal that the operator sometimes opens or closes the gate according to verbal requests from local fishers or farmers.

Focus group discussions revealed that institutional involvement in decision-making regarding the operation of all three major sluice gates is inadequate. The Talimnagar sluice gate committee at PIRDP is more active than other two gates (Bawlakhola at PIRDP and Jugini at CPP).

Rapid Rural Appraisal in PIRDP

Decision-making regarding gate operation usually starts when the sluice gate committee receives a written application from farmers or fishers. The secretary of the sluice gate committee organizes a meeting to deal with this application. The secretary serves invitation letters to committee members to attend a schedule of meetings at the Upazila level. The Talimnagar sluice gate committee (in PIRDP) consists of four Union Chairmen in Suzanagar Upazila, one farmer representative and one fisher representative. However, sometimes few of the government officers are present at this meeting. The issue is discussed in the meeting and a decision made by the head of the sluice gate committee, the Upazila Nirbahi Officer (UNO), who gives written instruction to the gate operator on when to open the gate.

Focus Group Discussions in PIRDP

The committee which determines Talimnagar sluice gate operations is headed by the Upazila Nirbahi Officer (UNO), who usually makes decisions regarding the opening and closing of the sluice gate on the basis of water demand for crops. He gives the order either verbally or in written form. He usually organizes a meeting to discuss requirements for operating the sluice gate after receiving a written application from a farmers group. He makes his decision following discussion with the Upazila Agricultural Officer (UAE) and the Upazila Fisheries Officer (UFO). Sometimes the UNO advises the agricultural officer to make a field visit before a decision is made regarding gate operation.

Talimnagar sluice gate committee members are often absent from meetings. There is no fixed schedule for organizing meetings on sluice gate operation and management. Often the UNO has to make decisions in meetings where most committee members are absent. Committee members do not perform their role effectively. The Union Parishod Chairman is often too busy to attend all the meetings he is meant to attend, and he must also resolve many local problems, so is often absent from sluice gate committee meetings. Attending meetings takes time as they are not local, travel costs are considerable and no extra benefits are provided. A focus group discussion with the Union Chairman and committee members revealed that they are often overworked and scheduled to attend more than one meeting at the same time in different places. They are therefore unable to participate some important meetings.

The committee does not represent all relevant stakeholders. There is only one representative from the farming and one from the fishing community on the committee. The fishers' representative (a member of the Talimnagar Sluice Gate committee) has left his village to an unknown place due to unexpected local social unrest, and has been absent for many months. The committee therefore has no fishers' representative at present.

There is no baseline information on water demand according to land elevation and plans to improve agriculture productivity. There is no system for updating regular needs for opening the sluice gate. Due to this lack of quality information, the committee depends on requests from farmers for water in their fields or for draining water out from their fields. Sometimes a fishers' representative submits an application to open the Talimnagar sluice gate. The command area of Talimnagar is so large that several small committees are needed at the grass root level to initiate field level discussions, and take grass root level concerns to the Upazila level meeting where they can participate in discussions about the current situation and sluice gate operation needs.

Village Level Involvement in Different Institutions

Results from the household survey, rapid rural appraisal and key informant interviews provided the names of organizations that operated locally, and the reasons for people engaging in the activities of these

organizations. Such organisations include different societies, government departments, non-government groups and other associations (see appendix I). Names of these organizations are presented in Table 15.

Table 15: Household Involvement in Different Institutions

Name of Institutions	PIRDP households involved with organizations	CPP households involved with organizations
Government departments		
Bangladesh Rural Development Board (BRDB)	Yes	yes
Krishok (Farmer) Samobaya Samity (KSS)	Yes	-
Fishers Cooperative Society	Yes	yes
Non-government organizations		
ASHA	Yes	yes
Grameen Bank	Yes	yes
BRAC	-	yes
SSS	-	yes
Buro Tangail	-	yes
SATU	-	yes
Diganto	-	yes
Proshika	-	yes
Associations		
Fertilizers Association	Yes	-
Mason Association	Yes	-
Labour Association	Yes	-

Various different formal and informal institutions operate in Kathua Jugini village: the union council office, tax office, union health and family welfare centre, the Jugini haat, two non-government organisation offices, three mosques, one registered primary school, one non-government school, a large number of non-government organisations, one fishers' society, a VDP group, two mashjid committee, one puja committee, several female members of the road repair workers group, one eidgha committee, one graveyard committee, one haat committee, five musilm samaj, five hindu samaj, and a chalk committee for water management. The ten Samaj in Kathua Jugini Village operate on the basis of lineage group, religion and better understanding. They mainly act to provide mediation skills and to control religious functions and marital occasions within the member households in the village.

Household survey findings reveal that 75% of Kathua Jugini village occupants are involved at least in one organization (see Table 16). In CPP, results for the two villages differed widely, but an average of 60% of village inhabitants were involved in at least one organization. Many households were involved in more than one organization.

Table 16: Percentage of Households Involved in at least one Organization/Institution

Village name	Involvement in any organization	
	Yes (% of total)	No (% of total)
Sharirbhita (N= 57)	29.8	70.2
Badhai (N= 38)	21.0	78.9
Dorimalonchi (N=55)	40.0	60.0
Krishnapur (N=54)	50.0	50.0
Four villages of PIRD combined	**36.3**	**63.7**
Kathua Jugini (N=71)	74.6	25.3
Chaubaria (N=7)	24.1	75.9
Two villages of CPP combined	**60.0**	**40.0**

Source: BCAS Household Survey

In the last five years, many non-government organisations have been established in the locality to provide credit facilities. Most households have taken loans from these non-government organisations to construct houses, sink tube wells or raise household income from different livelihood activities. Many households also have a significant amount of savings with non-government organisations, and also several household

members who are also non-government organisation members. All respondent households received a loan at least once a year. They repaid their loans by weekly instalments and were then granted more loans after fully repaying the initial loan amount. Survey data also shows that about 93% of households received credit and some 7% of households were involved in money saving schemes.

COMMUNITY HOPES AND SUGGESTIONS FOR IMPROVED WATER MANAGEMENT

Water Management Problems Resulting from Sluice Gate Operation

Focus Group Discussions in PIRDP

Suggestions included:

- Fish and fish fry cannot enter the beel because the advice of fishers regarding gate operation is not taken.
- The gate is operated mainly to increase crop production. It is therefore only farmers and not other groups, which benefit from committee decisions.
- Many farmers' early crops are damaged by floodwater, while other groups' crops are damaged due to a lack of water on higher land.
- Winter crops are damaged when water is drained late out of the beels.
- The Talimnagar gate is operated mainly for Gajner beel people, without considering the water needs that nearby villagers have for crop cultivation.

Focus Group Discussions in CPP

Suggestions included:

- Fish and fish fry cannot pass through the gate. There is therefore less fish production in the beel.
- A few elites are able to influence gate operation, and these people then benefit from this. Many farmers and fishers do not benefit from current gate operation.
- Faulty gate operation means that fishers and farmers do not get adequate benefits.
- Aman rice crops are damaged when there is a lack of water inside the sluice gate.
- Farmers and fishers do not get adequate benefits, as their advice is not taken into account.
- Some individuals benefit from current gate operations.

Bottlenecks to Improved Sluice Gate Management

Focus Group Discussions in PIRDP

Suggestions included:

- Inadequate cooperation among members of the sluice gate committee.
- Real fishers are not members of the sluice gate management committee.
- Government officers make decisions without doing field verification or monitoring.
- Various groups pressure the gate operator regarding gate operation.
- There are no well-planned guidelines for sluice gate operation.
- BWDB officials are not available to open the gate in times of need.
- Different interest groups pressurise the gate operator to manage the gate according to their needs.
- Individuals should take responsibility for supervising or monitoring sluice gate management.

Focus Group Discussions in CPP

Suggestions included:

- Lack of coordination among government representatives, community representatives and professional groups.
- The gate remains closed in Asar and Sraboon to save crops.
- Monitoring of sluice gate management is absent.
- The small gate is operated according to pressure from influential individuals.
- The main gate is operated without conducting field investigation.
- The sluice gate structure is faulty.
- There is a lack of awareness within the local community.

Suggestions for Increasing Fish Production Without Damaging Rice Production

Rapid Rural Appraisal

In PIRDP, rapid rural appraisal respondents in 34 villages hoped that an increase in fish production would be possible. They suggested several key issues to improve open water fish production without damaging rice production. These are shown in Table 17.

Table 17: Rapid Rural Appraisal Suggestions on how to Increase Fish Production in PIRDP

View of rapid rural appraisal respondents	Percentage of respondents who held this view
Talimnagar Sluice gate should be open during the first tide	38
Sluice gate should be open during the month of Ashar (mid June to mid July)	32
Opening the gate in the month of Jaista (mid May to mid June), i.e. one month earlier	9
Something different, such as law enforcement, particularly for banning spawn collection in the river and catching fish fry	12
The need for a government programme releasing fingerlings in the beel	12

Household Survey

Table 18: Household Survey Respondent Opinions on How to Increase Fish Production without Damaging Rice Production in PIRDP

Suggestions how to increase fish production	Number of respondents	Percentage (N=204)
The gate should be opened during the first tide (early floods)	101	50.0
The gate should be opened to allow water in the beel in the months of Jaista (mid May to mid June)	55	27.0
Catching spawn/fry should be prohibited	46	22.0
Fishing using fine net meshes should be stopped	48	24.0
Re-excavating rivers and linking khals	35	17.0
Government should release fish fingerlings	19	10.0
Fishers should be prohibited from fishing during Baishak	12	6.0
Fishing using band jal should be prohibited	10	5.0
The gate should remain open during Ashar (mid June to mid July)	9	5.0
The gate should remain open during Ashar to Sraboon	6	3.0
Dewatering for fishing should be stopped	5	2.5
Fish sanctuaries should be established in the beel	5	2.5
The gate should remain open during every tide	3	1.5

Source: BCAS Household Survey

Household survey respondents also provided suggestions regarding how to increase fish production without damaging rice crops in the PIRDP area. These are presented in Table 18. About 50% of respondents suggested opening the gate during first tide period (early floods). About 27% respondents thought that the fish production would increase if the gate remained open in the months of Jaista, and another 5% thought the gate should be opened to let water into the beel in the month of Ashar. These three

responses suggest that there is a need to keep the gate open during the early flood to allow more fish migration into the beel. This would increase fish production without damaging rice production. Many respondents mentioned issues around water levels, while others gave the name of particular months when the gates should be opened.

Focus Group Discussions in PIRDP

Suggestions included:

- The sluice gate should be opened in the first joar (when the first flood water reaches the main river) during the month of Jaista / Ashar (June/July) to let water into the beel.
- The Badhai and other rivers inside the beel need re-excavation.
- Create a fish sanctuary inside the main beel.
- Stop dewatering for fishing and ban fishing using bandh jal.
- Fishers should be encouraged to use the kachal jal fishing gear they used in the past.

Focus Group Discussions in CPP

Suggestions included:

- The sluice gate should be opened in the first joar (when the first flood water reaches the river) during the month of Ashar/Sraboon (July) to let water enter the CPP.
- Re-excavation of the Lohajang River and other linking canals is needed.
- Fish fry (renu) collection should be stopped in the Jamuna and Dhaleshari Rivers.
- Stop dewatering for fishing.
- Re-excavation of some beel areas is needed to keep them as perennial water bodies.
- Use of khuia net for catching small fry should be banned.
- Small meshed nylon seine nets and current nets should be banned for fishing.
- A link canal between Chawbaria village and the Dhaleshari River is needed.
- Development of beels and other canals for holding water all year round is needed.
- Chemical pesticides and fertilizers should be used carefully in crop fields.

Suggestions for Future Institutional Involvement

Focus Group Discussions in PIRDP

Suggestions included:

- Government should implement suggested solutions.
- Different professional groups need to be involved in sluice gate development activities.
- Local government and non-government bodies need to be involved in sluice gate development activities.

Focus Group Discussions in CPP

Suggestions included:

- Government institutions (BWDB, Fisheries Department and Local Government Engineering Department - LGED) responsible for implementing suggestions should be more involved.
- Representatives from professional groups should be on the sluice gate management committee.
- Local government and NGOs need to be involved in sluice gate development activities.

Changing Sluice Gate Operations

Upazila Level Workshop

The Upazila level workshop held in December 2004 presented preliminary key study findings for comment and feedback. About 28 participants attended the meeting, including the head of the sluice gate committee (the UNO), the committee members representing farmers and fishers, two out of four Union Chairmen committee members, reporters and local communities. After the presentations, a lively discussion was conducted for about two hours. Participants asked many questions, discussed several issues and built consensus on the study findings. Finally they identified several key problems in relation to sluice gate operation and agreed to act on the most important suggestion of opening the sluice gate during the first tide. The UNO decided to hold an annual general meeting near the sluice gate to discuss when the gate should be opened to improve fish migration according to the findings of the study.

Consultation with the Upazila Fisheries Officer, PIRDP

Mr Sadhon Chandra is the Upazila Fisheries Officer (UFO) in PIRDP. He is a member of the Talimnagar sluice gate management committee. Although relatively new to the Upazila he had already visited the Talimnagar sluice gate and Gajner Beel area.

Mr Chandra had received complaints from professional fishers about the illegal use of current jal and ber jal fishing gear in the Gajner beel. He therefore organised law enforcement by seizing these illegal fishing nets with the help of the Upazila Magistrate.

He had also discussed with the fishers how to increase fish production in the Gajner Beel. Fishers informed him that fish breed during March and April when river water rises. The sluice gate needs to be open during this period to allow brood fish to enter the beel. This will increase fish production in the beel. Fishers said the gate was never opened according to their needs. As a result, Gajner Beel, which was full of fish resources in the past, now has declining fish production. This severely affects local fishers' livelihoods. Many fishers are now unemployed as they cannot live from their traditional profession. Many professional fishers have changed their profession. Fishers also pointed out that fish production might increase if the sluice gate committee members make timely decisions and maintain the gate properly. There are representatives of fishers, farmers and other professionals, the UP Chairmen and several government officers on the sluice gate management committee, but many of these members do not conduct their responsibilities in relation to sluice gate operation. Mr Chandra agreed with this complaint against sluice gate committee members. He also observed that only few committee members attend the meetings. He personally felt that fish production could increase if the fishers' opinions on opening the gate at the right time and stopping the use of illegal fishing gear like current jal and ber jal, and stopping dewatering were honoured. He also mentioned that there is a need for alternative livelihoods for fishers during the fish breeding months when fishing should be banned.

Consultation with the Upazila Agriculture Officer, PIRDP

As Upazila Agriculture Officer (UAO), Mr Md. Kudrat-e Khuda is the Member Secretary of the Talimnagar sluice gate management committee. In an interview in Suzanagar on 21st October 2003, he described how farmers of the Gajner Beel area suffered in the past when there was no sluice gate. Before gate construction only Aman rice was grown. Now Robi and Borrow crops are grown, as floodwater can be controlled by the sluice gate. In recent years crop production has dramatically increased and the economy of the area has changed significantly. This has also changed villagers' social life. However, negative impacts have also been observed when the sluice gate is operated improperly and at the wrong time. The UAO said that benefits to farmers are hampered if the sluice gate is opened due to pressure from fishers. For example, the gate was closed for a longer time this year due to pressure from local fishers. This

will delay cultivation of robi crops like onion (the main cash crop in the area) and wheat. Production will be reduced and the impact will be felt all over the Gajner Beel and adjacent areas.

Mr Md. Kudrat-e Khuda also mentioned that on 29th September 2003, the sluice gate committee decided to fully open the gate and passed an order to open all vents of the Talimnagar sluice gate on 30 September 2003 in order to reduce beel water levels so that farmers could cultivate robi crops. Unfortunately, the gate was not fully opened due to pressure from fishers. Whilst fishers may benefit from this, farmers will be negatively affected, as their immature aman paddy will be damaged due to the long period of time that stagnant water would be left in the beel. Local farmers pressurised the UAO to reduce water fast. After receiving these complaints, the UAO visited the Talimnagar sluice gate, discussed the issue with farmers and fishers, and gave an order to fully open all gate vents from 16 October 2003. Water then receded rapidly.

The UAO described two different groups of farmers; one whose land is on lower elevations and another whose land is on higher elevations. These two groups have different views and water needs for their crops. Those with land on higher elevations want water to recede slowly and those with land on lower elevations want it to recede fast. The UAO must try to ensure both groups benefit, but this can be difficult. He said it would be more rational if sluice gate committee members agreed to keep in mind the needs of both farmers and fishers. He said that the opinion of local farmers has less influence on gate operations, but that most local professional groups were for farmers.

The UAO thought that there was a lack of coordination among the members of the Talimnagar sluice gate committee. Most of them do not play an active role or participate in committee meetings. As a result, both farmers and fishers are not getting the full benefit of effective sluice gate operation. He strongly emphasised the need for improved direction and management regarding Talimnagar sluice gate operation in order to benefit both farmers and fishers.

Outsiders' View on the PIRDP Embankment (Mujib Band) and Talimnagar Sluice Gate

There are three villages outside the embankment within one kilometre of the Talimnagar sluice gate; Ratanganj, Talimnagar and Trimohini. All are located along the Badhai River, and the total population of the three villages is about 12,000. Villagers' main occupations are agriculture, business and fishing. There are also a few service holders. Most of the villagers are Muslim, but some are Hindu. About 20-25 years ago Hindu families dominated all these villages.

In the past there were many haldar families in Trimohini and Ratanganj, who lived only on fishing. They were professional fishers, who caught fish in the Padma, Jamuna and Badai Rivers. These rivers used to be full of fish. River canals and ditches were perennial water bodies, but recently even rivers have become seasonal water bodies, and this has affected fish production. The haldar community has therefore faced enormous problems, as they only know how to fish. Some have had to change their traditional profession and adopt new livelihood occupations.

There was no scarcity of fish in the rivers when only the haldar community used to fish, because the haldar community adhered to their religious beliefs. They avoided fishing during particular seasons, for example when the first tide reached the river. They knew that this first tide (in April/May) carried eggs and hatchlings up the river. The haldar community prayed to their Gods for a better catch and made their own fishing equipment. They kept the mesh size of nets large so that eggs, hatchings and fingerlings could escape easily. Destruction of fish populations actually started when the Muslim community began fishing, as they used nets with small mesh size.

Besides fishing, huge quantities of crops such as rice and jute were produced before the sluice gate was built. Every year crop production was enhanced by deposition of fine silt from flooding. Since sluice gate construction, different species of rice have been planted and production of rice and jute has decreased. The sudden release of water through the sluice gate can flood aman rice and jute crops prematurely. Likewise

when the gate remains closed and the floodwater is rising, crop fields go under water. This happens every year, so farmers are gradually losing interest in planting crops like aman rice and jute. Current sluice gate management causes problems in Ratanganj, Talimnagar, Trimohini and neighbouring villages, where two floods every year damage crops and harm livelihoods. Local people feel that both the embankment and the sluice gate are responsible for this situation.

Another problem is that outside the embankment, crop fields are covered with a layer of sand instead of silt during the flood. Land therefore loses fertility and farmers become exhausted. Local people blame this on the sluice gate and embankment. They say that the flood used to happen every year before the embankment was built, but that water did not stay in a particular region for any long period of time. It spread over the whole Gajnar Beel and surrounding floodplain area. So crops were not submerged and agricultural land was not damaged.

Non-scheduled sluice gate operation is a common problem for people living outside the gate. The gate operator sometimes takes bribes from the farmers and fishers inside the empoldered area regarding gate operation. Farmers inside the gate influence gate operation to ensure the gate remains closed when the first tide raises water levels in the Padma and Jamuna Rivers. The excess water enters the Badai River, and as water cannot pass through the sluice gate, tidal water inundates cultivated land outside the empoldered area and damages crops. Again, when water is needed in the crop fields outside the gate, the gate remains closed preventing water from leaving the floodplain. Fishers and other people outside the empoldered area feel that sluice gate operation must be perfectly timed according to the opinions of all the local communities in the area. They suggest that government should take on this responsibility.

The people of Ratanganj, Talimnagar and Trimohini were well off before construction of the sluice gate. They did not suffer from fish scarcity. Lower population densities and large fertile areas of agricultural land provided them with enough rice and other crops. People see the sluice gate as a man-made disaster but feel that government could not have predicted the impact of the sluice gate on peoples' lives. They are angry that government did not involve local people or institutions in sluice gate management. They feel that all the benefits of the sluice gate accrue to people living inside the embankment. They think that if people from outside the embankment were involved in sluice gate management then maybe they would benefit a little.

Local people see a lack of coordination as the main problem with sluice gate management. Another problem is the lack of attention given to their views. Government is responsible for this, as government officers require the sluice gate operator to open or close the gate without conducting a local enquiry. Preferences are given to the demands of the people inside the empoldered area. Local people suggest the following to ensure the sluice gate meets its objectives:

- Participation of local people both outside and inside the empoldered area in sluice gate management should be ensured.
- Government should supervise this.
- Non-government organisations should be involved.

Flooding is not a new thing in this area, but floodwater used not to remain for as long as it currently does. Floodwater from the Padma/Jamuna River used spread over the Gajner Beel and floodplain areas in Sujanagar and Bera. The Badhai River linked these two water bodies. Sluice gate construction led to much suffering amongst local people. When the floodwater rises in the Padma and Jamuna Rivers, local people living inside the empoldered area want the gate to remain closed. Water flows along the Badai River carrying silt and sand particles, which is deposited in the Badai River, as water cannot get into the floodplain through the sluice gate. The Badai River is therefore losing depth due to siltation, which means the river itself can hold less water, so water overflows into nearby villages. Thus agricultural fields are flooded and covered with layers of sand, making it hard for people to earn a living. To avoid this problem, the following steps are proposed:

1. Floodwater should be allowed to pass through the sluice gate unimpeded, thereby allowing water and silt to be carried inside.
2. Local people should be engaged in sluice gate management.
3. A new embankment should be constructed to protect the above three villages from the Jamuna and Padma Rivers.
4. The Badai River should be dredged, with resultant solid materials used to raise the banks of the Badai River. This will prevent floodwater form overflowing into croplands. Allowing floodwater along the Badai River and through the sluice gate will also allow many fish to enter Gajner Beel, and increase fish production.

Outsiders' View on the CPP Embankment and Jugini Sluice Gate

The villages located outside the empoldered area near the Kathua-Jugini sluice gate include Shitki Bari, Bashuria, Faillar Ghona, Char Parturia, Saya Shupravat, Baitkamari. About 18,000 people live in these villages. Some 90% of people depend on agriculture, but other occupations include business, services and fishing. Some people are seasonal fishers. More than 50% of the people in the area used to live on islands in the Jamuna River, but their houses and wealth fell into the Jamuna River due to erosion, so they had to move.

No local committee currently operates the sluice gate. The Bangladesh Water Development Board (BWDB) operates the gate, and local people outside the empoldered area say that BWDB staff keep the gate closed to protect people inside the empoldered area during the flood. No regard is given to the effect this has on the people outside the empoldered area. Local people therefore want a sluice gate operating committee with members including people outside and inside the empoldered area.

Flooding is a regular annual natural calamity for these villages, but the effects of flooding have increased since sluice gate construction. People say that in the past, floodwater rose up for two or three days, and then water levels receded as water flowed away down the Lawhojang River. This meant that aman crops and local livelihoods were unharmed.

Current sluice gate management activities negatively impact people living outside the empoldered area. When floodwater comes in from the Jamuna River to the Lawhojang River, the sluice gate remains closed. Water therefore rises up outside the gate, and stays for a long time. Opening the sluice gate would allow water to flow into the empoldered floodplain, which would prevent water damage to crops, plants and the local natural habitat.

Local people think that it is not only the sluice gate which is responsible for the present flooding problem. Historically, a lower population density left many ponds, canals and ditches for holding water. Increasing populations mean that houses and shelter now occupy these areas. The Lawhojang River used to be deep. The Dhaleswari River, which carries water to the Lawhojang River is becoming increasingly blocked. This is likely to lead to increase flooding problems in the future. Some people also think that unplanned construction of infrastructure such as bridges and culverts caused the terrible flood. Some 'kancha rasta' (roads) have been built, and 'chungis' have been set up across them to keep water flowing. But these chungis have been blocked by soil and mud. People think that this has also contributed to the large affects of the flood.

Local people suggest the following steps to reduce devastation from floods every year:

- All small sluice gates and the Jugini sluice gate should be kept fully open when the first floodwater arrives from the Lawhojang and Jamuna Rivers.
- The Dhaleswari and Lawhojang Rivers should be dredged. Both banks of the Lawhojang should be built up to prevent water overflow.
- Plantations should be planted on both riverbanks to reduce bank erosion.

- The Bashuria Canal runs through Bashuria Village to Shitki bari Beel. There is a 'bandh' on the west bank of this channel. If a similar bandh is made on the east bank, parts of the villages of Bashuria, Baitkamari, Faillar Ghone and Kandapara, and some agricultural land in Sayapara Village would be protected from the flood.
- Construction of a 'veri bandh' is made from Alanga Village to the outer boundary of the three villages of Potol, Mogra and Durgapur, these villages would be permanently protected from floods. This would also protect the main bandh and the sluice gates from breaking down.
- The kancha rasta (road) connecting the Shibpur Ghat from Shitki Bari to Rasulpur is in poor condition. Local people suggest repairing this road to form a 'veri bandh' to protect the area adjacent to the road from flooding.
- A veri bandh road on the western boundary of Sitkabari Village would protect the crop fields, households and plants in the localities of Shitkabari, Moisha, Delpa and Gerachakta from flooding. The road would also improve communications.

To implement these suggestions the people propose:

- River dredging by non-government organizations.
- A project to dig channels during the dry season on the basis of the 'food for work' programme. This will benefit local people.
- Veri bandh and bandh construction on both banks of the Lawhojang River by the army.
- Development projects implemented by non-government organisations. Many villagers had great faith in non-government organisations.
- Local engagement in sluice gate management. Local people have a wealth of indigenous knowledge on the characteristics of water movement, the effects of rainfall and tide etc. They have learned this from their forefathers. This knowledge could contribute to effective sluice gate operation.

SUMMARY AND RECOMMENDATIONS

Summary

The Economic Role of Fish and Fishing in the Community

The population of the two study sites is 6,850 in PIRDP and 2,986 in CPP. Village size varies between 943 and 2,060 people. 51.7 of the total population are male. The average household size is 5.7 in PIRDP villages and 5.5 in CPP villages. Both of these figures are larger than the national rural average household size of 4.9.

Respondents identified their own household wealth categories. In the two CPP study villages, 79% of households said they were poor or very poor. In the two PIRDP study villages, 55% of households said they were poor or very poor. Only 1% of households are rich in PIRDP, and only 6% are rich or very rich in CPP. One of the study villages in CPP (Kathua Jugini) has about 160 new families (38% of the total number of households) who migrated here from the Jamuna riverbank area after their land and properties were lost to bank erosion and floods.

The dominant natural capital asset of the villagers is land. Land holding size determines people's wealth and social status. An average of 54% of households in PIRDP study villages are effectively landless. This figure is 68% for CPP villages. Very few households own over 500 decimals of land in any study villages.

Standards of education are low in all study villages. In PIRDP, some 36% of household heads are illiterate and about 21% can only sign their name. However, education is improving, and better literacy levels mean that livelihood opportunities are increasing.

Many householders have multiple livelihoods. These provide income but also reduce household expenses or maintain family and socio-cultural needs. Livelihoods include agriculture (people who cultivate their own land, sharecrop in and out land, mortgage or lease in and out land, cultivate vegetables or work as a wage labourer on land), fishing (full-time, part-time or for subsistence purposes), wage labour, business, vehicle driving/pulling, professional skills, household work, service and other non-agricultural occupations.

Over the last few decades, agricultural productivity has increased as a result of high yield variety rice cultivation, the adoption of modern agricultural technologies, rural infrastructure development, marketing networks and other modern forms of communication. Irrigation is also common. Before sluice gate construction, the PIRDP beel area was underwater for seven to eight months a year and people cultivated a single rice crop (deep water aman paddy). Crop production was uncertain and floodwater often damaged the aman rice. These days, two or three crops are grown each year (including high yield rice varieties), and many different crop types are cultivated using irrigation. Onions are a particularly important cash crop. In CPP, vegetable cultivation has increased since sluice gate construction, but many other crops are no longer cultivated. High yield rice variety cultivation has increased, thus increasing food security. It is, however, harder to attribute changes in cropping patterns to sluice gate construction.

In PIRDP, the most common primary occupation of household heads is agriculture (at 48.9%) followed by fishing (at 17.5%). In CPP, the most common primary occupation of household heads is agriculture (at 21.8%), with only 7.7% having fishing as their primary occupation. In PIRDP, the most common secondary occupation of household heads is wage labour (30.4%), followed by fishing (29.4%). In CPP, agriculture is also the most common secondary occupation of household heads. Fishing is comparatively less important as secondary occupation.

Some 37% of households sampled in CPP rely on fishing to some degree, and 27% of these rely on fish for 80% to 100% of their family income. The remaining 73% only rely on fishing to provide 20% or less of their total family income. In PIRDP, about 27% of households rely on fishing to some degree for income, and of these, about 22% rely on fishing to provide 80% to 100% of household income.

In PIRDP and CPP villages, crop cultivators, service holders and those involved in business (as their primary household head occupation) have more valuable household assets than other occupational groups such as fishers, wage labourers, rickshaw pullers, household workers and carpenters. Poorer groups (mainly wage labourers, sharecroppers and small farmers) often engaged in fishing for both consumption and livelihood purposes.

Many people have shifted from their traditional livelihoods to new ones. In the past, people were primarily dependent on agriculture, business and fishing in the floodplain. More recently, people have become involved in business, pulling rickshaws, vegetable cultivation etc.

Seasonal variation is also observed, especially where rural livelihoods depend on agricultural activities. However, recent increases in irrigation mean that livelihood insecurity resulting from seasonal changes in demand for agricultural labour is reduced, as crops can be planted almost all year round. Diversification of livelihoods has also helped reduce seasonal vulnerability.

Recent construction of road networks has increased diversification opportunities, as has the installation of a power supply and other development initiatives. Local people felt that since sluice gate construction, income levels are generally higher and poverty has been reduced. Communications development, better marketing systems for agricultural goods, new employment opportunities at national and international levels, introduction of modern agricultural systems, and NGO programmes to eradicate poverty and enhance livelihoods have also all helped improve livelihoods.

Local people felt fishing had decreased in recent years, whereas livelihoods from farming, business, pulling rickshaws or vans, service provision and skilled labour had increased. Several professional fishers have migrated from villages in the PIRDP area to India, and subsistence fishing is almost redundant for most months in CPP. Many fishers have adopted alternative livelihoods such as pulling rickshaws or running small businesses.

Before sluice gate construction, fishers used larger meshed nets made from cotton thread. These days, fishers use nylon nets with a smaller mesh size. Some of these damage small fish. Dewatering (excavation of ponds and then pumping water out to collect fish) has also increased. This damages brood fish stocks and results in low fish production.

Where the primary occupation of the household head is agriculture or service holder, PIRDP households show the greatest increases in household assets since sluice gate construction (at 69%). Only 10% of these households claimed a decrease in household assets. The assets of households where the primary occupation of the household head is fishing show the largest reductions, except those of housework. In CCP, household assets have increased most where the primary occupation of the household head is business or 'other occupations'. Household assets have decreased most where the primary occupation of the household head is weaving or fishing.

Where the primary occupation of household heads is fishing, dependence on this one source of income tends to be higher than where household heads rely primarily on other livelihood sources. Fishers tend to be very dependent on fishing as their sole income source. This might make them more vulnerable than those who rely primarily on other occupations.

Rice and fish are traditionally the staple food for Bengali people, but households now consume less fish compared to the past. Fewer fish are caught in the open water, and if they can afford it, most people must

therefore buy fish to eat from the market. Before sluice gate construction there was a shortage of rice, but this is no longer a problem. People also consume more meat and vegetables than previously.

The Social/Institutional Framework of Fisheries, Farming and Water Control

Sluice gate management committees exist at Talimnagar sluice gate in PIRDP and Jugini sluice gate in CPP. No committee exists at Bawlakhola sluice gate in PIRDP, where farmers send written applications to the Union Chairman, who forwards these to the Upazila Water Development Board office, which instructs the gate operator.

In PIRDP, fishers or farmers sometimes bribe or force the gate operator to open the sluice gate. Powerful local people also create pressure to operate the sluice gate. The gate operator does not always follow decisions made by the Upazila Nirbahi Officer (UNO) who chairs the sluice gate management committee, and who receives written applications for gate operation and chairs a meeting to make decisions on gate operation. A lack of coordination between committees also results in poor water management decision-making. Cooperation within the sluice gate management committee is inadequate and committee members do not supervise gate operation well. Some sluice gate management committee meetings are attended by few of the government committee members. Meetings are hard to get to for some committee members, and travel costs are considerable. Many committee members are overworked and cannot attend all meetings. The committee does not represent all relevant stakeholders, and only has one representative from the farming and one from the fishing community. The current fisher's representative has been absent for many months.

Bangladesh Water Development Board officials at Tangail usually instruct the Jugini sluice gate operator. Applications from, or consultation with the community on gate operation does not occur.

Many different formal and informal institutions operate in study villages. In CPP, an average of 60% of study village inhabitants were involved in at least one organization. Many households were involved in more than one. In addition, nearly all village households are involved with non-government organisations, which provide credit and savings facilities. About 93% of households received credit and some 7% of households were involved in money saving schemes. Loans are used to construct houses, sink tube wells or raise household income from different livelihood activities.

Changing Sluice Gate Operations: Community Hopes and Suggestions

Local people felt that water management problems resulting from sluice gate operation included: gate operation according to farmers' needs, which reduces fish recruitment and disadvantages fishers; local elites influencing gate operation; individuals benefiting at the expense of farmers and fishers; faulty gates; farmers at different elevations having different water needs; crops in different seasons having different water needs; and local people in different areas having different water needs.

Local people felt that bottlenecks for improved sluice gate management included: poor cooperation within the sluice gate committee; poor coordination of government, community and other stakeholders; inadequate fisher representation on the committee; decision-making without field verification or monitoring; pressure groups influencing gate operation; inadequate gate operation guidelines; unavailability of government officials at key times; no supervision/monitoring of sluice gate management; low local awareness levels; and faulty sluice gate structures.

The most popular suggestion for increasing fish production without damaging rice production included opening the sluice gate during the first tide and early rising floodwater. Other suggestions included: law enforcement, particularly banning spawn and fish fry collection in rivers, dewatering and using fine mesh nets; a government programme releasing fingerlings in the beel; preventing fishing in certain months; banning certain fishing gear; establishing fish sanctuaries; re-excavating rivers, canals and beels to

improve water flow and provide permanent water bodies; and controlling use of chemical pesticides and fertilizers.

Suggestions for future institutional involvement included: government implementation of suggested solutions; and involvement of different groups (government and non-government) in sluice gate issues.

Following a successful well-attended Upazila level workshop, the value of an annual general meeting near the sluice gate to discuss when the gate should be opened was recognised.

Additional suggestions by local government officials for improving water management and reducing poverty included: paying more attention to the needs of fishers in sluice gate management; paying less attention to the needs of fishers in sluice gate management; providing alternative livelihood opportunities for fishers if fishing becomes regulated seasonally; and improved direction and management of the sluice gate management committee.

Communities living outside the empoldered areas have suffered in recent years. These villages are significant in size, with about 18,000 people living outside CPP, and 12,000 in three villages outside CPP. This is more than three times as many people as those living inside the empoldered study areas. Fishers have suffered as perennial water bodies have become seasonal, and as traditional Hindu fishing practices, such as avoiding fishing in certain seasons, and using large mesh sizes also no longer occur. Sluice gate and embankment construction has increased sand deposition which means land is less fertile. It has also reduced rice and jute crop production due to flooding. Such flooding occurs when rising floodwater cannot enter the empoldered area, or when water is suddenly released from the empoldered area. Historically floodwater used to disperse more rapidly into the wider floodplain, but now it stays for longer thus increasing crop damage. Non-scheduled sluice gate operation is also problematic. As is construction of infrastructure such as bridges and culverts, which may also impede water flow, and thus increase flooding. Currently all benefits accrue to those living inside the embankment. The fact that water cannot access the floodplain in the early flood period means that rivers are losing depth due to siltation. This then means that water overflows into nearby villages and fields. Suggestions for improved water management and poverty reduction include: giving people outside the empoldered area more say in sluice gate management; supervision by government and involvement of non-government organisations (for example with implementing development projects) and the army (for example with embankment construction); more regular opening of the sluice gate; new embankments and raised river banks to protect villages from flooding; river dredging and channel construction; plantations on river banks to reduce erosion; and repairing existing embankments and roads.

Recommendations

Table 19 summarises the recommendations for improving sluice gate management, and water management more generally, for the mutual benefit of both fish and rice crops in modified floodplains (those studied and indeed those throughout Bangladesh), and hence providing improved, more diverse and secure livelihoods for poor rural people. The project team developed these recommendations during a brainstorming session in January 2005. They are based on the research described above, and on the opinions of the researchers involved.

Table 19: Recommendations for improving sluice gate management and general water management

Recommendations	Stakeholder responsible for implementing recommendation
Recommendations for Improved Sluice Gate Management	
Sluice gate management committees should be established where they do not currently exist.	Bangladesh Water Development Board (BWDB), Local Government (Upazila Parishad)
Where sluice gates management committees exist, they need support to ensure they function effectively. Members need encouragement to ensure they actively undertake their responsibilities. This may involve providing funding to cover committee member and meeting costs. Such funds could come from government, which collects rent from leasing out *jalmohals* and from the water tax.	Ministry of Finance, Ministry of Land (MOL), Ministry of Water Resources and Department of Revenue
Sluice gate management committees may need training to help them function effectively.	BWDB, Department of Fisheries (DOF), Local Government and Engineering Department (LGED), Department of Agricultural Extension (DAE), non-government research organisations
Sluice gate management committees need more farmer and fisher representatives on them. This could include local people from outside the empoldered areas. The local community should elect such members. Farmer members should represent a range of different areas (and elevations) within (and outside) the flood control area.	BWDB, DAE, Upazila Parishad, LGED and Union Parishad
Each sluice gate management committee needs site-specific guidelines on gate operation. This should include information on gate maintenance and how to monitoring gate operations. Guidelines should stipulate how regularly the sluice gate committee should meet, and provide site-specific technical information on aperture, current speed, recommended times of opening etc.	BWDB in consultation with others (including LGED and Union Parishad)
Sluice gate management committees should ensure sluice gates are opened early to allow fish to migrate into the floodplain during the early flood season.	Sluice Gate Management Committees
Gate maintenance should be ensured. This requires funding, which could come from the Water Tax (if enforced) or another source.	BWDB
The regular Upazila level monthly coordination meetings should incorporate sluice gate management as an agenda item, particularly before the early flood season.	Upazila level government officials
Sluice gate operation needs supervision by a sluice gate management committee member.	Sluice gate management committee
Recommendations for General Improvements in Water Management	
The Fish Act needs to be implemented/enforced. This includes preventing collection of fish spawn and hatchlings/fry, use of fine mesh nets, and de-watering (pumping out all water from beels/canals/rivers using low lift pumps to facilitate fishing).	DOF and the local Upazila level administration. Coordination may be needed with other Upazila level administration.
Further research on levels of inundation within the empoldered floodplain area is required. This could come from detailed Global Positioning System data, or from interviews with local people. Such data would facilitate a cost-benefit analysis for the entire empoldered floodplain, with a view to ensuring that possible losses of agricultural land are easily offset by gains from fish recruitment. It would also ensure fishers who benefit do not do so at the expense of the poorest farmers (who may rely on low lying land, which gets inundated first).	Research orientated non-government organisations
Establish fish sanctuaries in the beels and major rivers.	DOF and MOL
Existing sanctuaries may need re-excavation if they have become silted up.	BWDB and MOL
Fishing gear control: prevent use of *Bandh Jal* in channels connecting the river with the floodplain area. Such fishing gear stretches across the whole channel and catches large quantities of fish, thus preventing them from reaching the floodplain area.	DOF and Upazila level local administration. Coordination may be needed with other Upazila level administrations.
Stop hatchling collection in channels linking the floodplain with the river, in order to maximise fish recruitment in the floodplain.	DOF and local Upazila level local administration. Coordination may be needed with other Upazila level

	administrations.
Channels to sluice gates may need re-excavation (where siltation has occurred) to ensure water can flow freely to the floodplain.	BWDB
Hold an annual general meeting before the first floodwater comes. Involve local non-government organisations, fishers' societies and all interested local stakeholders in this.	Sluice gate committee/BWDB/Local government

APPENDIX 1: INSTITUTIONS OPERATING IN DIFFERENT VILLAGES

Table 20: Institutions operating in Raninagar Union, Sujanagar Upazila, Pabna District

Sl No	Village Name	Mosque	Temple	Hat/ Bazar	High School	Govt. Primary School	Req. Primary School	Madrasa	Abtadia Madrasa	Health & Family Planning Centre	Community Clinic	Revenue Office	Post Office	Samaboya Samiti	Fisher Samiti	Motor Labour Samiti	Day labour Samitiq
1	Vatikoya Charpara	7	-	3	1	1	1	1	-	1	1	1	1	5	1	-	1
2	Takigara	1	1	1	-	-	1	-	1	-	-	-	-	-	-	-	-
3	Vatsala	2	1	1	1	-	1	-	-	-	-	-	-	-	-	-	-
4	Bindupara	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Baghulpur	5	2	1	1	2	-	-	1	1	-	-	-	7	-	-	-
6	Badhai	2	2	1	-	1	-	1	-	1	-	-	1	-	1	1	1
7	Sharir vita	1	-	-	-	1	-	-	1	-	1	-	-	-	-	-	-
8	Bostal	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Uttar Faninagar	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Nakharaj	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-
11	Dakhin Raninagar	1	-	1	1	1	-	1	-	-	-	-	-	-	-	-	-
12	Brimalonchi	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
	Total	24	6	8	5	7	3	3	3	3	3	1	2	12	3	1	2

Source: UP Office, UP Member and Villagers

Table 21: Institutions operating in Sagarkandi Union, Sujanagar Upazila, Pabna District

Sl No	Village Name	Mosque	Temple	Hat/ Bazar	College	High School	Govt. Primary School	Reg. Primary School	Madrasa	Health Centre	Bank	Post Office	Community Clini	Eye Hospital	Sluice gate	Fisher Samity	Labour Samity
1	Pukurnia	2	-	1	-	-	1	-	2	-	1	-	-	-	-	1	1
2	Baliadanghi	1	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-
3	Goal Kandhi	1	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-
4	Bazar Sinduri	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
5	Dori Malonchi	2	1	-	-	-	1	-	1	-	-	-	1	-	-	-	-
6	Samsundorpur Kuthibari	1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
7	Kodi Malonchi	3	-	-	-	1	1	-	1	-	-	-	-	-	-	-	-
8	Pukurnia Badhai	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
9	Samsundorpur Talimnagar	6	-	-	-	1	1	-	1	-	-	-	-	1	1	-	1
10	Madhiar Kandi	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
11	Manusala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Ramkantopur	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
13	Mugludanghi	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
14	Kestopur	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
15	Chandipur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Sreepur	2	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-

Sl No	Village Name	Mosque	Temple	Hat/ Bazar	College	High School	Govt. Primary School	Reg. Primary School	Madrasa	Health Centre	Bank	Post Office	Commu ity Clini	Eye Hospital	Sluice gate	Fisher Samity	Labour Samity
17	Gobindopur	4	1	-	-	1	-	-	1	-	-	-	1	-	-	-	-
18	Kumuria	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
19	Char Kumuria	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
20	Barovagia	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
21	Khalilpur	3	1	2	-	-	1	1	-	-	-	1	-	-	1	-	1
22	Char Khalilpur	2	-		-	1	-	-	1	-	-	-	-	-	-	-	-
23	Muraripur	4	1	-	-	-	1	-	1	1	-	-	-	-	-	-	-
24	Sagarkandi	2	1	1	-	-	1	1	1	-	-	1	-	-	-	-	1
25	Amiranad Niri;oa	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
26	Sinduri Burulia	8	1	-	-	-	1	-	1	-	-	-	1	-	-	-	-
27	Islampur Burulia	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	53	8	4	1	4	12	9	13	2	1	3	4	1	2	1	4

Source: UP Chairman, UP 3 Member, UP Secretary, Villagers

Table 22: Institutions operating in Danya Union, Tangail District

Sl No	Name of Village	Mosjid	Temple	Bazar	Hat	College	High School	Govt. Primary School	Reg. Primary School	Health & Family Planning Center	Post Officer	NGO Office	Youth Club	Fisher man Society	Play ground	UP Office
1	Danya Rampal	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Danya Shibram	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Danya Pran Ballab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Darijpara	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-
5	Goal para	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Bathuazani	3	5	1	1	-	1	1	-	1	1	1	-	1	1	1
7	Dharaputhi	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Panckania	2	3	1	-	-	-	1	-	-	-	-	1	-	1	-
9	Khanpur	3	2	-	-	-	-	-	-	1	-	-	1	-	-	-
10	Bowsha	3	4	1	-	-	-	1	-	-	-	-	-	-	2	-
11	Basarchar	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Chackguradi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Baimail	1	-	-	1	-	1	-	1	-	-	-	-	-	1	-
14	Lowzana	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Chilabari	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Pixepara	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Baranga	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	Danya Chowdhury	7	4	-	1	-	-	1	-	-	-	1	2	-	2	-
19	Dhit pur	2	2	1-	-	-	-	-	-	-	-	-	-	-	-	-
20	Shreefaliata	2	-	1	-	-	1	1	-	-	1	2	-	-	1	-
21	Sapua	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-
22	Chak Chowbaria	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
23	Chowbaria	1	-	-	-	-	-	-	1	-	-	-	1	-	1	-

24	Bill guylla	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Bill Kaya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	Choto Binyafair	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
27	Bora Binyafair	3	2	1	-	-	-	-	1	-	-	-	2	-	1	-
28	Alisa Kanda	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Moysa Kanda	2	2	-	-	-	-	1	-	-	-	-	-	-	1	-
30	Purabari	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
31	Fatepur	8	3	-	-	-	-	1	1	1	-	2	1	-	2	-
31	Charfatepur	4	-	-	1	-	-	-	-	-	-	-	-	-	-	-

Source: UP Chairman

Table 23: Institutions operating in Baghil Union, Sujanagar Upazila, Pabna District

Sl No	Name of Village	Mosjid	Temple	Bazar	Hat	College	High School	Govt. Primary School	Reg. Primary School	Health & Family Planning Center	Post Officer	NGO Office	Youth Club	Fisher man Society	Play ground	UP Office
1	Kandapara	1	-	-	-	-	-	1	-	-	-	-	2	-	1	-
2	Gagorzan	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-
3	Shoya	2	1	-	-	-	1	1	-	-	-	-	1	-	1	-
4	Chakta	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-
5	Faliarghona	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-
6	Hirakota	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Pichuria	4	-	-	-	-	-	1	-	-	-	2	1	-	1	-
8	Dharerbari	1	-	1	1	-	1	1	-	1	1	1	4	-	2	-
9	Duriabari	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
10	Baniabari	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
11	Konabari	3	-	-	-	-	-	-	-	-	-	-	3	-	-	-
12	Krishnapur	5	-	-	-	-	-	-	-	-	-	-	3	-	-	-
13	Kathua Jugini	3	1	-	1	-	-	-	1	1	-	-	3	1	-	1
14	Kharda Jugini	4	-	-	-	-	-	1	-	-	-	-	3	-	1	-
15	Basuria	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Baitkamari	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Bill muril (N)	3	-	-	1	-	1	1	-	-	-	-	-	-	1	-
18	Bill muril (S)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	Chitkibari	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Maisa	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Pikemusil	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-
22	Ramdebpur	5	-	-	-	-	-	1	-	-	-	-	-	-	-	-
23	Dohazani	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Bill Baghil	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Dhaba Baghil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	Gopalpur (N)	3	2	1	-	-	-	-	-1	-	-	-	-	-	-	-
27	Gopalpur (S)	3	1	-	1	-	-	1	-	-	-	-	-	-	1	-

Source: UP Office, Baghil

APPENDIX II: WATER BODIES AT STUDY SITES

Table 24: List of jalmohals (khas, water bodies) in the Gajner Beel area over 20 acres in size

Name of Jalmohals	Type of Jalmohal	Area	Location	Perennial/ Seasonal	Lease out or not	Leasing authority	Present Lease			Fish Production		Fishing methods	Major Fishing Months
							Name of leasee	Period of lease	Lease value (Tk)	Quantity of Fish harvested/ Annual	Major species		
1. Badhai Jalkar	Static water bodies (beel)	50 Acre	Mouza: Sindur Burulia U.P: Raninagar & Sagorkandi P.S: Sujanagar	Seasonal (Baishak to Paush)	Yes	Pabna DC Office	Md. Makbul Hossain Vill. Badhai	2003-2004	24,100/- (Twenty four thousand one hundred only)	1,000 Mounds (e.g., app. 40 MT)	1. Nola , 2.Tatkini 3. Tengra, 4. Soil, 5. Boal, 6. Gojar 7. Rui, 8. Katla	Ber jal, Moi jal, Current jal Tana Barshi, Khora with Bandh (fench of bamboo pole and net)	Asar-Magh
2. Bill Gondohati	- Do -	140 Acre	Mouza-Beel Gondohosti U.P- Raninagar P.S- Sujanagar	Perennial	Yes	Pabna DC Office	Sree Baidyanath Halder Vill: Badhai	2003-2004	74,300 (Seventy four thousand three hundred only)	3,000 Mounds (e.g., app. 120 MT)	1. Tatkini,2. Nola 3. Rui, 4. Tengra 5. Boal, 6. Gojar 7. Soil, 8. Katla	Ber jal, Moi jal, Current jal Tana Barshi, Khora with Bandh (fench of bamboo pole and net)	Asar-Magh
3. Horer Jala	- Do -	30 Acre	Mouza: Sugota Kasimnagar, Sreepur, Kamalpur U.P: Hatkhali P.S: Bera	Seasonal (Baishak to Poush)	Yes	Pabna DC Office	Sree Haridas Halder Vill. Sagota	2003-2004	31,000/- (Thirty one thousand only)	1,500 Mounds (e.g., app. 60 MT)	1. Nola, 2. Soil 3. Tatkini, 4. Boal 5. Katla, 6. Tengra 7. Rui, 8. Gojar	Ber jal, Moi jal, Current jal Tana Barshi, Khora with Bandh (fench of bamboo pole and net)	Asar-Magh
4. Bill Gomgara	- Do -	50 Acre	Mouza: Bonkhola UP Hatkhali PS: Bera	Perennial	Yes	Pabna DC Office	Sree Dulal Chandra Halder Vill. Hatkhali	2003-2004	1,01,000 (One lac one thousand only)	3,000 Mounds (e.g., app 120 MT)	1. Tatkini, 2. Boal 3. Tengra, 4. Soil 5. Nola, 6. Katla 7. Rui, 8. Gojar	Ber jal, Moi jal, Current jal Tana Barshi, Khora with Bandh (fench of bamboo pole and net)	Asar-Magh (Bangla month)
5. Chak Patta	- Do -	40 Acre	Mouja: Bandan pur Dulai U.P: Dulai P.S: Sujanagar	Perennial	Yes	Pabna DC Office	Sree Khudiram Halder Vill. Badanpur	2003-2004	47,000/- (Forty seven thousand only)	2,000 Mounds (e.g., app 8 MT)	1. Nola, 2. Tatkini 3. Tengra, 4. Boal 5. Soil, 6. Gojar 7. Katla, 8. Rui	Ber jal, Moi jal, Current jal Tana Barshi, Khora with Bandh (fench of bamboo pole and net)	Asar-Magh (Bangla month)

NB. There are a total of five jalmohals leased out by the ADC- Pabna. The total area of those jalmohals is about 310 acres.
Source: 1. Land Office, Pabna District Board, 2. Mr. Abdur Rajjak, Surveyor, Sujanagar Thana Land Office, 3. Sree Baidyanath Halder, Fishers, Badhai, Sujanagar

Table 25: List of jalmohals (khas, water bodies) in the Gajner Beel area less than 20 acres in size

Name of Jalmohal	Type of Jalmohal	Area	Location (Mouja, Union, P.S.)	Perennial/ Seasonal	Lease out or not	Leasing authority	Present Lease			Fish Production		Fishing methods	Major Fishing Months
							Name of leasee	Period of lease	Lease value (Tk)	Quantity of Fish harvested / Annual	Major species		
1. Modhupur Jalkar	Static water bodies (Beel)	17.51 Acre	Mouja:Tatibando U.P: Tatibando P.S: Sujanagar	Seasonal (Boishak - Poush)	Yes	Upazila Youth Development Office, Sujanagar	Enamul Haque President Khalilpur Jubo Samabaya Samiti	1409-1411 (Bangla year)	83,342/- (Eighty three thousand three hundred forty two only)	600 Mounds (e.g., app 24 MT)	1. Mila, 2. Tengra 3. Tatkini, 4. Shoil 5. Boal, 6. Katla 7. Rui, 8. Gojar	Khora, Khapla, Tana jal, Barshi	Asar-Agrahayan
2. Boganani Jalkar	- Do -	10.34 Acre	Mouja:Jorpukuria U.P: Dulai P.S: Sujanagar	Seasonal (Ashar-Poush)	Yes	- Do -	Khandaker Samser Ali, President, Notunpara Jubo Samabaya Samiti Ltd.	1410-1412 (Bangla year)	2,679/- (Two thousand six hundred seventy nine & paisa fifty only)	150 Mounds (e.g., app. 6 MT)	1. Tatkini, 2. Shoil 3. Mola, 4. Boal 5. Katla, 6. Rui 7. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi	- Do -
3. Beel Bardankhati-2 Jalkar	- Do -	13.03 Acre	Mouja: Jorpukuria U.P: Dulai P.S: Sujanagar	Seasonal (Ashar-Poush)	Yes	- Do -	- Do -	1410-1412 (Bangla year)	50,013/- (Fifty thousand thirteen & paisa sixty only)	500 Mounds (e.g., app 20 MT)	1. Nola, 2. Katla 3. Shoil, 4. Tatkini 5. Boal, 6. Rui 7. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi)	- Do -
4. Beel Katajola Jalkar	- Do -	5.10 Acre	Mouja: Soto Jorpukuria U.P: Dulay P.S: Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	- Do -	- Do -	1409-1411 (Bangla year)	39,935/- (Thirty nine thousand nine hundred thirty five only)	300 Mounds (e.g., app 12 MT)	1. Nola, 2. Tatkini 3. Boal, 4. Katla 5. Rui, 6. Shoil 7. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi	- Do -
5. Shaliar Beel Khaliar Beel Katajola Jalkar	- Do -	5.10 Acre	Mouja: Badhai Kakamtoli U.P: Raninagar P.S: Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	- Do -	Anisur Rahman Khokan, Preesident, Sujanagar U.P. Proshikkyan Prapt. Juba Unnayan Samiti Ltd.	1410-1412 (Bangla year)	32,988/75 (Thirty two thousand nine hundred eighty eight & paisa seventy five only)	300 Mounds (e.g., app 12 MT)	1. Tatkini, 2. Nola 3. Katla, 4. Boal 5. Rui, 6. Tengra 7. Shoil 8. Gojar	Khora (Ber Jaler Khora)	- Do -
6. Beel Bardonkhali-1 Jalkar	Static water bodies (Beel)	7.46 Acre	Mouja: Boro Jorpukuria U.P : Dulai P.S. : Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	Upazila Youth Development Office, Sujanagar	Khorshed Ali F.N. Ahed Ali Sheikh, Vill. Jorpukuria Chinakora, P.S. Sujanagar	1410-1412 (Bangla year)	40,281/ (Forty thousand two hundred eighty one only)	350 Mounds (e.g., app 13 MT)	1. Rui, 2. Mola 3. Katla, 4. Boal 5. Tatkini, 6.Tengra, 7. Shoil 8. Gojar	Khora, Khapla, Tana jal, Barshi	- Do -
7. Beel Motiar-1 Jalkar	- Do -	13.11 Acre	Mouja:Durgapur U.P : Dulai P.S. : Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	- Do -	Sree Sudip Kumar Ghose Sujanagar U.P. Jubo Samabaya Samiti	1408-1410 (Bangla year)	12,180/15 (Twelve thousand one hundred eighty)	400 Mounds (e.g. app 16 MT)	1. Nola, 2. Katla 3. Boal, 4. Tatkini 5. Shoil, 6. Rui 7.. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi	Ashar-Agrahayan

Name of Jalmohal	Type of Jalmohal	Area	Location (Mouja, Union, P.S.)	Perennial/ Seasonal	Lease out or not	Leasing authority	Present Lease			Fish Production		Fishing methods	Major Fishing Months
							Name of leasee	Period of lease	Lease value (Tk)	Quantity of Fish harvested / Annual	Major species		
8. Bamundi Jola Jalkar	- Do -	5.10 Acre	Mouja: Mundi U.P : Tatibando P.S. : Sujanagar	Seasonal (Baishak - Agrohayan)	Yes	- Do -	- Do -	1408-1410 (Bangla year)	798/70 (Seven hundred ninety eight & paisa seventy)	150 Mounds (e.g., app 6 MT)	1. Mola, 2. Boal 3. Tatkini, 4. Rui 5. Katla, 6. Shoil 7. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi	- Do -
9. Beel Gajna Jalkar	- Do -	10.85 Acre	Mouja: Khudra Durgapur U.P : Dulai P.S. : Sujanagar	Seasonal (Baishak Agrohayan)	Yes	- Do -	Anisur Rahman Khan, President, Suzanagar U.P. Jubo Samabaya Samiti Ltd.	1410-1412 (Bangla year)	63,894/- (Sixty three thousand eight hundred ninety four)	300 Mounds (e.g., app 12 MT)	1. Tatkini, 2. Mola 3. Boal, 4. Katla 5. Rui, 6. Shoil 7. Tengra, 8. Gojar	Khora, Khapla, Tana jal, Barshi	- Do -
10. Motiar Beel-2 Jalkar	- Do -	17.41 Acre	Mouja: Rayshimul U.P : Dulai P.S. : Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	- Do -	- Do -	1410-1412 (Bangla year)	62,505/- Sixty two thousand five hundred five only)	500 Mounds (e.g., app 20 MT)	1. Tatkini, 2. Mola 3. Rui, 4. Katla 5. Boal, 6. Shoil 7. Gojar, 8. Tengra	Khora (Ber Jaler Khora)	- Do -
11. Khalilpur to Badhai River Jalkar	Khal	7.62 Acre	Mouja:Sagota Sinduri Bururia U.P : Sagarkandi P.S. : Sujanagar	Seasonal (Ashar-Agrohayan)	Yes	- Do -	Enamul Haque Ferdous, President, Jgakukoyr Jubo Unnayan Samabaya Samiti Ltd.	1408-1410 (Bangla year)	9,910/- (Nine thousand nine hundred ten only)	250 Mounds (e.g., app 10 MT)	1. Nola, 2. Rui 3. Katla, 4. Tatkini 5. Boal, 6. Shoil 7. Tengra, 8. ojar	Khora, Khapla, Tana jal, Barshi	- Do -
12. Dorimalonchi Jalkar	River	3.05 Acre	Mouja: Dorimalonchi U.P : Masumdia P.S. :Bera	Seasonal (Ashar-Agrohayan)	Yes	BWDB Pabna	Ilias Mondal F.- Montu Member Vill. Dorimalonchi.	1408-1410 (Bangla year)	2,510/-(Two thousand five hundred ten only)	200 Mounds (e.g., app 8 MT)	1. Nola, 2. Rui 3. Puti, 4. Boal 5. Shoil, 6. Tatkini 7. Katla, 8. Gojar 9. Tengra	Khora, Khapla, Tana jal, Barshi	- Do -
13. Samsundarpur Kuthibari Jalkar	Closed river-	7.00 Acre	Mouja: Samsundarpur U.P : Sagarkandi P.S. : Sujanagar	Seasonal Asar-Agrahayan	Yes	BWDB Pabna	Mannan Bepari Vill. Ratanganj U.P. Masundia	1408-1410 (Bangla year)	3,765/-	250 Mounds (e.g., app 8 MT)	1. Mola, 2.Tatrkini 3. Rui, 4. Katla 5. Boal, 6. Shoil 7. Tengra, 8. Gujar	Khora (Ber Jaler Khora)	Ashar-Agrahayan

NB. A total of 13 jalmohals are less than 20 acres in size, and the total area of three jalmohals is about 122.68 acres

Source: Mr Mustafiz Ahmed, Upazila Youth Development Officer, Sujanagar, Pabna, Mr. Md. Abdul Hamid, Cashier, UYDO, Sujanagar, Pabna , Water Development Board, Pabna.. Mr. Ilias Mondal, Fishers Leasee, Dorimalonchi.

APPENDIX III: FOCUS GROUP DISCUSSIONS/MEETINGS/WORKSHOPS HELD

Table 26: Focus Group Discussions, meetings and workshops held in PIRDP, Pabna

Date	FGD/ Meeting/ Workshop	Location	Participants	
			Profession	Numbers
14-01-'04	FGD	Badhai	Fisher	15
19-12-'03	FGD	Dorimalanchi	Fisher	09
22-12-'03	FGD	Sharirvita	Fisher	11
20-12-'03	FGD	Krishnopur	Fisher	09
15-01-'04	FGD	Bhadai	Small Farmer	14
10-01-'04	FGD	Dorimalanchi	Small Farmer	12
17-01-'04	FGD	Sharirvita	Small Farmer	13
12-01-'04	FGD	Khirnopur	Small Farmer	14
25-12-'03	FGD	Bhadai	Large Farmer	12
23-12-'03	FGD	Dorimalanchi	Large Farmer	16
22-12-03	FGD	Sharirvita	Large Farmer	11
24-12-'03	FGD	Khirisnopur	Large farmer	08
15-01-'04	FGD	Bhadai	HH Head women	05
17-01-'04	FGD	Sharirvita	HH head women	05
08-01-'04	FGD	Sagarkandi	UP Chair.& Member	06
24-01-'04	FGD	Raninagar	UP Chair.& Member	11
23-01-'04	FGD	Jatsakini	UP Chair.& Member	12
24-08-'04	Meeting	Ratanganj	Farmers	11
28-08-'04	Meeting	Trimohini	Farmers and Fishers	10
21-10-'03	Meeting	Suzanagar Upazila	Upazila Fishery Officer	04
21-10-'03	Meeting	Suzanagar Upazila	Upazila Agriculture Officer	04
19-10-'04	Meeting	Dulai High School	Farmers representative of SG Committee	03
08-06-'03	Meeting	Badhai Village	Fisher representative of SC Committee	03
06-06-'03	Meeting	Talimnagar	Farmers, Fishers, UP members and Lease	24
13-07-'03	Meetings	Talimnagar	Jalmohal (Fishery leases)	05
26-10-'04	Meeting	Badhai	Jalmohal (Fishery leases)	03
24-10-'04	Meeting	Dorimalonchi	Jalmohal (Fishery leases)	05
19-09-'03	Meeting	Talimnagar	Fishers	24
28-12-'04	Workshop	Upazila Conference Room, Suzanagar	Sluice Gate (SG) Committee Head (UNO), SG Members, Gov. Officials, Farmers, Fishers, Reporters	28

Table 27: Focus Group Discussions, meetings and workshops held in CPP, Tangail

Date	FGD/Meeting	Location	Participant	
			Profession	Nos.
27-02-'04	FGD	Kathuajugni	Fisher	16
03-03-'04	FGD	Kathuagijini	Large Farmer	12
07-03-'04	FGD	Choubaria	Fisher	05
09-03-'04	FGD	Kathuajugni	Businessman	08
10-03-'04	FGD	Kathuajugni	Wage Lab our	11
14-03-'04	FGD	Choubaria	Large Farmer	10
16-03-'04	FGD	Choubaria	Businessman	13
18-03-'04	FGD	Choubaria	Small Farmer	10
23-03-'04	FGD	Kathuajugni	Small Farmer	12
17-03-'04	FGD	Baghil Union Parishad (UP)	UP Chair.& Member	09
06-03-'04	FGD	Kathuajugni	H/H Women	10

20-03-'04	FGD	Choubaria	Wage Lab our	04
25-03-'04	FGD	Choubaria	H/H Women	10
30-03-'04	FGD	Baghil	NGO Representatives	11
05-04-'04	FGD	Dainna UP	UP Chair.& Member	14
18-08-'04	Meeting	Tangail Sadar Upazila	Upazila Fishery Officer, Upazial Agriculture Officer, Upazila Youth Development Officer	05
18-08-'04	Meeting	Tangail Sadar Upazila	Upazila Nirbahi Officer (UNO)	06
10-06-'03	Meeting	Kathua Jugini	Farmers, Fishers, Businessmen, S. Gate Operators	
11-10-'04	Meeting	Faliergona	Farmer, Fishers, Business, Weaver, UP Member	15
Total				

APPENDIX IV: SUMMARY OF UPAZILA LEVEL WORKSHOP

A day-long workshop under the project "The Use of Sluice Gates for Stock Enhancement and Diversification of Livelihoods" was held on 28 December 2004 at a Conference Room in Sujanagar Upazila, Pabna. The objective of the workshop was to share project research findings with sluice gate committee members and other relevant stakeholders, and to get feedback from them and consensual decisions on the best way forward. The Upazila Nirbahi Officer chaired the whole workshop. Participants included: farmers, fishers, Sluice Gate Management Committee (SGMC) members, UP Chairman and Members, teachers, journalists, Upazila level government officers and Bangladesh Centre for Advanced Studies (BCAS) staff.

Mr Sarder Shafiqul Alam, Research Fellow, BCAS, Mr Monirul Islam, Senior Hydrologist, and Mr Shyamal Kanti Barman, Senior Fisheries Biologist, presented findings of the sociological study, hydrological study and fisheries study respectively. After the three presentations there was a long discussion on the presented findings and how to improve fish production in the PIRDP (Gajner beel) area without damaging rice production.

The key suggestions emerging from the workshop are as follows:

- Prevent fishing during the breeding season. This means that alternative income generating activities for fishers during this period need to be arranged.
- The Sluice Gate Management Committee (SGMC) will organize a general meeting in April (e.g. before the first flood).
- The SGMC will also organise several meetings with the local community near the sluice gate with a view to incorporating their opinions into sluice gate operation.
- BCAS expressed its willingness to monitor sluice gate operations and the impacts of changed operations in next year, if desired by the SGMC.
- The upazila agricultural extension department will work to facilitate the cultivation of early crop varieties and select crops according to land elevation.
- The Upazila Nirbahi Officer informed workshop participants that he would emphasise the following issues: repairing the sluice gate; re-excavating the Badai River from Kazir Hat to Talimnagar; preventing fishing in the river outside the sluice gate particularly during periods when brood fish and hatchlings migrate from the major river towards the beel.

The Chair ended the workshop with some concluding remarks. He thanked BCAS for their research. He reported that SGMC members never used to collectively consider the problems and possible solutions for sluice gate management as they had done at this workshop. The results of the study are very important for the development of Upazila resources. He mentioned that he would inform the district development committee about the research and its findings. He also requested that BCAS assist with monitoring sluice gate operations and ensuing impacts.