
Reducing Dependence on Fisheries in the Ecologically Critical Area Bordering the Sundarbans Reserved Forest

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Abstract

The Sundarbans is the largest single tract of mangrove forest in the world and supports diversified natural resources, including huge fishery resources. Thousands of people depend on the Sundarbans Reserved Forest (SRF) for their livelihoods, but there is a need to reduce the dependence of local communities on the forest resources. Providing alternative means of earning income could help to support the livelihoods of people currently dependent on fishing in the area, while also preserving threatened fish resources in and around protected areas. This study was conducted among fishers living in two villages located in a 10-kilometer wide Ecologically Critical Area that borders the SRF. Its goals are to (1) assess the dependence of fishers on fishing and fishing loans before and after they receive loans/grants for alternative income-generating activities (AIGAs), and (2) identify the impacts of AIGAs on fishing dependence and damaging fishing practices. I found that AIGAs have had a small but definite impact in this area, slightly reducing the surveyed households' dependence on fishing and on local moneylenders. However, the AIGAs provided thus far are insufficient; individual AIGA loans/grants should be larger and more households should have access to AIGAs. There is also a need for programs supporting greater awareness of sustainable practices, and it is crucial that more effort be put into halting fishing with poison.

Introduction

The Sundarbans has been recognized globally for its importance as a reservoir of biodiversity. Sundarbans Reserved Forest (SRF), the largest single tract of mangrove forest in the world, supports diversified natural resources, including huge fishery resources. In 1997, for their outstanding natural value and importance as reservoirs of biodiversity, three wildlife sanctuaries in SRF known as Sundarbans West, East, and South were recognized as a world heritage site by the UNESCO World Heritage Committee (UNESCO n.d.).

The mangrove forests of the Sundarbans, and particularly these three wildlife sanctuaries, act as good nurseries and potential breeding grounds for shrimps, prawns,



and many edible fishes. Thousands of people depend on the Sundarbans for their livelihoods. People living around the Sundarbans suffer from poverty, vulnerability to natural calamities, illiteracy, insufficient medical services, scarcity of drinking water, and limited income-generating opportunities. At the same time, they are highly dependent on fishing for their livelihoods, which contributes to high biotic pressure on the fishery resources. The local community also faces significant risks while fishing, including tigers, robbers, and natural calamities. In addition, there are financial barriers to fishing for a livelihood, as many fishers are unable to afford the necessary equipment and provisions for fishing, and thus resort to taking loans in order to fish. For all of these reasons, there is a need to reduce the dependence of local communities on fishing. Providing alternative means of earning income to members of these communities could help to support the livelihoods of people currently dependent on fishing, while also preserving threatened fish resources in and around protected areas.

Besides fishing, there is a lack of alternative economic opportunities for local communities to support their livelihoods. Other products are collected from the SRF as well, for example, by *mouwali*, who are honey collectors, and *bauwali*, who are collectors of golpata (*Nypa fruticans* palm leaves used for thatching). These activities entail many of the same problems as fishing for a livelihood. Some collecting is done legally, but there is also illegal harvesting of forest products (Zohara 2011). To address the lack of alternative income-generating activities and the high levels of dependence on the forest and the fisheries among local residents, the Bangladesh Forest Department (FD), with assistance from the United States Agency for International Development (USAID), initiated activities for co-management of natural resources in SRF through the Integrated Protected Area Co-management (IPAC) program. IPAC aims to expand local economic options by providing communities with the means for alternative income-generating activities (AIGAs), including some training and inputs such as stock for fish culture, supplies for vegetable gardening, sewing machines, and rickshaw-vans. The experience of co-management in SRF reveals that AIGAs are an effective means to reduce people's dependence on fishery resources and to enhance their livelihoods by diversifying their economic opportunities.

The present study seeks to (1) assess the dependence of fishers on fishing and fishing loans before and after they receive loans/grants for AIGAs; and (2) identify the impacts of AIGAs on fishing dependence and damaging fishing practices (especially poison fishing). This study should be useful for policy makers in government agencies and NGOs. Its goal is to provide information that will lead to policies that benefit fishermen and forest-dependent communities while promoting the sustainable management of these sources.

Background

Study Area

In accordance with the Bangladesh Environment Conservation Act (BECA) of 1995, the Department of Environment (DoE) declared nearly 40,000 hectares of Bangladesh as Ecologically Critical Areas (ECAs), where the ecosystem is considered to be threatened and in a critical state (DoE 1995). A separate 10-kilometer wide area surrounding the northern and eastern boundary of the SRF was declared an ECA with the main objective of providing protection to the SRF and conservation of its biodiversity (DoE 1995). This ECA fully covers 26 unions and partly covers 21 unions of five districts (FD 2010). This study was conducted in Chandpai Union of Bagerhat District, which is located entirely within the ECA (Figure 1).

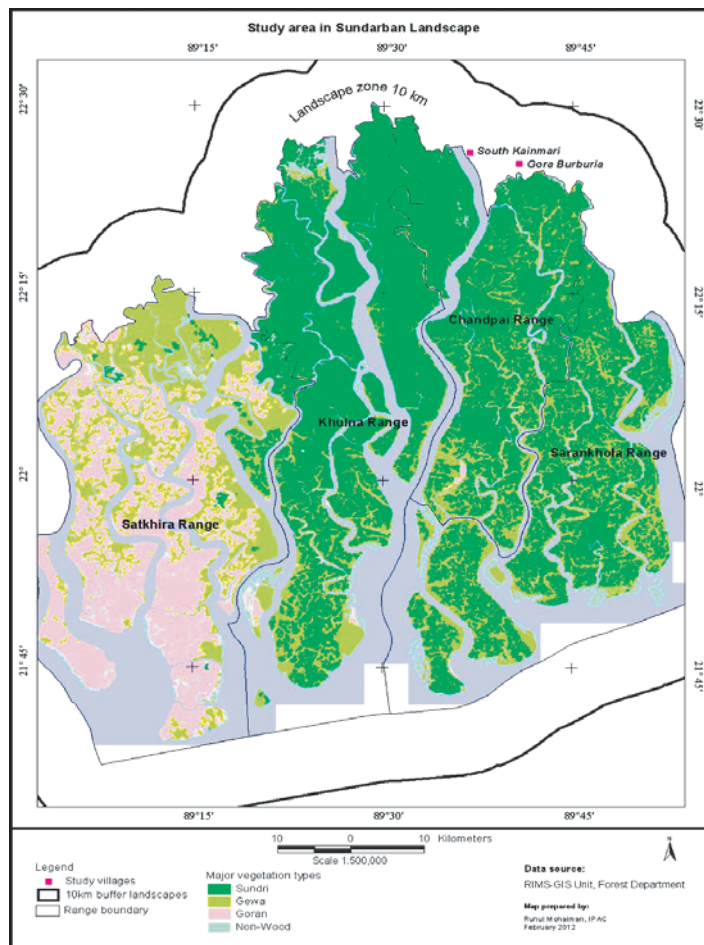


Figure 1: Map of the study area (Source: IPAC)

In the Sundarbans ECA, there are four co-management committees (CMCs), which focus on capacity building within the Sundarbans. There are about 209 village conservation forums (VCFs), which concentrate on reducing illegal activities in SRF with the help of the Forest Department, as well as on identifying the poorer members who are in need of AIGAs within these CMCs' areas. These CMCs and VCFs were formed to facilitate the participation of local people in the management of the resources. These groups provide linkages between people and government agencies and departments. There are 34 VCFs in the Chandpai CMC area, incorporating 437 households (IPAC 2011).

Farmers in the Sundarbans have converted agricultural lands into *gher* (blocks of agricultural land used for shrimp cultivation) because of the high economic returns from shrimp production. Shrimp cultivation requires farmers to use saline water, and hence these lands have now become unproductive for agricultural purposes. This alternation in the ecosystem has also reduced fish nursing areas and the movement of spawn and hatchlings. As a result, fisheries production is decreasing in the ECA.

Wetlands in the ECA include canals and river branches that are connected with the main rivers flowing through the Sundarbans. Many of the smaller canals have few connections with the larger rivers, and some have lost connectivity with larger rivers after becoming full of silt. This has caused their flow to become seasonal, with low water retention in the dry season. Upstream rivers and canals have also become full of silt, blocked, and extinct. Salinity is increasing in the area due to the reduction of freshwater flows. These changes in the wetlands have had socio-economic consequences, because with the reduction in fishing opportunities, unemployment rates have risen (FD 2010). As a result, larger numbers of local people now depend on the SRF for their livelihoods.

To reduce the dependence of the local people on the ECA of SRF for their livelihood needs, the IPAC project started to distribute AIGAs. IPAC has offered four basic types of AIGAs to encourage income-generating activities based on (1) fish culture; (2) vegetable gardening, (3) sewing machines, and (4) rickshaw-vans. However, as of June 2011, only eight percent of VCF members had received AIGA support.

Description of Fishery Resources

The Sundarbans provides a unique spawning and nursery ground for many species of marine fish and shrimp. This ecosystem supports 27 families and 53 species of pelagic fishes, 49 families and 124 species of demersal fishes, five families and 24 species of shrimps, three families and seven species of crabs, two species of gastropods, six species of pelecypods, eight species of locust lobster, and one family and three species of turtles (IUCN 1994). Despite this diversity, there has been an overall decrease in the number of fish species, and fisheries production has been reduced by 23 percent in the last 12 years (Shah *et al.* 2010).

To introduce rational harvesting of wetland resources and to improve fisheries resource conservation, the Bangladesh FD has implemented a number of fisheries management measures. These include fishing bans (implemented year round in wildlife sanctuaries, from July to August in canals, and from February to May in beels); species bans for selected fish and shellfish; limits on the size of fish that can be caught; regulation of the types of gear that can be used, with bans on some types; limits on the seasons that certain types of gear can be used; boat licenses; fishing permits; and time limits on fishing periods.

In the Sundarbans, inshore fishing is carried out using non-mechanized boats, while offshore fishing generally involves mechanized boats. Most fishers do not have enough of their own financial resources to equip themselves with fishing gear and other equipment, and thus they are heavily dependent on credit from *dadondar* (local moneylenders who charge extremely high interest rates).

Methods

I conducted this study in two villages of Chandpai Union of Bagerhat District, which is located entirely within the ECA. After holding a group discussion with CMC members, I selected the two villages, Dokkhin Kainmari and Goraburbaria, for the study because most of the people living in these villages are fishers and have already received AIGAs from IPAC. IPAC provided AIGAs to these villagers based on their dependence on SRF, number of family members, and income levels. The AIGA opportunities provided included fish culture, vegetable gardening, sewing machines, and rickshaw vans. I selected 27 households to interview about their livelihoods before and after they received AIGAs (Table 1).

IPAC provided AIGA grants to support fish culture (valued at BDT 2,200 per participant) consisting of fish feed and 10 kilograms of calcium carbonate for refreshing the ponds. Among my respondents, 12 households in Goraburbaria and 10 in Dokkhin Kainmari were provided with AIGAs for fish culture. IPAC provided grants/loans for vegetable gardening (valued at BDT 500 per participant) consisting of vegetable seeds, fertilizer, and protecting nets to cover the crops. As these grants were made in May 2009, I was only able to interview one of these households.

Table 1: Categories of AIGAs

Category	Goraburburia			Dokkhin Kainmari		
	Total AIGAs	Surveyed AIGAs	% of surveyed AIGAs	Total AIGAs	Surveyed AIGAs	% of surveyed AIGAs
Fish culture	23	12	52%	82	10	12%
Vegetable gardening	13	1	8%	8	0	0
Rickshaw-van	1	1	100%	2	1	50%
Sewing machine	0	0	0	3	2	67%
Total	37	14	38%	95	13	14%

I randomly chose participants from different age groups. The number and percentage of respondents per age group was 21–30 (2, 5%), 31–40 (13, 32%), 41–50 (8, 28%), 51–60 (12, 20%) and 61–70 (6, 15%). Interviews were conducted using a prepared questionnaire.

I began my work by collecting secondary data from various literature, reports, and records. I then collected primary data using a structured household survey to estimate how dependent people are on fishing. The survey included questions on various demographic and socio-economic parameters such as occupation, credit availability, and others opportunities. I compared statistics between the AIGA and non-AIGA households. The numbers and percentages of surveyed households are shown in Table 2.

Table 2: Households surveyed within the study villages

Name of Village	No. of VCFs	Received AIGA	
		Total Households	Surveyed Households
DokkhinKainmari	1	82	17 (21%)
Goraburburia	1	23	10 (43%)

I also conducted two focus group discussions. The first was with four representatives of the co-management committee (CMC) and the second was with five local officers from the FD (a range officer, a deputy ranger, a forester, a forest guard, and a boat man). I asked the focus group discussion participants about the present status of fishing and any changes in peoples' livelihoods or the environment since the implementation of AIGA activities in the study area.

Results and Discussion

Many of the households in the study area are dependent on fishing activities in the ECA of SRF. These households have already turned their paddy lands into gher for shrimp farming by keeping them continuously inundated with salt water. As a result, crop production has been reduced. Because shrimp culture is less labor intensive than agriculture, employment opportunities have also decreased. With the gradual extension of shrimp fields and their expansion into homestead areas, grazing grounds for cattle are fast diminishing and fresh water for stock feeding and domestic consumption is becoming scarce. As they have no legal alternative sources of food and income, people go into the SRF for subsistence and small-scale commercial fishing.

To address the high dependence on fishing in the SRF, IPAC began distributing AIGAs to the VCF participants in May 26, 2009. The study period was in the summer of 2011. Hence, it is too early to definitively assess how these benefits affect people's fishing dependence. Nevertheless, although it is a slow process, I found that people who received AIGAs were doing better in both of the two study villages. I observed that fish cultivation is one of the most successful AIGAs. Most participants derive a good income from this type of AIGA. Before the introduction of this activity, most of their ponds were fallow and they did not use them for fish cultivation.

Vegetable gardening is another AIGA supported by IPAC. The individuals involved in this activity have developed and improved their livelihoods by a small amount. They attempt to grow different types of vegetables year round. They have earned some returns from their AIGAs, but they do not have much capital for continuing their vegetable gardening. They generally spend everything they earn from vegetables to meet their daily needs. A member of one AIGA household in Goraburberia earned BDT 8,000 last year from selling vegetables raised on his land. He is continuing his efforts this year and expects to earn a good income from selling his products. Because most cultivable land has been converted into gher for shrimp cultivation, little land is available for cultivating gardens. Consequently, people living in this area are bound to import vegetables from nearby districts.

Rickshaw-vans and sewing machines are the other two types of AIGAs. These two options were started in the middle of 2011. One of the participants I interviewed now drives a rickshaw-van in Dokkhin Kainmari. Previously, he fished all year round but now he has decided not to fish. He earns approximately BDT 300 daily from driving his rickshaw. This has changed his livelihood. Many VCF families are interested in these kinds of activities. The IPAC program included three months of training for these activities. If IPAC could give more support to sewing machine and rickshaw-van owners by providing them proper training, these VCF members would be greatly benefitted.

Considering that 207 VCF members are completely dependent on the Sundarbans for fishing, the amount of AIGAs is insufficient. As of August 2011, 145 of the 207 VCF members (70%) in Chandpai ECA had received AIGAs. About two thirds of the VCF members have received AIGA grants worth BDT 3,000 to 4,000 per member.

Impacts of AIGAs on Fishers' Socio-economic Status in SRF

According to the socio-economic data that I collected, in terms of age groups, the largest group of fishers who took part in the study are between 31 and 40 years of age (32%). About 80 percent of the fishers have received some education (ranging from the first year to completion of secondary school), but about 27 percent of fishers can only sign their names. Rabbani and Sarker (1997) reported that 22 percent of the fishers in SRF can write their names and only 16 percent can read and write. The present study also asked the fishers' households about their family sizeduring and after the AIGA period, and found no significant change, with only a minor increase after AIGAs were introduced. In terms of the quality of the fishers' homes, the study found that only 7 percent of the households had electricity before the AIGAs, and 11 percent had electricity after AIGAs were introduced. Forty-four percent of the houses had tin roofs and 56 percent had golpata roofs. Forty-two percentof the houses were made of wood, and 93 percent of them had earthen floors.

Impacts of AIGAs on Fishers' Dependence on Fishing and Fishing Loans

The first goal of this study was to assess the dependence of fishers on fishing and fishing loans before and after the AIGAs. My study reveals that about 48 percent of the fishers were fully dependent on fishing-related activities for their livelihood, meaning that they spent 10 to 12 months per year fishing, before they received AIGAs. This was reduced to 44 percent after the AIGAs. About 37 percent of the fishers surveyed were partially dependent (spending four to six months per year) on fishing before they received AIGAs, and this was reduced to 26 percent after the AIGAs. Table 3 presents the surveyed households' level of dependence, in terms of months per year, on fishing-related activities before and after the AIGAs.

Table 3: Fishing dependence before and after AIGAs

Dependence (months per year)	Dependence before AIGAs	Dependence after AIGAs
1-3	4% (n=1)	15% (n=4)
4-6	37% (n=10)	26% (n=7)
7-9	11% (n=3)	15% (n=4)
10-12	48% (n=13)	44% (n=12)

The results of the surveys presented in Table 4 suggest that AIGAs had a minor impact on fishing activities in the wetlands. Fishers collected slightly less post larvae fish (5 to 25 days after hatching), crabs, hilsa (*Hilsa ilisha*), and other fish after they received AIGAs than they did before. The AIGAs, however, did increase fishers' dependence on non-fishing activities. The information shown in Table 4 suggests that hilsa fishing decreased and fishers invested more time in activities like growing fish in private ponds. Because hilsa fishing is offshore fishing, changing this type of activity will reduce the dependence of fishers on SRF.

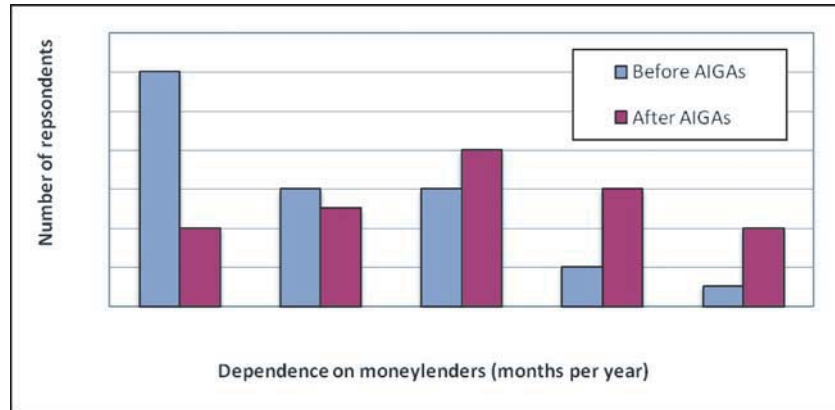
Table 4: Proportion of income from fishing vs. non-fishing activities (before/after)

Types of activity	Activities	Before AIGAs (no. of HH)	After AIGAs (no. of HH)	Percentage change
Fishing types	Post larvae fish collection	22	21	-4.5%
	Crab collection	11	12	9.1%
	Hilsa fishing	12	10	-16.7%
	Other fishing	21	20	-4.8%
Non-fishing types	Livestock	1	1	0.0%
	Poultry	7	5	-28.6%
	Fish culture	2	6	200.0%
	Van pulling	0	1	0.0%
	Daily labor	5	3	-40.0%
	Small trade	1	2	100.0%
	Others	10	7	-30.0%

Although there are policies and programs for making credit support to poor and marginal fishers available from formal financial institutions, most fishers do not benefit from these programs. Most fishers borrow money from local moneylenders instead of using formal loan facilities from scheduled banks. An absence of collateral, too-small loans, poor communication networks, a fixed monthly repayment system, and poor repayment rates are the major constraints for the provision of credit by scheduled banks. So the fishers have to take loans from local moneylenders to equip themselves with the gear that they need in order to fish. These loans come with high interest rates.

In the two study villages, Goraburbaria and Kainmari of Bagerhat District, I found that 96 percent of the fishers had taken loans from local moneylenders before receiving AIGAs, while 85 percent had taken such loans after. The study found that AIGA households reduced their dependence on loans from informal moneylenders after they received AIGA support (Figure 2). The study also showed that fishers do not get fair prices for their fish.

Figure 2: Fishers' dependence on moneylenders before and after AIGAs



Impacts of AIGAs on Fishing Dependence and Damaging Fishing Practices

The second goal of this study was to identify the impacts of AIGAs on fishing dependence and damaging fishing practices in particular, using poison to catch fish.

My study revealed that in Chandpai ECA there are full-time fishers who depend on fishing for their livelihoods for more than 10 months per year. The other fishers depend on fishing for nine or fewer months per year and are engaged in other activities for the rest of the year. In terms of the impacts of AIGAs on fishing, my key informants told me that, nowadays, due to the reduction of fishes in the SRF, some dishonest fishers try to catch fish by pouring poison into the water, which is a quick way to kill a lot of fish at one time. By using poison in the water, however, they also kill the hatchlings of many fish species and the zooplankton, which is the most important food of fish and other marine creatures. My key informants also informed me that the size of the AIGA grants is insufficient to change their livelihoods; they are not large enough for them to develop alternative income-generating activities that would meet the needs of their families. For example, while the fish culture AIGA grants help them to increase their incomes, they still need to fish. Nevertheless, my study suggests that people are fishing less today than in the past. The other AIGAs implemented by IPAC in this area vegetable gardening, rickshaw-van pulling, and using sewing machines may have a greater impact on fishing in that they have the potential to change the professions of households so that they would stop catching fish in the SRF.

In terms of damaging fishing practices, my key informant interviews suggest that CMC meetings are increasing fishers' awareness of the damage caused by poisoning fish. The study also reveals that while legal instruments exist to stop fish poisoning,

the Forest Department and other agencies lack the capacity to stop fishers from using poison. However, building fishers' awareness through CMC meetings and better enforcing bans on using poison to kill fish should lead to a gradual decrease in this damaging practice.

Factors Influencing Fishing

From the interviews with key informants, I learned that in the study area people fish because they have no alternative sources of income to meet the requirements of their families. Because fishing requires less labor and investment, because fishers have easy access to SRF for fishing, and because demand exists in the markets for fish, most people do not think of trying other income-generating activities. Furthermore, fishing is their traditional profession, which they inherited from their grandfathers, and they are habituated to this profession. The additional fact that these fishers are very poor means that they must take loans to meet their daily needs; they incur a great obligation to repay the loans, and then they must fish to repay the loans, going deeper into debt with the moneylenders in order to have the funds necessary to fish. All of these reasons combine to trap people in the fishing profession.

Conclusion

In conclusion, I would like to make three suggestions. First, the AIGAs that are provided by government organizations or NGOs with the goal of changing fishers' livelihoods must be larger and distributed more widely if they are to be sufficient for supporting such change. Second, there must be a greater emphasis on awareness programs in the ECA of the SRF, to increase the local residents' knowledge and understanding of sustainable practices. Third, it is crucial that more effort be put into halting fish poisoning; the Forest Department must receive more support so that it is able to enforce the ban on using poison to catch fish. These suggestions, if followed, will help fishers living in the SRF ECA to reduce their dependence on fishing, as well as preserving threatened fish resources in and around the protected areas.

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