Deforestation and Forest Conservation in a Tanchangya Community

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Abstract

In Bangladesh, people living within and near protected areas (PAs) are increasingly regarded as partners in sustainable conservation, rather than as threats to biodiversity. Accordingly, a paradigm shift is occurring in contemporary policy-making regarding management of PAs. Recognizing this shift, the Bangladesh government has strived to develop new approaches to management in an attempt to integrate the livelihoods of forest dependent people with conservation objectives. The government of Bangladesh recently adopted a co-management framework for PAs, which recommends the integration of human needs and biodiversity conservation when approving PA management plans, and this framework has taken root in internationally funded programs. In this paper I examine the livelihoods of Tanchangya peoples who live within and near the Teknaf Game Reserve (TGR) in southeastern Bangladesh and give particular attention to issues of forest management. In addition, I identify pre-requisites for interventions that can help improve and expand livelihood options for the Tanchangya community in order to boost conservation. I conclude that effective co-management of the TGR requires both long term efforts towards empowerment of Tangchaya people, as well as short term solutions to critical livelihood issues.

Introduction

Natural forests are integral parts of the habitat and socio-cultural framework of rural communities (Byron and Arnold 1999) that contribute to human livelihoods in many ways. They provide land for homesteads, agriculture, and horticulture. Also, they offer a range of goods such as fresh foods and medicinal plants that sustain households and help tide them over during seasonal or other unforeseen shortfalls. Income from the sale of forest products provides cash for paying off debts and serves as a vital economic buffer in times of stress, particularly for women, children, and the poorest households. Forests also provide essential local environmental services (such as watershed services), the loss of which often disproportionately afflicts the poor.

Globally, protected areas (PAs) play a major role in the conservation of natural forests and of biodiversity. However, traditional "fence and fine" approaches have been shown not to be effective for achieving conservation objectives. These approaches are not sustainable, fail to reduce social inequality, alienate local resource users, and often jeopardize the livelihoods of people who depend on forests. In Bangladesh, there are people living within the boundaries of almost all PAs. The ascribing of PA status to forests profoundly impacts local residents by influencing where and what types of forests exist, and who benefits from them.

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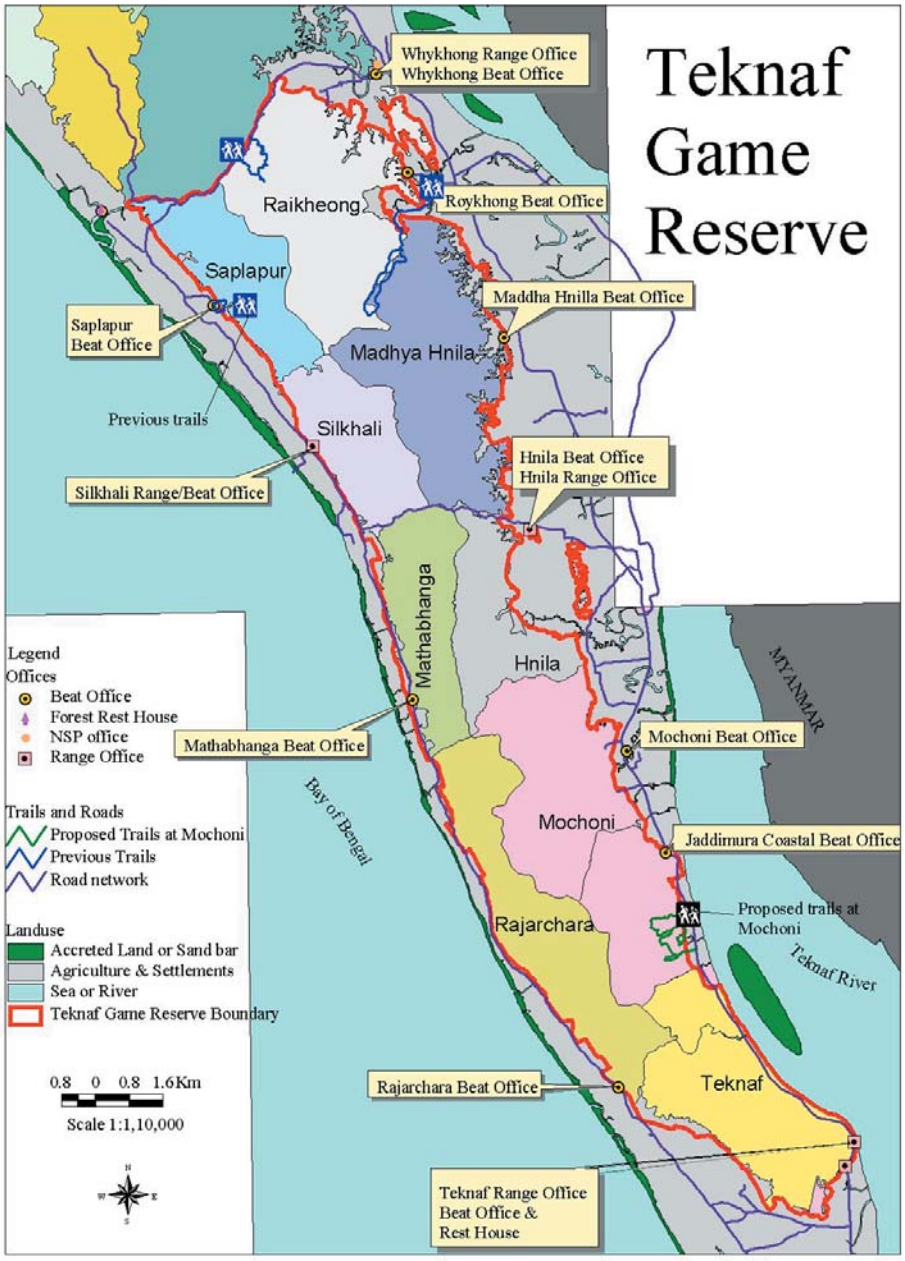
In Bangladesh a paradigm shifts is occurring in contemporary forest management practices as people living within and near PAs are increasingly regarded as partners in sustainable conservation rather than as threats to biodiversity. Recognizing this shift, the Bangladeshi government has strived to develop new policies and approaches for the management of PAs, primarily in terms of attempting to integrate the livelihoods of forest dependent people with conservation objectives. The government recently adopted a co-management framework for PAs that recommends the integration of human needs and biodiversity conservation when approving PA management plans. These programs have taken root in Bangladesh through two programs funded by USAID, namely the Nishorgo Support Project (2003-2007) and the IPAC (Integrated Protected Area Co-management) (launched in 2008). IPAC seeks to understand relationships between biodiversity and local livelihoods so that stakeholder benefits that provide incentives for conservation can be designed. Within this approach, livelihood considerations drive conservation efforts, rather than simply being compatible with them (Brown 2002).

Background

Teknaf Game Reserve (TGR) is situated in Teknaf Upazilla, a sub-district of Cox's Bazaar District located in the southeastern part of Bangladesh. It is bordered on the east by the Naf River, and on the south and the west by the Bay of Bengal. To the north it is connected with other parts of Cox's South Forest Division and Myanmar. The reserve lies between 20°52' – 21°09' north latitude and 92°09' – 92°18' east longitude (Figure 1). Cox's Bazaar runs along the entire eastern length of the forest from north to south to the Teknaf highway. The reserve can also be reached by a road that runs entirely on the western boundary of the forest, along the beach between Cox's Bazaar and Teknaf road.

TGR was established in 1983 with a reserve forest area of 11,615 hectares (Bangladesh Forest Department 2010). The reserve has long been known for its elephants and currently supports a population of approximately 15 to 100, which is 20-30% of the total number of elephants in Bangladesh (Khan *et al* 1994, Rosario 1997, Forest Department 2007). The reserve is broadly classified as a tropical evergreen or semi-evergreen forest. Originally, the reserve's vegetation consisted of tall mixed evergreen trees, dominated by unique varieties, such as *Dipterocarpus turbinatus, Anisoptera schapula,* and *Artocarpus chaplasha* (Champion *et al* 1965, Das 1990, Rosario 1997). However, at present the hills of the TGR are mostly denuded and dominated by sun-grass, herbs, shrubs, and brush woods. The hill forests of TGR support 290 plant species belonging to 212 genera and 65 families, 55 mammal species, 286 bird species, 55 reptile species, and 13 species of amphibians (Khan *et al* 1994, ADB 2002); commonly observed wildlife include elephants, deer, macaques, languor, wild pigs, pythons, wild dogs, and bears.

Figure 1: Land-use/cover map of TGR



Management of the forests that constitute TGR started with the promulgation of their legal status as reserved forests in 1907. At that time revenue generation was the imperial government's main focus for forest management. To this end permits were issued to cut selected trees based only on diameter. The first management plan for the forests of Cox's Bazaar district was prepared in 1935 wherein the main prescription was conversion of natural forest to plantations using timber species (teak, an exotic, as well as indigenous species, such as *Diptercarpus turbinatus, Tecktona grandis, Hopea odorata, Artocarpus chapalasha*). This form of management continued until 2002.

In 1997, a conservation management plan was prepared for the first time in the forest management history of Bangladesh. Forest Department personnel, however, were not enthusiastic to implement the plan because they still held traditional attitudes favoring timber plantations and were largely indifferent to the wildlife and environmental values of forests. In 2002, the Asian Development Bank (ADB) implemented a conservation management plan under the ADB funded Forestry Sector Project (1998-2004). Under this plan the reserve was divided into a central core zone with a buffer zone covering an outer strip of forest land. With community participation, a plantation of approximately 2000 hectares was successfully planted and maintained following the FD's Social Forestry Rules (amended in 2000). While the plantation initiatives were successful, nothing was done to improve the habitat of TGR's banner species, the Asian elephant, and degradation and deforestation of natural forests continued unabated. According to local residents I spoke with, present land uses in TGR include open natural forests (20%), plantation forests (20%), cultivated areas (45%), and permanent homesteads (5%).

TGR has historically been impacted by natural calamities. Velum Von Sandal (1997) reported that in 1698 a tropical cyclone destroyed ninety percent of the standing trees. More recently in 1991 and 1994 the reserve was seriously damaged by tropical cyclones which uprooted seventy percent of the standing trees. Around 10,000 households lost their homes as a result of these natural calamities.

Teknaf Upazilla has a population of 152,557 people, of these 52 percent are male and 48 percent are female; 19 percent are children, 12 percent are youth, and 69 percent are adults (18 years old or older). Levels of schooling are very low in the community a mere 17 percent of the population is literate, while only about 9 percent has attended primary school, 3 percent high school, and less than 2 percent some form of higher secondary education (BANGLAPEDIA 2006). Mollah *et al* (2004) identified a total of 115 settlements or villages, locally called *paras*, where villagers have various degrees of dependency on TGR to meet their livelihood needs. Of these villages, slightly less than half (46%) are located inside reserve boundaries. The rest are located adjacent to and outside of the forest area. Ethnic groups in Teknaf Upazilla include Bengali, Rakhaine, Tanchangya, and Rohingya refugees. The FD has not been able to stop villagers from encroaching into TGR and this has made the reserve a de-facto open access forest.

In the mid 2000s the Nishorgo Support Program (NSP) introduced the idea of co-management in the reserve. Since that time co-management committees (CMCs) exist wherein managers and local people make decisions together and share responsibilities for resource management. Through the CMCs, human well-being and elephant habitat restoration have become main foci of park management. The CMCs have been granted the right to collect revenues from forest based activities such as eco-tourism, with fifty percent of revenues generated from park entrance fees being dedicated to the CMCs to support community participation in forest conservation.

The Tangchangya

According to oral history, the Tanchangya people, called "Chakma" by the dominant Bengali population, came to Teknaf Upazilla in the mid 1800s. The first Tanchangya village was located at Kerontoli in Whykheong Union Parishad[2]. The primary livelihoods of the Tanchangya were slashed and burn agriculture (*jhum*) along with hunting and gathering of forest products and they moved their homesteads across the landscape following their *jhum* fields. When the tropical rainforest area of TGR was declared reserve forest in 1923 a ban was imposed on jhum cultivation. The new legal status accorded to the forest created dilemmas for the Tanchangya people.

After 1923 the Tanchangya settled in a village known as Amtoli with a population of thirty five households. Registered as official 'forest villagers', every family was allocated a rice plot, a homestead plot (2 hectares), and was given opportunities to participate in a *tangya*[3] agroforestry system instead of using slash and burn agriculture. This is how the mobile Tanchangya community transformed into a sedentary agricultural community. As their population grew, the Tanchangya expanded to cover more forest valleys. New sites were identified mainly by the availability of flat land for agriculture and the presence of perennial streams as sources of water. Today six Tanchangya villages exist within the game reserve, namely: Shilkhali, Monkhali, Horikhola, Lambaghona, Amtoli, and Putibunia.

The Tanchangya community presently consists of 584 households all of whom are fully dependent on forest resources for their livelihood. They depend on forests for many of their daily household needs and they also use forests as a source of cash income. Most households are involved in jhum cultivation, fuelwood and bamboo collection, and betel leaf cultivation. Though these villagers have little respect for agreements with the FD, they try to maintain good relations with staff. However, FD staff and the local Bengali community believe that the Tanchangya are the main source of deforestation and degradation within the reserve. Today the FD recognizes approximately thirty five households as descendants of the original "forest villagers" and considers other households to be encroachers even though many of these people are descendants of the original forest villagers. Some FD staff believe that the Tanchangya actively encourage outsiders (including Rohingya refugees) to settle with them in the TGR by granting them informal leases on forest land. Presently no effective rules and regulation exist for controlling occupancy of TGR lands.

2. A *union parishad* is the lowest unit of local governance in Bangladesh
3. Tangya is a system of plantation forestry in which crops are planted between the rows of tree for a few years until the canopy closes. The agricultural crops meet farmer's immediate needs such as food while trees provide long- term products.

In the last two years, local FD staff members have tried to prevent Tanchangya households from expanding their jhum plots and converting forest land to permanent agriculture by strictly enforcing regulations through training, awareness building and the provision of small incentives. However, this has been to no avail. Some Tanchangya households, however, are not involved in illegal activities.

Research objectives

In this paper I seek to:

- Examine the livelihoods of the Tanchangya community in TGR with particular focus on their interactions with forest management;
- Identify interventions and pre-requisites for improving and expanding livelihood options for the Tanchangya community in order to boost conservation.

Research methods

Primary data collection began with community workshops in all six Tanchangya villages in which I briefed villagers of my intention to learn about them. Next, I carried out focus group discussions (FGD) in the six villages using a checklist. I also walked a transect across each village to observe village life. In addition, I conducted interviews using a checklist with key informants from the FD, representatives from local non-governmental organizations (NGOs) and CMCs, and other knowledgeable people in the communities. Finally, I interviewed the heads of households at their homes using a semi-structured questionnaire. Respondent households were selected randomly (Table 1 shows the distribution of sample households). To overcome the language barrier I hired an assistant from a Tanchangya community who had completed 12 years of schooling. I gathered secondary data by examining relevant books, journals, reports, websites, and other sources.

Table 1: Number of sample households by village.

Village name	Total number of households	Number of sample households
Shilkhali	39	10
Monkhali	144	36
Horikhola	209	52
Lambaghona	84	21
Amtoli	86	21
Putibunia	26	10
Total	588	150

Results

The study revealed that among the 588 households in the 6 study villages the average family size is 6.5 persons, the average mother bears 4.5 children, while literate mothers bear on average only 3 children. Of residents, 49 percent are male and 51 percent are female. Only 36 percent of respondents were literate; 30 percent had attended primary school, 6 percent had attended junior high school, 1.5 percent had

completed high school, and only 0.5 percent had passed public examination and entered higher level schooling (Table 2). A large proportion of children (30%) are not enrolled in primary school. Respondents suggested that the poor level of literacy is due to the absence of schools within walking distance, an absence of roads, and household poverty. Many poor children work in family agricultural plots or engage in collecting fuelwood to earn money, a necessary survival strategy.

Tanchangya villages remain unconnected by roads to market places and growth centers. Villagers do not have access to radios or televisions and fewer than ten people occasionally read Bengali newspapers. None of the villages have electricity and they also lack irrigation facilities for dry season agriculture. Each village has a *Kheang* (religious centre) led by a *Bhante* (religious leader) who gives sermons and educates people in the Pali language. Tanchangya people usually build their homesteads on slopes or on the top of small hillocks. Houses are generally constructed at the centre of the homestead, with the latrine (if any) behind the house at the foot of the hill. Most houses in Tanchangya communities are made of sun grass, bamboo and wood (53%). However, wealthier families build their houses with tin (20%), and poorer families build their houses with leaves for thatching and walling (20%). A recent trend in house construction is to build walls with mud (7%) due to a lack of wood in the forest.

Table 2: Education Indicators in Tanchangya communities

ITEM	Indicator	%
Schooling	Illiterate	64
Class	Literate	
	I-V	30
	VI-VII	4
	IX-X	1.5
	Secondary School Certificate (SSC+)	0.5
	Sub-total	36
Children enrolled	% of children enrolled in school	77
Access To Schooling	Government Primary school	Available at Shilkhali
	Non-government Primary school	Monkhali, Horikhola, Lambaghona, Amtoli,
	Government High school	Not available
	Non-government High school	Not available

Most people in Tanchangya communities have limited access to health facilities (Table 3). Mothers do not have access to registered doctors during pregnancy and children are delivered at home without a trained birth attendant or registered doctor. Only twenty four percent of villagers have access to safe drinking water. Most people (75%) do not wash their hands with soap after defecating, and only fourteen percent of respondents had access to a sanitary latrine. Therefore, the Tanchangya are vulnerable to water borne diseases, such as dysentery and diarrhea.

It is important to note that because they live within TGR these Tanchangya communities have no legal title to the lands they occupy. Table 4 lists respondent households according to their land possessions. In 1907, when the Tanchangya people were settled on this land as forest villagers by the FD they were given rights of usufruct that allowed them to use the land. These rights are still recognized today. Approximately fifty five percent of households have cultivable land. Major land uses include homesteads, rice cultivation, vegetable cultivation, and betel leaf farming. Rice is cultivated by forty three percent of households in these communities, with an average plot size of 0.27 hectares, which is larger than the national average. Less than twenty five percent of households cultivate vegetables, with an average plot size of 0.15 hectares. A few households (15%) engage in betel leaf farming with an average plot size of 0.10 hectares. Betel leaf cultivation is not widespread because it requires a large amount of startup capital and a longer period to generate returns. One percent of households in these communities have neither a homestead nor a cultivable plot.

Table 3: Standard of Living Indicators in Tanchangya Community

Items	Tanchangya (%)	Bangladesh (%)
Child Immunization	80	97
Ante natal care:		
Registered doctor	5	25
Trained paramedic	25	50
Local women	70	25
Child Delivery:		
At Hospital	0	25
At home with trained attendant	0	25
At home with non-trained local attendant	100	50
Access to Medical Personnel :		
Registered doctor	1	25
Trained paramedic	25	50
Untrained paramedic	64	25
Herbal doctor	10	10
Washing hands with soap/ash after defecation	25	75
Source of drinking water:		
Tube-well	24 (safe)	72 (rural)
Ring-well(unprotected)	30 (not safe)	
Streams	15 (not safe)	
Pond	30 (not safe)	

Latrine:		
Septic	16	32
Pit	40	
Open	44	

Table 4: Land Use Practices

Land Use	% of households (average size in hectares)	Remarks
Homesteads	99 (0.20)	Landless households only in Shilkhali
Rice plots	43 (0.27)	
Vegetables plots	17 (0.15)	Not available in Shilkhali
Betel Leaf plots	15 (0.10)	Not available Putibunia
Households without cultivable land	55	
Households with cultivable land	45	

A vast majority of respondents (88%) are involved in farm-based occupations, while a smaller proportion of households (12%) depend on non-farm activities (Table 5). Non-farm activities include small-scale trading, tailoring, bamboo and cane based cottage enterprises, carpentry, and driving. This study found that people who engage in non-farm activities tend to be younger and have attended high school.

Though Tanchangya households have above average access to land compared to other parts of Bangladesh, they are poorer in terms of common development indicators, i.e. education, child healthcare, female healthcare, sanitation, housing, and food security. In this study I asked people to classify households based on poverty. Though a number of criteria are used to determine poverty and the prevalence of poverty in a community, FGD members had their own way of determining poverty based on food security during lean periods. The months of Chaitra (May/June), Bhadra (June/July), and Ashwin (July/August) at the end of the dry season and the beginning of the wet season constitute lean periods in terms of work opportunities and food availability. During the rainy season little farm work is available and there is limited range for collecting forest products due to both enhanced law enforcement by the FD and heavy rainfall, which makes much forest inaccessible. During lean periods ultra-poor families (52%) cannot secure food for household members one or two days a week; poor families (14%) can manage only one meal per day; on the other hand, wealthier households (27%) do not suffer from food shortages because they are large farmers or are engaged in non-farm activities.

Table 5: Distribution of workforce according to livelihood activities

Occupation	(%)	Remarks
Farmer	29	Farm (88 %)
Farm labor	20	
Housewife	39	
Small trader	2.88	Non farm (12 %)
Tailor	1.71	
Bamboo and cane artisan	1.71	
Carpenter	0.6	
Mechanic	0.4	
Driver	0.22	
Service	1.33	
Fisher	0.22	
Herbal doctor	0.88	
Jobless	1.33	
Wage earner	0.22	
Untrained doctor	0.22	
Mason	0.22	
Total	100	100%

Jhum fields are prepared by clearing and burning a forest plot and then using the land to grow crops such as upland rice, sweet potatoes, cowpeas, cucumbers, maize, millet, various gourds, and okra. After three or four years of cropping, the plot is abandoned to regenerate with secondary brush and shrubs. Occasionally the FD uses abandoned plots for plantations. Although illegal, the Tanchangya continue to practice *jhum* cultivation even in the face of strong prohibitions by the FD. The Tanchangya use social networks to support one another and to resist law enforcement efforts. In 2009 more than twenty five households cleared land for *jhum* agriculture (average plot size was 0.10 ha); twenty households cleared land for permanent cultivation plots (average size was 0.05 ha); and fifteen households established new homesteads (average size was 0.20 ha). These clearings defied the strongest efforts of the FD and the co-management councils. In addition, most of these households (60%) graze their cattle on forest land.

Each Tanchangya homestead can be regarded as a farm and often includes a house, kitchen, courtyard, vegetable plot, cows, goats, pigs, and poultry. Half of the households have an average of three cows, ten percent keep an average of two goats, ten percent keep an average of one pig, and almost all keep an average of eight poultry. Domesticated plants include bamboo (5 species), fruit trees (10 species), timber trees (20 species), and medicinal plants. Medicinal plants and timber trees generate naturally. Other plants such as fruit trees and bamboo are planted. Preferred fruit species include banana, tamarind, mango, jackfruit, betel palm, and *litchi*, but *jambura, bel, amra,* lemon, guava, papaya, *kamranga*, pineapple, blackberry, and other fruits are also planted. Ginger, turmeric, sweet potato and cassava are other indispensable components of a Tanchangya homestead.

Principal agricultural activities include rice cultivation and vegetable and betel leaf farming. Farmers plant two rice crops per year-one in winter using stream water

coming from the forest, and one during the monsoon, which is rain-fed. Vegetable cultivation started in 1995 after farmers received training from an NGO. Vegetable crops include pepper, eggplant (*brinjol*), radish, cabbage, potatoes, cucumber, tomato, carrot, *shalgom*, bean, long bean, taro, *arum*, watermelon, *bangi, lal shak, kalmi*, pumpkin, snake gourd, ribbed gourd, *marfa, and pulsel*.

The Tanchangya have a substantial understanding and knowledge of forests and how to derive food and other products from them. They collect wild foods (leaves, roots, shoots) throughout the year. These foods constitute a substantial share of their daily food requirement; according to my household interviews seventy five percent of households collect wild vegetables. The Tanchangya also rely substantially upon forests for health. Each village has its own *Baidhya* (hereditary herbal medical practitioner) who provides medication for mental disorders, anemia, abscesses, jaundice, snakebites, dog bites, indigestion, leprosy, orthopedic disorders, among other ailments. During key informant interviews, Baidhyas identified 22 medicinal plants (Appendix I). Tanchangya communities depend on forests for both curative and preventive measures against diseases.

The Tanchangya interact intimately with forests, entering for many purposes. In addition to wild foods and herbs, the Tanchangya also collect other forest products such as timber, poles, fuelwood, sun grass, bamboo, cane, and leaves. Table 6 lists forest products collected both for subsistence (100%) and income (60%). Focus group discussants argued that the Tanchangya have no alternatives but to make their living out of the TGR reserve. They also collect forest products in commercial quantities.

Table 6: Percent of households collecting various forest products in 2007

Items collected	For use (%)	For sale (%)
Timber	59	14
Poles	89	25
Fuel wood	100	60
Sun grass	45	10
Bamboos	59	12
Canes	50	5
Wild food	70	10
Medicinal plants	61	0
Leaves (thatching)	7	0

Table 7 lists government agencies in the Teknaf Upazilla headquarters and the services they provide to rural people in Bangladesh. The data suggest that Tanchangya communities most frequently interact with FD personnel, followed by Union Parishad and police department personnel. Conversely, villagers have limited interactions with the Department of Social Services, and the local government engineering, relief, and rehabilitation departments. Ironically, other development oriented agencies, including the departments of health, family planning, and agricultural extension, are all but absent. While this lack of services may be due to an absence of leadership in Tanchangya communities, it may also be due to the inability

or unwillingness of government officers of relevant agencies to access these communities. Government Officers are not ignorant of Tanchangya communities, but the Tanchangya live in remote areas making it difficult to reach them. It is noteworthy that the Tanchangya have no representation in the Union Parishad and that no individuals from Tanchangya villages occupy managerial positions in any government agencies. Moreover, mainstream politicians view the Tanchangya as marginal. The only time politicians visit or pay any attention to the Tanchangya community is during parliamentary elections.

The broad Tanchangya community of today began as a single sedentary village in 1907 with only thirty five households. Over the span of 100 years they have grown to 588 households. The growing population has required more land to support their livelihoods, which has lead to a loss of forest. Life in forests is never easy, and this study shows that it has been made more difficult by the lack of institutional support for basic civic amenities coupled with naturally occurring calamities (such as diseases), unemployment, and food insecurity. Moreover, male members of these communities often like to drink locally made alcohol, which interferes with work. All these problems cause poor and ultra poor families to fall prey to debt. Moneylenders and local grocers provide loans to these families at high interest rates with difficult terms and conditions. In turn, failure to repay loans causes indebted households to lease their cultivation plots and then their homesteads to others. Eventually these families end up transferring ownership (informal) of their lands to others. They then move deeper into the forest to clear new land for their jhum gardens and homesteads. This study reveals that most of the Tanchangya have shifted their homesteads at least four times.

Table 7: Services offered to Tanchangya villages by government agencies

AGENCY	SERVICES
Police Department	*law and order*
Forest Department	*land, housing materials, fuel wood, Social Forestry training in 2007, traditional weaving, etc*
Social Services Department	*old age allowances*
Department of Relief and Rehabilitation	*food for vulnerable groups*
Public Health Engineering	*sanitary latrines*
Local Government Engineering Department (LGED)	*rural roads*
Women Affairs Department	*services not available*
Youth Development Department	
Bangladesh Board of Rural Development (BRDB)	
Co-operative Department	
Bangladesh Agricultural Bank	
Family Planning Department	
Department of Agriculture Extension	

As part of this study I used data from group discussions to compile a list of the forest dependent activities of the Tanchangya community and brought FD officers, CMCs and Tanchangya people together to discuss and analyze these activities in the context of management issues. The group agreed that rampant illegal logging began in the 1980s by armed miscreants supported by powerful politicians; the Tanchangya in those days served only as day laborers. Massive degradation occurred in the cyclones of 1991 and 1994 when winds reached up to 250 kilometers per hour and seventy percent of the standing trees in TGR were uprooted. The remaining valuable trees in the natural forest were illegally felled by government appointed logging contractors in connivance with FD personnel and politicians. In addition to the above observations, discussants categorized Tanchangya activities as either causing or not causing forest degradation, as shown in Table 8.

Table 8: Forest dependent activities and their relationship to forest degradation

Activities causing forest degradation	Activities not causing forest degradation
○ Jhumming ○ Cattle grazing ○ Collection of : ▪ Timber ▪ Poles ▪ Fuel wood	○ Homesteads ○ Collection of : ▪ Bamboos ▪ Canes ▪ Leaves ▪ Wild foods ▪ Sun grass ▪ Medicinal plants

Discussants also identified major vulnerabilities among the Tanchangya, and these were discussed as being key issues. Major vulnerabilities identified by discussants include food insecurity, land and tree tenure, health, and physical security. Next, I will briefly explore each of these identified vulnerabilities.

Food Security

The Tanchangya do not have adequate food security. Every year they suffer during the three month lean season, and famine is only avoided by accessing wild foods and selling informal land "possessions". The causes of food insecurity include insufficient water in the dry season for irrigated agriculture, poor agricultural practices, lack of agricultural extension services, lack of fertilizer, and poor infrastructure that limits trade and the ability to buy food.

Lack of Formal Land Rights

As alluded to above, the Tanchangya have no formal land ownership; households listed as forest villagers have informal agreements to use land for their farms and homesteads but they have no official documentation of these agreements. More than ninety percent of households who are descendents of forest villagers, however, are not recognized as such and are regarded as encroachers by the FD. Frequent transfers of land rights to outsiders (usually Bengalis) indicate the ease with which current informal access rights can be lost. Fifty five percent of Tanchangya households have lost their agricultural plots to Bengalis.Land is the only significant physical

resource available to the Tanchangya and if they lose access to it then there is little hope for sustaining their livelihoods.

Disease

The Tanchangya are also at high risk for diarrhea, dysentery, and malaria. Most Tanchangya are not aware of how these diseases are transmitted. There appear to be no preventive measures taken by the government. My field appraisal indicated a poor level of sanitation and unsafe drinking water as the main causes of transmission.

Encroachment

Monkhali and Horikhola villages have been subject to robbery, including the violation of women and Bengali Muslims have encroached on land in the villages of Amtoli, Lambaghona, Horikhola, and Monkhali. More than ten petitions have been recorded with the Teknaf police station and with the judicial magistrate court concerning conflicts that have arisen over these encroachments. In these conflicts the Bengalis are supported over the Tanchangya by local elites.

Lack of Support

The Tanchangya who participated in this study expressed concern about a perceived lack of support from the FD. According to participants, up until the 1990s the FD was active in constructing ring wells, a necessary step to ensure safe drinking water, however neither the FD nor other government agencies have taken a more holistic view of development. Tanchangya lack knowledge of basic human rights guaranteed citizens by the Bangladesh constitution. They also do not understand the concept of advocacy, and how their issues could be presented to raise awareness and increase the likelihood of progress being made to improve their situation.

Discussion

This study reveals that the Tanchangya are aware of the impacts of deforestation and forest degradation. According to their own observations, due to the loss of natural forest in TGR they must search harder and walk further to find wild foods and medicinal plants. Today Tanchangya spend more than 400 percent more time collecting daily necessities (wild foods, medicinal plants, fuelwood) than they did in 1995. Important medicinal trees, such as *Terminalia chebula, Terminali belerica,* and *Alstonia scaphula* have become rare. Until the 1990s streams passing through villages were full of water during the dry season (November through May). Today, however, water flow in these streams has reduced by one-third of what it was previously, which is why fifty percent of agricultural plots remain fallow during the dry season. This situation poses a great threat to the livelihoods of the Tanchangya.

Forest conservation and sustainable livelihood issues in Tanchangya communities are closely linked and complex. I argue that key problems include the lack of registration of descendents of Tanchangya communities as forest villagers, as well as a lack of land and tree tenure including certificates of usufruct rights, which creates insecurities concerning land that may be appropriated for plantations. Other significant problems that contribute to poverty are inefficient farming, poor

infrastructure, and a lack of education, which limits livelihood possibilities.

The World Bank (2003) defines poverty as pronounced deprivation of wellbeing related to lack of material income or consumption; low levels of education and health; vulnerability and exposure to risk; lack of representation; and powerlessness. In other words, to be poor is to have few resources from which to secure a livelihood (Shimizu 2006) that contributes to human well being. The FAO (2003) defines poverty reduction as the lessening of deprivation of wellbeing or successful prevention of increase in deprivation. The Tanchangya are largely illiterate and among the poorest communities in Bangladesh in terms of non-farm skills, health, physical assets, and access to power at local, sub-district, and district levels. Therefore, according to the World Bank criterion for poverty, the Tanchangya are extremely poor.

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From an historical perspective this study reveals that the Tanchangya have contributed little to forest degradation because their population is small (less than 4,000 individuals) compared to the total number of people (150,000) living inside TGR. The major players in forest degradation are the government, through its plantation program, the influx of Rohingya refugees, frequent natural calamities, and lack of political support for forest conservation. It must be noted, the Tanchangya are involved in deforestation through conversion of forest land to produce cultivable plots. However, the Tanchangya people carry out this sort of activity because they have not received enough support from the government to build up their capacity to shift towards non-forest activities.

What can be done?

The challenge of reconciling livelihood improvement and forest conservation in developing countries is daunting and remains largely unmet. Levang *et al* (2003) and Wunder (2001) argue that due to a number of peculiarities of forestry activities, the real frontier for achieving these two objectives is inevitably limited. Accordingly, attempts to reconcile poverty alleviation and forest conservation should be carried out deliberately and systematically at local, regional, and national levels.

Populist and people-centered discourses on conservation and development have emphasized the need for empowerment of local people. Chambers (1993) coined the term "empowerment", which is generally understood as a process by which people, especially poor people, are enabled to take more control over their lives and secure a better livelihood with ownership of productive assets as one key element. The concept therefore has political dimensions, in terms of rights to resources, as well as socio-economic dimensions, in terms of sustainable livelihood security. Empowerment is seen as both a means (to conservation and to better development) and as an end itself (Brown and Rosendo 2000).

My study suggests that it is necessary to take a number of steps in order to achieve the twin goals of conservation and livelihood improvement. First, Tanchangya villages should be surveyed and individual plots mapped, and each household should be awarded a non-transferable certificate of usufruct rights for their homestead and

cultivation plots. This will secure user rights and provide a tool for the FD to monitor and prevent land transfers. Second, all descendent families of Tanchangya should be registered as forest villagers. Finally, I suggest administering the Participatory Benefit Sharing Agreement (PBSA) under the FD's 2000 Social Forestry Rules with the Tanchangya appointed as beneficiary members, for which they are very much enthusiastic. Up to this point the FD has done nothing to assist forest villages but rather has used them as a source of cheap labor for FD plantations. Under the NSP the FD has been trying to protect natural forest in TGR by engaging community patrol groups. Though this effort has failed, participatory plantations established by the Forestry Support Project funded by ADB were successful. Because the Tanchangya are dependent on natural forests for their livelihoods and live in close proximity to existing natural forest within the core zone, they are ideal candidates to help protect natural forests. However to make PBSA successful the FD must restore the non-timber forest resource-base because current supplies do not meet the need.

I also examined the impact of education upon behavior change in Tanchangya communities and my results are very encouraging (Table 9); they suggest that up to eight years of schooling has generated considerable improvements in all aspects of life. Most noticeably, educated people appear not to take part in legal offenses towards or the clearing of TGR forests, but rather work with the FD. This indicates that those Tanchangya with education develop different kinds of life skills and training that allow them to work in the TGR forest.

Table 9: Education and Behavior among Tanchangya

INDICATOR	ILLITERATE	LITERATE
Child per mother (person)	6	3
Age at marriage		
• Male (years)	21	26
• Female (years)	16	21
Children enrolled in school (%)	70	100
Access to safe drinking water (%)	10	100
Latrine (%)	10	100
Forest offense (in 2009)	20	0
Clearing forest (in 2009)	25	0

I suggest, therefore, that education is the investment that has the greatest impact on forest-related practices. Individuals who had completed at least eight years of schooling were not involved in opening forests for cultivation or cutting trees for income. Rather, such individuals were involved in intensifying cultivation by introducing new vegetables and rearing cattle. Those with at least eight years of education also went for skill development training and have received jobs in NGOs and the private sector outside their villages. The educated men had sanitary latrines, received ante-natal care, and went to paramedics or registered doctors in case of ailments. Their average age of marriage was higher, they had fewer children, practiced family planning, and washed their hands after defecation.

In these circumstances I suggest establishing a governmental primary school in each Tanchangya village and establishing local high schools or technical schools. The sooner these educational infrastructure projects are undertaken the better. Until the proposed high schools are established, competent students could be sent to nearby high schools on scholarships or the government could provide interest free loans for students. As a short term initiative with high and immediate impact for skill development, my key informants suggested that educated youths could be sent to technical training centers in urban areas followed by job placement. Better roads should be constructed in Tanchangya villages in order to increase social mobility, improve market access and open access to governmental services. Lastly, the Tanchangya should enjoy privileged representation in governance; one Union Parishad member should come from the Tanchangya to look after their interests. This is a key reform as the Union Parishad is the door to all government services and social security provisions.

Conclusion

The role and value of forest resources in supporting the livelihoods of the poor has been widely recognized. Tanchangya people depend upon forests for shelter and land, and forests serve as safety nets during lean periods. The Tanchangya are involved in forest conversion because of a lack of other livelihood alternatives. They have remained on the periphery in terms of government support systems and rural power structures, and this has created a state of perpetual marginality. The attitude and practice of educated people (with at least eight years of schooling) are compatible with forest conservation. The participation of Tanchangya people cannot be ensured merely through the development of awareness. Both long term efforts towards empowerment (i.e., updating forest villagers' certificates, forest village mapping, participatory forestry in core areas, NTFP restoration in core areas, privileged representation in local government) and short term efforts to solve key livelihood issues (i.e., establishment of governmental primary schools, water conservation, agricultural and vocational training, supplying of fertilizer) are required.

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Appendix 1
[Plants used by Tanchangya Baidhya from natural forests]

LOCAL NAME	SCIENTIFIC NAME	FAMILY	USES
Apeng	Achyranthes aspera L.	Amaranthaceae	Jauindice, dog and fox bite
Agnichita	Plumbago indica L.	Plumbaginaceae	Anaemia, menustration irregular, skin disease, leuchorrhoea
Bon holud	Cucuma aromatica	Zingiberaceae	Snake bite, tonic, carminative, Blood purifier
Baggach	Lee macrophylla Roxb.	Leeaceae	Boils, arthrities
Bombaraja	Rauwolfia serpentine Benth.	Apocynaceae	Snakebite, headache
Bon methi	Sida acuta Burm.	Malvaceae	Fever, chronic dysentery, intestinal worm, gonorrhoea
Chita	Plumbago zeylanica L.	Plumbaginaceae	Leucorrhoea, jaundice, menstrual problem
Dadmordon	Cassia alata L	Leguminosae	Skin disease
Gila lata	Derris trifoliate Lour.	Papilionaceae	Stomach disorder,
Harjora	Vitex quadrangularis Wall	Vitaceae	Orthopedic disorder
Kamranga	Averrhoa carambola L	Oxalidaceae	Cough, fever
Kala holud	Kaempferia parviflora Wall ex. Baker	Zingiberaceae	Diarrhoea, vomiting

LOCAL NAME	SCIENTIFIC NAME	FAMILY	USES
Langio	Cynoglossum Lancelatum Forssk.	Boraginaceae	Bowl syndrom
Moragphul	Celosia cristata L.	Amarantaceae	Body swalling(dropsy), allergy
Menmuni	Centella asitica L.	Hydrocotylaveae	Blood dysentry
Mainshak	Gelonium multiflorum	Euphorbiaceae	Boils
Misridana	Scoparia dulcis	Schorphulariaceae	Stomach pain
Penchi	Annona muricata Linn	Annonaceae	Pain relief
Rakta chita	Plumbago rosea L.	Plumbaginaceae	Eye infection, skin diseases, paralysis, abortion, leprosy, indigestion
Sapangeys	Antidesma ghaesembilla Garten	Euphorbiaceae	Madness
Simakrakhi	Helmintostcheys zelynica L.	Ophyglossaceae	Jauindice
Veg	Clerodendrum viscosum L.	Vervenaceae	Round worm , indigestion, vomiting