

Community attitudes toward forest conservation programs through collaborative protected area management in Bangladesh

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Abstract The formulation of conservation policies with options for creating protected areas is significantly influenced by the social factors of the surrounding communities. Therefore, indigenous knowledge, attitudes and perceptions of the local communities need to be explored during the planning and implementation stages of conservation projects. A government-initiated experiment in co-management was conducted in the Rema-Kalenga Wildlife Sanctuary, Bangladesh. This paper analyzes the attitudes toward conservation by members of local communities living in and around the wildlife sanctuary. Training incentives on alternative income-generating (AIG) activities and allotment of agricultural lands were distributed among the Forest User Groups. It is of interest to policy makers and

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resource managers whether this technique leads to improved attitudes on the part of local people. Although there were different attitudes toward protected areas and conservation, overall, a favorable attitude of the respondents was observed. The opinions of respondents also varied based on factors such as village position, village dependency level on forest resources, ethnicity and gender. Increase in annual income resulting from the augmented skills by trainings on AIG activities and getting agricultural lands leased from the Forest Department contributed significantly to the variation in respondents' conservation attitudes. It is suggested that eliminating inequity and inequality in incentive distribution, discovering and launching training on more need-based livelihood activities, and liberalizing the restriction of resource extraction from the protected area by fixing the harvesting limit would encourage the community to be more cordially and actively involved in the conservation efforts of the sanctuary.

Keywords Biodiversity conservation · Protected area · Stakeholders · Forest User Group · Bangladesh

1 Introduction

Worldwide archeological investigations suggest the existence of early human habitation in the forests (Ichikawa 2012), many of which have now been designated as conservation areas. Protected areas provide all the four categories¹ of “ecosystem services” that help to meet the needs of local communities who live in and around them (MEA 2005; Suckall et al. 2009). Although protected areas have usually been set aside from human exploitation, it is now increasingly recognized that they should play a role in sustaining livelihood of adjacent local communities (Charnley et al. 2007). Local people, especially those living in and around protected areas, have important and long-standing relationships with these areas. Their needs, aspirations and attitudes should be considered in protected area management. Otherwise, the long-term survival of protected areas will be jeopardized (McNeely 1990). Previously, conservationists have generally ignored traditional exploitation as a way to conserve biological diversity, preferring instead to protect natural systems by excluding people from parks and reserves and, in doing so, denying them access to vital natural resources (Dolisca et al. 2007). The premise of this strategy is that local community resource use will conflict with conservation (Weeks and Packard 1997). The conflicts between the authority of conservation areas and the local people are often a result of a disconnection between the conservation regulations and local conditions (Ostrom 1990). McNeely (1990) echoes this point, suggesting the long-term protection of environmentally sensitive areas is threatened if people living in and around protected areas are ignored. For example, Trakolis (2001) describes how, during the establishment of the Prespes Lakes National Park in Greece, a top-down decision-making process excluded the local community. As a result, conflicts arose with the local people resenting the imposition of the national park. The long-term survival of protected areas in developing nations will be jeopardized if needs, aspirations and attitudes of local people are not accounted for

¹ According to Millennium Ecosystem Assessment (2005), the four categories of ecosystem services are: provisioning (e.g., food, water, wood & fiber, fuel), regulating (e.g., climate regulation, flood regulation, disease regulation, water purification), cultural (e.g., esthetic, spiritual, educational, recreational), and supporting (nutrient cycling, soil formation, primary production).

(Mehta and Heinen 2001). To improve protected area management, perceptions and attitudes of the participants need to be studied, which, as Sewell (1973) pointed out, will aid in identifying the problems and recognizing potential solutions for developing appropriate strategy. Also, the outcome of decision-making is affected considerably by the perceptions and attitudes of participants in the process (White 1966).

Indeed, communities whose livelihoods chiefly involve the direct exploitation of local natural resources often come into conflict with the institutions of protected areas, which are primarily designated for natural resource conservation or preservation (Anthony 2007). The general theme is that local people's perceptions of protected areas depend on their perceived cost and benefit from protected areas, their dependence on local resources and their knowledge about protected area management. Because local people are not homogeneous and do not share common norms, their interests and resource use patterns vary greatly at both the individual and household level (Xu et al. 2006). Disregarding their diversity would cause detrimental effects to local people and hinder the achievement of conservation and management objectives (Agrawal and Gibson 1999; Geoghegan and Renard 2002). Therefore, managers and planners of protected areas are required to identify and understand the different interests of individuals, assess their dynamics and integrate the pertinent information into protected area management. There is growing empirical evidence indicating that assessment of local responses toward protected areas is a crucial step in gathering information that can be incorporated into decision-making processes and lead to people–park conflict mitigation (Jim et al. 2002; Rao et al. 2003). Indeed, local communities' perceptions of protected areas influence the kinds of interactions people have with them and thereby conservation effectiveness (Allendorf et al. 2006). Their perceptions of protected area management also play an important role in their attitudes toward them (Allendorf et al. 2006; Anthony 2007). Therefore, understanding local residents' perceptions about conservation is key to improving the relationship between people and protected areas and will subsequently help to achieve the goals of protected areas (Weladji et al. 2003). Meanwhile, it has been increasingly recognized that protected areas are contributing on the lifestyle and livelihoods of local communities (Charnley et al. 2007) who have important and historical relationships with these areas. Rashid et al. (2013) pointed out that local people's support and involvement should be incorporated in protected area management; otherwise, conservation effort through protected areas will be ineffective. Consequently, various alternative approaches to conservation have been suggested, the most popular of which include the collaborative governance arrangements and combining conservation and development within projects (Oil 1999). The development of management partnerships, termed "collaborative management" or "co-management," involving all the major stakeholders is a relatively well-recognized management approach to reconcile cultural and biodiversity conservation in protected areas (DeKoninck 2005; Berkes 2009). The trend is away from exclusive management models toward inclusive models that involve a high degree of local participation, recognize the links between nature and culture, and employ collaborative approaches that incorporate the traditional resource rights of local communities (Phillips 2002). There has been the moral argument underlying this to the effect that conservation goals should contribute to rather than conflict with basic human needs (Mahanty et al. 2007). Purnomo and Mendoza (2011) remarked this policy as the most viable option of protected area management that leads to a win–win situation for all the stakeholders involved. Because, this approach not only addresses livelihood security of local communities but also deals with various management functions, rights, responsibilities and the scope of negotiation in a given set of area and or resources (Kothari et al. 1996).

In Bangladesh, conservation of biological diversity through protected area management emerged as a major concern of the state Forest Department since the last decade. Recognizing the inadequacy of conventional forest management, the government has been exploring various alternatives (Rana et al. 2007). Establishing additional protected areas and at the same time increasing community involvement in resource management are two important strategies of the government. Declaration of forests, or parts of forests, as protected areas in Bangladesh dates back to 1960s under the provision of the Forest Act 1927 that was further fortified in the comprehensive legislative instrument of the Bangladesh Wildlife (Preservation) Order 1973 (Chowdhury et al. 2009). The mission got its momentum with multifarious regulatory provisions of biodiversity conservation articulated in the Wildlife (Preservation and Protection) Act 2012, where the approach of co-management has been emphasized (BFD 2013). Although it is a stern challenge to keep the forest aside as “protected” in such a densely populated country like Bangladesh where around 85 % rural people are diversely dependent on forest resources, the government is showing its keenness to biodiversity conservation (Balasinorwala et al. 2008; Chape et al. 2008). Today, there are 34 protected areas in Bangladesh encompassing all forest and ecosystem types throughout the country. Among those, 17 are national parks and 17 are wildlife sanctuaries (BFD 2013). Co-management approach, with a view to achieving better conservation outcomes along with sustainable community development, was initiated in 2004 in five protected areas under the name “Nishorgo Support Project (NSP)” by the government with the assistance from USAID (Chowdhury and Koike 2010a). Rema-Kalenga Wildlife Sanctuary (RKWS) is one of these five pilot sites. The program has now been scaled up under the name “Integrated Protected Area Co-management (IPAC)” with broader scopes that included wetlands along with other forest protected areas. Mukul and Quazi (2009) suggested the continuance of the program to maintain the country’s forests and biodiversity through sustaining local livelihoods, especially when large numbers of the rural poor are forest dependent for their subsistence (Roy and DeCosse 2006). But one of the key challenges for the NSP in these protected areas was to provide people with alternative income-generating (AIG) options to reduce their dependency on forests and forest products. However, because the effort had limited financial resources, it was not possible to bring the entire forest-dependent communities under the umbrella of AIG (Rashid et al. 2013). The authority was obligated to form Forest User Groups (FUG) with selective stakeholders, primarily from the neediest households, for offering AIG packages with a view to supporting their livelihoods (Chowdhury et al. 2009). Additionally, to promote participation in protected area management and decision-making, NSP formed legal institutional structures in the name of Co-management Councils and Co-management Committees (CMC) in each of the pilot sites officially (Bangladesh Gazette No. pabama/parisha-4/nishorgo-64/(part-4)/112 dated August 10 2006). These institutional structures were formed taking representatives from all stakeholder groups including civil society, local government, local residents and resource user groups, and other government agencies (Chowdhury et al. 2009). There were monthly meetings in these sites where members of the committees were informed any progress or initiatives taken in their respective protected areas and could share their views, needs and/or any recommendations for better management of the sites (Rashid et al. 2013).

In the context of such variegated characteristics of the surrounding communities, it is, therefore, essential to understand how heterogeneity within a community can result in a diverse range of attitudes and perceptions toward a protected area and how these attitudes and perceptions can impact on long-term management (Suckall et al. 2009). Mulder et al. (2009) are of the opinion that the conservation community has a special responsibility to

foster conservation awareness in the people living in the vicinity of conservation areas that have inordinately high levels of biodiversity. Taking all of these issues into consideration, this study was conducted among the local communities in and around Rema-Kalenga Wildlife Sanctuary, Bangladesh, to analyze attitudes regarding various perceptions of forest conservation, community development and people’s participation in a co-management program.

2 Materials and methods

2.1 Study site

Rema-Kalenga Wildlife Sanctuary (Fig. 1) is situated in Gazipur and Ranigaon unions (small administrative unit of the local government) of Chunarughat upazila (sub-district) in Habigonj district, Bangladesh (24°06′–24°14′N latitude and 91°34′–91°41′E longitude) (BCAS 2008). It is under the jurisdiction of Habigonj-2 Forest Range of Sylhet Forest Division located approximately 130 km east–northeast of the capital Dhaka and 80 km southeast of Sylhet city. The sanctuary is bounded by Tripura State of India to the south and east, the Kalenga Forest Range to the north and west, and tea estates to the southwest. Bioecologically it falls under the Sylhet Hills zones as part of the Tarap Hill Reserve Forest, of which 1,095 ha was first designated as wildlife sanctuary first in 1982 before being expanded further to 1,995 ha in 1996 under the Bangladesh Wildlife (Preservation) Order 1973.

The sanctuary is divided into three beats (small administrative units of the Forest Department) namely Rema, Chonbari and Kalenga. It encompasses several hills of various elevations and low-lying valleys, with the highest peak at about 67 m above sea level. The area is characterized by a moist tropical climate with a period of high rainfall from April to September and a relatively dry period from November to March. The forest of Rema-Kalenga was declared a wildlife sanctuary due to its biodiversity values and conservation needs. It is characterized as tropical evergreen and semievergreen forest housing a total of

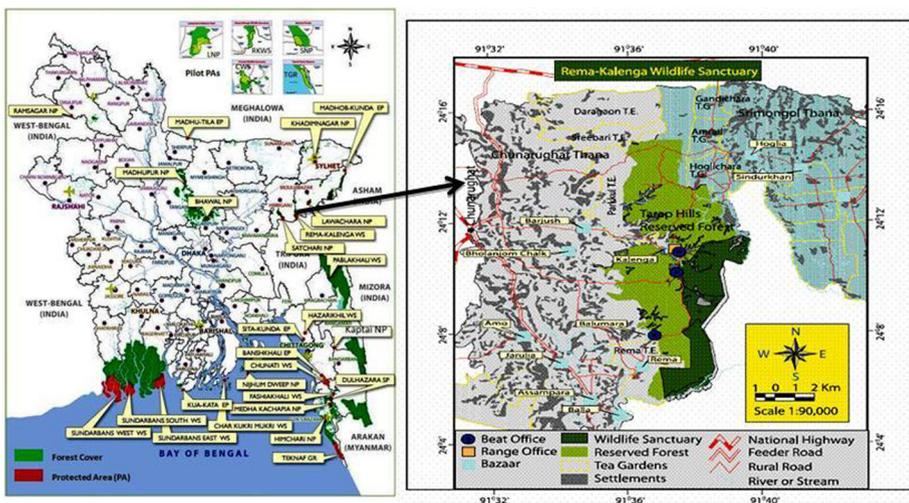


Fig. 1 Map of Rema-Kalenga Wildlife Sanctuary, Bangladesh

606 plant species and 167 wildlife species (NACOM 2003). The RKWS is the home of several globally endangered primates such as hoolock gibbon/*Hylobates hoolock* (critically endangered), capped langur/*Trachypithecus pileatus* (endangered), Phayre's langur/*Trachypithecus phayrei* (critically endangered) and Bengal slow loris/*Nycticebus bengalensis* (critically endangered) (IUCN 2000). It also houses other mammals, the number of which has been decreased locally in the recent past. These are black giant squirrel (*Ratufa bicolor*), leopard (*Panthera pardus*), masked palm civet (*Paguma larvata*), sambar (*Cervus unicolor*), barking deer (*Muntiacus muntjak*) and northern pig-tailed macaque (*Macaca leonina*) (Khan 2008). The presence of all these wildlife signifies the government's effort to protect their habitat in this conservation area.

2.2 Background of the local stakeholders

The settlement history of the Tarap Hill Reserve Forest that surrounds Rema-Kalenga Wildlife Sanctuary goes back to 40–100 years (NACOM 2003). The sanctuary is the part of government-owned forestland and has been subject for years to massive exploitation by neighboring people for subsistence and income, traditionally extracting fuelwood, medicinal plant parts, wild edible vegetables and fruits, fodders for livestock, and other non-timber forest products (NTFPs) (Chowdhury and Koike 2010b; Chowdhury et al. 2011, 2013). Based on the intensity and patterns of their resource extraction from forests, the local communities were informally categorized as major, medium, minor-medium and minor stakeholders by the development organizations (IRG 2004). A total of 36 villages have been identified as having varying degrees of interest in the sanctuary (10 are major stakeholders, six medium, 15 minor-medium and five minor). One village is located inside the sanctuary (in the core zone), 10 are adjacent (in the buffer zone) and 25 are outside (neither in the core nor in the buffer zone). The households living in villages inside and adjacent to the forest are registered with the Forest Department and recognized as forest villagers (people who are allowed to live on the public land but with no specific legal land rights). Eight of them are inhabited by a number of ethnic communities like *Tripura*, *Santal*, *Urang*, *Kharia*, *Kurmi*, *Goala*, *Munda* and *Bunargi* among whom *Tripura* makes up approximately 90 % of the total ethnic population (Uddin and Roy 2007).

Agriculture is the primary occupation of the people living both inside and outside the sanctuary, whereas collection of forest resources is generally a secondary livelihood activity (NSP 2009). In order to reduce pressure on the sanctuary, the Forest Department has introduced several alternative income generation (AIG) activities for local communities while initiating the co-management approach under the Nishorgo Support Project (NSP) in 2004. DeCosse (2006) estimated that the total population of these villages is 24,000, 90 % of whom are poor or ultrapoor. He suggested that even if the project allocated its entire budget to address the needs of this huge population, it still would not have an impact. For this reason, NSP formed the Forest User Groups (FUGs), which consist of an average number of 12 members selected from among the most deprived people of the surrounding communities (NSP 2009). A total of 67 FUGs were formed from the 36 villages, and among them, 30 groups are comprised of female stakeholders.

3 Methods

This was a micro-approach study, conducted among the members of the FUGs of Rema-Kalenga Wildlife Sanctuary in the months of January and February 2009. Multi-stage

partly random sampling was used in the study. A preliminary discussion was carried out at the Forest Range Office located in the sanctuary with the Forest Department officials, members of the Co-management Committee and local leaders of the community. The objective of the discussion was to provide information on the work intended, to collect an overall picture of the various stakeholders and forest-dependent local community and to select a village guide. An experienced middle-aged male was selected from the local community as to be the guide of the four-member research team. The team was headed by the first author and voluntarily assisted by the other three who were post-graduate students of the Department of Forestry and Environmental Science of Shahjalal University of Science and Technology, Bangladesh. The research assistants had the experience of community survey with background knowledge in forest–people relationship.

Out of the 36 villages of varying degrees of dependency, five were selected from major stakeholders, two from medium, two from minor-medium and one from minor stakeholders, making a total of 10 villages. In terms of position, one village was inside the sanctuary, five were adjacent, and four were outside. These are *Debrabari* (inside-major stakeholder), *Chanbari* (adjacent-major stakeholder), *Balumara* (adjacent-major stakeholder), *Kalengabari* (adjacent-major stakeholder), *Chakidarbari* (adjacent-major stakeholder), *Jamburachara* (adjacent-medium stakeholder), *Harinmara* (outside-medium stakeholder), *Himalia* (outside-minor-medium stakeholder), *Basulla* (outside-minor-medium stakeholder) and *Krishnanagar* (outside-minor stakeholder). The village sizes ranged from 18 to 300 households; therefore, we sampled the cent percent households from the villages with major stakeholders and 15–20 % from the others. Out of 67 FUGs, we selected 25 groups at random, five of which had female members. Finally, a total of 302 households were selected randomly for the study. An open-ended semi-structured questionnaire, pretested for the intelligibility in the local community, was used for the face-to-face interviews of the respondents. It was designed to gather information relating to various socioeconomic, demographic and cultural variables. Both the quantitative and qualitative data were collected during the study. Household heads (male 232, female 70) were the respondents and were assisted by other members of the family as necessary. In the family level, informal meetings were held in the interviewee's home using the native language (Bangla), sometimes with the participation of more than one respondent together, everyone being selected randomly. In addition, one focus group discussion was arranged in each village at the end of the survey. This was done to find the perception of the community and to cross-check the validity of opinions recorded during the interviews.

The measurement of respondent attitudes about various conservation issues was assessed using a Likert scale (Likert 1932). The Likert scale is a method of ascribing quantitative value to qualitative data, to make it amenable to statistical analysis. Likert scales usually have five potential choices (strongly agree, agree, neutral, disagree, strongly disagree) but sometimes go up to ten or more. A numerical value is assigned to each potential choice, and a mean figure for all the responses is computed at the end of the evaluation or survey. The final average score represents overall level of accomplishment or attitude toward the subject matter. Although this is mainly used in training course evaluations and market surveys, it has been widely used for assessing the community attitudes on natural resource management, protected and other conservation areas (e.g., Mehta and Heinen 2001; Baral and Heinen 2007; Rodela and Udovc 2008; Pipinos and Fokiali 2009; Nicholas and Thapa 2010). In our study, five choices with numerical values from 1 (strongly disagree) to 5 (strongly agree) were used. Attitude was defined using attitude theory (Ajzen and Fishbein 1980) as human psychological tendencies expressed by

evaluating a particular object with favor or disfavor, or, in this case, agree or disagree to the statements given. Data obtained were then organized and analyzed by using SPSS 15.

4 Results

4.1 Basic socio-demographic features of the respondents

The average age of the respondents was 41.38 (SE, 0.63) years, most of who were illiterate (77.5 %). The average size of their families was 6.14 (SE, 0.14) with average annual household income of Tk. 43,517.88 (SE, 1,203.35), nearly half of them (48.3 %) being short-term insolvent throughout the year. Most of them were farmers (72.8 %) having varied landholdings such as homesteads, agricultural lands of their own and agricultural lands leased from the FD (Table 1). The housing status of the respondents was dominated by tin-shed mud-walled category (55.3 %) followed by thatching grass bamboo fenced (27.2 %) and tin-shed bamboo fenced (22.5 %). Almost all the respondents (98.7 %) possessed various livestock (cattle, buffalo, goat, pig, chicken and duck) in their homes. The respondents were from both the *Bangalee* and tribal communities and were male dominated (76.8 %). They covered all the dependency levels (major, medium, minor-medium and minor) and positions (inside, adjacent and outside) of villages all around RKWS.

4.2 The incentives and changing pattern in respondents' occupation

About 82 % of the respondents received training from the Forest Department on various AIG activities, while the remaining (18 %) did not receive any training. Training on a total of 12 AIG options was given to the FUG members based on the selection by the co-management committee. Among the respondents who received AIG training, the highest proportion (16.2 %) were given training on vegetable gardening followed by pig rearing (15.8 %), bamboo-based handicrafts (13.4 %), cattle rearing (10.5 %), cloth weaving (10.5 %), fishery (9.3 %) and so on (Fig. 2).

On an average, the respondents possessed 24.26 (SE, 1.09) decimal² of land for homestead and 11.58 (SE, 2.19) decimal of own agricultural land. The Forest Department allotted the vacant plain lands inside the sanctuary to the local community in the form of physical incentives for practicing agriculture. An average of 177.27 (SE, 9.40) decimal of such vacant lands were allotted to the FUG members in the neighboring communities of the sanctuary. The respondents living inside the forest, having major dependency level on the sanctuary, belonged to the tribal community, and being male were found to have been allotted higher amount of lands such as 206.00 (SE, 48.07), 199.01 (SE, 14.30), 183.72 (SE, 18.05) and 189.07 (SE, 11.82) decimal, respectively. There were no significant differences in average landholdings of homestead, own agricultural lands and agricultural lands allotted by FD among the FUG members in terms of village position, village stake pattern and ethnicity except the gender of the respondents (Table 2). Significant differences ($p < 0.05$) were found in the amount of land in all the three categories among the male and female respondents.

A remarkable change in the respondents' occupation for securing livelihoods was noticed in the community. Before joining the FUG, the highest proportion of the

² The local unit of landholdings; 1 decimal = 40.46 sq m.

Table 1 Basic socioeconomic and demographic features of the respondents in RKWS

Parameters	Values
Farmers' age (years)	41.38 (SE, 0.63)
Gender (%)	
Male	76.8
Female	23.2
Average household size	
Total	6.14 (SE, 0.14)
Male	3.30 (SE, 0.09)
Female	2.83 (SE, 0.08)
Education (%)	
Illiterate	77.5
Primary	17.9
Secondary level	4.6
Average annual income (Taka)	43,517.88 (SE, 1,203.35)
Solvency status (%)	
Solvent	39.7
Surplus	3.3
Short-term insolvent	48.3
Long-term insolvent	8.6
Average land holdings (decimal)	
Homestead	24.26 (SE, 1.09)
Agro-land (own)	11.58 (SE, 2.19)
Agro-land (leased from FD)	177.27 (SE, 9.40)
Housing status (%)	
Tin-shed bamboo fenced	17.5
Thatching grass bamboo fenced	27.2
Tin-shed mud-walled	55.3
Livestock possession (%)	
Yes	98.7
No	1.3

community members (27.5 %) earned their livelihoods by the profession of day labor followed by forest product collection (27.2 %), agriculture/farming (22.8 %) and so on. But presently, most of them (72.8 %) were found to be involved in agriculture/farming that includes a variety of activities like cultivating agricultural crops, vegetable gardening, cattle rearing, poultry farming, pig rearing, fishery, fruit cultivation, etc. Illegal woodcutting and its sale in the market was also a livelihood strategy before which, in the changed situation, has been replaced with establishing plant nursery for seedling sale (Table 3). The category "others" include a variety of such other livelihood mechanisms as cloth weaving, handicrafts making, lower-level office worker, forest product collection, herbal practitioner, barber and middleman in various local businesses.

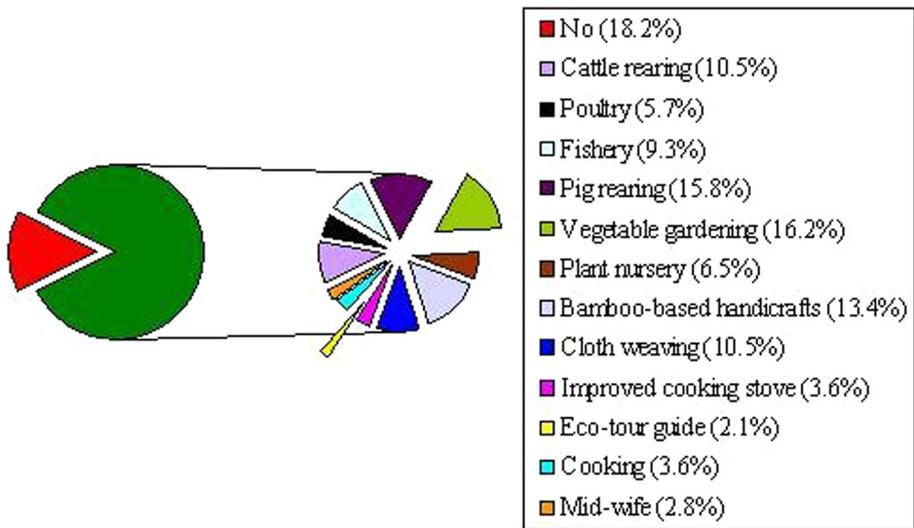


Fig. 2 Types of AIG training given to the respondents in the study area

Table 2 Average landholdings of the respondents' family in and around RKWS

Category	Average landholdings (decimal)		
	Homestead	Agro-land of own	Agro-land allotted from FD
Overall	24.26 (SE, 1.09)	11.58 (SE, 2.19)	177.27 (SE, 9.40)a
Village position			
Inside	21.00 (SE, 4.79)a	–	206.00 (SE, 48.07)a
Adjacent	25.34 (SE, 1.46)a	11.54 (SE, 3.08)a	194.44 (SE, 12.90)a
Outside	23.32 (SE, 1.73)a	13.37 (SE, 3.54)a	150.23 (SE, 13.86)a
Village stake			
Major	26.15 (SE, 1.70)a	11.51 (SE, 3.41)a	199.01 (SE, 14.30)a
Medium	22.23 (SE, 2.04)a	12.14 (SE, 4.32)a	174.95 (SE, 19.93)a
Minor-medium	23.39 (SE, 2.18)a	13.46 (SE, 4.52)a	148.19 (SE, 17.06)a
Minor	24.47 (SE, 4.59)a	–	146.40 (SE, 21.50)a
Ethnicity			
Bangalee	23.87 (SE, 1.23)a	12.58 (SE, 2.60)a	175.74 (SE, 10.83)a
Tribe	25.93 (SE, 2.35)a	7.45 (SE, 3.28)a	183.72 (SE, 18.05)a
Gender			
Male	25.49 (SE, 1.34)a	8.1842 (SE, 2.41)a	189.07 (SE, 11.82)a
Female	20.20 (SE, 1.47)b	22.63 (SE, 4.81)b	138.17 (SE, 9.26)b

SE standard error

a, b stand for indicating the levels of significant difference at the $p < 0.05$ significant level; similar letters indicate “no significant difference,” and dissimilar letters indicate “significant difference”

4.3 Change in community’s annual income

An increase in the average annual income was seen in the community. Before joining the FUG, their average annual income was Tk.³ 25,812.91 (SE, 756.14), which was increased to Tk. 43,517.88 (SE, 1,203.35) after joining the FUG. It was increased by as much as 68.56 %. If considered category-wise, the highest increase in average annual income was found in the respondents with major stake (Fig. 3).

4.4 Community attitudes toward conservation

There were 15 statements symbolizing the perceptions of forest and biodiversity conservation, community development and community participation in co-management activities. These were to measure the respondents’ attitude on those perceptions. The overall

Table 3 Changing pattern in the respondents’ occupation for sustaining livelihoods in the study area

Occupations before joining the FUG	Relative frequency (%)	Present occupations	Relative frequency (%)
Day labor	27.5	Agriculture/farming	72.8
Forest product collection	27.2	Small business	8.9
Agriculture/farming	22.8	Plant nursery	7.0
Illegal wood cutting	7.6	Day labor	5.0
Nothing	7.0	Housewife	4.6
House wife	3.6	Eco-tour guide	1.0
Small business	3.3	Others	0.7
Others	1.0		

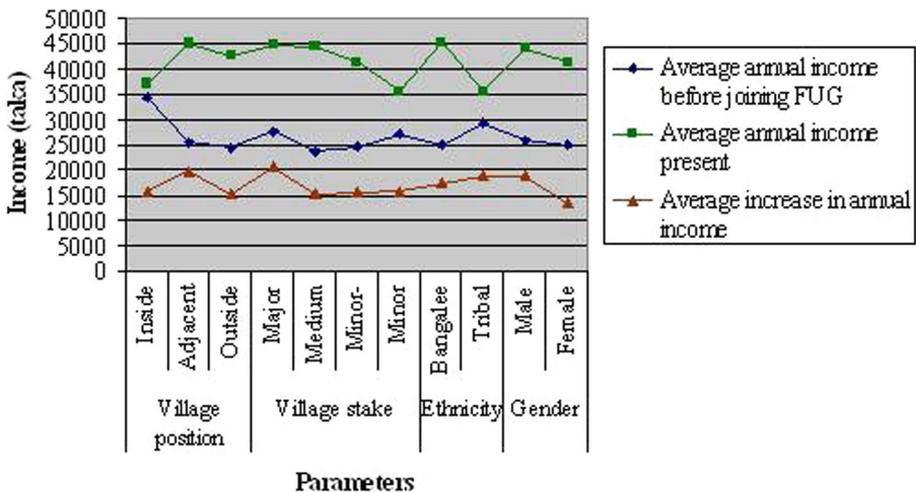


Fig. 3 Respondents’ average annual income before and after joining the FUG

³ Bangladeshi currency unit Taka. US\$1 = Tk. 78.00 as of September 2013.

Table 4 Mean score of respondents' agreeing or disagreeing with conservation statements

Sl. no.	Statements	Mean score	Remarks
1	Forests around my village have decreased in recent years	4.61 (SE, 0.04)	Strongly agree
2	It is responsibility of local people to protect natural resources	3.78 (SE, 0.07)	Agree
3	If there is unlimited access to forests for fuel wood and fodder, forests will be disappeared soon	4.78 (SE, 0.03)	Strongly agree
4	There are more wild animals now than 4 years ago	3.02 (SE, 0.07)	Neutral
5	What people and their livestock need are more important than saving plants and wild animals	2.97 (SE, 0.06)	Neutral
6	My living condition improved since the co-management started	4.08 (SE, 0.06)	Agree
7	After the establishment of buffer zone forests/reserve I don't have problem of access to resources	2.59 (SE, 0.06)	Disagree
8	It is important to set aside a place for the animals and plants to live in	3.56 (SE, 0.05)	Agree
9	It is important to protect the animals and plants so that our children may know and use them sustainably	4.20 (SE, 0.05)	Agree
10	There is an equitable distribution of common pool resources and benefits to the communities by CMC/FD	1.38 (SE, 0.04)	Strongly disagree
11	I am willing to contribute for conservation process	4.58 (SE, 0.03)	Strongly agree
12	AIG activities are able to reduce pressure on forests	4.48 (SE, 0.04)	Agree
13	We are now more aware of conserving forests due to campaigning by NSP	4.10 (SE, 0.05)	Agree
14	Training on improved stove is necessary to know how forest can be saved using less amount of wood	2.75 (SE, 0.06)	Disagree
15	The behavior and attitude of the FD official toward local marginal people have been changed positively since the co-management started	3.01 (SE, 0.06)	Neutral

attitudinal measures are shown in Table 4. The levels of people's attitude according to various categories are given in the supplementary documents. Additionally, results of paired *t* test for the respondents' attitude levels to the incentives are also presented in the appendices.

5 Discussion

The positive attitude among majority of the respondents of the surrounding community of Rema-Kalenga Wildlife Sanctuary regarding various dimensions of conservation perceptions is a very encouraging finding. Among the 15 statements (combination of conservation, socioeconomic development of the community and their participation grade), the respondents were found to "strongly agree" with three, "agree" with six, "disagree" with two and "strongly disagree" with one while remaining "neutral" with three statements. The evidence of forest degradation in recent past was reflected in their attitude on the perception of forest and biodiversity status, which was expressed by the statements "forests around my village have decreased in recent years" and "there are more wild

animals now than 4 years ago.” The former tells about the reduction in floral components in recent past and the latter about the increase in faunal components since the starting of the co-management. A varying attitude was noticed regarding the perception of forest and biodiversity conservation which was articulated by six statements, viz., “if there is unlimited access to forests for fuel wood and fodder, forests will be disappeared soon,” “what people and their livestock need are more important than saving plants and wild animals,” “it is important to set aside a place for the animals and plants to live in,” “It is important to protect the animals and plants so that our children may know and use them sustainably,” “We are now more aware of conserving forests due to campaigning by NSP” and “I am willing to contribute for conservation process.” The respondents agreed (Mean = 3.78, SE = 0.07) with the statement regarding the custodianship of forest resources that stated that the protection of natural resources should be the responsibility of local people. Perceptions of socioeconomic upliftment and the role of AIG trainings on it were found to be positive from their agreement with statements like “my living condition improved since the co-management started” and “AIG activities are able to reduce pressure on forests.” A matter of resource use conflicts was reflected from the communities’ disagreeing (Mean score = 2.59, SE, 0.06) with the particular statement “after the establishment of buffer zone forests/reserve I don’t have problem of access to resources.” A negative attitude on the perception of the activities of Forest Department as the project implementing authority was mirrored by the comparatively lower mean values of the three statements, such as “there is an equitable distribution of common pool resources and benefits to the communities by CMC/FD” (mean score = 1.38, SE = 0.04), “training on improved stove is necessary to know how forest can be saved using less amount of wood” (mean score = 2.75, SE = 0.06) and “the behavior and attitude of the FD official towards local marginal people have been changed positively since the co-management started” (mean score = 3.01, SE = 0.06). The positive attitude of the local people regarding various dimensions of two protected areas of Nepal was also revealed by Mehta and Heinen (2001), where about 85 % of respondents showed favorable attitudes toward the conservation areas. The Swiss farmers responded positively to the characteristics feature such as the naturalness, esthetics and diversification in field margins established for the sake of biodiversity conservation (Junge et al. 2009). In Pakistan, local communities living in the periphery of Chitral Gol National Park know about the importance of the protected area, as 68 % of them are friendly with park management and the willingness of communities to participate in the management and protection of wildlife is high (97.1 %) (Khan and Bhagwat 2010). Dimitrakopoulos et al. (2010) reported the presence of a relatively high level of knowledge in local residents regarding the existence of three wetland protected areas in Greece.

Local people’s perceptions are determined by their values and frames of reference (ecological, economic and ethnological/cultural) that lead to differences in needs, perceptions and attitudes along the lines of their personal attributes. It has been recognized that many demographical factors, such as age, education, residence location, affluence and ethnic origin, can significantly shape the attitudes of locals (Mehta and Heinen 2001; Bandara and Tisdell 2003). The people in the study area mostly had favorable attitudes on various perceptions. However, there are many similarities as well as dissimilarities according to the categories based on the village position, village stake level, ethnicity and gender. It was found that the perception of the respondents about wildlife population trends varied significantly ($p < 0.05$) among the communities according to the village position. This perception was measured by the respondents’ attitude on the statement “there are more wild animals now than 4 years ago.” There was no significant difference in the other

perceptions among the respondents according to the village position. The attitude on the similar perception along with the one of resource use conflicts was also found significantly different among the respondents according to the village dependency level. There was no significant difference in the other perceptions among the respondents according to the village dependency level. When ethnicity was taken into account, a significant difference was identified in respondents' attitudes to resource use conflict. This was determined by finding opinions on the statement "after the establishment of buffer zone forests/reserve I don't have problem of access to resources," while no significant difference was seen on other perceptions. The most significant difference was found in the mean values of the respondents' attitude about various perceptions according to their gender. In this regard, the perceptions with significant differences were related to forest and biodiversity status, wildlife population trends, some of the conservation attitudes, resource use conflict and the inefficacy of one of the AIG strategies, i.e., training on improved cooking stoves. Ethnicity and gender along with some other socioeconomic and demographic factors were found to be significant predictors of conservation attitudes among other communities worldwide (e.g., Fiallo and Jacobson 1995; Mehta and Kellert 1998; Gillingham and Lee 1999; Sah and Heinen 2001).

Perceptions of rural farmers with regard to protected areas, particularly to forests, may differ among farmers according to their socioeconomic and demographic situations. For example, some group members might be concerned about the degree of deforestation of the reserve and prefer government and NGO intervention in putting in place environmental policies for management of the reserve. Others may be more concerned about the economic benefits of the reserve (Dolisca et al. 2007). Many factors influence the perceptions local residents have of protected areas, including the history of park management, the degree of awareness of protected areas existence, education level, concerns for the future generation, and gender and ethnicity. Having an understanding of these factors is key for raising community awareness about the importance of biodiversity conservation and will subsequently help to improve the relationship between local residents and protected areas (Vodouhe et al. 2010). A major divergence was seen in the perceptions of local people over various aspects of Joint Forest Management program in Tamil Nadu, India (Matta and Alavalapati 2006). In the present study, a significant contribution of the incentives was found on the level of the respondents' attitude on various conservation perceptions (see supplementary documents). An increase in annual income as a result of the trainings on various AIG activities, and leasing of vacant agricultural lands in and around the sanctuary were considered the potential incentives here. These were believed to have been powerful factors in influencing respondents' attitudes. A similar trend was revealed by Baral and Heinen (2007) in the communities of Bardia National Park and Sukla Phanta Wildlife Reserve, Nepal. While the main purpose of training is skill enhancement for income generation, it was suggested that NGOs can take the opportunity to raise conservation awareness during sessions. This tactic could also be applied to our study area. However, the absence of equity in distribution of the AIG trainings has been identified as a severe problem, as depicted from the respondents' strongly disagreeing (Mean = 1.38, SE = 0.04) to the statement "there is an equitable distribution of common pool resources and benefits to the communities by CMC/FD." This is a "red flag" that needs the authority's immediate attention if the goals of the project are to be achieved properly. Another AIG-related problem existing in the study area was few "need not-based trainings," which was revealed and explained by Chowdhury et al. (2013) in their recent study. Pig rearing is such a program that was viewed less profitable than cattle rearing, and there was a strong opinion among the FUG members in favor of the latter. It was seen that

training on pig rearing was launched targeting the tribal people who not form really a considerable portion there. Since the community is dominated by the *Bangalee* ethnicity, most of who are Muslims by religion and thereby they do not have the provision to keep pork in the food habit, the tribes face difficulty in marketing their pig products. Moreover, the tribal people themselves are not in that much of an economically well-off position that they can buy all the pigs produced in the community for their own consumption. Therefore, choosing need-based AIG options for the community becomes crucial day by day (Chowdhury et al. 2013). In the Focus Group Discussion, the respondents complained that their agricultural crops often suffered damage by wildlife, particularly from monkeys. However, it did not change their positive attitude toward conservation because most believed that benefits accrued through the project activities at the societal level were effective in offsetting local costs unlike the communities studied by Akama et al. (1995) and Gillingham and Lee (1999) in Kenya and Tanzania, respectively.

Participation in decision-making and strategy formulation enables learning and helps to strengthen collaborative relationships and trust (Schusler et al. 2003). This held true for the communities in the study area because they mentioned their improved understanding of the protection regime and the functioning of the management authority. This was reflected by their agreement (mean = 4.10, SE = 0.05) with the statement “we are now more aware of conserving forests due to campaigning by the FD.” Ziadat (2010) reported that environmental awareness in Jordan as an emerging economy has moved a long way toward understanding the need for a cleaner environment and better social–environmental behaviors. However, personal actions, levels of political environmental literacy and obligations of citizens to improve the environment appear to lag in comparison with people in developed countries. In the study area, although an overall neutral attitude remained toward the perception of the pro-people behavior of the authority; negative attitude was observed category-wise among the respondents. The women and tribal groups were found more vulnerable in this regard. By disagreeing to the statement “the behavior and attitude of the FD official towards local marginal people have been changed positively since the co-management started,” they expressed their negative attitude to this particular issue. This is, in fact, a very common phenomenon that is still prevailing in almost every developing country accompanied by weak governance. Newmark et al. (1993) revealed the similar trend in Tanzania where local people living adjacent to protected areas hold less positive attitudes toward the protected area employees than to the protected area itself. Traditionally, in rural societies of Bangladesh, women have subordinate role and less power in decision-making, and men usually dominate; but realistically, women are more involved in forestry activities in terms of resource extraction and maintenance. Therefore, special attention should be given to eliminate gender inequality by encouraging women to be more involved in co-management activities.

6 Conclusion

In the study area, local communities expressed positive attitudes toward forest conservation efforts through protected areas. This study revealed the efficacy of co-management approach in strengthening the protected area system in Bangladesh. It was inferred that the efficacy becomes conspicuous when co-management program is launched with the provision of need-based incentive packages. As the strategy of providing incentives, the Forest Department’s contemporary thoughtful initiative of AIG supports motivated local stakeholders to cooperate in carrying out the conservation programs. However, for the ultimate

success in conserving the biological diversity, a pragmatic mission should be commenced on to diminish the defects prevailing in the whole system. In that connection, findings of the present study would be hint-worthy for the policy makers in forestry sector of Bangladesh and other countries with the similar biophysical and socioeconomic contexts. Therefore, the findings are envisioned for developing participatory action plans considering the community needs and thoughts toward livelihood development and biodiversity conservation. The state Forest Department may use the findings as tools for protected area management through active involvement of local communities, where their behavioral mind-set would be reflected more realistically.

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