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Understanding Culture-based Fisheries: An Assessment of a Community-Managed *Beel* Fisheries in Bangladesh

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Abstract

This paper presents a critical review of culture-based fisheries under the framework of a co-management arrangement of this resource in Bangladesh. It is recognized that the research and practice of culture-based fisheries are largely focused on production and put emphasis mainly on the economic aspects that relate to investment returns and cost-effectiveness of culture fisheries. In the resource management regimes of recent decades, little attention has been given to other crucial management, societal and environmental aspects. In consideration of these perspectives, the study attempts an empirical analysis of community-based fisheries management (CBFM), with a focus on the assessment of its role in facilitating the development of culture-based fisheries. By adopting a participatory approach to resource management, this research examines several critical aspects of management related to issues of property rights, the leasing out of public land and water bodies, and institutional linkages. It also pays due attention to related social considerations under a community-managed, culture-based fisheries program in Bangladesh. It is argued that culture-based fisheries will not achieve their goals without the adoption of a wide-encompassing management strategy.

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Introduction

Background

Culture-based fisheries are a form of low-cost and technologically less intensive aquaculture. They are developed at the local community level, which is characterized by limited technical skills and financial capability (Welcomme & Bartley 1998; Sugunan 2005; De Silva et al. 2006). Research in various parts of the world has revealed that culture-based fisheries offer a number of economic, social and environmental benefits. Culture-based fisheries, for example, increase yields in the water bodies where natural productivity is high but auto-recruitment of the available fish species is limited. As culture-based fisheries contribute significantly to gross inland production in many Asian nations, this sector has been receiving importance as a fish culture technique (De Silva et al. 2006). Examples of culture-based fisheries in Asia include small reservoir fisheries e.g. Vietnam, Lao PDR (Garaway & Lorenzen 2001; Nguyen et al. 2001; Garaway 2006), oxbow lake fisheries e.g. Bangladesh (Middendorp & Balarin 1999), and fisheries in seasonal tanks e.g. Sri Lanka (De Silva et al. 2006). The practice of culture-based fisheries for food and recreational purposes is also a well-established component of aquatic resource use in Europe and North America (Heidinger 1999).

Research on culture-based fisheries is primarily focused on production and highlights the economic returns and cost effectiveness of the fisheries. In recent resource management regimes, however, considerations of critical management, ecological and societal aspects, such as issues of property rights and ownership, values of local level institutional relationships, and the role of formal and informal links, have not been adequately assessed (Capistrano et al. 1994; Pokrant et al. 1997; Islam 1999; Garaway 2006). In addition, the results of stocking are often not realized in terms of the equitable distribution of benefits.

The objectives of this study are: (i) to critically review the pivotal management and societal aspects of the community-managed culture-based fisheries programs in Bangladesh, with special emphasis on *beels*; and (ii) to assess the role of the community-based approach in shaping stocked-based fisheries in the country. *Beels* are saucer-shaped, shallow natural depressions of marshy character representing perennial or seasonal water bodies (Tripathi et al. 1999) and are found largely in the active or inactive flood zones of rivers. Except the floodplain *beels*, there are many fully-

closed *beels* with no connection to larger water bodies like the river channels (Rashid 1977). In general, a closed *beel* is a fully rain-fed water body that is filled up with water during the *monsoon* (May-December) but partly dries up during late winter and summer seasons (February-May). In general, *beels* are highly productive entities and are easily manageable small- to medium-sized water bodies; aquaculture production is feasible in these water bodies.

The present study is based on 15 stocked waterbodies in Bangladesh that were managed by the communities during 2002-2003 under a Community-Based Fisheries Management Project Phase-2 (CBFM-2). The project was implemented by the WorldFish Center with funding support from DFID.

Culture-based fisheries in Bangladesh

The vast aquatic systems (such as rivers, flooded lands, and closed and semi-closed small waters bodies like oxbow lakes and *beels*) of Bangladesh support very high levels of aquatic biodiversity. These aquatic resources are extremely important in supporting the rural livelihoods of more than a hundred million people of Bangladesh. The sustainable management of these resources is thus crucial to the national economy and food security of the country and the sector has become a vital element of national development activities (Thompson 1999).

Culture-based fisheries in the country have evolved, centering around two different approaches with respect to management, public participation and income distribution. In some cases, culture-based fisheries were developed under the control of local cooperatives (Thompson & Firoz 2003), while in many cases, government institutions organized local fisheries groups to collaborate in culture-based projects in the oxbow lakes in Bangladesh (Middendorp & Balarin 1999). In the case of oxbow lakes, the Department of Fisheries (DoF), remains responsible for stocking fish, controlling weeds and preventing fish escape, while fishing responsibility lies with the groups organized by the government. Both approaches have resulted in the increased production of fish above natural levels.

The culture-based fisheries, however, are seriously constrained by the inequitable distribution of benefits, the control of the resources and associated decision-making by local elites, illegal poaching, and the degradation of the aquatic environment. The long-term sustainability of the fisheries resources therefore became questionable. In order to overcome some of these obstacles to fisheries development, newer approaches have

been emerging in Bangladesh, including culture-based fisheries development under a co-management arrangement (Thompson & Mamun 2004; Mustafa & Mamun 2005). Co-management arrangement emphasizes establishing the rights of poor communities over common pool resources; increase yields from natural production; and at the same time, emphasizes building the financial and institutional capacity of the rural poor. It is also aimed at empowering fishers to promote a sustainable and participatory management approach to these resources and to ensure a more equitable distribution of benefits. The development of such capacities helps increase the fishers' bargaining and negotiating power, particularly in dealing with matters of leasing water bodies. Once the access of the fishers' community to aquatic resources is established, the community then develops a sense of ownership that guides the members to take care of the resources through investing their time and effort in a coordinated way, as their livelihood is dependent on the long-term sustainability of the natural resources.

To expedite participatory fisheries management, the Community-Based Fisheries Management (CBFM) Project has been implemented through a partnership with the Department of Fisheries (DoF), the World-Fish Center and several other NGOs with the objectives of improving the livelihoods of the poor who are dependent on common pool fisheries resources through the adoption of improved fisheries management policies and practices. To achieve these objectives, the project developed and tested a range of community-based fisheries management approaches and models such as the fisher-managed fisheries, and women-managed fisheries. In the CBFM project approach, one of the key components was developing stock-based fisheries which was considered for this paper. The co-management approach to stocked-based fisheries has been developing primarily in the *beel* environment. Seasonal and perennial *beels* of both small and medium-sizes (e.g. 10-30 ha.) having a minimum outlet(s) were chosen for the stocking. Such a stocking program was undertaken only in the beels where the fishers' groups had a strong organizational capacity, had the capacity to pay the lease price, were capable of deputing labor to prevent fish escape, and could control illegal fishing. The data used in this paper were derived from 15 sites representing the country as a whole (Figure 1).

Management strategies of culture-based beel fisheries under CBFM

Under the CBFM program, seasonal *beels* were stocked during the full *monsoon* (July-August). However, pre- and late *monsoon* stockings were performed in most perennial *beels*. In perennial *beels*, multi-year

operations with recurrent stockings were possible, while such a practice was not possible in the seasonal *beels*. After stocking had been completed, fishers followed a rotation of guard duty to prevent poaching and destruction of the fence/screen that had been put in place to prevent fish escape. Following stocking, intensive fishing was not allowed until the beel management committee had assessed the fish growth and decided to allow harvesting. At that time, only limited fishing was allowed, including subsistence fishing to meet the household needs of the people living in areas surrounding the *beels*. Subsistence fishing was composed of basically non-stocked indigenous small fishes. The time for stocked fish harvest was determined by assessing the water levels and the extent of fish growth. In general, fishing commenced in October and continued through the months of December-January and sometimes even up to February-March. In some cases, additional fishing was allowed that targeted particular natural species (for example, *chapila-Gudusia chapra*) and other wild fish. This type of unplanned fishing had two objectives: generating livelihood incomes for fishers' groups during the fish-ban period and reducing the density of the wild fish that helped the growth of the stocked species. When the fisher groups did not have their own nets, the Beel Management Committees sometimes hired professional fishers on a catch-sharing basis and 25-30% of the wild fish caught was disbursed to the hired fishing groups, but no share of the stocked species was given to hired fishers.

Figure 1. Map of Bangladesh showing the location of sites covered in this study

The harvested fish was either sold on the spot by the members of the Beel Management Committees through auctions or were carried to nearby markets to get a better price. On all fishing days, a portion of the catch was also kept aside to be distributed among the participating members as well as to be sold locally at a subsidized rate (generally 20-30% less than market price) to help other community members who were not

involved in the fishers' groups. Thirty percent of the total sale was deposited in a commercial bank to cover the expenditures (such as to pay for leasing the *beels*) during the subsequent year's operation while the rest was divided among the participants.

Institutional linkages in culture-based fisheries

Under the CBFM approach, institutional linkages played a key role in fisheries development. In principle, linkage development is the outcome of the coordinated approach among institutions and has followed an evolutionary trend. In the past, there were only a few components; for example, in the case of fees and revenue-based management, the arrangement was between the fishers and the *zamindars* (landlords). Gradually, more diverse links were established among the institutions as they undertook a modern approach to fisheries management, such as co-management (Figure 2). As a result, a well-structured, multi-level institutional link has developed among various administrative units (Government and non-governmental organizations), NGOs and fisher institutions (Figure 2). The organizations linked to each other have created the space for a shared management, helping conflict resolution and ensuring the equitable distribution of benefits among fishers.

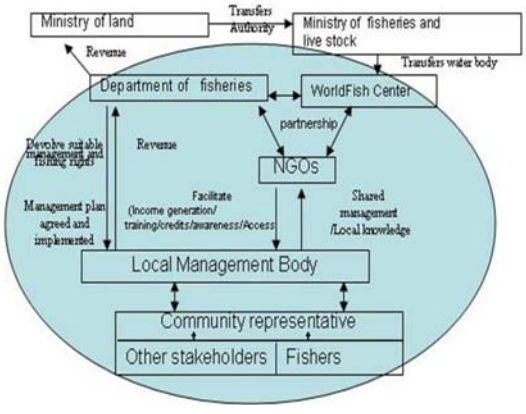

Figure 2. Diagrammatic representation of institutional arrangements/links in culture-based fisheries under CBFM-2 (Adapted from Hussain et al. 1999)

A critical examination of the existing cross-scale institutional interactions and functions is, therefore, essential to understanding how they have interacted and helped the development and management of the culture-based fisheries program.

The key organizational body at the local level is a *Beel* Management Committee (BMC). It serves as a form of community-based organization (CBO), such as the *samaj* (a local level congregation) in Bangladesh. The BMCs consist of village groups who form the lowest level of fisheries management committee, and these village-level groups are represented by different stakeholders/professionals, such as fishers, farmers, land owners and commu-

nity leaders. The representatives from the fisheries groups form the executive body of BMC. Full-time fishers and landless farmers who had been living in the areas surrounding the *beel* were given priority to participate as general membership of the committee. Stakeholders from other professions such as school teachers, local elites, and the chairmen of union councils, also took part in the BMCs but served in the advisory boards. The BMCs were linked both horizontally (e.g. fisher groups and local farmers and other stakeholders) and vertically (e.g. with NGOs, DoF and WorldFish Center). They serve as an active body to oversee the activities, such as organize group fishing, ensure guarding and stocking. The BMCs were also responsible for the management and other day-to-day activities related to managing the fisheries *such as* organizing community meetings to discuss issues related to stocking and managing the fisheries and also in facilitating conflict resolution among other stakeholders, such as conflicts between fishers and agricultural farmers.

The NGOs have played an important role in the institutional linkages. They have the network and experience in grass-root level communication with the community living around the *beels* and have extensive expertise in creating interest among the community members about development issues. As such, NGOs have worked as a key link between local communities and various organizations, including different levels of government (for example, the district fisheries office and other local offices related to land administration) and international research institutes (such as the WorldFish Center). All the BMCs were organized by the partner NGOs working in each *beel* area. In many cases, NGOs have disbursed loans and served as a partial source of funds for culture-based fisheries programs, especially by giving micro-credit to the participants at the village level. Micro-credit is considered very useful in supporting small businesses. The NGOs have also been responsible for the capacity building of the BMCs by providing training and informing stakeholders how to develop various management plans. Some NGOs have also performed other activities related to the CBFM that include public advocacy and legal aid.

With respect to technical support and organizational capacity building for the BMCs, the WorldFish Center has acted as a key coordinating and funding organization for NGOs and local communities. The Center has helped access to funding for the communities by providing grants or interest-free loans in the form of a revolving fund. The revolving fund is a temporarily useable fund from which some amount of money can be withdrawn on the condition that it will be reimbursed at the end of a fishing season, so that core reserve is maintained.

The BMCs have used the funds to meet various needs, such as paying annual leasing dues for the water body, as well as for procuring fingerlings, boats, and nets. Other key functions of Center include influencing policy dialogue regarding the leasing of the culture-based fisheries area out to genuine fishers, negotiating over the lease value, working to ensure longer term leasing and period monitoring and evaluation of the implementation process of the program.

The Department of Fisheries (DoF), Government of Bangladesh, has assisted in mobilizing other agencies, like the Ministry of Fisheries and Livestock, to deal with land affairs relating to *jalmohal beels*. *Jalmohals* are parts of water estate and are operated under government revenue-oriented management, where fishing rights are sold out periodically to the highest bidders. Such a management strategy is generally considered a major cause of the marginalization of community fishers (for details, see Toufique 1997). Such mobilization has helped influence various policy decisions favoring leasing out fisheries to fishers' groups. It has also helped in persuading other management offices to deal with lawsuits. This horizontal linkage among various government ministries, however, has faced several barriers at the operational level. Often this linkage has not received adequate government bureaucratic or political support. Many plans submitted by the community via the NGOs have been stalled at the national governmental level, due to bureaucratic processes and the lack of genuine political commitment to promote development in rural areas.

Social considerations: property rights, ownership and access to resources

Property rights in culture-based fisheries

A number of property rights are relevant to management systems used with common pool resources that include *open-access, private property, state-property and communal/common property* (Berkes 1996). An established property right, such as private and common property, facilitates establishing security over resources and it gives the rights to access, withdrawal, management decision-making, exclusion, and the alienation of individuals and groups of individuals, which will be recognized in the future by potential competitors for those rights (Ostrom and Schlagher 1996). In practice, however, there is a combination of two or more types of property rights concerning land-use practices as well as the fishing system in community-managed culture-based fisheries. For instance, the fisheries resources of leased *beels* are state property but the user rights are sold through a lease arrangement (e.g. leasing of *jalmohals*) to other individuals

or cooperatives and function as a common property regime. However, this level of property rights has failed to achieve the full exclusion of potential users. This is because in most culture-based fisheries water bodies, a certain level of open-access fishing by subsistence fishers is always allowed. To a certain extent, the maintenance of an open-access regime has proven to be very useful in the management of culture-based fisheries as it helps avoid conflict between fishers' groups and non-participants, especially the poorer households which have been historically living and fishing around the *beel* and often try to continue fishing in the culture-based fisheries areas as historical rights on the resource.

The simultaneous operation of fisheries and other land-use practices (such as agricultural farming on the same piece of land) is always challenging as they often lead to serious conflicts. Both seasonal shallow *beels* and deep *beels* that are used for culture-based fisheries exhibit temporal and spatial variations in shape and size. These features of *beels* greatly influence the land-use patterns of *beels* under culture-based fisheries. The deeper parts of *beels* (mainly central basins) are designated as *jalmohal* (revenue-based management) by the government and are periodically leased out to private individuals or cooperatives. But almost all the deep *beels* under *jalmohals* management also possess some fringe lands (Figure 3), which alternate between dry and flooding conditions every year following the cycle of the seasons. These fisheries areas are often leased out again to private individuals who use them for agricultural purposes. This second lease of the same piece of land creates a direct conflict with revenue-based fisheries management under culture-based fisheries (Thompson 2004).

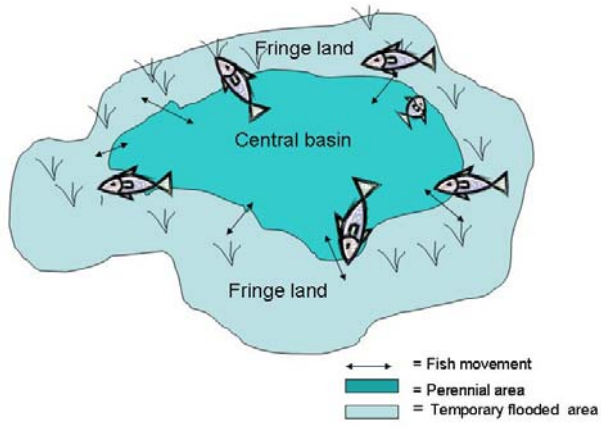

Figure 3. Diagrammatic representation of land-use patterns and fish movement in beels

Nature of ownership and access rights in culture-based fisheries

The ownership and access regimes in the inland fisheries of Bangladesh are complex but these aspects are critical to an understanding of the approaches to establishing rights and the collective use of these resources (Thompson 2004). Access to fisheries as well as ownership regimes have come a long way following the historical trajectory of the land management systems in Bangladesh. Reliable anthropological records of fishing access or management strategies prior to the colonial era (1793-1950) are unavailable. However, prior to 1793, all open water bodies were assumed to be open access and fished mostly by a designated Hindu fishing cast called *jele* (Pokrant et al. 1997). During the colonial era, fishing rights were partially revoked and the large fishing areas were converted into estates of the z*amindars* (landlords). The landlords either sub-leased the divided land to local people on the basis of an annual payment of fees or imposed shared fishing rights. Following the independence of India and Pakistan from colonial rule in 1947, the *zamindari* system was abolished in East Bengal (in 1950) and the water bodies once again became state property. At present, many fisheries resources (rivers and canals), floodplains, deeper *beels* and oxbow lakes are government properties and have been privatized by the Ministry of Land as *jalmohal* for revenue collection (Capistrano et al. 1994; Toufique 1997).

Traditionally, *jalmohals* have been leased out to the highest bidders. In general, the fishers' communities are the poorest and the leasing out of *jalmohals* to the highest bidders implies their exclusion. Usually, under such a process, the fisheries are controlled by wealthy and influential lease holders who hire traditional professional fishers for nominal wages or under an arrangement of sharing fish catch. With the increasing demand for generating more national revenue, there has been a continuous expansion of the *jalmohal* areas by the government. This policy of bringing more land areas under *jalmohal* arrangements virtually limits the fishers' access right to closed and semi-closed *beels* and river sections or regimes. This system of revenue generation has marginalized many traditional fishers by ceasing their rights to fish. This has proved detrimental to the sustainability of the fisheries (Ali & Middendorp 1998).

Since the early 1970s, the government of Bangladesh has attempted to direct fishing access rights to those who actually catch fish, through the transfer of rights over government water bodies (i.e. the *jalmohals*; Toufique 1997; Thompson 2004). As part of enhancing the welfare of the fishers, a system of negotiated leasing out of water bodies to the fishing

cooperative societies was introduced in 1973. Through this system, a preference to leasing *jalmohals* out to fisher cooperatives was partially established. Moreover, since 1986, the New Fisheries Management Policy (NFMP) has piloted licensing individual fishers in many *jalmohals*. In reality, these policy changes have had a little impact in managing open-water fisheries since fishers' cooperatives have been forced to function under the patronage of the money lenders and *de facto* leasers who helped to pay the lease price. Also, the decisions on who receives licenses have been controlled by the cooperatives and therefore indirectly by their patrons (Ahmed et al. 1997).

The previous land management policy concerning *jalmohal* systems in Bangladesh has left an important legacy for undertaking co-management in Bangladesh. The fisheries co-management initiative, established by the WorldFish Center and the assigned NGOs, has played a crucial role in culture-based fisheries management under the co-management arrangement. The Center and the NGOs have worked together to achieve property rights over *jalmohals* by assisting the fishers to form groups and by helping them to pay for lease expenses through using project funds for a fixed time, but on a revolving basis. The WorldFish Center and the Department of Fisheries, Government of Bangladesh, have also pursued the central and local government offices that deal with lands and leasing affairs, so that the fishers' groups receiving project support from the WorldFish Center are given priority to get leases of fisheries areas.

Experience with the leasing of *jalmohals* has shown that if a *jalmohal* is not handed over to the fishers' group under a project framework, then the targeted fishers cannot exclude outsiders (non-targeted fishers) from fishing in *jalmohal* areas. But if the fishers' access rights are legally established through a project framework, they can fight to save their resources. Notably, there has been no visible change in the fixed lease value for a given year payable by the fishers' groups. However, there were some changes in the leasing period of *jalmohals*; the length of the leasing period was changed from three years to ten years. Long-term leasing is important as it encourages the fishers' group to invest their time and money to perform some small-scale developmental works. For example, putting up a durable barricade in water ways to prevent escape of fish stocks, digging a canal to help fish migration, and repairing a road/culvert are regarded as long-term investments. Long-term leasing is also important for achieving good returns from the stocked fish as well as for providing an adequate growth period for the target species.

Performance of culture-based fisheries in Bangladesh

In reviewing culture-based fisheries under the community-based fisheries management (CBFM-2) program of Bangladesh, it appears that the success of the culture-based fisheries program involves a number of factors. These include measures like clearly defined property rights, the delineation of the *jalmohal* boundaries, and the participants' knowledge and familiarity with stocking methods. Nonetheless, the most crucial factor in such a success is the establishment of property rights over *jalmohals*. Complications in policies concerning *jalmohal* management are quite common and hamper the establishment of the fisher community's property rights over *jalmohal* for a number of reasons. It has been cited that *jalmohal* boundaries are often purposefully kept undefined by the government authorities. It has been further reported that farmers using the fringe lands surrounding the *jalmohal* beels (Figure 3) often encroached into leased areas as the delineation of boundaries was lacking. This process has reduced the officially declared area of *jalmohal*. Field citations have exhibited that often there are no consistencies between the physically available *jalmohal* area and its corresponding officially declared area. As a result, leaseholders (the fishers' community/individuals) have complained of unfairly paying a higher lease value than for the actual area they can use (Islam 1999).

Many *jalmohals* have both shallow and deeper parts; the comparatively shallow areas alternate between wet and dry conditions during the annual cycle. The dry areas are privatized through a separate leasing arrangement for agricultural framing. When the overlapped leased areas become flooded during a monsoon, both wild and stocked fish enter into these areas (Figure 3). In such cases, all occupants (which include farmers as well as leaseholders) declare these fish as their own property, leading to conflicting claims. It has also been revealed that stocking leads to the possible production of large and high valued carp fish, which attract outsiders. Stocking efforts thus may face the risk of increased poaching and theft if the *Beel* Management Committees are not well aware of these risks and organize for them ahead of time to prevent such undesired activities.

Most *beels* under community-managed, culture-based fisheries programs were previously either open-access entities or under intermittent leasing arrangements which offered uncontrolled fishing by the community living around the *beels.* A sudden change of fishing rights into common property within a historically open-access regime (open access to community control) has not been readily recognized by many community mem-

bers. The lack of recognition of the property rights under the new regulatory arrangements has led to conflicts, tensions and violence among the user groups, locals and non-locals, and other stakeholders. The physical harassment of community participants has turned into litigations or court injunctions on the community-based fisheries programs. The injunctions, followed by litigations, have blocked a number of community-based activities under culture-based fisheries. In some cases, the implementation of the culture-based fisheries program has brought minimum benefits to fisheries groups because of limited organization capacity of *Beel* Management Committees, which could not resist the entrance of outsiders into fishing activities. However, multi-stakeholder consultations facilitated by *Beel* Management Committees have often helped to resolve some of these conflicts.

Major species stocked in the water bodies were Indian major carps and exotic Chinese carps. The success of stocking has been constrained by factors associated with the management of stocked fish. In a number of water bodies, community participants had no previous experience of stocked fish management and perceived that the stocking of small fingerlings might bring better results. They very often ignored the environmental constraints, such as the presence of carnivorous fish in the stocked waters or the high water depth, which caused an unsatisfactory survival rate. The high mortality rate of fingerlings (the average rate of survival was 20-25% of stocking) caused substantial monetary loss in culture-based fisheries operations and, in turn, discouraged the communities from pursuing culture-based fisheries further. However, stocking was not always considered as a key to increase yields, but rather as a mechanism to establish commands of the fishers groups over the area. For example, stocking in many *beels* was symbolic and adequate attention was not given to managing the fish stocked. Fishing in those areas had to rely mostly on wild stocks but stocking helped significantly to prevent the entry of outsiders when they were claimed as stocked areas.

In the context of culture-based fisheries in Bangladesh, a full analysis considering the social, environmental and economic issues between wild and stocked fisheries was not available. However, there are concerns that reliance on the large-scale stocking of carp in natural waters might impact negatively on the ecosystem and biodiversity, leading to an adverse impact on non-stocked fish (Ali 1997). Moreover, stocking brings larger fish such as carp, which attract outsiders and may cause the increased risk of illegal fishing practices and lead to enhanced conflicts. Given the pros and cons of fish stocking, a moderate stocking density of 3000-4000 fin-

gerlings•ha^{-1}•year^{-1} proved to be beneficial to increasing production while helping conserve and maintain the catches of native fish. Conserving native fish is important for rural people as it maintains fish biodiversity, and supports a diversity of fishing units and livelihoods.

Discussion and Conclusion

The global contribution of enhancing fish production by introducing culture-based fisheries is difficult to ascertain. There is little doubt, however, that the enhancement of yields in fisheries worldwide is dominated by culture-based fisheries (Lorenzen et al. 2001). Culture-based fisheries have been gaining wider attention for achieving higher yields from aquaculture through an affordable investment, the equitable distribution of benefits, especially to the rural poor, and the environmental friendliness of the practice. Still, many culture-based fisheries enhancements have not realized their full potential because of failures to address several specific requirements that are rooted in the institutional, technological and management aspects of fisheries. The dependency of culture-based fisheries on natural conditions, control over outcomes and performance is often beyond the hands of day-to-day management by the participants. Consequently, a secure return from culture-based fisheries cannot always be guaranteed. Moreover, the enhancement of fisheries involves investments that can only be sustained under effective institutional arrangements. It also requires established property rights so that regulations of use (alienation) are in place and the flow of benefits can be ensured to those who bear the costs of enhancement. Hence, well-established property rights are considered vital for managing common-pool resources, including culture-based fisheries. There is a general agreement that *open access* is not compatible with sustainability as there are no established property rights, which turns into overexploitation, generates conflicts and leads to the degradation of the resource (Berkes 1996). Achieving sustainability thus requires the establishment of visible property rights in management systems. Community managed culture-based fisheries are built on the notion of establishing common property rights regimes. A given common property regime is composed of a recognized group of users, a well-defined resource that the group uses and manages, and a set of institutional arrangements for the use of the resource (Bromley 1991 in Pomeroy & Rivera-Guieb 2006).

The management of culture-based fisheries must be adapted to suit

the local socio-economic conditions as well as environmental factors related to the development of effective culture-based fisheries. In low-income countries like Bangladesh, the government and NGOs need to play their particular roles in facilitating culture-based fisheries initiatives. These institutions can perform these roles through establishing programs conducive to institutional arrangements, establishing property rights, negotiating appropriate fees for leasing out fishing rights, and managing environmental and other external impacts of the culture-based fisheries programs. In addition to the above considerations, it is realized from the assessment that, for the effective management of culture-based fisheries, the participation process of the local people must be inclusive, incorporating various stakeholders in all stages of decision-making. An exclusionary approach would create an unfair distribution of benefits, inequity and undesired outcomes that might even lead to increased violence, poaching and other social ills. The case of the reservoirs in Kerala, India can be cited as an example where fishing rights were reserved for members of certain castes and all other fishers were turned into poachers (Kumar & Hartmann 1995). It is thus essential to empower the local people with appropriate organizational and technical skills and knowledge so that they can take effective part in the management of common pool resources.

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