

Property Rights and Access: the Case of Community Based Fisheries Management in Bangladesh

Gazi Md. Nurul Islam¹ & Tai Shzee Yew²

¹ Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

² Faculty of Economics and Management, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Correspondence: Gazi Md. Nurul Islam, Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia, Putra Infoport, Serdang 43400, Selangor, Malaysia. Tel: 603-8947-1093. E-mail: gazinurul236@gmail.com

Received: February 27, 2013 Accepted: March 29, 2013 Online Published: May 15, 2013

doi:10.5539/jas.v5n6p164

URL: <http://dx.doi.org/10.5539/jas.v5n6p164>

Abstract

The revenue oriented approach has not been able to involve poor fishers in the inland fisheries management in Bangladesh. A community-based fisheries management (CBFM-2) approach was implemented over a period of 6 years (2001-2006) to improve access to fishing rights of the poor and to improve productivity as well as sustainability of fisheries resources. This study investigates the changes in fisher's access to livelihoods in the various types of water bodies such as closed beels (deeper depressions in the floodplain), open beels (lake), rivers and floodplains to enhance their livelihoods. Data for the study was obtained from two questionnaire-based field surveys conducted by the Bangladesh CBFM project office: a baseline study carried out in 2002 and an impact study in mid-2006. A total of 2,826 households were randomly selected from several regions in Bangladesh, comprising 1,994 households at 34 (51%) CBFM project water bodies and 832 households at 10 (59%) control water bodies. This study found that the CBFM fishers have obtained greater access to fisheries and improved livelihoods than non-CBFM fishers. The fishers have now changed their attitudes, have greater awareness of fisheries rules and are able to resolve conflicts much easier in the CBFM water bodies. Long term access rights over fisheries resources should be considered as the priority for a sustainable inland fishery and livelihoods of fishers in Bangladesh.

Keywords: community based management, inland fisheries, livelihood assets, social capital, access rights, poor fishers

1. Introduction

The importance of securing fisher's access to fisheries is being increasingly recognized in many parts of the world. In Bangladesh about 80% of rural households rely on fisheries as the important source of food and income (Thompson & Hossain, 1998) and fish alone supply 60-80% of the total animal protein needs of the country (Muir, 2003). The economic value of fish and other aquatic resources (mainly plant products) from wetlands has been found to be more than double the return from a single rice crop (Colavito, 2002). Poor households catch small wild fish for their own consumption, which are inexpensive and are not included in official statistics. In the monsoon (rainy) season in Bangladesh about 4 million hectares of land are inundated, and more than half the country is under water in an exceptional flood year (Ali, 1997). The floodplains are rich in nutrients and provide good habitat for fish. However, excess fishing efforts in these fisheries are now a major threat to the livelihood of poor fishers. Fish production and catch per fisher has declined (DOF, 2006; ICF, 2006), the low per capita consumption has caused great concern to the poor fishing households (Sultana & Thompson, 2007).

Fishing rights on public water bodies is determined by conferring lease. However, the lease usually goes to the elites who can acquire exclusive rights to determine fishing access to the water body by using their social power (Toufique, 1997). The leaseholders had less incentive to conserve the natural habitat. Maximizing profit from fisheries was the prime aim for the lease holders.

Property rights in inland fisheries are complex and poorly defined in Bangladesh. The main reason for this complexity is due to the heterogeneity in the characteristics of water bodies, types of fishers, types of gear used, varieties of species caught and state regulation (Toufique, 1999; Smith et al., 2005). The majority of fisheries are

treated as common pool resources during the monsoon, while in the dry season when fish are trapped in floodplain ditches they however becomes the property of the private ditch owner. Thus property rights arrangements can change their features by fishing seasons in these floodplains. The characteristics of the property rights described by Scott (1988) as exclusivity, durability, security and transferability do not fit into the inland fisheries of Bangladesh.

The government, NGOs and donors have initiated to implement a community based approach in inland fisheries in Bangladesh since 1990s. Community Based Fisheries Management Phase 2 (CBFM-2) projects (2001 – 2006) has developed an alternative fisheries management system where the responsibilities of fisheries are shared by the government, non-government organizations (NGOs) and the fishers^{Note 1}. The ultimate goal of the CBFM is to organize poor fishers in securing use rights, protect their resources from outsiders (lease holders).

The main thrust of the CBFM-2 project was to test a range of community managed and co-managed approaches considering the diversity of resource systems and local circumstances. The Bangladesh government through the Ministry of Land transferred 116 water bodies including 77 *jalmahals* (public water bodies) to the Department of Fisheries (DoF) for CBFM-2 project. The CBFM project has adopted a flexible management approach in the water bodies suitable to local circumstances. The protection of freshwater biodiversity is increasingly recognized as a major conservation priority (Abell et al., 2002); conservation measures helps to reduce poverty and resource degradation (Brown et al., 2005).

The access issue has been raised and debated in all successive regimes in Bangladesh. The complexity of securing property rights over fisheries has been an issue for more than a decade (Metzner, 2008). The aim of the study is to assess the impact of community based approach on establishing user rights to the inland fisheries in Bangladesh. This study addresses how the fishers are able to enforce their fisheries rules to reduce fishing effort and conserve natural stock, and how they cope with livelihood maintenance and sustain their livelihoods when fish catches are on continuous decline.

This paper is organized into six sections: Section 2 reports the property rights, livelihoods approach and CBFM project; Section 3 describes the methodology and data sources of the study; Section 4 describes livelihoods of fisher households; Section 5 presents access to various assets: fishing, land, micro credit, and social assets for fishing household in the CBFM and control areas. This paper concludes with a summary of findings and recommendations.

2. Property Rights, Livelihood Approach and CBFM Project

In Bangladesh there are different types and characteristics of inland water bodies: closed *beels*, open *beels*, rivers and floodplain *beels*^{Note 2}. The government (Ministry of Land) transferred 77 *jalmahals* to the DoF for the CBFM-2 project. The DoF was primarily responsible in pursuing local administration to handover of the water bodies officially to the organized fisher groups. The organized fishers took several years to establish access rights to some of the CBFM water bodies after formal handover of water bodies from MoL to the DoF (Thompson, 2004).

In the CBFM approach, the DOF and NGOs had worked jointly in identifying fishers, according to their poverty criteria^{Note 3} and to ensure that these poor fishers are not excluded from the fisher groups. The NGOs had formed fisher groups in all CBFM sites and provided them with training and credit. The CBFM fishers were offered leases to government owned water bodies (*jalmahals*) from the MoL for 10 years. Management committees (Beel or River Management Committee) representing fisher groups were formed in all CBFM water bodies. They introduced fisheries rules which are tailored to local conditions in reducing fishing effort. The fishers in the closed *beels* (CB)^{Note 4} established use rights and paid lease fees annually to the government revenue department. However, there are now conflicts over fisheries access between the new and the previous leaseholders in some of the CB sites. Conflicts were severe in some water body areas where local elites were involved in the management (Islam & Dickson, 2006).

Open *beels* (OB) are relatively bigger where a large number of people from different socio-economic classes participate to fish for their livelihoods. Fishers in OB paid lease fees annually to the government and established use rights. These *beels* remain submerged during the monsoon seasons when subsistence fishing is allowed free of lease costs. Conflicts occurred between the lease holders and the new fisher groups in the OB during the monsoon seasons.

Fishing in sections of rivers are year-long operations in Bangladesh. Since 1995, most of the previously leased river-sections have been made open-access. However, previous leaseholders have invested their capital by erecting *katha* (brush piles) in the deeper and more productive areas of the river. Poor fishers are hired to harvest fish from

katha and are paid a minimum price from their catch, while the majority of the benefits go to the investors. Thus poor fishers are gradually losing their fishing rights over the river sections.

In Bangladesh, around 6.3 million hectares of agricultural land is regularly inundated for about 4 to 5 months (Master Plan Organization, 1987; Ali, 1997). The lands in the floodplain *beels* (FPB) are privately owned and fishing access to these fisheries is free during the monsoon seasons. Fishing in FPB is thus seasonal, primarily operated for subsistence needs of the surrounding fishers based on their customary use rights. However, the landowners are concerned about damages to their crops on their lands during these fishing seasons. The fisher groups are encouraged to conserve brood fish stocks in the floodplains, by excavating dry season refuges for fish.

Fishers in Bangladesh are generally divided into three categories, namely full time fishers, part-time fishers and subsistence fishers (Thompson et al., 2003). The full time fishers are the poorest group who mainly fish for income; part time fishers fish for both income and own consumption, while subsistence fishers only fish for their own consumption. In Bangladesh, fishers generally have limited assets and their livelihoods are crucially dependent on fisheries. The livelihood approach (Carney, 1998; Scoones, 1998) is increasingly being used by many development agencies and NGOs in order to achieve a better understanding of natural resource management systems (Ashley & Carney, 1999). The analyses of the livelihood approach are based on the belief that people require a range of assets to achieve positive livelihood outcomes in the rural livelihood framework (Ellis, 2000). These assets include natural, human, physical, financial and social/political assets. A single asset category on its own is not sufficient to yield diverse livelihood outcomes (Haan & Lipton, 1998). The household combines these various asset endowments to sustain their livelihoods. Livelihood diversification can play key role in reducing fisher poverty who have limited livelihood options (Ellis, 1998).

The inability of the fishers to actively participate in fisheries management are due to the lack of various livelihood assets. This paper reports the CBFM organized fishers' access to livelihood assets that contribute to their household income and non-income benefits using a livelihood asset framework.

3. Methodology

Table 1. Category of households by income and fishing profiles

| Category | Household type | Characteristics |
|----------|------------------------------|--|
| I | Poor fisher | Fishes for income or for both income and food, usually possesses no agricultural land. |
| II | Poor – Non-fisher | Does not fish for income, has no agricultural land, usually does labouring work. |
| III | Moderately poor fisher | Fishes for income, has some agricultural land but less than 100 decimals (0.4 ha), or if occupation includes service or professional job and has thatched house |
| IV | Moderately poor – Non-fisher | Does not fish for income, has some agricultural land but less than 100 decimals (0.4 ha), or if occupation includes service or professional job and has thatched house |
| V | Better off | May or may not fish for income, has land more than 100 decimals (0.4 ha), has someone with a service and a tin or a pucca (concrete) house |

Note: fisher include category I & III, non fisher include category II & IV, and category V is better off.

Data used in this study were obtained from CBFM (phase 2) project. The project office had conducted two questionnaire-based field surveys: the first was in 2002 shortly after the start of the CBFM-2 project and the second was carried out in mid-2006, just before the conclusion of the project. Prior to the first survey, partner NGOs had carried out household census in all project and control areas. Random sample of more than 6,000 households was selected from the census list for the first survey. For the second survey, 1994 households from 34 (51%) CBFM project water bodies and 832 households from 10 (59%) control water bodies have been randomly selected. These selected households in the second survey were also being interviewed in the first survey. The questionnaire used in both surveys covered a wide range of socio-economic and livelihood parameters, aquatic resource use, fishing involvement, access, compliance, existing NGO support and indicators of various livelihood assets. The questionnaires were administered to five categories of households based on their income and fishing

profiles (as shown in Table 1) in both project water bodies and control sites. The surveys were conducted through face to face interview by a team of ten experienced local enumerators. Training was given to acquaint them with the nature and purpose of the questionnaire prior to the fieldwork. The respondents were informed about the schedule of the survey through DOF and NGO field officers to ensure their presence during the survey. This paper reports the descriptive statistics on livelihood and income as well as access to various livelihood assets of fisher households in Bangladesh.

4. Livelihoods of Fisher Households

4.1 Household Incomes from Fishing

Fishing is the primary source of income for the majority of the fishers. Table 2 shows that the overall fishers' income from fishing increased by 21 percent (from Tk 15,035 to Tk 18,189) over 2002-2006 (Table 2). Income from fishing has significantly increased in FPB and rivers (104 percent and 60 percent respectively), and slightly increased in OB (9 percent). However, fishing income has decreased in CB (23 percent). These results show that the implementation of CBFM partly contributed to raising income of fishing households in Bangladesh. Fishing income from CB has reduced because fishers have to pay up-front for leasing fees and costs of stocking fish. The organized fishers have failed to harvest their stock due to conflicts and litigations^{Note7} with previous leaseholders (Islam & Dickson, 2006).

In the control sites, the non fishers have increased their income from fishing in OB, CB and FPB, while fishing income has significantly reduced in rivers from 2002 to 2006 (Table 2). This indicates that fishers' access to fishing in OB, CB and FPB is less restricted. Although the river fisheries are open access in Bangladesh, increased in fishing activities has reduced household fishing income due to overexploitation of fisheries in rivers.

Table 2. Households fishing incomes by water body type and occupation in CBFM and control sites, 2002-2006

| Water bodies | | Project | | | Control | | |
|--------------|------------|---------|--------|----------|---------|--------|----------|
| | | 2002 | 2006 | % change | 2002 | 2006 | % change |
| Open Beel | Fisher | 15,917 | 17,256 | +9 | 14,585 | 18,859 | +30 |
| | Non fisher | 913 | 629 | -32 | 609 | 2,125 | +249 |
| | Better off | 1,867 | 1,386 | -26 | 2,441 | 4,012 | +65 |
| Closed Beel | Fisher | 12,967 | 9,973 | -23 | 9,956 | 7,378 | -26 |
| | Non fisher | 731 | 826 | +13 | 553 | 1,257 | +128 |
| | Better off | 2,377 | 2,431 | +3 | 1,150 | 809 | -30 |
| Flood Plain | Fisher | 15,599 | 31,761 | +104 | 13,817 | 12,314 | -7 |
| | Non fisher | 5,023 | 1,590 | -69 | 2,458 | 2,801 | +14 |
| | Better off | 7,682 | 5,855 | -24 | 5,910 | 6,230 | +6 |
| River | Fisher | 14,573 | 23,271 | +60 | 22,379 | 20,797 | +7 |
| | Non fisher | 1,097 | 1,980 | +81 | 3,687 | 666 | -820 |
| | Better off | 3,542 | 3,943 | +12 | 668 | 1,050 | +58 |
| All | Fisher | 15,035 | 18,189 | +21 | 15,076 | 17,286 | 15 |
| | Non fisher | 1,316 | 1,015 | -23 | 1,509 | 1,773 | 18 |
| | Better off | 2,811 | 2,443 | -13 | 2,392 | 3,304 | 38 |

4.2 Income Diversification

Fisher households earned their incomes from a wide range of sources. Reduction in fishing effort can be supplemented by other income generating activities. In the CBFM project, partner NGOs provided training and credit support to the organized fishers. The fishers were able to invest in alternative income generating activities to improve their livelihoods. Table 3 shows that among the income sources, the share of income from fishing for the CBFM fisher households reduced from 49 percent to 46 percent over 2002-2006. However, fisher's income from farming increased significantly from 12 percent to 16 percent over 2002-2006 (Table 3). Fisher who previously worked as labourer in agriculture are now involved in own farming activities.

Table 3. Households' income from different sources in CBFM and Control sites, 2002-2006

| Source of Income | Project (percentage) | | Change (+/-) | Control (percentage) | | Change (+/-) |
|-----------------------|----------------------|------|--------------|----------------------|------|--------------|
| | 2002 | 2006 | | 2002 | 2006 | |
| Fishing Income | 49.2 | 45.8 | - 3.4 | 48.2 | 41.6 | - 6.6 |
| Farm Income | 11.9 | 15.6 | + 3.7 | 11.1 | 15.4 | + 4.3 |
| Wage Labour | 16.3 | 12.5 | - 3.8 | 20.7 | 16.4 | - 4.3 |
| Business | 11.4 | 12.3 | + 0.9 | 10.5 | 10.3 | - 0.2 |
| Other Self employment | 5.7 | 5.9 | + 0.2 | 4.5 | 3.9 | - 0.6 |
| Remittance | 1.9 | 4.1 | + 2.2 | 1.9 | 9.0 | + 7.1 |
| Other | 3.7 | 3.8 | + 0.1 | 3.1 | 3.4 | + 0.3 |
| All | 100 | 100 | | 100 | 100 | |

Fishers in the CBFM sites were able to increase their income from non fishing sources. As shown in Table 3, incomes from farming and remittances have increased for fishers in the CBFM project sites. Households in CBFM areas were less reliant on wage laboring as their income from this source showed a significant decline (-3.8) from 2002 to 2006. Similar pattern has observed in the control sites. Many poor people migrate to other regions in Bangladesh for seasonal employment, such as paddy harvesting, road and building construction, rickshaw pulling and other wage laboring activities (Hossain & Nargis, 2010). The poor household members are increasingly residing temporarily away from their villages to find better work (CARE/LMU, 2005).

Table 4. Number of fishers in CBFM project and control sites

| Water bodies | Project | | | Control | | |
|----------------------------------|---------|------|----------|---------|------|----------|
| | 2002 | 2006 | % change | 2002 | 2006 | % change |
| Closed Beel fishers | | | | | | |
| Fish in single (main) water body | 199 | 196 | -1.5 | 67 | 62 | -7.5 |
| Fish in multiple water bodies | 109 | 77 | -29.4 | 13 | 17 | 33.3 |
| All | 308 | 273 | -11.4 | 80 | 79 | 1.3 |
| Open Beel fishers | | | | | | |
| Fish in single (main) water body | 383 | 437 | 14.0 | 157 | 174 | 10.8 |
| Fish in multiple water bodies | 171 | 147 | -14.0 | 18 | 67 | 272.2 |
| All | 554 | 584 | 5.4 | 175 | 241 | 37.7 |
| Floodplains fisher | | | | | | |
| Fish in single (main) water body | 36 | 56 | 55.0 | 43 | 60 | 39.5 |
| Fish in multiple water bodies | 68 | 36 | -47.1 | 39 | 24 | -38.5 |
| All | 104 | 92 | -11.5 | 82 | 84 | 2.4 |
| Rivers fisher | | | | | | |
| Fish in single (main) water body | 117 | 103 | -12.0 | 45 | 58 | 29.0 |
| Fish in multiple water bodies | 37 | 50 | 35.1 | 19 | 12 | -36.8 |
| All | 154 | 153 | -0.6 | 64 | 70 | 9.4 |

5. Household Access to Various Assets

5.1 Access to Fishing

The involvement of fishers in fishing activities is highly determined by resource availability, property rights arrangements and their livelihood options. Accessibility to fishing in various fisheries determines households' income and consumption. Fishers usually catch fish in the water bodies close to their homes. A good number of fishers fish in multiple water bodies to increase their income from fishing. As shown in Table 4, the number of CBFM participating fishers in all types of water bodies except for OB has decreased from 2002 to 2006. The number of fishers fishing in their main water body increased in OB and FPB which indicates that fishing access was relatively less restricted in these water bodies. The number of fishers has decreased in CB which indicates that access was more restrictive for these sites. This is consistent with the fact that closed beels are stocked by a limited number of fishers and they usually share the costs and benefits from fisheries. Rivers are managed by local elites who employ limited number of people to fish in the water bodies which indicate that access to the CBFM river sites was more restrictive due to the influence of previous leaseholders. Table 4 also shows that the number of fishers who fish in multiple water bodies has significantly reduced in all the CBFM water bodies, except in the rivers. This indicates that besides fishing in their respective main water body fishers tend to move their fishing to rivers (Table 4).

In the control areas the number of fishers has increased in all the water bodies except CB (Table 4). These water bodies are stocked by lease-holders where access to fishing is restricted. However, there is less restriction to fish in other water bodies (OB, FPB, and river) in the control sites. Table 4 shows that the number of fishers who fish in multiple water bodies have reduced in FPB and rivers while there was a significant increase in the number of fishers in OB followed by CB. This indicates that the lease-holders in these water bodies aimed to maximize their fishing income by employing poor people to fish. The FPB and rivers are open access, these fisheries have been severely overexploited, and thus catch has reduced. Fishers are less likely to go for fishing in these water bodies.

5.2 Access to Land

Majority of the households live in the rural areas and rely mainly on agriculture. Fishers are largely poor in Bangladesh and 56 percent of rural households are classified as functionally landless (that is they own less than 0.2 ha of land). Table 5 shows that the size of the landholdings for households from both project and control sites has increased from 2002 to 2006 through renting or share cropping.

Table 5. Household land holdings in CBFM and control areas

| Household category | Project | | | Control | | |
|-----------------------|---------|------|------------|---------|------|------------|
| | 2002 | 2006 | % increase | 2002 | 2006 | % increase |
| Fisher | | | | | | |
| Own Land (decimal) | 34 | 39 | 16 | 31 | 36 | 16 |
| Lease/share (decimal) | 31 | 43 | 40 | 33 | 54 | 62 |
| Total (decimal) | 65 | 83 | 27 | 65 | 90 | 39 |
| Non fisher | | | | | | |
| Own Land (decimal) | 53 | 56 | 5 | 47 | 56 | 19 |
| Lease/share (decimal) | 36 | 35 | 0 | 35 | 37 | 6 |
| Total (decimal) | 89 | 92 | 3 | 83 | 94 | 14 |

However, the size of land holdings for the fisher households is smaller compared to the non fisher households. Fishers in the CBFM sites increased their land areas from 65 decimals in 2002 to 83 decimals in 2006, while in the control sites, fishers increased their land from 65 decimals in 2002 to 90 decimals in 2006 (Table 5). The increasing land holdings for fisher households show that farming has become increasingly more important for them.

5.3 Access to Micro-Credit

Poor fishers lack access to credits in the rural areas of Bangladesh. The main source of credit for majority of the poor fishers comes from *mohajons* (money lenders). The NGOs play a crucial role in providing micro-credit for the poor people in Bangladesh. The CBFM project had facilitated credit support to the organised fishers. As shown in Table 6 that the CBFM project households received considerably greater amount of credit from NGOs

(both CBFM partner NGOs and other NGOs) and from relatives compared to the households in the non-CBFM control sites (Table 6). The CBFM fishers had received higher amount of credit (Taka 6,759/household) from other NGOs as compared to the amount of credit received from partner NGOs (Taka 3,624/household)^{Note 5}. The findings indicate that the organised fishers were able to source out multiple credit agencies in the project areas. Community based approach could facilitate the poorest fishers in building links with various NGOs for sourcing out credit. The respondents report that they have invested a large portion of their micro-credit to obtain land (rent/share cropping) for crop cultivation, which was considered as the main supplementary income earning activity for the fishers.

Table 6. Sources and amount of credits (Taka) received by the households in CBFM and control sites, 2005

| Source of micro-credit | Project | | | Control | | | t-value |
|-------------------------|---------|-----|--------|---------|-----|--------|---------|
| | Mean | N | SD | Mean | N | SD | |
| NGO (CBFM) | 3,624 | 24 | 1,611 | 4,750 | 4 | 1500 | -1.30 |
| Other NGOs | 6,759 | 41 | 4,142 | 4,803 | 38 | 4327 | 2.05** |
| Banks | 15,271 | 14 | 17,376 | 13,525 | 12 | 14,411 | 0.28 |
| Relatives/neighbour | 4,711 | 28 | 5,671 | 2,488 | 25 | 2,785 | 1.78* |
| Mohajans (money lender) | 5,669 | 31 | 5,768 | 5,088 | 25 | 6,232 | 0.36 |
| Samity/society | 3,468 | 28 | 2,924 | 3,718 | 17 | 2,773 | -0.28 |
| Total | 5,242 | 166 | 4,441 | 4,797 | 121 | 5,814 | 0.74 |

5.4 Access to Social Capital

Social capital emphasizes the different ways of mobilizing social relationship in a society to manage various resources and to engage with other actors. Such relationship can play important roles in securing access and defend private as well as group natural resource property rights, and thus seclude those resources from other users (Islam et al., 2011). The CBFM fishers have had more interactions with NGO staffs, government officials, local politicians and elites during meetings and public gatherings to discuss various social issues and exchange information on various sources of credit support and income generating potentials in their localities. These interactions may have improved the confidence of poor fishers to participate in the CBFM project activities. In order to measure changes in social assets, an index was constructed using the Principal Component Analysis^{Note 6}. Six variables load highly on a single common factor (Table 7).

The scores of six separate variables were aggregated to form the social capital index. In social capital index the most important factor found is household's active participation in fisheries management (0.876). The organized fishers introduced fisheries management rules in the CBFM water bodies. They participated in fisheries enhancement activities in the water bodies and these include establishing fish sanctuaries, introducing closed seasons and gear restrictions. The second most important social capital factor is that local community has complied with fisheries rules introduced by the management committee (0.861). The fisheries rules were endorsed by the DoF and other local government agencies to be effectively implemented at water-body levels. Fishers introduced stocking of fingerlings in CB where poaching was a common threat for stocked beels. However, guarding was performed by fishers and successfully controlled poaching in most of the CB sites.

Table 7. Social capital factor

| Performance Indicator | Factor Loading |
|------------------------------------|----------------|
| Active fisheries management | 0.876 |
| Compliance with fishery rules | 0.861 |
| Ability to enforce fisheries rules | 0.795 |
| Speed of resolving conflicts | 0.725 |
| Information exchange | 0.699 |
| Knowledge in fisheries management | 0.648 |
| Total | 4.604 |

Extraction Method: Principal Component Analysis.

The ability to enforce fisheries rules (0.795) is an important social capital factor. The CBFM activities were monitored by local staff in each water body. Rule breakers were punished by confiscating their destructive gears, fishing was banned for certain period of time and rule breakers were excluded from fisher groups. The management committees with the help of local administration were able to resolve fisheries related conflicts. The respondents reported that conflicts can now be resolved quicker as compared to five years ago. This speed of resolving conflicts has a factor loading of 0.725 (Table 7). The information exchange among the fishers and the level of knowledge factors (0.699 and 0.648 respectively) were important in social capital factors. Attainment of formal education is miserably low among the fishing households in Bangladesh. The partner NGOs had conducted trainings on leadership development and accounting management. They produced newsletters as well as audiovisual materials and organized TV talk shows in the project areas. These media activities were found to be very effective for disseminating fisheries knowledge at village levels.

It was observed that the number of court cases increased in areas with poor level of trust among the villagers. Court cases were only lodged when conflicts were severe and beyond the control of the management committee and community leaders (Islam & Barr, 2006). It was found in this study that conflicts were resolved through *salish* (village court) in the CBFM project areas (75 percent in 2002 to 78 percent in 2006), while in the control areas, the incidence of court cases have increased (13 percent in 2002 to 17 percent in 2006). This indicates that fishers are now more united and cooperative (Islam, 2006).

6. Summary of Findings and Recommendations

This paper investigated how the organized fishers under the CBFM project secure access to various assets in order to enhance their livelihoods. Comparisons between CBFM and non-CBFM fisher households fishing in closed *beels*, open *beels*, floodplains and river sections were made by using household survey data collected by CBFM project office in 2002 and 2006.

Fishing income increased by 21 percent (from Tk 15,035 to Tk 18,189) from 2002-2006. The increased in fishing income reflects better utilization of the fisheries resources at the CBFM sites. However, fishing income decreased in the CBFM CB as fishers had to incur higher operating costs by paying lease fees and stocking costs. This may have negative impact on the long-term viability of the community management of CB fisheries in Bangladesh. Although, fishing income has reduced, fishers in the CBFM project areas have also diversified their income sources. Fishers income from agricultural farming increased from 12 percent to 16 percent over 2002-2006. Therefore, CBFM fishers were able to increase income from non fishing income generating activities.

The number of participating fishers has been reduced in most of the CBFM project water bodies while their number has increased in the control sites. The CBFM fishers established user rights to the fisheries and were able to implement local management rules for achieving sustainable use of fisheries. Fishers in the CBFM sites obtained more areas of land through renting or sharecropping and used for agricultural farming. Similar increase in land areas were also found for the fishers in the non-CBFM sites. The increased areas of land holdings of fisher households indicate that agriculture has become important for many fisher households in the CBFM project.

The CBFM fishers received larger amount of credits from NGOs (not necessarily from project partner NGOs) compared to non-CBFM fishers. Fishers also obtained their credit from other NGOs and other interest free sources such as friends and relatives. The fishers are now more aware of new credit opportunities available in their locality.

The CBFM fishers have changed their attitudes, are more cooperative, have greater awareness of fisheries rules and are able to resolve conflicts much easier in the CBFM project sites as compared to the control sites. The CBFM fishers have greater access to fisheries and were able to defend themselves against outside threat. Therefore, long term securities of resource use and government support are required for sustaining the CBFM in the inland fisheries of Bangladesh.

Acknowledgements

The financial assistance provided by the Department for International Development (DFID) of the United Kingdom in carrying out this study is gratefully acknowledged. The views expressed in the paper and any errors and omissions are solely the responsibilities of the authors. We are indebted to three referees for their helpful comments.

References

- Abell, R., Thieme, M., & Lehner, B. (2002). *Eco-region Conservation for Freshwater Systems, With a Focus on Large Rivers*. Washington DC: World Wildlife Fund.
- Ahmed, M. M., & Dickson, M. (2007). Institutional Issues in the CBFM-2 Project. *CBFM-2 International Conference on Community Based Approaches to Fisheries Management*. Conference Paper No. 2, WorldFish Center Proceedings 75, Dhaka, Bangladesh.
- Ali, M. Y. (1997). *Fish, Water and People*. University Press Limited. Dhaka, Bangladesh.
- Ashley, C., & Carney, D. (1999). *Sustainable livelihoods: lessons from early experience*. London: Department for International Development
- Brown, J., Mitchell, N., & Beresford, M. (2005). *The Protected Landscape Approach-Linking Natures, Culture and Community*, IUCN.
- CARE/LMU. (2005). *Livelihood Change in Northwest Bangladesh: Patterns and Processes*.
- Northwest Rural Livelihoods Survey. (2004). *Panel Data Analysis*. CARE Bangladesh Livelihoods Monitoring Unit, Dhaka.
- Carney, D. (1998). *Sustainable rural livelihoods: What contribution can we make?* London: Department for International Development, UK.
- Colavito, L. (2002). Wetland Economic Valuation using a bioeconomic model: the Case of Hail Haor, Bangladesh. *Paper presented at the workshop on Conservation and Sustainable use of Wetlands: Learning from the World, IUCN – The World Conservation Union: Katmandu*.
- DOF (Department of Fisheries). (2006). *Annual Report*, Department of Fisheries. Bangladesh.
- Ellis, F. (2000). *Rural Livelihood Diversity in Developing Countries*. New York: Oxford University Press.
- Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies*, 35(1), 1-38.
- Haan, A., & Lipton, M. (1998). Poverty in Emerging Asia: Progress, Setbacks, and Log-jams. *Asian Development Review*, 16(2), 135-176.
- Hossain, M., & Nargis, N. (2010). Dynamics of poverty in rural Bangladesh, (1988-2007): an analysis of household level panel data. In L. Banerjee, A. Dasgupta, & R. Isdlam (Eds.), *Development equity and poverty: essays in honour of Azizur Rahman Khan* (pp. 213-32). Delhi: Macmillan Publishers India Ltd.
- ICF (Inland Capture Fisheries Strategy). (2006). Department of Fisheries. Dhaka, Bangladesh.
- Islam, M. N., Tai, S. Y., Abdullah, N. M., & Viswanathan, K. (2011). Community Based Fisheries Management, Social Capital and Fisher's Livelihood in Bangladesh. *Ocean & Coastal Management*, 54(2), 173-180
- Islam, M. N. (2006). Policy Brief on Social Capital of Community Based Fisheries Management Project, WorldFish Center, Bangladesh and South Asia office, Dhaka.
- Islam, M. N., & Dickson, M. (2006). *Community Based Fisheries Management Project, Phase 2 (CBFM-2) Livelihood Impacts of CBFM 2, Working Paper*. WorldFish Center Bangladesh and South Asia office, Dhaka, Bangladesh.
- Islam, M. N., & Barr, J. (2006). *Policy Brief on Livelihoods Impact of Community Based Fisheries Management Project*. WorldFish Center, Bangladesh and South Asia office, Dhaka
- Master Plan Organization. (1987). Open water capture fishery resources. *Technical Report, Ministry of Irrigation, Water Control and Flood Control, Dhaka*.
- Metzner, R. (2008). Property Rights and Institutional Arrangements in Southeast Asian Fisheries. In R. M. Briones, & A. G. Garcia (Eds.), *Poverty Reduction through Sustainable Fisheries: Emerging Policy and Governance Issues in Southeast Asia* eds. (pp. 233-259). ISEAS/SEARCA.
- Muir, J. (2003). *The Future for Fisheries: Findings and Recommendations from the Fisheries Sector Review and Future Developments Study Report*. Dhaka, Bangladesh.
- Scoones, I. (1998). *Sustainable rural livelihoods: a framework for analysis*. IDS Working paper, No. 72, Institute of Development Studies, Sussex, UK.

- Scott, A. D. (1988). Conceptual Origins of Rights Based Fishing. In Neher (Ed.), *Rights Based Fishing*. Dordrecht: Kluwer Academic Publishers.
- Smith, L. E. D., Khoa, S. N., & Lorenzen, K. (2005). Livelihood functions of inland fisheries: policy implications in developing countries. *Water Policy*, 7, 359-383
- Sultana, P., & Thompson, P. (2007). Community Based Fisheries Management and Fisher Livelihoods: Bangladesh Case Studies. *Human Ecology*, 35, 527-546
- Thompson, P. M., & Hossain, M. M. (1998). In Social and distributional issues in open water fisheries management in Bangladesh. Inland Fishery Enhancements. *FAO Fish. Tech. Pap.*, 374, 351-370.
- Thompson, P. M., Sultana, P., & Islam, N. (2003). Lessons from Community Based Management of Floodplain Fisheries in Bangladesh. *Journal of Environmental Management*, 69(3), 307-321.
- Thompson, P. M. (2004). Lessons from Community Based Fisheries Management in Bangladesh. *Briefing Paper*. Worldfish Center. Dhaka, Bangladesh.
- Toufique, K. A. (1997). Some observations on Power and Property rights in the Inland Fisheries of Bangladesh. *World Development*, 25(3), 457-467.
- Toufique, K. A. (1999). Property Rights and Power Structure in Inland Fisheries in Bangladesh. In H. A. J. Middendorp, P. M. Thompson, & R. S. Pomeroy (Eds.), *Sustainable Inland Fisheries Management in Bangladesh*. ICLARM Conf. Proc. 58, ICLARM, Manila.

Notes

Note 1. The partner NGOs are mixed in size and characteristics. They include large national NGOs such as BRAC, PROSHIKA and, international NGO such as Caritas. The NGO effort has largely focused on institution-building: organizing fishers into groups, getting access to resources, providing credit, enabling them to design and carry out their own measures for resource management.

Note 2. These names appear to refer just to the physical characteristics of water bodies, each has implication for tenure and access.

Note 3. See Thompson, P. M. (2004). It was agreed by each partner NGO, the WorldFish Center and the DoF in the CBFM project that the beneficiary selection criteria was to ensure that a major share of the benefits from project activities reach the poorest members of the community. The general selection criteria were: (a) persons who catch fish by themselves for their livelihoods; (b) persons who have less than 50 decimals of land including the homestead in floodplain sites, and (c) persons who have an annual income of less than Tk. 30,000, primarily from manual work (Ahmed & Dickson, 2007).

Note 4. Beels are the deepest part of the floodplains, often with a permanent area of water. Closed beels are relatively "smaller" and well defined waterbodies (these may be above or below 8 ha in official area, but are generally not more than about 50 ha in the monsoon) with few outlets. Open Beels are relatively larger fisheries and are extensively used as capture fisheries for the purpose of subsistence fishing by a wide range of stakeholders.

Note 5. CBFM partner NGOs were assigned to work in particular waterbodies, they were not overlapped. Therefore, one particular NGO is treated as CBFM partner in a waterbody, while the same NGO is not treated as partner NGO in non-CBFM waterbodies. The number of waterbodies covered per NGO depends on their own implementation capacity and working areas.

Note 6. Principle Component Analysis (PCA) is based on the multiple correlation principle and can explain the variance of the dependent variables. The combination of the important variables with high factor loadings is used for constructing an index. The overall value of the index is calculated by percentage contribution of each selected highly loaded variables. This percentage contribution is used as weight for constructing an index of social capital.

Note 7. CBFM organised fishers failed to harvest their stocked fisheries in CB due to conflicts with landowners who influenced local administration, court cases resulted in delayed handover the water bodies to the CBFM, and due to flood occurs almost every year that destroyed their fish ponds in some of the CB sites.